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STRUCTURAL ANALYSIS & DESIGN
FOR
PROPOSED G+4 & S+5 STORIED RESIDENTIAL BUILDING PROJECT AT ASHIANA NEMILI,CHENNAI.

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DESIGN BASIS REPORT
OF
STRUCTURAL ANALYSIS & DESIGN
FOR
PROPOSED G+4 & S+5 STORIED (TOWER – 6 & 7) RESIDENTIAL BUILDING PROJECT
AT ASHIANA NEMILI,CHENNAI.

A. FOREWORD:

This report contains the Design parameters involved in Structural Analysis and Design for TOWER – 6 & 7 of the proposed G+4 & S+5 storied residential building project at Ashiana Nemili, Chennai.

The intent of this document is to identify and record all the pertinent input requirements, analysis & design criteria for structural design of the building. It is aimed at formulating the basis of the structural analysis, design & detailing work that the Structural Engineer is planning for delivering the structural scheme of the building. The scheme will be compatible with the architectural theme, satisfy the functional needs, at the same time confirming to the Indian Standards and other applicable building norms to achieve safe, stable, strong and yet optimally economic structure.

The parameters adopted in this report are going to be the basis of the structural design calculations.

This report covers the minimum design requirement to establish the unified design basis that will form the overall design philosophy to be adopted in the structural design of the proposed building.

The design will aim to achieve

a) Structural and functional integrity of the building.

b) Desirable Structural performance under characteristic service design loads.

c) Resistance to loads due to natural phenomena i.e. earthquakes, winds.

d) Structural durability & maintainability of the building.

B. PROJECT DESCRIPTION

Project : Analysis & Design of Residential Complex of TOWER – 6 & 7.

Location : Ashiana Nemili ,Chennai.

1. Description of the Site

The general topography of site is plain.

2. Detail Description of Buildings:

The proposed G+4 and S+5 storied residential buildings are located at Ashiana Nemili ,Chennai.

MAINAK MAJUMDAR
Structural Engineer Grade-II (SE)
Reg. No. CGLDIST/SE/Gr-II/2023/04/004

The height of different floors is as follows:

- FOR TOWER no - 6.

  Stilt floor - 3.4 m.

  1st floor - 2.95 m

  2nd Floor to roof - 2.95 m.

- FOR TOWER no - 7.

  Stilt floor - 3.4 m.

  1st floor - 2.95 m

  2nd Floor to roof - 2.95 m.

C. MATERIALS OF CONSTRUCTION:

The buildings are predominantly RCC framed structures.

Concrete of Grade M25 for RCC structure of Building will be used.

High yield strength deformed bars conforming to IS 1786 of grade Fe 500 will be used.

D. LOADS

Loading and Other Design Considerations

Loading for the design of building will be as per IS: 875 - 1987.

1.Dead Loads:

Self-weight of the structural members will be considered on the basis of the following properties--:

1.	Density of reinforced concrete	2.50	T/m3
2.	Density of plain concrete	2.40	T/m3
3.	Density of steel	7.85	T/m3
4.	Density of floor plasters	2.10	T/m3
5.	Density of floor finishes	2.40	T/m3
6.	Density of soil	1.80	T/m3
7.	Density of Clay Brick	2.00	T/m3

Self-weight of RCC elements will be as per the sizes mentioned in the respective drawings.

The structural loading shall be in accordance with IS 875 Part 1.

It will be derived by the software based on density and size assigned to respective member.

The super imposed dead load due to floor finish, services; filling etc. is applied as uniformly distributed load over the slab.

Wall Loads shall be applied on beams as line loads. In case, walls are directly supported by slabs, then the slabs will be designed for equivalent UDL.

2. Imposed Loads:

The structural loading shall be in accordance with IS 875 Part 2.

All areas except corridor, stair, etc.	:	0.2 T/m2
Corridor, stair, lobby balconies etc.	:	0.3 T/m2
Lift Machine Room	:	0.5 T/m2
Roof (accessible)	:	0.15 T/m2
Roof (inaccessible)	:	0.075 T/m2

3. Wind Load:

The wind loads will be taken as per IS:875-2015 Part 3. Wind loads and seismic forces are not considered to act simultaneously. The value of wind load is worked out based upon IS:875 (Part 3) – 2015, which is as follows:

Wind velocity at any height, $V_z = V_b K_1 K_2 K_3 K_4$

Where,

V_b = Basic wind velocity (from Fig.1 of the code for the project site)

Vb = 50 m/s

K_1 = 1 (Table 1 of the code, design life = 50 years)

K_2 = From Table 2 of the code, for terrain category-3, assuming Class B structure
1.0

K_3 = 1.0 (Clause 6.3.3 of the code)

K_4 = 1.0 (Clause 6.34 of the code)

➢ **FOR TOWER no - 6.**

Width of the building = 22.45 m
Length of the building = 36.32 m
Height of Building up to roof = 18.15 m

H/W =18.15/22.45=0.81 &
L/W = 36.32/22.45 = 1.62

θ = 0° Windward = 0.7
Leeward = 0.3

θ = 90° Windward = 0.7
Leeward = 0.1

➢ **FOR TOWER no - 7.**

Width of the building = 18.7 m
Length of the building = 53.4 m
Height of Building up to roof = 18.15 m

H/W =18.15/18.7=0.971 &
L/W = 53.4/18.7 =2.86

θ = 0° Windward = 0.7
Leeward = 0.3

θ = 90° Windward = 0.7
Leeward = 0.1

Wind pressure, $P_z = 0.6 V_z^2$.

Off shore wind velocity factor will be considered as per the codal provision. The buildings will be designed for appropriate force co-efficient as per IS: 875 (Part-3):2015.

4. Seismic Load:

As per Cl.19.4 of IS 456: 2000, the earthquake forces shall be calculated in accordance with IS 1893 – 2016 (Part I).

The proposed Hospital is located in Zone III with Z = 0.16.

The seismic load calculations will be carried out in accordance with IS: 1893:2016.

RCC Detailing shall be carried out as per IS 13920: 2016.

The design horizontal seismic co-efficient (Ah) shall be determined by the following method

$$A_h = \frac{Z\ I\ Sa}{2\ R\ g}$$

Where,

Z	Zone Factor For (Zone III)	0.16
I	Importance Factor	1
R	Response Reduction Factor (SMRF)	5.0

Medium stiff soil will be considered as per soil report and Damping 5%.

Sa/g = 2.5 for 0<T<0.55
=1.36/ T for 0.55< T <4.00
=0.34 T> 4.00

➢ **FOR TOWER no – 6 & 7.**

Height of Building up to roof = 18.15 m

WITHOUT BRICK INFILL:

TIME PERIOD: (As per clause 7.6.2 of IS 1893 (Part 1):2016)

$Tx = Ty = 0.075\ H^{0.75}$

$= 0.075\ X1815^{0.75}$ Sec

=0.66 Sec

Design seismic base shear $V_B = Ah * W$

W = Seismic weight of building from Analysis (Live load used in calculations of Seismic Weights will be 50% for live load greater than 3 kN/m^2 and 25% for live load less than & equal to 3 kN/m^2.)

E. PROPOSED APPROACH TO STRUCTURAL ANALYSIS:

The buildings are predominantly R.C.C framed structures. The lateral force resisting system shall be RCC special moment resisting frames. After preliminary sizing of various structural members, a computer model of the structural frame of each of the buildings will be generated for carrying out analysis for the effects of vertical and lateral load that are likely to be imposed on the structure.

The building structure will be analyzed using the ETABS and SAFE software for the following computer models of the building.

Space frame analysis (Static) of the entire structure - for dead, live, seismic and wind loads

ETABS has been thoroughly tested, validated and recognized internationally by several organizations and is well suited for the analysis of building systems.

Geometrical dimensions, member properties and member-node connectivity, including eccentricities will be modelled in the analysis problem. Variation in material grades, if present, will also be considered. The seismic loads will be derived from the results of Equivalent Static analysis and Dynamic analysis of the structure in accordance with the code IS 1893 – 2016 and relevant code of practice. The permissible values of the load factors and stresses will be utilized within the purview of the Indian Standards.

F. ANALYSIS METHOD ADOPTED FOR MODELLING USING ETABS:

- Geometry shall be developed for building as per final and approved GA drawings.

- Vertical members will be connected from floor to floor to assemble space frame.
- Preliminary sectional properties will be assigned to all the structural elements.
- All columns and shear-walls will be treated as fixed at the foundation level.
- The floor slabs will be modelled as shell.
- Appropriate torsion / moment releases will be given wherever required.
- Appropriate grades of concrete as mentioned earlier will be assigned.
- Gravity loads (Dead load and Live load) will be applied to all the respective areas as per the location and occupancy.
- Allowances in terms of Live-Load reductions as per number of floors shall be duly considered strictly in accordance with the codes.
- Seismic analysis will be carried out procedures mentioned in IS -1893(Part-1):2016
- Wind load analysis will be carried out using procedures mentioned in IS: 875 (Part-3):2015.
- The computer analysis will evaluate individual internal member forces, reactions at foundation level and deflection pattern of the entire structure and in the individual members.
- This data will then be used to verify adequacy of the member sizes and after further iterations arrive at the appropriate reinforcement design of the structural members.

G. LOAD COMBINATIONS:

The results obtained from the computer analysis in the form of member forces and reactions will be used for design the structural members. Following load combinations of the member forces will be considered for arriving at the design forces.

While making load combinations, some points are followed such as:

a) The wind and seismic loads are considered to act on the structure separately and not simultaneously.
b) Whenever Live load is combined with seismic load, appropriate part of live load is considered as per IS:1893 (Part-1):2016 for evaluating earthquake effect and combined load effect used in such combination.

The following load cases shall be considered as per IS.

Type	Load Case	Combinations
Primary	1	Dead Load (DL)
Primary	2	Live Load 1 (LL)
Primary	3	Wind Load X(+)
Primary	4	Wind Load X(-)
Primary	5	Wind Load Y (+)
Primary	6	Wind Load Y (-)
Primary	7	Seismic load along X - EL (X)
Primary	8	Seismic load along Y - EL (Y)
Primary	9	Spec X
Primary	10	Spec Y

The following load combinations shall be considered as per IS.

Load Combination	Limit State of Collapse		
	DL	LL	WL/EL
DL + LL	1.5	1.5	—
DL + WL	1.5 or 0.9*	—	±1.5
DL+LL+WL	1.2	1.2	±1.2
DL + EL	1.5 or 0.9*	—	±1.5
DL+LL+EL	1.2	1.2	±1.2

(where, DL - Dead Load, LL-Live Load, WL - Wind Load, EL - Earthquake Load).

1. General Design Procedure

For the design of R.C.C. elements, the Limit State Method will be used as per IS 456-2000. Materials of construction will be predominantly concrete with consideration for strength and durability. The grade of concrete for Foundation is taken as M25.The grade of concrete for Columns is M25 up to roof. All beams and slabs are of M25.

High Yield Strength Deformed bars conforming to IS: 1786 of grade Fe 500 will be used.

Ductile detailing norms will be adopted in accordance with IS: 13920:2016.

2. Nominal Cover to Reinforcement:

Covers to reinforcement will be in accordance with IS 456:2000 corresponding to moderate exposure and to satisfy fire rating of 2 hours accordance with National Building Code of India – SP –7 (part IV). Only fire escape staircase area is required to have a fire rating of 4 hours as per.

Element	COVER
Foundation	75 mm
Columns	40 mm
Beams	30 mm
SLABS	30 mm

3. Design of Structural Elements

4.1 Design Of Slabs:

Slabs will be designed using Tailor made excel sheets.

4.2 Design Of Beams:

Beams will be designed for the results of critical load combination. The condensed results will be obtained in a particular format using the established excel sheets. The design procedure will take into account all the member forces like axial, shear, torsion and bending.

4.3 Design Of Walls/Columns:

Column will be designed for bi-axial bending for the forces of critical load combination. The designs will be made using computer software as per the guide lines of IS: 456-2000 and IS-13920 adopting limit state method.

3.4 Design Of Foundation:

As per soil investigation report, ISOLATED FOOTING is adopted.

Design of foundation will be done using Tailor made excel sheets as attached in Annexure-1.

H. LIST OF DESIGN CODES :

1. For Loads Other Than Earthquake Loads:

IS Code	Description
IS 875(Part 1): 1987	Dead Loads - Unit Weight of Building Material and Stored Material.
IS 875(Part 2): 1987	Imposed Loads.
IS 875(Part 3): 2015	Wind Loads.
IS 875(Part 5): 1987	Special Loads and Combinations.

2. For Earthquake Loads:

IS Code	Description
IS 1893 (Part 1): 2016	Criteria for earthquake resistance design of structures.
IS 13920: 2016	Ductile Detailing of Reinforced Concrete Structures.

3. For Design Of Concrete Elements:

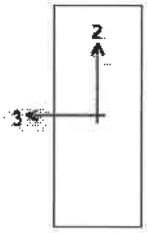
IS Code	Description
IS 456: 2000	Code of practice For Plain and Reinforced Concrete.
SP 16 : 1980	Structural Design Charts For Reinforced Concrete Elements.
SP 7(Part IV)	National Building Code of India
IS 1786 : 2008	Specification for high strength deformed bars and wires.

4. For Fire Safety Designs:

IS Code	Description
IS 1642 : 1989	Fire Safety Building Materials
SP 7 (Part II)	National Building Code of India

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
GROUNDFL	B365	404	B200X500M25	1.5DL+1.5LL	3.6	3.6	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{cl} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.03	0.03

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
-0.3764	2.61E-05	0.7927	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
-0.3764	0.0001	0	-0.3764

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-0.3764		2	0	1.814E-01	2
Bottom (-2 Axis)		0	1	0	0	1

Shear Force and Reinforcement for Shear, V_{u2} & T_u

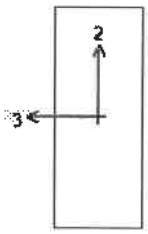
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
0.7927	3.3836	3.8341	1.2735	0.2

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{u2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
2.61E-05	0.7927	0.16	0.46	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
1ST FL	B71	1812	B200X500M25	1.5DL-1.5SLX	0	3.2	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.03	0.03

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
-8.2293	0.0001	7.1859	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
-8.2293	0.0002	0	-8.2294

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-8.2294		4	0	4	2
Bottom (-2 Axis)		0	2	0	0	2

Shear Force and Reinforcement for Shear, V_{u2} & T_u

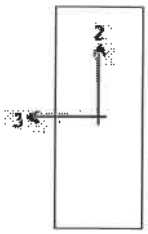
Shear V_s tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
9.7384	0	9.739	5.7149	0.6

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
0.0001	7.1859	0.16	0.46	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
1ST FL	B365	1946	B200X500M25	1.5DL+1.5LL	3.6	3.6	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.03	0.03

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
-0.224	0.0001	0.6617	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
-0.224	0.0001	0	-0.2241

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-0.2241		2	0	1.077E-01	2
Bottom (-2 Axis)		0	1	0	0	1

Shear Force and Reinforcement for Shear, V_{u2} & T_u

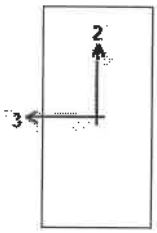
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
0.6617	3.3836	3.8341	1.2735	0.2

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
0.0001	0.6617	0.16	0.46	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
1ST FL	B144	99	B250X500M25	1.5DL+1.5SLX	3.6	3.6	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.25	0.5	0.25	0	0.03	0.03

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
-7.8632	0.0001	7.1163	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
-7.8632	0.0001	0	-7.8633

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-7.8633		4	0	4	3
Bottom (-2 Axis)		0	2	0	0	2

Shear Force and Reinforcement for Shear, V_{u2} & T_u

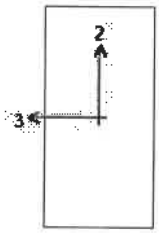
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
9.2641	0	9.2645	5.3458	0.5

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
0.0001	7.1163	0.21	0.46	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
3RD FL	B144	64	B250X500M25	1.5DL+1.5SLX	3.6	3.6	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.25	0.5	0.25	0	0.03	0.03

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
-6.7464	3.09E-05	6.5438	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
-6.7464	0.0001	0	-6.7465

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-6.7465		3	0	3	3
Bottom (-2 Axis)		0	2	0	0	2

Shear Force and Reinforcement for Shear, V_{u2} & T_u

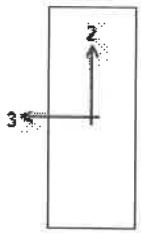
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
8.8108	0	8.811	4.8899	0.5

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
3.09E-05	6.5438	0.21	0.46	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
3RD FL	B36	929	B200X500M25	1.5DL+1.5LL	3.45	3.45	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.03	0.03

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
-2.4436	0.0004	3.5153	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
-2.4436	0.0008	0	-2.4444

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-2.4444		2	0	1	2
Bottom (-2 Axis)		0	1	0	0	1

Shear Force and Reinforcement for Shear, V_{u2} & T_u

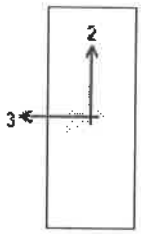
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
3.5153	3.3836	3.8341	3.6914	0.2

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{sv1}/s mm²/mm
0.0004	3.5153	0.16	0.46	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
3RD FL	B214	916	B200X500M25	1.5DL+1.5SLY	4	4	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.03	0.03

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
-5.0608	0.0001	4.6035	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
-5.0608	0.0002	0	-5.061

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-5.061		3	0	3	2
Bottom (-2 Axis)		0	1	0	0	1

Shear Force and Reinforcement for Shear, V_{u2} & T_u

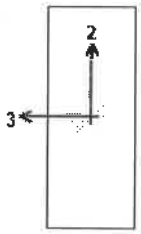
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
6.6446	0	6.6456	2.6284	0.4

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
0.0001	4.6035	0.16	0.46	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
2ND FL	B63	1602	B200X500M25	1.5DL+1.5SLX	2.85	2.85	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.03	0.03

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
-7.0093	4.453E-05	6.59	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
-7.0093	0.0001	0	-7.0093

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-7.0093		4	0	4	2
Bottom (-2 Axis)		0	2	0	0	2

Shear Force and Reinforcement for Shear, V_{u2} & T_u

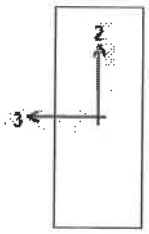
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
8.5972	0	8.5976	5.7757	0.5

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
4.453E-05	6.59	0.16	0.46	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
2ND FL	B23	1559	B200X500M25	1.5DL+1.5LL	4.9125	5.4	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.03	0.03

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
0.062	4.626E-05	0.0302	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
0.062	0.0001	0.0621	0

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	0		1	0	0	1
Bottom (-2 Axis)		0.0621	2	2.982E-02	0	2

Shear Force and Reinforcement for Shear, V_{u2} & T_u

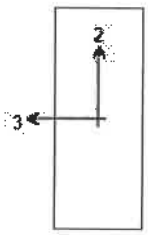
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
0.0302	3.3836	3.8341	2.3584	0.2

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{u2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
4.626E-05	0.0302	0.16	0.46	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
5TH FL	B133	610	B200X500M25	1.5DL+1.5LL	4.15	4.15	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.03	0.03

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
0	0.0001	0.7932	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
0	0.0002	0.0002	-0.0002

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-0.0002		2	0	1.073E-04	2
Bottom (-2 Axis)		0.0002	2	1.073E-04	0	2

Shear Force and Reinforcement for Shear, V_{u2} & T_u

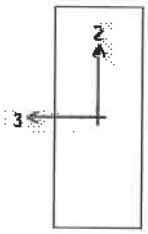
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
0.7932	3.3836	3.8341	3.0688	0.2

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
0.0001	0.7932	0.16	0.46	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
5TH FL	B20	47	B200X500M25	1.5DL+1.5SLY	1.2	4.2	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.03	0.03

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
4.6279	1.104E-05	3.6272	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
4.6279	2.272E-05	4.6279	0

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	0		1	0	0	1
Bottom (-2 Axis)		4.6279	2	2	0	2

Shear Force and Reinforcement for Shear, V_{u2} & T_u

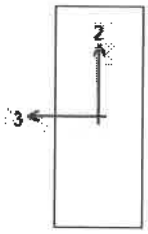
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
5.132	0	5.1321	3.0322	0.3

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
1.104E-05	3.6272	0.16	0.46	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
4THFL	B71	2017	B200X500M25	1.5DL-1.5SLX	0	3.2	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.03	0.03

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
-6.5546	0.0001	6.434	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
-6.5546	0.0001	0	-6.5547

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-6.5547		3	0	3	2
Bottom (-2 Axis)		0	2	0	0	2

Shear Force and Reinforcement for Shear, V_{u2} & T_u

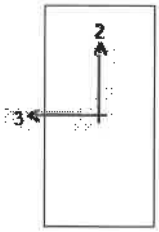
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
9.3046	0	9.305	4.9332	0.5

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
0.0001	6.434	0.16	0.46	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
4THFL	B360	2147	B250X500M25	1.5DL+1.5LL	2.2	2.2	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.25	0.5	0.25	0	0.03	0.03

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
0.0244	0.0001	0.3218	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
0.0244	0.0002	0.0246	0

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	0		1	0	0	1
Bottom (-2 Axis)		0.0246	3	1.182E-02	0	3

Shear Force and Reinforcement for Shear, V_{u2} & T_u

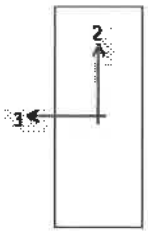
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
0.3218	4.2295	4.7927	7.236	0.3

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
0.0001	0.3218	0.21	0.46	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
4THFL	B52	2001	B200X500M25	1.5DL+1.5LL	3.45	3.45	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.03	0.03

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
-0.7795	0.0001	1.7443	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
-0.7795	0.0001	0	-0.7797

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-0.7797		2	0	3.772E-01	2
Bottom (-2 Axis)		0	1	0	0	1

Shear Force and Reinforcement for Shear, V_{u2} & T_u

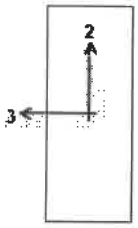
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
1.7443	3.3836	3.8341	3.6914	0.2

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
0.0001	1.7443	0.16	0.46	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
GROUND FL	B70	131	B200X500M25	1.5DL-1.5SPECY	1.45	1.55	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.05	0.05

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
5.1088	0.0026	9.0584	0.2571

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
5.1088	0.0053	5.114	-5.7097

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-5.7097		3	0	3	2
Bottom (-2 Axis)		5.114	3	3	0	2

Shear Force and Reinforcement for Shear, V_{u2} & T_u

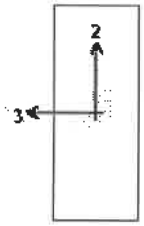
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
10.3839	0	10.4102	8.6801	0.6

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
0.0033	9.0584	0.12	0.42	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
GROUND FL	B66	1568	B200X500M25	1.5DL+1.5LL	3.43	3.43	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.05	0.05

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
-0.4788	3.18E-05	0.7094	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
-0.4788	0.0001	0	-0.4788

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-0.4788		2	0	2.413E-01	2
Bottom (-2 Axis)		0	1	0	0	1

Shear Force and Reinforcement for Shear, V_{u2} & T_u

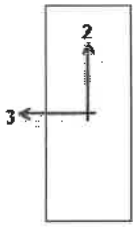
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
0.7094	3.2396	3.671	3.4037	0.2

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{u2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{sv1}/s mm²/mm
3.18E-05	0.7094	0.12	0.42	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
GROUND FL	B31	1632	B200X500M25	1.5DL-1.5SPECY	3.13	3.13	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.05	0.05

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
1.8203	0.003	5.8624	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
1.8203	0.0063	1.8266	-5.2938

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-5.2938		3	0	3	2
Bottom (-2 Axis)		1.8266	2	1	0	2

Shear Force and Reinforcement for Shear, V_{u2} & T_u

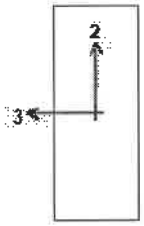
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
7.9056	0	7.9299	4.2867	0.5

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{sv1}/s mm²/mm
0.0006	5.8624	0.12	0.42	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
1ST FL	B168	1371	B200X500M25	1.5DL+1.5LL	3.65	3.65	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.05	0.05

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
0	0.0078	1.0327	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
0	0.0161	0.0161	-0.0161

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-0.0161		2	0	8.047E-03	2
Bottom (-2 Axis)		0.0161	2	8.047E-03	0	2

Shear Force and Reinforcement for Shear, V_{u2} & T_u

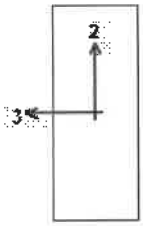
Shear V_s tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
1.0327	3.2396	3.671	3.1985	0.2

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
0.0078	1.0327	0.12	0.42	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
1ST FL	B512	1432	B200X500M25	1.5DL+1.5LL	3.275	3.275	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.05	0.05

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
0	0.0009	2.6681	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
0	0.0019	0.0019	-0.0019

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-0.0019		2	0	9.669E-04	2
Bottom (-2 Axis)		0.0019	2	9.669E-04	0	2

Shear Force and Reinforcement for Shear, V_{u2} & T_u

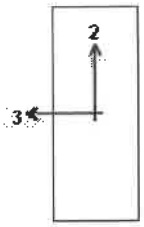
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
2.6681	3.2396	3.671	3.5648	0.2

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{u2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
0.0009	2.6681	0.12	0.42	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
1ST FL	B52	1391	B200X500M25	1.5DL-1.5SPECY	3	3.15	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.05	0.05

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
0.3854	0.0004	4.1382	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
0.3854	0.0009	0.3863	-4.25

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-4.25		2	0	2	2
Bottom (-2 Axis)		0.3863	2	1.945E-01	0	2

Shear Force and Reinforcement for Shear, V_{u2} & T_u

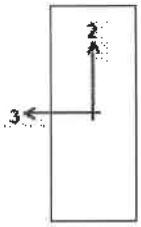
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
6.6446	0	6.6481	3.9643	0.4

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
1.209E-05	4.1382	0.12	0.42	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
3RD FL	B520	731	B200X500M25	1.5DL-1.5SLX	0	3.275	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.05	0.05

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
-4.1979	0.0005	3.8377	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
-4.1979	0.0009	0	-4.1988

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-4.1988		2	0	2	2
Bottom (-2 Axis)		0	1	0	0	1

Shear Force and Reinforcement for Shear, V_{u2} & T_u

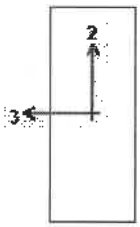
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
6.0382	0	6.0419	3.6087	0.4

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
0.0005	3.8377	0.12	0.42	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
3RD FL	B59	668	B200X500M25	1.5DL+1.5LL	3.275	3.275	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{cl} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.05	0.05

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
-1.9763	0.0023	3.8822	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
-1.9763	0.0047	0	-1.981

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-1.981		2	0	1	2
Bottom (-2 Axis)		0	1	0	0	1

Shear Force and Reinforcement for Shear, V_{u2} & T_u

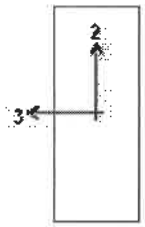
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
3.8822	3.2396	3.671	3.5648	0.2

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
0.0023	3.8822	0.12	0.42	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
4TH FL	B346	1504	B200X500M25	1.5DL+1.5LL	3.275	3.275	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.05	0.05

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
-0.7875	0.0014	2.1045	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
-0.7875	0.003	0	-0.7905

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-0.7905		2	0	3.998E-01	2
Bottom (-2 Axis)		0	1	0	0	1

Shear Force and Reinforcement for Shear, V_{u2} & T_u

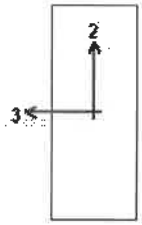
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
2.1045	3.2396	3.671	3.5648	0.2

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
0.0014	2.1045	0.12	0.42	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
4TH FL	B64	821	B200X500M25	1.5DL-1.5SLX	0	3.25	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.05	0.05

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
-6.3212	0.0002	5.8548	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
-6.3212	0.0004	0	-6.3217

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-6.3217		3	0	3	2
Bottom (-2 Axis)		0	2	0	0	2

Shear Force and Reinforcement for Shear, V_{u2} & T_u

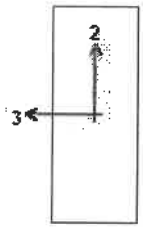
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
8.6707	0	8.6724	4.5955	0.5

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{u2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
0.0002	5.8548	0.12	0.42	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
4TH FL	B392	1588	B200X500M25	1.5DL+1.5LL	3.275	3.275	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.05	0.05

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
-1.0615	0.0005	2.3116	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
-1.0615	0.001	0	-1.0625

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	-1.0625		2	0	1	2
Bottom (-2 Axis)		0	1	0	0	1

Shear Force and Reinforcement for Shear, V_{u2} & T_u

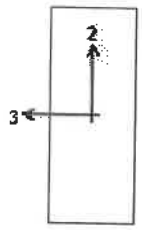
Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
2.3116	3.2396	3.671	3.5648	0.2

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
0.0005	2.3116	0.12	0.42	0

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
5TH FL	B12	1037	B200X500M25	1.5DL+1.5LL	3.65	3.65	1	Ductile Frame

Section Properties

b (m)	h (m)	b_f (m)	d_s (m)	d_{ct} (m)	d_{cb} (m)
0.2	0.5	0.2	0	0.05	0.05

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} tonf-m	Factored T_u tonf-m	Factored V_{u2} tonf	Factored P_u tonf
1.5397	0.008	0.2758	0

Design Moments, M_{u3} & M_t

Factored Moment tonf-m	Factored M_t tonf-m	Positive Moment tonf-m	Negative Moment tonf-m
1.5397	0.0165	1.5562	0

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment tonf-m	Design +Moment tonf-m	-Moment Rebar cm²	+Moment Rebar cm²	Minimum Rebar cm²	Required Rebar cm²
Top (+2 Axis)	0		1	0	0	1
Bottom (-2 Axis)		1.5562	2	1	0	2

Shear Force and Reinforcement for Shear, V_{u2} & T_u

Shear V_e tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
0.2758	3.2396	3.671	3.1985	0.2

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u tonf-m	V_u tonf	Core b_1 m	Core d_1 m	Rebar A_{svt}/s mm²/mm
0.008	0.2758	0.12	0.42	0

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
3RD FL	P1	0	21.85	0.8	0.2	0.94

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	0	21.45	0	22.25	0.8	0.2
Bottom	Leg 1	0	21.45	0	22.25	0.8	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	5	0.0031	0.0025	1.5DL-1.5SPECX	46.9115	-4.2641	-2.1522	1600
Bottom	4	0.0025	0.0025	1.5DL+1.5LL	60.201	1.9533	1.2715	1600

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL-1.5SPECY	46.3259	2.9896	3.2397	5.1309	16.9064
Bottom	Leg 1	0.5	1.5DL-1.5SPECY	48.1302	4.1522	3.2397	5.1251	16.9006

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0.2	1.5DL+1.5SLY	59.6951	-4.9945	607.21	509.86
Top–Right	Leg 1	0	1.5DL+1.5SPECY	58.8962	2.9896	508.24	509.86
Bottom–Left	Leg 1	0	1.5DL+1.5SPECY	60.7006	-1.7203	460.02	509.86
Botttom–Right	Leg 1	0.2	1.5DL+1.5SLY	61.4994	4.2868	585.31	509.86

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
2ND FL	P11	0	17.25	0.8	0.2	0.888

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	0	16.85	0	17.65	0.8	0.2
Bottom	Leg 1	0	16.85	0	17.65	0.8	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	4	0.0025	0.0025	1.5DL+1.5LL	70.0693	-1.7226	4.0545	1600
Bottom	4	0.0025	0.0025	1.5DL+1.5LL	71.8737	1.7618	-4.3071	1600

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL-1.5SPECY	57.5695	7.5326	-4.7873	5.3879	17.1634
Bottom	Leg 1	0.5	1.5DL-1.5SPECY	59.3738	-0.6756	-4.7873	5.4382	17.2137

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0	1.5DL+1.5SPECY	68.3823	-0.5671	453.97	509.86
Top–Right	Leg 1	0.2	1.5DL-1.5SLX	74.6413	2.9358	604.12	509.86
Bottom–Left	Leg 1	0.2	1.5DL-1.5SLX	76.4457	-3.0664	621.52	509.86
Botttom–Right	Leg 1	0	1.2DL+1.2LL+1.2SLX	0	0	0	0

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
3RD FL	P45	0	5.05	0.8	0.2	0.956

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	0	4.65	0	5.45	0.8	0.2
Bottom	Leg 1	0	4.65	0	5.45	0.8	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	4	0.0025	0.0025	1.5DL+1.5LL	58.5714	-1.1714	-3.9729	1600
Bottom	4	0.0025	0.0025	1.5DL+1.5LL	60.3758	1.2075	3.8652	1600

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL-1.5SPECY	49.3469	0.507	4.4478	5.159	16.9345
Bottom	Leg 1	0.5	1.5DL-1.5SPECY	51.1513	5.9093	4.4478	5.2092	16.9847

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0.2	1.5DL-1.5SLX	61.8001	-3.2687	539.47	509.86
Top–Right	Leg 1	0	1.5DL+1.5SPECY	56.0536	0.507	374.1	509.86
Bottom–Left	Leg 1	0	1.2DL+1.2LL+1.2SLX	0	0	0	0
Botttom–Right	Leg 1	0.2	1.5DL-1.5SLX	63.6045	3.2045	547.74	509.86

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
2ND FL	P40	0	0.45	0.8	0.2	0.877

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	0	0.05	0	0.85	0.8	0.2
Bottom	Leg 1	0	0.05	0	0.85	0.8	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	6	0.0037	0.0025	1.5DL-1.5SPECX	78.4652	5.0566	2.5553	1600
Bottom	6	0.0039	0.0025	1.5DL-1.5SPECX	80.2696	5.0959	-2.6141	1600

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL-1.5SPECY	62.3865	5.7655	-3.6252	5.963	17.7385
Bottom	Leg 1	0.5	1.5DL-1.5SPECY	64.1908	2.0593	-3.6252	6.147	17.9225

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0.2	1.5DL+1.5SPECY	80.5583	-3.2113	654.02	509.86
Top–Right	Leg 1	0.2	1.5DL-1.5SLY	81.2973	4.9534	740.3	509.86
Bottom–Left	Leg 1	0.2	1.5DL-1.5SLY	83.1016	-4.8925	748.72	509.86
Botttom–Right	Leg 1	0.2	1.5DL+1.5SPECY	82.3626	2.0593	611.3	509.86

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
3RD FL	P46	2.2	5.85	0.8	0.2	0.868

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	2.2	5.45	2.2	6.25	0.8	0.2
Bottom	Leg 1	2.2	5.45	2.2	6.25	0.8	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	4	0.0025	0.0025	1.5DL+1.5LL	72.2705	-1.4454	0.2364	1600
Bottom	4	0.0025	0.0025	1.5DL+1.5LL	74.0748	1.4815	-0.2311	1600

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL-1.5SPECY	62.0233	4.1447	-2.3414	5.5119	17.2874
Bottom	Leg 1	0.5	1.5DL-1.5SPECY	63.8277	2.0708	-2.3414	5.5621	17.3377

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0.2	1.5DL+1.5SLY	66.8723	-2.9617	556.78	509.86
Top–Right	Leg 1	0.2	1.5DL+1.5SPECY	66.7202	4.1447	611.29	509.86
Bottom–Left	Leg 1	0.2	1.5DL+1.5SPECY	68.5245	-2.8544	562.08	509.86
Botttom–Right	Leg 1	0.2	1.5DL+1.5SLY	68.6766	2.2848	536.33	509.86

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
3RD FL	P46	2.2	5.85	0.8	0.2	0.868

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	2.2	5.45	2.2	6.25	0.8	0.2
Bottom	Leg 1	2.2	5.45	2.2	6.25	0.8	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	4	0.0025	0.0025	1.5DL+1.5LL	72.2705	-1.4454	0.2364	1600
Bottom	4	0.0025	0.0025	1.5DL+1.5LL	74.0748	1.4815	-0.2311	1600

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL-1.5SPECY	62.0233	4.1447	-2.3414	5.5119	17.2874
Bottom	Leg 1	0.5	1.5DL-1.5SPECY	63.8277	2.0708	-2.3414	5.5621	17.3377

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0.2	1.5DL+1.5SLY	66.8723	-2.9617	556.78	509.86
Top–Right	Leg 1	0.2	1.5DL+1.5SPECY	66.7202	4.1447	611.29	509.86
Bottom–Left	Leg 1	0.2	1.5DL+1.5SPECY	68.5245	-2.8544	562.08	509.86
Botttom–Right	Leg 1	0.2	1.5DL+1.5SLY	68.6766	2.2848	536.33	509.86

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
3RD FL	P6	20.8	21.85	0.8	0.2	0.939

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	20.8	21.45	20.8	22.25	0.8	0.2
Bottom	Leg 1	20.8	21.45	20.8	22.25	0.8	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	4	0.0025	0.0025	1.5DL-1.5SPECX	49.6726	-4.268	-1.8674	1600
Bottom	4	0.0025	0.0025	1.5DL+1.5LL	61.4737	1.9343	1.5088	1600

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL+1.5SLY	61.6143	-5.3816	3.4072	5.5005	17.276
Bottom	Leg 1	0.5	1.5DL+1.5SLY	63.4186	4.6697	3.4072	5.5508	17.3263

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0.2	1.5DL+1.5SLY	61.6143	-5.3816	637.35	509.86
Top–Right	Leg 1	0	1.5DL+1.5SPECY	60.5953	2.3362	488.23	509.86
Bottom–Left	Leg 1	0	1.5DL+1.5SPECY	62.3997	-1.2735	449.69	509.86
Botttom–Right	Leg 1	0.2	1.5DL+1.5SLY	63.4186	4.6697	615.26	509.86

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
4THFL	P14	20.8	17.25	0.8	0.2	1

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	20.8	16.85	20.8	17.65	0.8	0.2
Bottom	Leg 1	20.8	16.85	20.8	17.65	0.8	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	4	0.0025	0.0025	1.5DL+1.5LL	47.1115	-1.1423	1.7145	1600
Bottom	4	0.0025	0.0025	1.5DL+1.5LL	48.9159	1.1816	-2.0775	1600

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL-1.5SLY	41.3914	6.5041	-4.0759	4.9375	16.713
Bottom	Leg 1	0.5	1.5DL-1.5SLY	43.1958	-5.5197	-4.0759	4.9878	16.7633

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0	1.5DL+1.5SLY	43.3382	-3.7275	445.59	509.86
Top–Right	Leg 1	0.2	1.5DL+1.5SPECY	43.1374	5.8012	541.54	509.86
Bottom–Left	Leg 1	0.2	1.5DL-1.5SLY	43.1958	-5.5197	528.71	509.86
Botttom–Right	Leg 1	0	1.5DL+1.5SLY	45.1426	2.1176	381.4	509.86

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
4THFL	P50	20.8	5.05	0.8	0.2	1

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	20.8	4.65	20.8	5.45	0.8	0.2
Bottom	Leg 1	20.8	4.65	20.8	5.45	0.8	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	4	0.0025	0.0025	1.5DL+1.5LL	45.7569	-0.9151	-3.1473	1600
Bottom	4	0.0025	0.0025	1.5DL+1.5LL	47.5612	0.9512	3.144	1600

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL+1.5SLY	43.3747	-5.9652	3.5636	4.9927	16.7682
Bottom	Leg 1	0.5	1.5DL+1.5SLY	45.1791	4.5474	3.5636	5.043	16.8185

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0.2	1.5DL+1.5SLY	43.3747	-5.9652	550.71	509.86
Top–Right	Leg 1	0	1.5DL+1.5SPECY	42.995	0.563	295.11	509.86
Bottom–Left	Leg 1	0	1.2DL+1.2LL+1.2SLX	0	0	0	0
Botttom–Right	Leg 1	0	1.5DL-1.5SLX	48.7869	2.1292	404.73	509.86

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
4THFL	P59	20.8	0.45	0.8	0.2	1

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	20.8	0.05	20.8	0.85	0.8	0.2
Bottom	Leg 1	20.8	0.05	20.8	0.85	0.8	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	6	0.0035	0.0025	1.5DL-1.5SLX	45.6527	-4.4463	1.4868	1600
Bottom	4	0.0026	0.0025	1.5DL-1.5SLX	47.4571	4.2307	-1.5455	1600

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL-1.5SLY	46.0672	5.0379	-2.9197	5.3875	17.163
Bottom	Leg 1	0.5	1.5DL-1.5SLY	47.8715	-3.5752	-2.9197	5.1179	16.8934

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0	1.5DL+1.5SPECY	45.3818	-1.9238	373.82	509.86
Top–Right	Leg 1	0.2	1.5DL-1.5SLY	46.0672	5.0379	524.07	509.86
Bottom–Left	Leg 1	0	1.5DL-1.5SLY	47.8715	-3.5752	466.79	509.86
Botttom–Right	Leg 1	0	1.5DL+1.5SPECY	47.1862	0.5033	318.51	509.86

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
3RD FL	P8	28.4	21.85	0.8	0.2	0.776

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	28.4	21.45	28.4	22.25	0.8	0.2
Bottom	Leg 1	28.4	21.45	28.4	22.25	0.8	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	8	0.0049	0.0025	1.5DL-1.5SPECX	73.1711	4.9987	-6.0186	1600
Bottom	8	0.0049	0.0025	1.5DL-1.5SPECX	74.9754	5.038	5.7506	1600

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL-1.5SPECY	63.9893	-0.4853	6.4927	6.8153	18.5908
Bottom	Leg 1	0.5	1.5DL-1.5SPECY	65.7937	8.9393	6.4927	6.8872	18.6627

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0.2	1.5DL+1.5SLY	80.8259	-9.9262	970.45	509.86
Top–Right	Leg 1	0	1.2DL+1.2LL+1.2SLX	0	0	0	0
Bottom–Left	Leg 1	0	1.2DL+1.2LL+1.2SLX	0	0	0	0
Botttom–Right	Leg 1	0.2	1.5DL+1.5SLY	82.6302	9.1472	945.21	509.86

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
4THFL	P15	28.4	17.35	1	0.2	0.969

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_S	Γ_C	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	28.4	16.85	28.4	17.85	1	0.2
Bottom	Leg 1	28.4	16.85	28.4	17.85	1	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	10	0.0049	0.0025	1.5DL+1.5SLX	38.9114	5.5179	1.5266	2000
Bottom	9	0.0047	0.0025	1.5DL-1.5SPECX	40.9487	5.2832	-3.1143	2000

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL-1.5SLY	38.7459	12.5968	-7.9029	7.1284	21.8478
Bottom	Leg 1	0.5	1.5DL-1.5SLY	41.0014	-10.7167	-7.9029	7.0541	21.7734

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0	1.5DL+1.5SPECY	39.0272	-8.8145	459.57	509.86
Top–Right	Leg 1	0.2	1.5DL+1.5SPECY	39.0272	12.4691	569.21	509.86
Bottom–Left	Leg 1	0.2	1.5DL-1.5SLY	41.0014	-10.7167	526.51	509.86
Bottom–Right	Leg 1	0	1.5DL+1.5SPECY	41.2827	6.0858	388.99	509.86

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
5TH FL	P52	28.4	4.95	1	0.2	0.961

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	28.4	4.45	28.4	5.45	1	0.2
Bottom	Leg 1	28.4	4.45	28.4	5.45	1	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	7	0.0036	0.0025	1.5DL+1.5SLX	34.3294	4.298	-3.3584	2000
Bottom	6	0.0029	0.0025	1.5DL+1.5SLX	36.5848	-4.1744	3.2855	2000

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL+1.5SLY	34.0368	-11.3598	6.8938	6.0935	20.8129
Bottom	Leg 1	0.5	1.5DL+1.5SLY	36.2922	8.977	6.8938	5.7419	20.4612

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0.2	1.5DL+1.5SLY	34.0368	-11.3598	510.98	509.86
Top–Right	Leg 1	0	1.5DL+1.5SPECY	34.5823	4.5988	310.88	509.86
Bottom–Left	Leg 1	0	1.5DL+1.5SPECY	36.8377	-1.8879	240.83	509.86
Bottom–Right	Leg 1	0	1.5DL+1.5SPECY	36.8377	8.0612	426.02	509.86

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
4THFL	P61	28.4	0.45	0.8	0.2	0.788

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	28.4	0.05	28.4	0.85	0.8	0.2
Bottom	Leg 1	28.4	0.05	28.4	0.85	0.8	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	5	0.0033	0.0025	1.5DL-1.5SPECX	62.8623	4.3118	5.5659	1600
Bottom	5	0.0032	0.0025	1.5DL-1.5SPECX	64.6667	4.351	-5.4031	1600

Shear Design

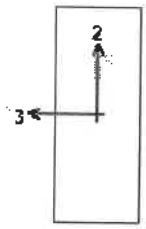
Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL-1.5SLY	68.6319	9.3353	-5.8924	5.877	17.6525
Bottom	Leg 1	0.5	1.5DL-1.5SLY	70.4363	-8.0472	-5.8924	5.8461	17.6216

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0	1.2DL+1.2LL+1.2SLX	0	0	0	0
Top–Right	Leg 1	0.2	1.5DL-1.5SLY	68.6319	9.3353	866.54	509.86
Bottom–Left	Leg 1	0.2	1.5DL-1.5SLY	70.4363	-8.0472	817.44	509.86
Botttom–Right	Leg 1	0	1.2DL+1.2LL+1.2SLX	0	0	0	0

ETABS Concrete Frame Design

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



Column Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
4TH FL	C5	999	CLM300X750M25	1.5DL-1.5SPECX	0	2.95	0.604	Ductile Frame

Section Properties

b (m)	h (m)	dc (m)	Cover (Torsion) (m)
0.3	0.75	0.06	0.03

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Axial Force and Biaxial Moment Design For P_u , M_{u2} , M_{u3}

Design P_u tonf	Design M_{u2} tonf-m	Design M_{u3} tonf-m	Minimum M_2 tonf-m	Minimum M_3 tonf-m	Rebar Area cm²	Rebar % %
76.5711	-5.7203	4.712	1.5314	2.2895	18	0.8

Axial Force and Biaxial Moment Factors

	K Factor Unitless	Length m	Initial Moment tonf-m	Additional Moment tonf-m	Minimum Moment tonf-m
Major Bend(M3)	0.973383	2.45	-2.594	0	2.2895
Minor Bend(M2)	0.770984	2.45	-1.1988	0	1.5314

Shear Design for V_{u2} , V_{u3}

	Shear V_u tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
Major, V_{u2}	4.4028	13.1639	8.4433	1.9788	0.3
Minor, V_{u3}	3.5581	12.298	7.342	3.5581	0.8

Joint Shear Check/Design

	Joint Shear Force tonf	Shear V_{Top} tonf	Shear $V_{u,Tot}$ tonf	Shear V_c tonf	Joint Area m²	Shear Ratio Unitless
Major Shear, V_{u2}	N/N	N/N	N/N	N/N	N/N	N/N
Minor Shear, V_{u3}	N/N	N/N	N/N	N/N	N/N	N/N

(1.4) Beam/Column Capacity Ratio

Major Ratio	Minor Ratio
N/N	N/N

Additional Moment Reduction Factor k (IS 39.7.1.1)

A_g m²	A_{sc} m²	P_{uz} tonf	P_b tonf	P_u tonf	k Unitless
0.225	0.0018	326.9466	113.8494	76.5711	1

Additional Moment (IS 39.7.1)

	Consider M_a	Length Factor	Section Depth (m)	KL/Depth Ratio	KL/Depth Limit	KL/Depth Exceeded	M_a Moment (tonf-m)
Major Bending (M_3)	No	0.831	0.75	3.18	12	No	0
Minor Bending (M_2)	No	0.831	0.3	6.296	12	No	0

Notes:

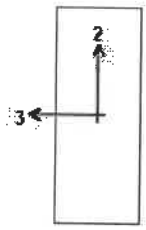
N/A: Not Applicable

N/C: Not Calculated

N/N: Not Needed

ETABS Concrete Frame Design

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



Column Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
4TH FL	C1	1000	CLM300X750M25	1.5DL-1.5SPECX	0	2.95	0.673	Ductile Frame

Section Properties

b (m)	h (m)	dc (m)	Cover (Torsion) (m)
0.3	0.75	0.06	0.03

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Axial Force and Biaxial Moment Design For P_u , M_{u2} , M_{u3}

Design P_u tonf	Design M_{u2} tonf-m	Design M_{u3} tonf-m	Minimum M_2 tonf-m	Minimum M_3 tonf-m	Rebar Area cm²	Rebar % %
58.4618	7.5811	-4.2216	1.1692	1.748	18	0.8

Axial Force and Biaxial Moment Factors

	K Factor Unitless	Length m	Initial Moment tonf-m	Additional Moment tonf-m	Minimum Moment tonf-m
Major Bend(M3)	0.973383	2.45	2.2308	0	1.748
Minor Bend(M2)	0.777848	2.45	0.888	0	1.1692

Shear Design for V_{u2} , V_{u3}

	Shear V_u tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
Major, V_{u2}	5.6926	12.5708	8.4433	1.9788	0.3
Minor, V_{u3}	3.9148	11.744	7.342	3.9148	0.8

Joint Shear Check/Design

	Joint Shear Force tonf	Shear V_{Top} tonf	Shear $V_{u,Tot}$ tonf	Shear V_c tonf	Joint Area m²	Shear Ratio Unitless
Major Shear, V_{u2}	N/N	N/N	N/N	N/N	N/N	N/N
Minor Shear, V_{u3}	N/N	N/N	N/N	N/N	N/N	N/N

(1.4) Beam/Column Capacity Ratio

Major Ratio	Minor Ratio
N/N	N/N

Additional Moment Reduction Factor k (IS 39.7.1.1)

A_g m²	A_{sc} m²	P_{uz} tonf	P_b tonf	P_u tonf	k Unitless
0.225	0.0018	326.9466	113.8494	58.4618	1

Additional Moment (IS 39.7.1)

	Consider M_a	Length Factor	Section Depth (m)	KL/Depth Ratio	KL/Depth Limit	KL/Depth Exceeded	M_a Moment (tonf-m)
Major Bending (M_3)	No	0.831	0.75	3.18	12	No	0
Minor Bending (M_2)	No	0.831	0.3	6.352	12	No	0

Notes:

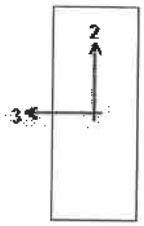
N/A: Not Applicable

N/C: Not Calculated

N/N: Not Needed

ETABS Concrete Frame Design

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



Column Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
3RD FL	C24	790	CLM300X750M25	1.5DL-1.5SPECX	0	2.95	0.544	Ductile Frame

Section Properties

b (m)	h (m)	dc (m)	Cover (Torsion) (m)
0.3	0.75	0.06	0.03

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Axial Force and Biaxial Moment Design For P_u , M_{u2} , M_{u3}

Design P_u tonf	Design M_{u2} tonf-m	Design M_{u3} tonf-m	Minimum M_2 tonf-m	Minimum M_3 tonf-m	Rebar Area cm²	Rebar % %
111.3953	-5.8751	4.8701	2.2279	3.3307	18	0.8

Axial Force and Biaxial Moment Factors

	K Factor Unitless	Length m	Initial Moment tonf-m	Additional Moment tonf-m	Minimum Moment tonf-m
Major Bend(M3)	0.973383	2.45	-2.3703	0	3.3307
Minor Bend(M2)	0.773864	2.45	-1.1557	0	2.2279

Shear Design for V_{u2} , V_{u3}

	Shear V_u tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv} /s mm²/mm
Major, V_{u2}	6.2839	14.4407	8.4433	2.2427	0.3
Minor, V_{u3}	3.9325	13.4909	7.342	3.9325	0.8

Joint Shear Check/Design

	Joint Shear Force tonf	Shear V_{Top} tonf	Shear $V_{u,Tot}$ tonf	Shear V_c tonf	Joint Area m²	Shear Ratio Unitless
Major Shear, V_{u2}	N/N	N/N	N/N	N/N	N/N	N/N
Minor Shear, V_{u3}	N/N	N/N	N/N	N/N	N/N	N/N

(1.4) Beam/Column Capacity Ratio

Major Ratio	Minor Ratio
N/N	N/N

Additional Moment Reduction Factor k (IS 39.7.1.1)

A_g m²	A_{sc} m²	P_{uz} tonf	P_b tonf	P_u tonf	k Unitless
0.225	0.0018	326.9466	113.8494	111.3953	1

Additional Moment (IS 39.7.1)

	Consider M_a	Length Factor	Section Depth (m)	KL/Depth Ratio	KL/Depth Limit	KL/Depth Exceeded	M_a Moment (tonf-m)
Major Bending (M_3)	No	0.831	0.75	3.18	12	No	0
Minor Bending (M_2)	No	0.831	0.3	6.32	12	No	0

Notes:

N/A: Not Applicable

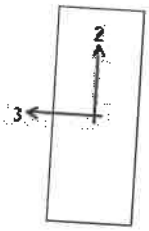
N/C: Not Calculated

N/N: Not Needed

License #*1P5EGPSAYZ89SBP

ETABS Concrete Frame Design

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



Column Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
4TH FL	C3	998	CLM300X750M25	1.5DL-1.5SPECX	0	2.95	0.671	Ductile Frame

Section Properties

b (m)	h (m)	dc (m)	Cover (Torsion) (m)
0.3	0.75	0.06	0.03

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Axial Force and Biaxial Moment Design For P_u , M_{u2} , M_{u3}

Design P_u tonf	Design M_{u2} tonf-m	Design M_{u3} tonf-m	Minimum M_2 tonf-m	Minimum M_3 tonf-m	Rebar Area cm²	Rebar % %
63.5159	5.7495	3.9248	1.2703	1.8991	18	0.8

Axial Force and Biaxial Moment Factors

	K Factor Unitless	Length m	Initial Moment tonf-m	Additional Moment tonf-m	Minimum Moment tonf-m
Major Bend(M3)	0.973383	2.45	-2.1974	0	1.8991
Minor Bend(M2)	0.773864	2.45	0.8802	0	1.2703

Shear Design for V_{u2} , V_{u3}

	Shear V_u tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv} /s mm²/mm
Major, V_{u2}	6.0739	12.5894	8.4433	1.9788	0.3
Minor, V_{u3}	3.7679	11.7613	7.342	3.7679	0.8

Joint Shear Check/Design

	Joint Shear Force tonf	Shear V_{Top} tonf	Shear $V_{u,Tot}$ tonf	Shear V_c tonf	Joint Area m²	Shear Ratio Unitless
Major Shear, V_{u2}	N/N	N/N	N/N	N/N	N/N	N/N
Minor Shear, V_{u3}	N/N	N/N	N/N	N/N	N/N	N/N

(1.4) Beam/Column Capacity Ratio

Major Ratio	Minor Ratio
N/N	N/N

Additional Moment Reduction Factor k (IS 39.7.1.1)

A_g m²	A_{sc} m²	P_{uz} tonf	P_b tonf	P_u tonf	k Unitless
0.225	0.0018	326.9466	113.8494	63.5159	1

Additional Moment (IS 39.7.1)

	Consider M_a	Length Factor	Section Depth (m)	KL/Depth Ratio	KL/Depth Limit	KL/Depth Exceeded	M_a Moment (tonf-m)
Major Bending (M_3)	No	0.831	0.75	3.18	12	No	0
Minor Bending (M_2)	No	0.831	0.3	6.32	12	No	0

Notes:

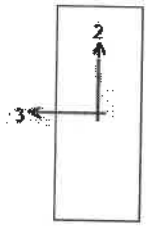
N/A: Not Applicable

N/C: Not Calculated

N/N: Not Needed

ETABS Concrete Frame Design

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



Column Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (m)	LLRF	Type
4TH FL	C6	1002	CLM300X750M25	1.5DL-1.5SPECX	0	2.95	0.673	Ductile Frame

Section Properties

b (m)	h (m)	dc (m)	Cover (Torsion) (m)
0.3	0.75	0.06	0.03

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

γ_c	γ_s
1.5	1.15

Axial Force and Biaxial Moment Design For P_u , M_{u2} , M_{u3}

Design P_u tonf	Design M_{u2} tonf-m	Design M_{u3} tonf-m	Minimum M_2 tonf-m	Minimum M_3 tonf-m	Rebar Area cm²	Rebar % %
58.4952	7.5972	4.3601	1.1699	1.749	18	0.8

Axial Force and Biaxial Moment Factors

	K Factor Unitless	Length m	Initial Moment tonf-m	Additional Moment tonf-m	Minimum Moment tonf-m
Major Bend(M3)	0.973383	2.45	-2.387	0	1.749
Minor Bend(M2)	0.777848	2.45	0.9085	0	1.1699

Shear Design for V_{u2} , V_{u3}

	Shear V_u tonf	Shear V_c tonf	Shear V_s tonf	Shear V_p tonf	Rebar A_{sv}/s mm²/mm
Major, V_{u2}	5.4476	12.5725	8.4433	1.9788	0.3
Minor, V_{u3}	3.9704	11.7456	7.342	3.9704	0.8

Joint Shear Check/Design

	Joint Shear Force tonf	Shear V_{Top} tonf	Shear $V_{u,Tot}$ tonf	Shear V_c tonf	Joint Area m²	Shear Ratio Unitless
Major Shear, V_{u2}	N/N	N/N	N/N	N/N	N/N	N/N
Minor Shear, V_{u3}	N/N	N/N	N/N	N/N	N/N	N/N

(1.4) Beam/Column Capacity Ratio

Major Ratio	Minor Ratio
N/N	N/N

Additional Moment Reduction Factor k (IS 39.7.1.1)

A_g m²	A_{sc} m²	P_{uz} tonf	P_b tonf	P_u tonf	k Unitless
0.225	0.0018	326.9466	113.8494	58.4952	1

Additional Moment (IS 39.7.1)

	Consider M_a	Length Factor	Section Depth (m)	KL/Depth Ratio	KL/Depth Limit	KL/Depth Exceeded	M_a Moment (tonf-m)
Major Bending (M_3)	No	0.831	0.75	3.18	12	No	0
Minor Bending (M_2)	No	0.831	0.3	6.352	12	No	0

Notes:

N/A: Not Applicable

N/C: Not Calculated

N/N: Not Needed

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
4TH FL	P42	0	18.9	0.8	0.2	1

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	0	18.5	0	19.3	0.8	0.2
Bottom	Leg 1	0	18.5	0	19.3	0.8	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	5	0.0029	0.0025	1.5DL-1.5SPECX	29.7556	3.0302	-5.7238	1600
Bottom	5	0.0029	0.0025	1.5DL-1.5SPECX	31.56	3.0695	5.9027	1600

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL-1.5SPECY	32.4505	-1.0867	5.2722	4.6886	16.4641
Bottom	Leg 1	0.5	1.5DL-1.5SPECY	34.2548	7.0884	5.2722	4.7388	16.5143

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0.2	1.5DL+1.5SPECX	38.6985	-5.7238	510.17	509.86
Top–Right	Leg 1	0	1.2DL+1.2LL+1.2SLX	0	0	0	0
Bottom–Left	Leg 1	0	1.2DL+1.2LL+1.2SLX	0	0	0	0
Botttom–Right	Leg 1	0.2	1.5DL-1.5SLX	41.6065	5.4083	513.56	509.86

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
3RD FL	P41	0	12.45	0.8	0.2	0.974

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	0	12.05	0	12.85	0.8	0.2
Bottom	Leg 1	0	12.05	0	12.85	0.8	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	5	0.0034	0.0025	1.5DL-1.5SPECX	52.9372	-3.8545	7.4824	1600
Bottom	4	0.0026	0.0025	1.5DL-1.5SPECX	65.5931	3.9745	-6.8184	1600

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL-1.5SPECY	54.7285	10.5391	-6.4678	5.5741	17.3496
Bottom	Leg 1	0.5	1.5DL-1.5SPECY	56.5329	-3.8966	-6.4678	5.3591	17.1346

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0	1.2DL+1.2LL+1.2SLX	0	0	0	0
Top–Right	Leg 1	0.2	1.5DL-1.5SLX	64.7766	6.6941	718.64	509.86
Bottom–Left	Leg 1	0.2	1.5DL-1.5SLX	66.581	-6.3294	712.82	509.86
Botttom–Right	Leg 1	0	1.2DL+1.2LL+1.2SLX	0	0	0	0

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
4TH FL	P40	0	7.385	0.8	0.2	0.977

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	0	6.985	0	7.785	0.8	0.2
Bottom	Leg 1	0	6.985	0	7.785	0.8	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	4	0.0026	0.0025	1.5DL-1.5SLX	56.1012	-3.8292	-6.4369	1600
Bottom	4	0.0025	0.0025	1.5DL+1.5LL	57.8654	1.9306	6.5722	1600

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL-1.5SPECY	47.4901	-2.0157	5.8415	5.1073	16.8828
Bottom	Leg 1	0.5	1.5DL-1.5SPECY	49.2945	7.4752	5.8415	5.1575	16.933

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0.2	1.5DL-1.5SLX	56.1012	-6.4369	652.36	509.86
Top–Right	Leg 1	0	1.2DL+1.2LL+1.2SLX	0	0	0	0
Bottom–Left	Leg 1	0	1.2DL+1.2LL+1.2SLX	0	0	0	0
Botttom–Right	Leg 1	0.2	1.5DL-1.5SLX	57.9056	6.3432	659.25	509.86

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
3RD FL	P39	0	1.2	0.8	0.2	0.919

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	0	0.8	0	1.6	0.8	0.2
Bottom	Leg 1	0	0.8	0	1.6	0.8	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	7	0.0044	0.0025	1.5DL-1.5SPECX	50.8988	4.2849	6.4029	1600
Bottom	7	0.0043	0.0025	1.5DL-1.5SPECX	70.5159	4.7117	-6.0062	1600

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL-1.5SPECY	56.0011	9.1744	-5.6184	6.2518	18.0273
Bottom	Leg 1	0.5	1.5DL-1.5SPECY	57.8054	-2.5168	-5.6184	6.2352	18.0107

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0	1.2DL+1.2LL+1.2SLX	0	0	0	0
Top–Right	Leg 1	0.2	1.5DL-1.5SLX	70.9419	4.4898	653.84	509.86
Bottom–Left	Leg 1	0.2	1.5DL-1.5SLX	72.7462	-4.3591	659	509.86
Bottom–Right	Leg 1	0	1.2DL+1.2LL+1.2SLX	0	0	0	0

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
4TH FL	P37	3.65	11.915	0.8	0.2	1

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	3.65	11.515	3.65	12.315	0.8	0.2
Bottom	Leg 1	3.65	11.515	3.65	12.315	0.8	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	5	0.0031	0.0025	1.5DL+1.5SLX	36.7365	3.6561	3.7332	1600
Bottom	4	0.0025	0.0025	1.5DL+1.5LL	46.8703	-1.331	-3.7815	1600

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL-1.5SPECY	38.3053	7.4515	-4.3723	4.93	16.7055
Bottom	Leg 1	0.5	1.5DL-1.5SPECY	40.1097	-0.9843	-4.3723	4.9018	16.6773

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0	1.5DL+1.5SPECY	40.3219	-1.1792	307.29	509.86
Top–Right	Leg 1	0.2	1.5DL+1.5SPECY	40.3219	7.4515	601.3	509.86
Bottom–Left	Leg 1	0.2	1.5DL+1.5SPECY	42.1263	-5.6091	526.21	509.86
Botttom–Right	Leg 1	0	1.2DL+1.2LL+1.2SLX	0	0	0	0

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
4TH FL	P36	3.65	7.77	0.8	0.2	0.923

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	3.65	7.37	3.65	8.17	0.8	0.2
Bottom	Leg 1	3.65	7.37	3.65	8.17	0.8	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	4	0.0025	0.0025	1.5DL+1.5LL	58.1684	1.1634	-2.399	1600
Bottom	4	0.0025	0.0025	1.5DL+1.5LL	59.9728	-1.1995	2.3587	1600

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL-1.5SPECY	48.5197	3.046	3.9506	5.136	16.9115
Bottom	Leg 1	0.5	1.5DL-1.5SPECY	50.3241	4.7351	3.9506	5.1862	16.9617

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0.2	1.5DL+1.5SLY	54.4308	-6.3652	638.56	509.86
Top–Right	Leg 1	0	1.5DL+1.5SPECY	54.4272	3.046	482.95	509.86
Bottom–Left	Leg 1	0	1.5DL+1.5SPECY	56.2316	-0.7999	388.94	509.86
Botttom–Right	Leg 1	0.2	1.5DL+1.5SLY	56.2352	4.7131	572.4	509.86

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
3RD FL	P15	15.1	18	1	0.2	0.823

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	15.1	17.5	15.1	18.5	1	0.2
Bottom	Leg 1	15.1	17.5	15.1	18.5	1	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	5	0.0025	0.0025	1.5DL+1.5LL	80.3733	1.9359	-3.0032	2000
Bottom	5	0.0025	0.0025	1.5DL+1.5LL	82.6288	-1.985	2.4915	2000

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL-1.5SPECY	44.8372	8.5181	8.1963	5.9798	20.6991
Bottom	Leg 1	0.5	1.5DL-1.5SPECY	47.0927	10.8123	8.1963	6.0425	20.7619

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0.2	1.5DL+1.5SLY	92.595	-12.4477	836.4	509.86
Top–Right	Leg 1	0.2	1.5DL+1.5SPECY	91.5915	8.5181	713.5	509.86
Bottom–Left	Leg 1	0.2	1.5DL+1.5SPECY	93.8469	-6.6635	669.14	509.86
Botttom–Right	Leg 1	0.2	1.5DL+1.5SLY	94.8504	11.0362	805.34	509.86

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
5TH FL	P24	15.1	13.97	0.8	0.2	1

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	15.1	13.57	15.1	14.37	0.8	0.2
Bottom	Leg 1	15.1	13.57	15.1	14.37	0.8	0.2

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	4	0.0027	0.0025	1.5DL-1.5SPECX	29.4705	2.8674	6.3236	1600
Bottom	4	0.0025	0.0025	1.5DL+1.5LL	38.644	-0.803	-3.6527	1600

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.5	1.5DL-1.5SLY	31.0914	12.2483	-7.7801	4.6508	16.4263
Bottom	Leg 1	0.5	1.5DL-1.5SLY	32.8957	-10.7029	-7.7801	4.701	16.4765

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0	1.5DL+1.5SPECY	35.2353	-3.4608	382.45	509.86
Top–Right	Leg 1	0.2	1.5DL+1.5SPECY	35.2353	11.5025	759.4	509.86
Bottom–Left	Leg 1	0.2	1.5DL+1.5SPECY	37.0397	-9.836	692.56	509.86
Botttom–Right	Leg 1	0	1.5DL+1.5SPECY	37.0397	3.3952	390.65	509.86

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
5TH FL	P20	15.1	7.3	1	0.25	0.799

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	15.1	6.8	15.1	7.8	1	0.25
Bottom	Leg 1	15.1	6.8	15.1	7.8	1	0.25

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	6	0.0025	0.0031	1.5DL+1.5LL	91.6065	1.8321	6.7912	2500
Bottom	6	0.0025	0.0031	1.5DL+1.5LL	94.4258	-1.8885	-4.3309	2500

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.6	1.5DL-1.5SLY	79.9069	19.4711	-11.1009	8.139	26.5382
Bottom	Leg 1	0.6	1.5DL-1.5SLY	82.7262	-13.2767	-11.1009	8.2175	26.6167

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0.25	1.5DL+1.5SPECY	82.3179	-8.4866	532.95	509.86
Top–Right	Leg 1	0.25	1.5DL+1.5SPECY	82.3179	18.9399	783.83	509.86
Bottom–Left	Leg 1	0.25	1.5DL+1.5SPECY	85.1372	-12.1621	632.44	509.86
Botttom–Right	Leg 1	0.25	1.5DL+1.5SLY	84.7938	7.3013	514.41	509.86

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (m)	Centroid Y (m)	Length (m)	Thickness (m)	LLRF
ROOF	P18	15.1	2.95	0.8	0.25	1

Material Properties

E_c (tonf/m²)	f_{ck} (tonf/m²)	Lt.Wt Factor (Unitless)	f_y (tonf/m²)	f_{ys} (tonf/m²)
2549291	2549.29	1	50985.81	42318.22

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 m	Left Y_1 m	Right X_2 m	Right Y_2 m	Length m	Thickness m
Top	Leg 1	15.1	2.55	15.1	3.35	0.8	0.25
Bottom	Leg 1	15.1	2.55	15.1	3.35	0.8	0.25

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (cm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u tonf	M_{u2} tonf-m	M_{u3} tonf-m	Pier A_g cm²
Top	5	0.0025	0.0031	1.5DL+1.5LL	54.9956	1.6958	-4.1348	2000
Bottom	5	0.0025	0.0031	1.5DL+1.5LL	57.2511	-1.753	4.7008	2000

Shear Design

Station Location	ID	Rebar mm²/mm	Shear Combo	P_u tonf	M_u tonf-m	V_u tonf	V_c tonf	$V_c + V_s$ tonf
Top	Leg 1	0.6	1.5DL+1.5SLY	45.8697	-6.4447	4.2958	6.0085	20.7279
Bottom	Leg 1	0.6	1.5DL+1.5SLY	48.1252	6.2278	4.2958	6.0713	20.7907

Boundary Element Check

Station Location	ID	Edge Length (m)	Governing Combo	P_u tonf	M_u tonf-m	Stress Comp tonf/m²	Stress Limit tonf/m²
Top–Left	Leg 1	0	1.5DL-1.5SLY	55.5137	-0.5861	299.55	509.86
Top–Right	Leg 1	0	1.2DL+1.2LL+1.2SLX	0	0	0	0
Bottom–Left	Leg 1	0	1.2DL+1.2LL+1.2SLX	0	0	0	0
Botttom–Right	Leg 1	0.25	1.5DL+1.5SPECY	57.2094	6.06	513.3	509.86

SLAB MARKING	S1	
CONCRETE (Fck)=	25	Mpa
STEEL (fy)	600	Mpa
xumax/d=	0.4560	
Mulim/bd^2=	3.3256	
50Xfck/fy=	2.5	
SLAB DEPTH=	150	mm
CLEAR COVER=	20	mm

REQUIRED DEPTH=	80.272	mm
EFFECTIVE DEPTH (d)=	130	mm
DEAD LOAD (DL)=	0.375	T/m^2
LIVE LOAD (LL)=	0.200	T/m^2
FLOOR FINISH and FILLING LOAD=	0.125	T/m^2
Total LOAD=	0.700	T/m^2

S1 Step 1 Slab dimensions

Clear LENGTH (Ly)=	6.85	m
Clear WIDTH(Lx)=	3.65	m
EFFECTIVE LENGTH=	6.200	m
EFFECTIVE WIDTH=	3.800	m
SPAN TO DEPTH RATIO=	25.333	

Step 2

$\left(\frac{l_y}{l_x}\right)$ 1.63

Step 3 Edge condition

	Type	4	TWO ADJACENT EDGE DISCONTINOUS

Step 5 Reinforcement

	Coefficients	Ultimate moments	4.6Mu/fckbd^2	p_t (%)	A_{st} (mm^2)	Spacing Provided	BAR DIA(mm)
	0.080	1.208	0.132	0.17	221.3	125	8
MIDSPAN	0.060	0.904	0.098	0.13	164.1	125	8
Long span							
SUPPORT	0.047	0.713	0.078	0.12	156.0	150	8
MIDSPAN	0.035	0.531	0.058	0.12	156.0	150	8

CHECK FOR SERVICABILITY

SHORT SPAN

	pt Provided	f_s	Modification factor	depth required	
SUPPORT	0.268	159.6	2.00	96.00	OKAY
MIDSPAN	0.268	118.4	2.00	96.00	OKAY
LONG SPAN					
SUPPORT	0.223	135.0	2.00	144.00	OKAY
MIDSPAN	0.223	135.0	2.00	144.00	OKAY

SLAB MARKING	S2	
CONCRETE (Fck)=	25	Mpa
STEEL (f_y)	500	Mpa
xumax/d=	0.4560	
Mulim/bd^2=	3.3256	
50XFck/fy=	2.5	
SLAB DEPTH=	135	mm
CLEAR COVER=	20	mm

REQUIRED DEPTH=	68.796	mm
EFFECTIVE DEPTH (d)=	115	mm
DEAD LOAD (DL)=	0.338	T/m^2
LIVE LOAD (L)=	0.200	T/m^2
FLOOR FINISH and FILLING LOAD=	0.125	T/m^2
Total LOAD=	0.663	T/m^2

S1 **Step 1** **Slab dimensions**

Clear LENGTH (Ly)=	4.3	m
Clear WIDTH(Lx)=	3.45	m
EFFECTIVE LENGTH=	4.435	m
EFFECTIVE WIDTH=	3.585	m
SPAN TO DEPTH RATIO=	26.556	

Step 2

$\left(\frac{l_y}{l_x}\right)$ 1.24

Step 3 **Edge condition**

	Type	4	TWO ADJACENT EDGE DISCONTINOUS

Step 5 **Reinforcement**

	Coefficients	Ultimate moments	$4.6Mu/fckbd^2$	p_t (%)	A_{st} (mm^2)	Spacing Provided	BAR DIA(mm)
	0.062	0.792	0.110	0.14	163.0	125	8
MIDSPAN	0.047	0.595	0.083	0.12	138.0	125	8
Long span							
SUPPORT	0.047	0.600	0.084	0.12	138.0	175	8
MIDSPAN	0.035	0.447	0.062	0.12	138.0	175	8

CHECK FOR SERVICABILITY

SHORT SPAN

	pt Provided	f_s	Modification factor	depth required	
SUPPORT	0.298	117.5	2.00	91.70	OKAY
MIDSPAN	0.298	99.5	2.00	91.70	OKAY
LONG SPAN					
SUPPORT	0.213	139.3	2.00	108.70	OKAY
MIDSPAN	0.213	139.3	2.00	108.70	OKAY

DESIGN OF ISOLATED FOOTING (F-1)

Foundation Marked :

Foundation Size : 2700 2100 0500 / 250

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation under column :

Column load on Foundation = 84 T

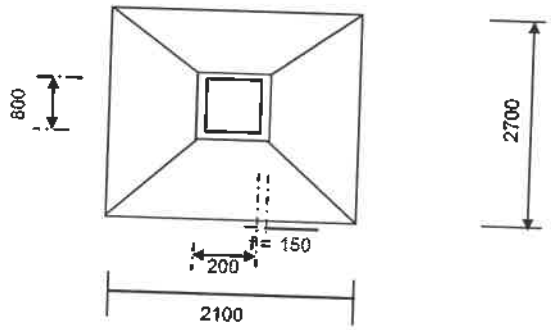
s/w of footing = 0

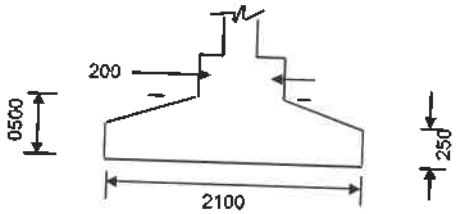
Total = 84 T

SBC of Soil= 15.0 T/m2

Area Reqd = 5.600 5.60 m^2

Provided Area = 5.67 m^2





CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 0.800 m **O.K.**

Moment at the face of column = (15 X 0.8^2)/2 4.80 T-m/m run

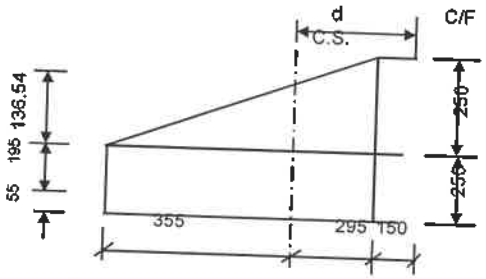
Effective depth of footing = 0500 - 50 - 5 = 445 mm.

Mu/bd^2 = 0.36 $N/mm.^2$

Required area of steel = 5.34 cm^2

Provide 12 Tor @ 150c/c = **7.54 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 445 mm

Depth of critical section = 305.94 mm 389.0625

Shear at critical section = 5.33 T/m run

Shear stress at critical sectic τ_v = 0.26 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.25

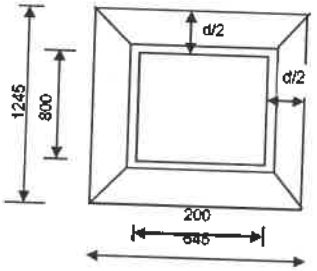
*(From Table 61, SP-16:1980)

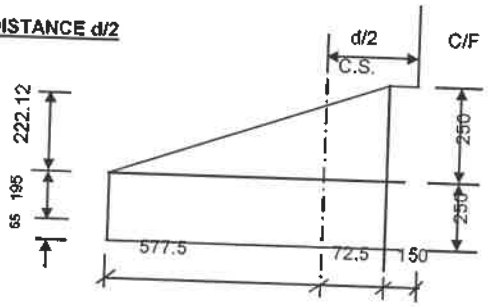
For pt = 0.25 τ_c = 0.36 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 3780 mm

Critical Depth = 416.12 mm

Shear at critical section = 84.00 T/m run

Shear stress at critical section τ_v = 0.80 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress K_s τ = 0.9375

Where, $K_s = (0.5 + \beta_c) \not< 1$

β_c = short side of the col / long side of the col = 0.25 → K_s = 0.75

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 → τ_c = 1.25

$\tau_v < K_s \tau$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-2)

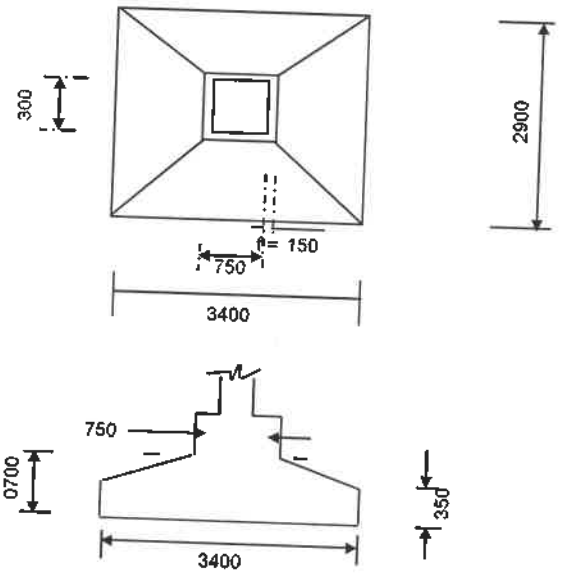
Foundation Marked :

Foundation Size : 2900 3400 0700 / 350

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation under column :

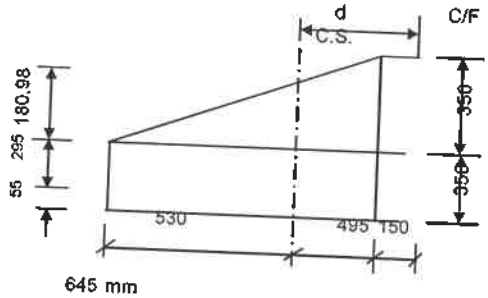
Column load on Foundation =	140	T	
s/w of footing =	0		
Total =	140	T	SBC of Soil= 15.0 T/m2
Area Reqd =	9.333	9.33	m^2
Provided Area =	9.86	m^2	



CHECK AGAINST MOMENT

Net Bearing Pressure =	15.00 T/m^2		
Max Cantilever length =	1.175 m		O.K.
Moment at the face of column =	(15 X 1.175^2)/2	10.35 T-m/m run	
Effective depth of footing =	0700 - 50 - 5 =	645 mm.	
	Mu/bd^2 =	0.37 $N/mm.^2$	
	Required area of steel =	7.74 cm^2	
Provide	12 Tor @ 125c/c =	**9.05 cm2**	(BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 645 mm

Depth of critical section = 452.87 mm 542.1276596

Shear at critical section = 7.95 T/m run

Shear stress at critical secti τ_{v} = 0.26 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.20

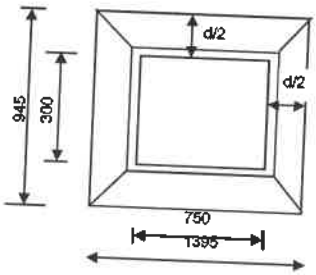
*(From Table 61, SP-16:1980)

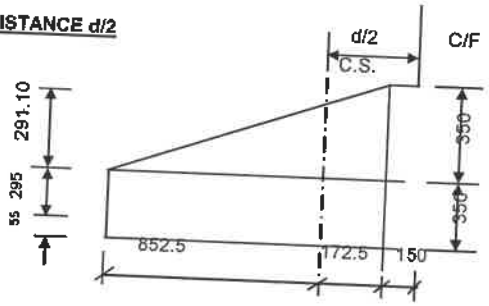
For pt = 0.20 τ_c = 0.33 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 4680 mm

Critical Depth = 585.10 mm

Shear at critical section = 140.00 T/m run

Shear stress at critical section τ_{v} = 0.77 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 1.125

Where, $K_s = (0.5 + \beta) \not< 1$

β_c = short side of the col / long side of the col = 0.4 → K_s = 0.9

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 → τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-3)

Foundation Marked :

Foundation Size : 3000 2300 0500 / 250

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation under column :

Column load on Foundation = 98 T

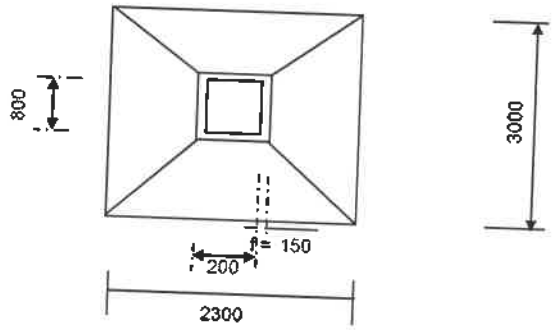
s/w of footing = 0

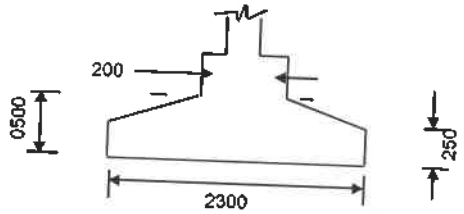
Total = 98 T

SBC of Soil= 15.0 T/m2

Area Reqd = 6.533 6.53 m^2

Provided Area = 6.9 m^2





CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 0.900 m **O.K.**

Moment at the face of column = (15 X 0.9^2)/2 6.08 T-m/m run

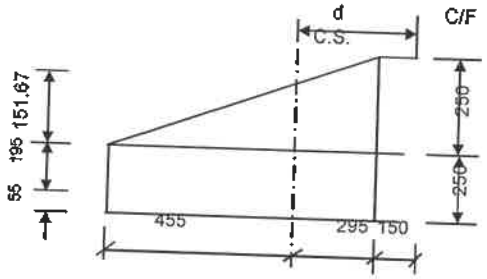
Effective depth of footing = 0500 - 50 - 5 = 445 mm.

Mu/bd^2 = 0.46 $N/mm.^2$

Required area of steel = 5.34 cm^2

Provide 12 Tor @ 150c/c = **7.54 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 445 mm

Depth of critical section = 321.39 mm 373.6111111

Shear at critical section = 6.83 T/m run

Shear stress at critical sectio τ_v = 0.32 N/mm^2/m width

Percentage of steel provided, pt_{prov} = 0.23

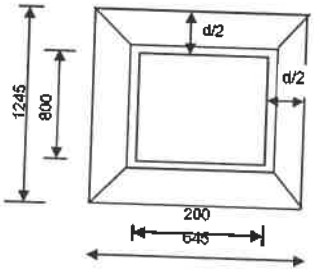
*(From Table 61, SP-16:1980)

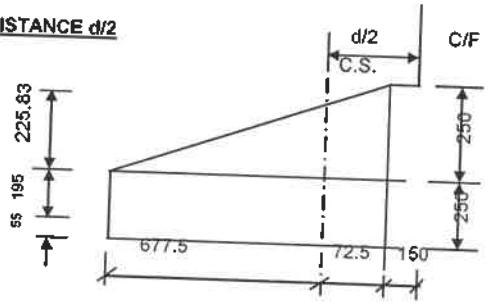
For pt = 0.23 τ_c = 0.35 N/mm^2/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 3780 mm

Critical Depth = 419.83 mm

Shear at critical section = 98.00 T/m run

Shear stress at critical section τ_v = 0.93 N/mm^2/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 0.9375

Where, $K_s = (0.5 + \beta_c) \not< 1$

β_c = short side of the col / long side of the col = 0.25 } K_s = 0.75

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 } τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-4)

Foundation Marked :

Foundation Size : 2600 2000 0500 / 250

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation under column :

Column load on Foundation = 78 T

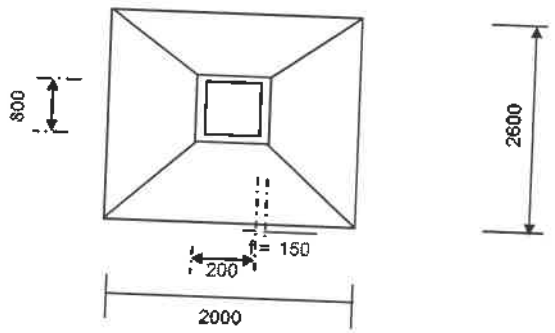
s/w of footing = 0

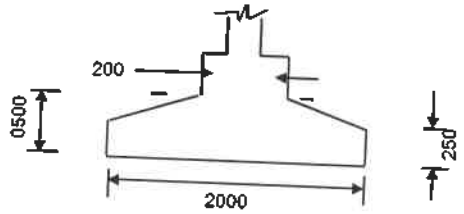
Total = 78 T

SBC of Soil= 15.0 T/m2

Area Reqd = 5.200 5.20 m^2

Provided Area = 5.2 m^2





CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 0.750 m **O.K.**

Moment at the face of column = (15 X 0.75^2)/2 4.22 T-m/m run

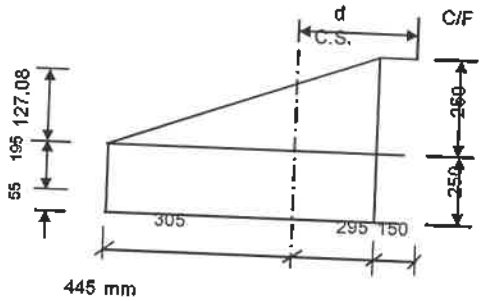
Effective depth of footing = 0500 - 50 - 5 = 445 mm.

Mu/bd^2 = 0.32 $N/mm.^2$

Required area of steel = 5.34 cm^2

Provide 12 Tor @ 150c/c = **7.54 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 445 mm

Depth of critical section = 296.67 mm 398.3333333

Shear at critical section = 4.58 T/m run

Shear stress at critical secti τ_v = 0.23 N/mm^2/m width

Percentage of steel provided, pt_{prov} = 0.25

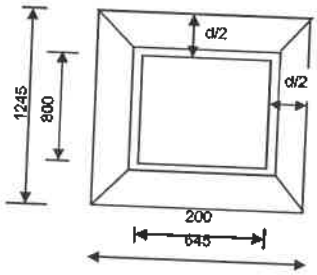
*(From Table 61, SP-16:1980)

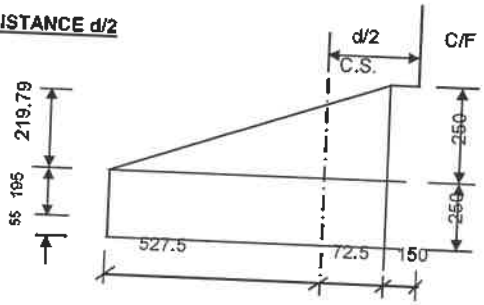
For pt = 0.25 τ_c = 0.36 N/mm^2/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 3780 mm

Critical Depth = 413.79 mm

Shear at critical section = 78.00 T/m run

Shear stress at critical section τ_v = 0.75 N/mm^2/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 0.9375

Where, $K_s = (0.5 + \beta_c) \not< 1$

β_c = short side of the col / long side of the col = 0.25 } K_s = 0.75

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 } τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-5)

Foundation Marked :

Foundation Size : 2700 2000 0500 / 250

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation under column :

Column load on Foundation = 80 T

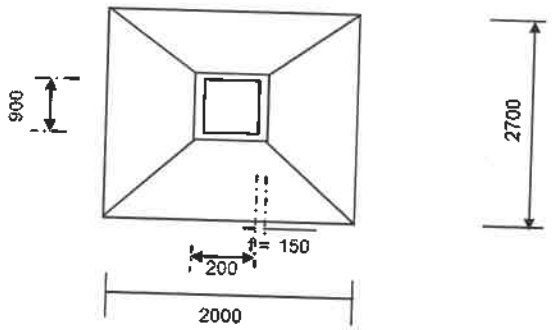
s/w of footing = 0

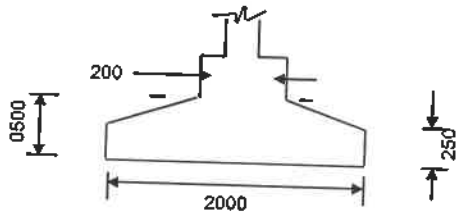
Total = 80 T

SBC of Soil= 15.0 T/m2

Area Reqd = 5.333 5.33 m^2

Provided Area = 5.4 m^2





CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 0.750 m **O.K.**

Moment at the face of column = (15 X 0.75^2)/2 4.22 T-m/m run

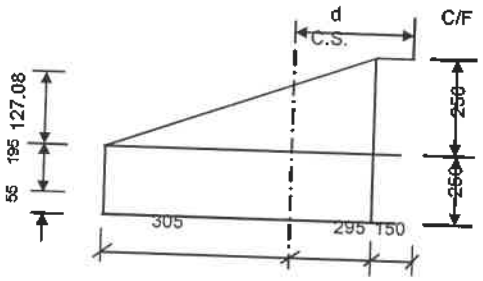
Effective depth of footing = 0500 - 50 - 5 = 445 mm.

Mu/bd^2 = 0.32 $N/mm.^2$

Required area of steel = 5.34 cm^2

Provide 12 Tor @ 150c/c = **7.54 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 445 mm

Depth of critical section = 296.67 mm 398.3333333

Shear at critical section = 4.58 T/m run

Shear stress at critical secti τ_v = 0.23 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.25

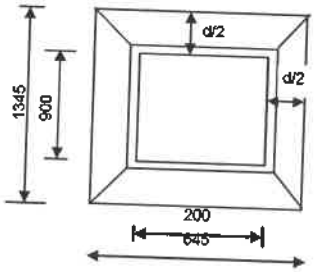
*(From Table 61, SP-16:1980)

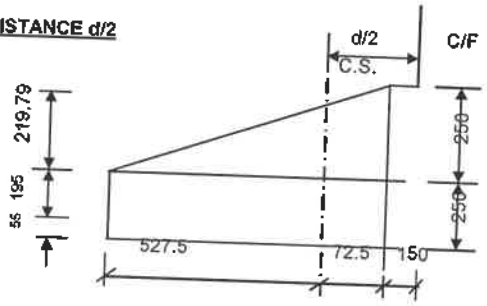
For pt = 0.25 τ_c = 0.36 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 3980 mm

Critical Depth = 413.79 mm

Shear at critical section = 80.00 T/m run

Shear stress at critical section τ_v = 0.73 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 0.902778

Where, $K_s = (0.5 + \beta_c) \not> 1$

β_c = short side of the col / long side of the col = 0.22222 } K_s = 0.722222222

τ_c = $0.25\sqrt{f_{ck}}$ = 1.25 } τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-6)

Foundation Marked :

Foundation Size : 2600 1900 0500 / 250

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation under column :

Column load on Foundation = 72 T

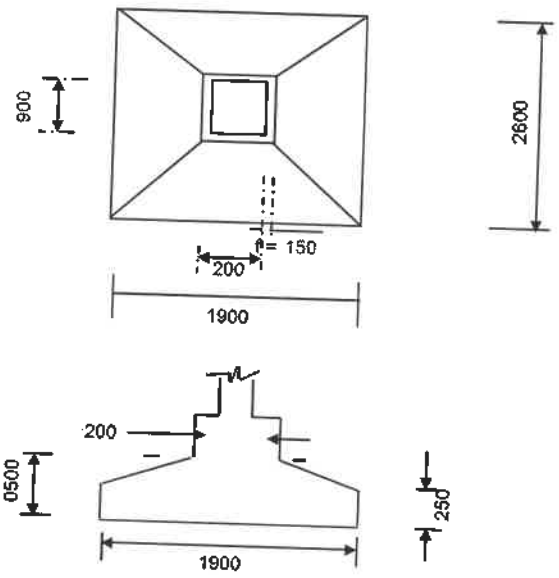
s/w of footing = 0

Total = 72 T

SBC of Soil= 15.0 T/m2

Area Reqd = 4.800 4.80 m^2

Provided Area = 4.94 m^2



CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 0.700 m **O.K.**

Moment at the face of column = (15 X 0.7^2)/2 3.68 T-m/m run

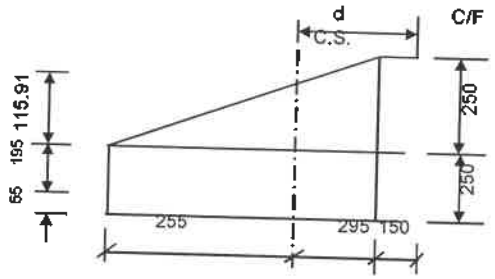
Effective depth of footing = 0500 - 50 - 5 = 445 mm.

Mu/bd^2 = 0.28 $N/mm.^2$

Required area of steel = 5.34 cm^2

Provide 12 Tor @ 150c/c = **7.54 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 445 mm

Depth of critical section = 286.07 mm 408.9285714

Shear at critical section = 3.63 T/m run

Shear stress at critical sectic τ_v = 0.20 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.26

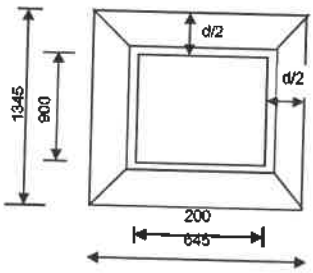
*(From Table 61, SP-16:1980)

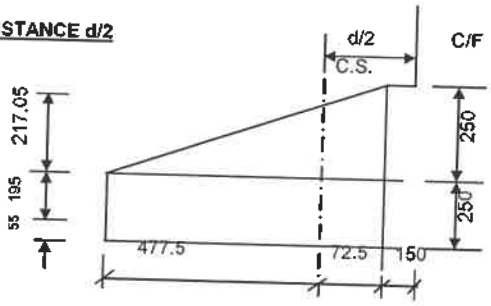
For pt = 0.26 τ_c = 0.37 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 3980 mm

Critical Depth = 411.05 mm

Shear at critical section = 72.00 T/m run

Shear stress at critical section τ_v = 0.66 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 0.902778

Where, $K_s = (0.5 + \beta) \neq 1$

βc = short side of the col / long side of the col = 0.22222 } K_s = 0.722222222

τ_c = $0.25\sqrt{f_{ck}}$ = 1.25 } τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

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DESIGN OF ISOLATED FOOTING (F-7)

Foundation Marked :

Foundation Size : 3300 2800 0700 / 350

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation under column :

Column load on Foundation = 136 T

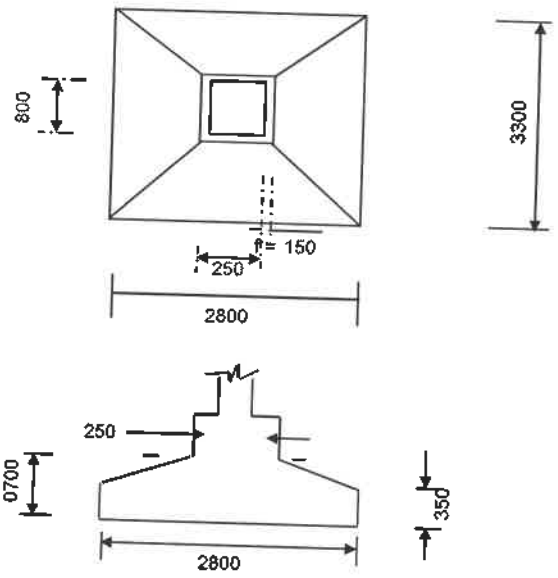
s/w of footing = 0

Total = 136 T

SBC of Soil= 15.0 T/m2

Area Reqd = 9.067 9.07 m^2

Provided Area = 9.24 m^2



CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 1.125 m O.K.

Moment at the face of column = (15 X 1.125^2)/2 9.49 T-m/m run

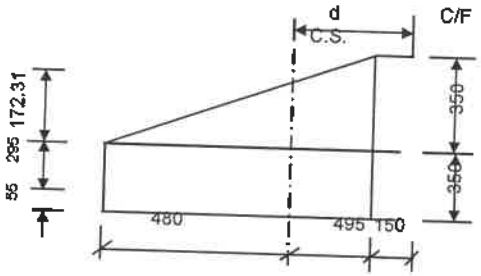
Effective depth of footing = 0700 - 50 - 5 = 645 mm.

Mu/bd^2 = 0.34 $N/mm.^2$

Required area of steel = 7.74 cm^2

Provide 12 Tor @ 125c/c = **9.05 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 645 mm

Depth of critical section = 444.33 mm 550.6666667

Shear at critical section = 7.20 T/m run

Shear stress at critical sectic τ_v = 0.24 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.20

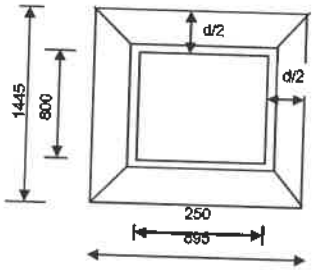
*(From Table 61, SP-16:1980)

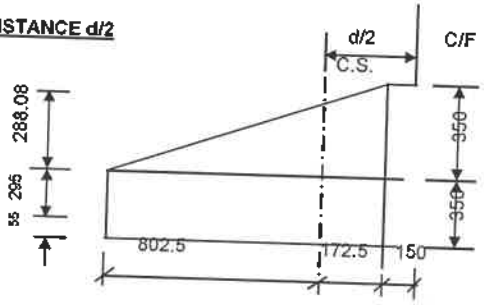
For pt = 0.20 τ_c = 0.33 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 4680 mm

Critical Depth = 582.08 mm

Shear at critical section = 136.00 T/m run

Shear stress at critical section τ_v = 0.75 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 1.015625

Where, $K_s = (0.5 + \beta_c) \not< 1$

β_c = short side of the col / long side of the col = 0.3125 → K_s = 0.8125

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 → τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-8)

Foundation Marked :

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation Size : 3000 2500 0600 / 300

Foundation under column :

Column load on Foundation = 110 T

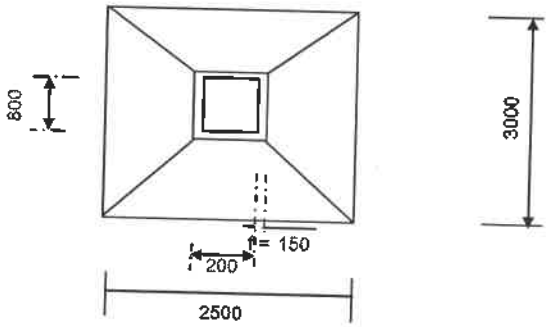
s/w of footing = 0

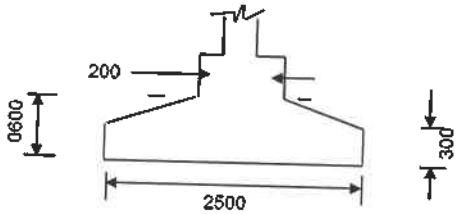
Total = 110 T

SBC of Soil= 15.0 T/m2

Area Reqd = 7.333 7.33 m^2

Provided Area = 7.5 m^2





CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 1.000 m **O.K.**

Moment at the face of column = (15 X 1^2)/2 7.50 T-m/m run

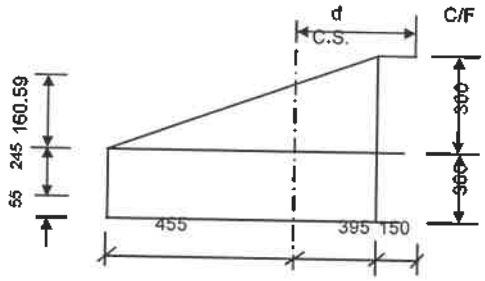
Effective depth of footing = 0600 - 50 - 5 = 545 mm.

Mu/bd^2 = 0.38 $N/mm.^2$

Required area of steel = 6.54 cm^2

Provide 12 Tor @ 150.c/c = **7.54 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 545 mm

Depth of critical section = 381.50 mm 463.5

Shear at critical section = 6.83 T/m run

Shear stress at critical sectic τ_v = 0.27 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.20

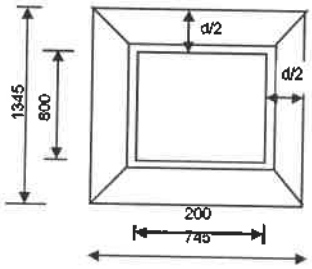
*(From Table 61, SP-16:1980)

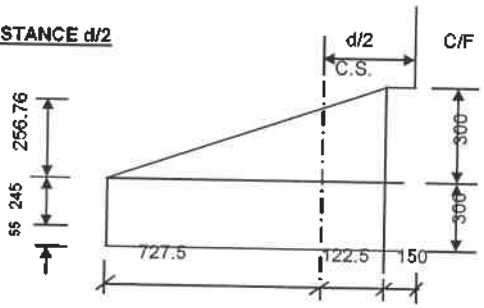
For pt = 0.20 τ_c = 0.33 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 4180 mm

Critical Depth = 500.76 mm

Shear at critical section = 110.00 T/m run

Shear stress at critical section τ_v = 0.79 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 0.9375

Where, $K_s = (0.5 + \beta_c) \not< 1$

β_c = short side of the col / long side of the col = 0.25 } K_s = 0.75

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 } τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-9)

Foundation Marked :

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation Size : 3200 2600 0600 / 300

Foundation under column :

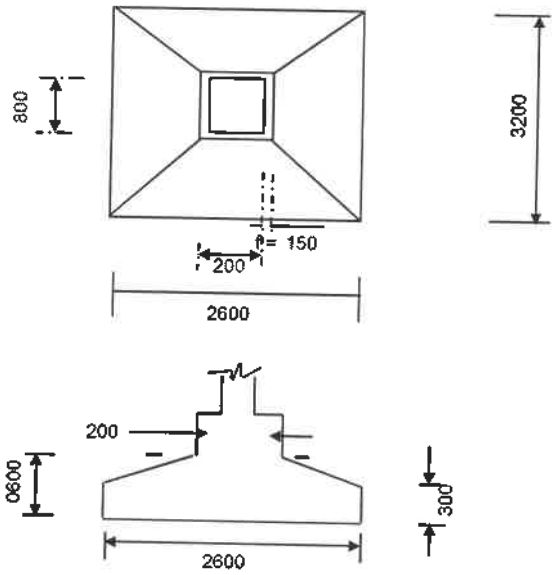
Column load on Foundation = 123 T

s/w of footing = 0

Total = 123 T SBC of Soil= 15.0 T/m2

Area Reqd = 8.200 8.20 m^2

Provided Area = 8.32 m^2



CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 1.050 m **O.K.**

Moment at the face of column = (15 X 1.05^2)/2 8.27 T-m/m run

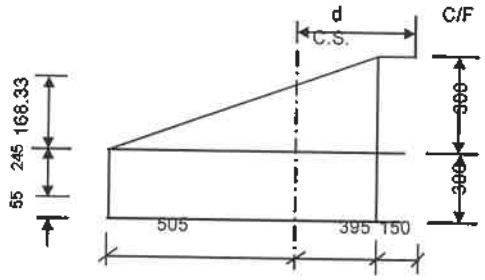
Effective depth of footing = 0600 - 50 - 5 = 545 mm.

Mu/bd^2 = 0.42 $N/mm.^2$

Required area of steel = 6.54 cm^2

Provide 12 Tor @ 150c/c = **7.54 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 545 mm

Depth of critical section = 389.29 mm 455.7142857

Shear at critical section = 7.58 T/m run

Shear stress at critical sectio τ_v = 0.29 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.19

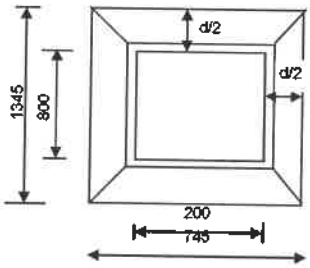
*(From Table 61, SP-16:1980)

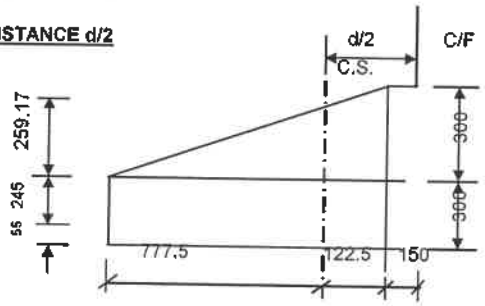
For pt = 0.19 τ_c = 0.30 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 4180 mm

Critical Depth = 503.17 mm

Shear at critical section = 123.00 T/m run

Shear stress at critical section τ_v = 0.88 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 0.9375

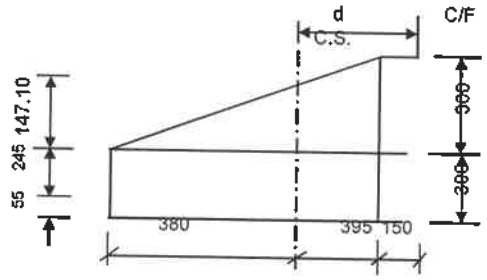
Where, $K_s = (0.5 + \beta_c) \not> 1$

β_c = short side of the col / long side of the col = 0.25 } K_s = 0.75

τ_c = $0.25\sqrt{f_{ck}}$ = 1.25 } τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 545 mm

Depth of critical section = 368.24 mm 476.7567568

Shear at critical section = 5.70 T/m run

Shear stress at critical sectic τ_v = 0.23 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.20

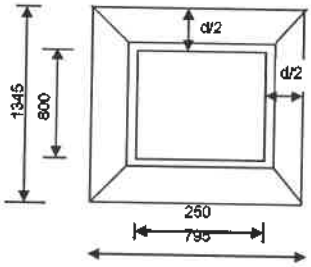
*(From Table 61, SP-16:1980)

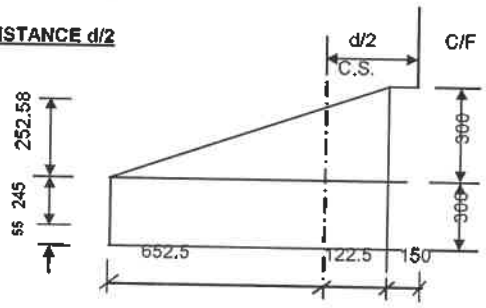
For pt = 0.20 τ_c = 0.33 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 4280 mm

Critical Depth = 496.58 mm

Shear at critical section = 102.00 T/m run

Shear stress at critical section τ_v = 0.72 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 1.015625

Where, $K_s = (0.5 + \beta) \not> 1$

βc = short side of the col / long side of the col = 0.3125 } K_s = 0.8125

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 } τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-10)

Foundation Marked :

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation Size : 2900 2400 0600 / 300

Foundation under column :

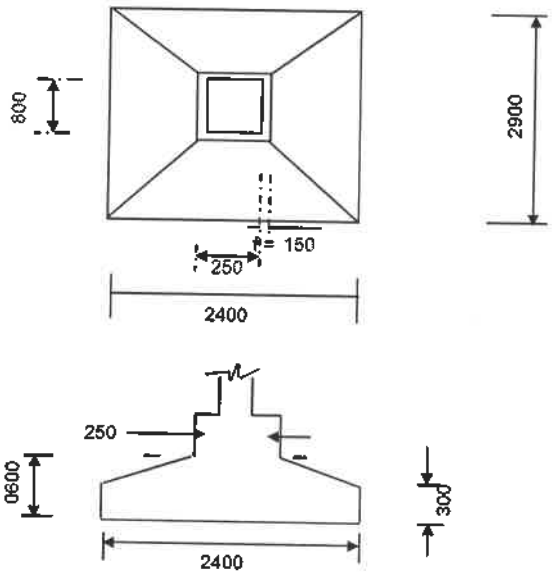
Column load on Foundation = 102 T

s/w of footing = 0

Total = 102 T SBC of Soil= 15.0 T/m2

Area Reqd = 6.800 6.80 m^2

Provided Area = 6.96 m^2



CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 0.925 m **O.K.**

Moment at the face of column = (15 X 0.925^2)/2 6.42 T-m/m run

Effective depth of footing = 0600 - 50 - 5 = 545 mm.

Mu/bd^2 = 0.32 $N/mm.^2$

Required area of steel = 6.54 cm^2

Provide 12 Tor @ 150c/c = **7.54 cm2** (BOTHWAYS)

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DESIGN OF ISOLATED FOOTING (F-11)

Foundation Marked :

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation Size : 2800 2200 0500 / 250

Foundation under column :

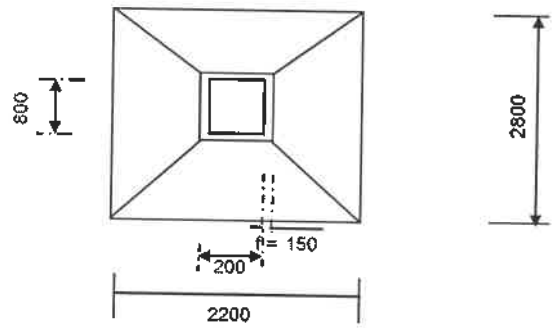
Column load on Foundation = 89 T

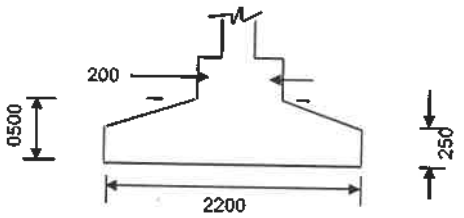
s/w of footing = 0

Total = 89 T SBC of Soil= 15.0 T/m2

Area Reqd = 5.933 5.93 m^2

Provided Area = 6.16 m^2





CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 0.850 m **O.K.**

Moment at the face of column = (15 X 0.85^2)/2 5.42 T-m/m run

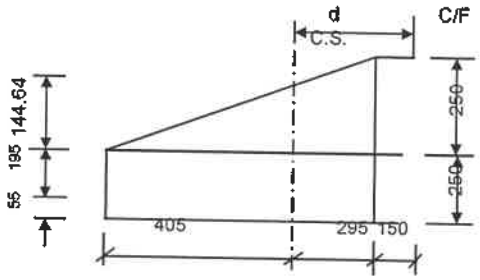
Effective depth of footing = 0500 - 50 - 5 = 445 mm.

Mu/bd^2 = 0.41 $N/mm.^2$

Required area of steel = 5.34 cm^2

Provide 12 Tor @ 150c/c = **7.54 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 445 mm

Depth of critical section = 314.12 mm 380.8823529

Shear at critical section = 6.08 T/m run

Shear stress at critical sectir τ_v = 0.29 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.24

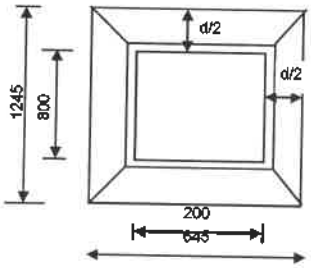
*(From Table 61, SP-16:1980)

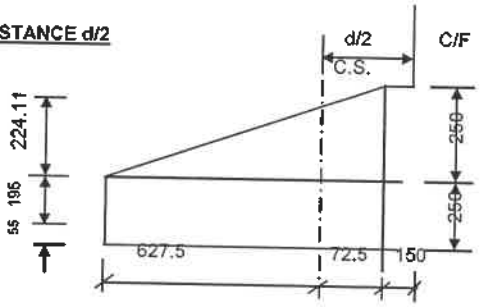
For pt = 0.24 τ_c = 0.36 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 3780 mm

Critical Depth = 418.11 mm

Shear at critical section = 89.00 T/m run

Shear stress at critical section τ_v = 0.84 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 0.9375

Where, $K_s = (0.5 + \beta_c) \not< 1$

β_c = short side of the col / long side of the col = 0.25 K_s = 0.75

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-12)

Foundation Marked :

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation Size : 3500 2800 0700 / 350

Foundation under column :

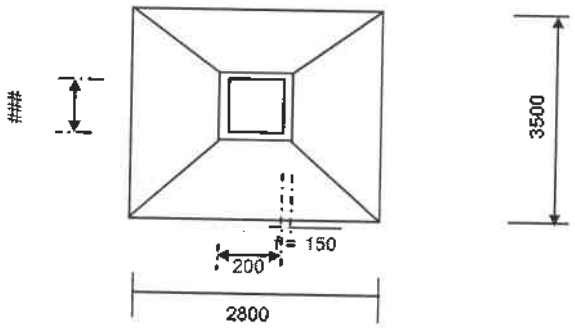
Column load on Foundation = 136 T

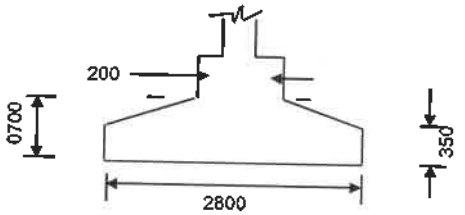
s/w of footing = 0

Total = 136 T SBC of Soil= 15.0 T/m2

Area Reqd = 9.067 9.07 m^2

Provided Area = 9.8 m^2





CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 1.150 m **O.K.**

Moment at the face of column = (15 X 1.15^2)/2 9.92 T-m/m run

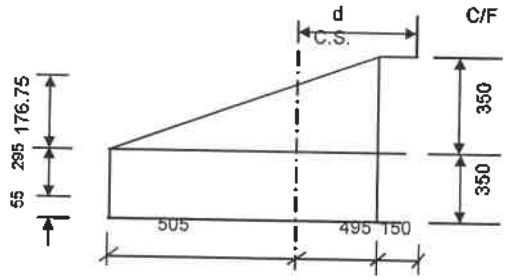
Effective depth of footing = 0700 - 50 - 5 = 645 mm.

Mu/bd^2 = 0.36 $N/mm.^2$

Required area of steel = 7.74 cm^2

Provide 12 Tor @ 125c/c = **9.05 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 645 mm

Depth of critical section = 448.70 mm 546.3043478

Shear at critical section = 7.58 T/m run

Shear stress at critical secti τ_v = 0.25 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.20

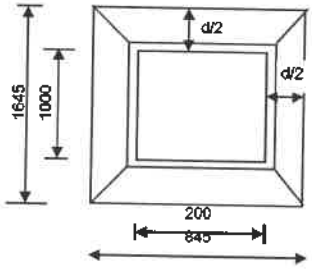
*(From Table 61, SP-16:1980)

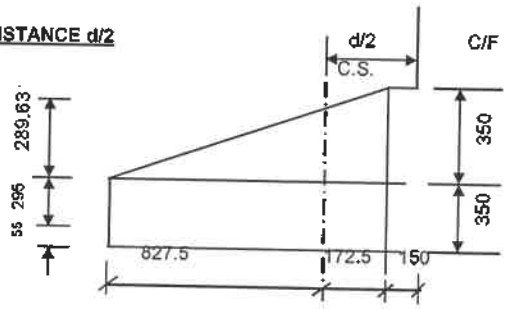
For pt = 0.20 τ_c = 0.33 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 4980 mm

Critical Depth = 583.63 mm

Shear at critical section = 136.00 T/m run

Shear stress at critical section τ_v = 0.70 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 0.875

Where, Ks=(0.5+ β_c) ≯ 1

β_c = short side of the col = 0.2 Ks = 0.7
long side of the col

τ_c = $0.25\sqrt{f_{ck}}$ = 1.25 τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-13)

Foundation Marked :

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation Size : 3100 2600 0600 / 300

Foundation under column :

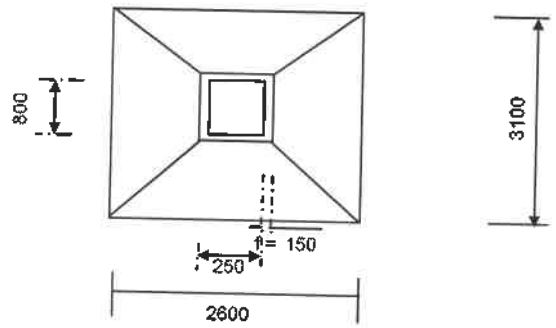
Column load on Foundation = 112 T

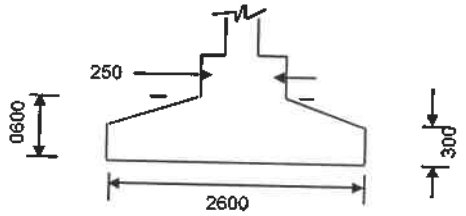
s/w of footing = 0

Total = 112 T SBC of Soil= 15.0 T/m2

Area Reqd = 7.467 7.47 m^2

Provided Area = 8.06 m^2





CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 1.025 m **O.K.**

Moment at the face of column = (15 X 1.025^2)/2 7.88 T-m/m run

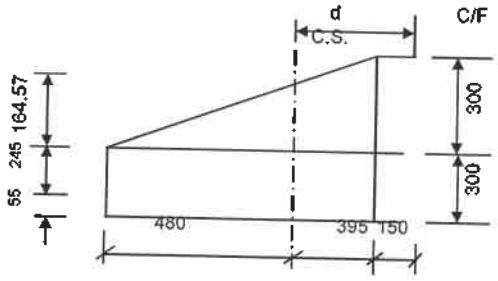
Effective depth of footing = 0600 - 50 - 5 = 545 mm.

Mu/bd^2 = 0.40 $N/mm.^2$

Required area of steel = 6.54 cm^2

Provide 12 Tor @ 150c/c = **7.54 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 545 mm

Depth of critical section = 385.49 mm 459.5121951

Shear at critical section = 7.20 T/m run

Shear stress at critical sectk τ_v = 0.28 N/mm^2/m width

Percentage of steel provided, pt_{prov} = 0.20

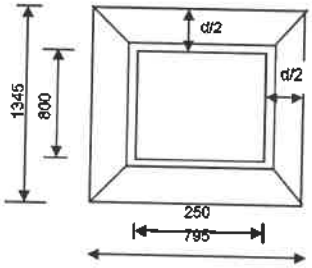
*(From Table 61, SP-16:1980)

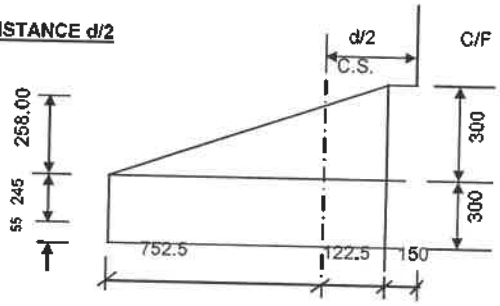
For pt = 0.20 τ_c = 0.33 N/mm^2/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 4280 mm

Critical Depth = 502.00 mm

Shear at critical section = 112.00 T/m run

Shear stress at critical section τ_v = 0.78 N/mm^2/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 1.015625

Where, $K_s = (0.5 + \beta) \not> 1$

β_c = short side of the col / long side of the col = 0.3125 } K_s = 0.8125

τ_c = $0.25\sqrt{f_{ck}}$ = 1.25 } τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-14)

Foundation Marked :

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation Size : 3200 2400 0600 / 300

Foundation under column :

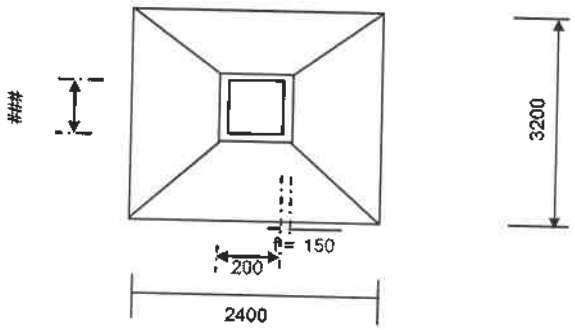
Column load on Foundation = 114 T

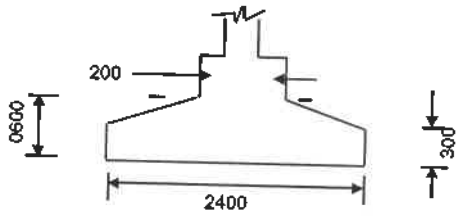
s/w of footing = 0

Total = 114 T SBC of Soil= 15.0 T/m2

Area Reqd = 7.600 7.60 m^2

Provided Area = 7.68 m^2





CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 0.950 m **O.K.**

Moment at the face of column = (15 X 0.95^2)/2 6.77 T-m/m run

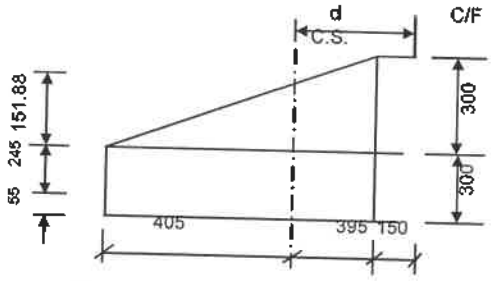
Effective depth of footing = 0600 - 50 - 5 = 545 mm.

Mu/bd^2 = 0.34 $N/mm.^2$

Required area of steel = 6.54 cm^2

Provide 12 Tor @ 150c/c = **7.54 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 545 mm

Depth of critical section = 372.89 mm 472.1052632

Shear at critical section = 6.08 T/m run

Shear stress at critical secti τ_v = 0.24 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.20

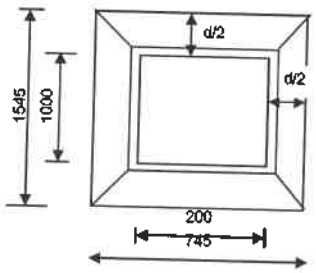
*(From Table 61, SP-16:1980)

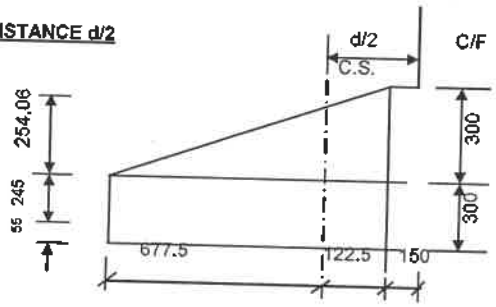
For pt = 0.20 τ_c = 0.33 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 4580 mm

Critical Depth = 498.06 mm

Shear at critical section = 114.00 T/m run

Shear stress at critical section τ_v = 0.75 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 0.875

Where, $K_s = (0.5 + \beta_c) \not> 1$

β_c = short side of the col / long side of the col = 0.2 } K_s = 0.7

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 } τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

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DESIGN OF ISOLATED FOOTING (F-15)

Foundation Marked :

Foundation Size : 3600 2900 0700 / 350

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation under column :

Column load on Foundation = 145 T

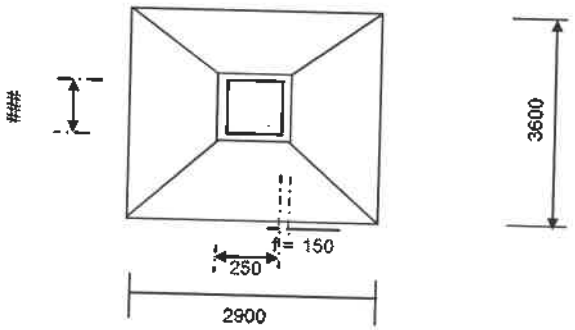
s/w of footing = 0

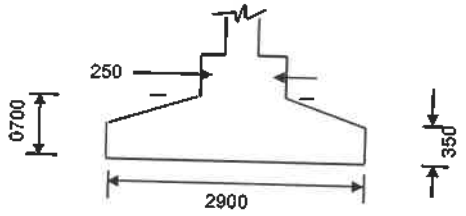
Total = 145 T

SBC of Soil= 15.0 T/m2

Area Reqd = 9.667 9.67 m^2

Provided Area = 10.44 m^2





CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 1.175 m **O.K.**

Moment at the face of column = (15 X 1.175^2)/2 10.35 T-m/m run

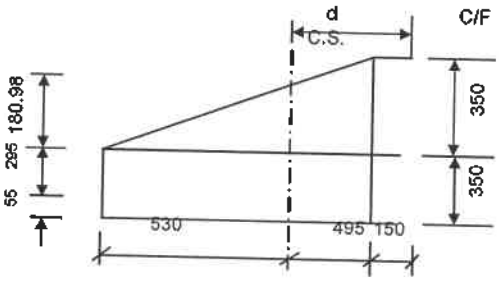
Effective depth of footing = 0700 - 50 - 5 = 645 mm.

Mu/bd^2 = 0.37 $N/mm.^2$

Required area of steel = 7.74 cm^2

Provide 12 Tor @ 125c/c = **9.05 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 645 mm

Depth of critical section = 452.87 mm 542.1276596

Shear at critical section = 7.95 T/m run

Shear stress at critical sectic τ_v = 0.26 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.20

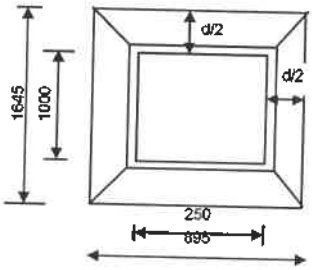
*(From Table 61, SP-16:1980)

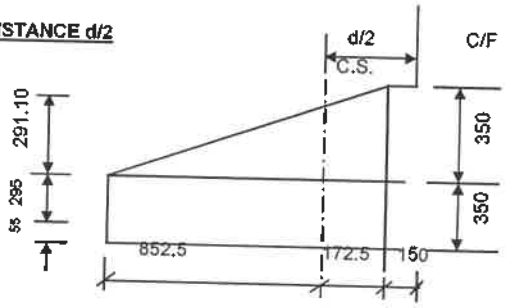
For pt = 0.20 τ_c = 0.33 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 5080 mm

Critical Depth = 585.10 mm

Shear at critical section = 145.00 T/m run

Shear stress at critical section τ_v = 0.73 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 0.9375

Where, $K_s = (0.5 + \beta_c) \not> 1$

β_c = short side of the col / long side of the col = 0.25 → K_s = 0.75

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 → τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-16)

Foundation Marked :

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation Size : 2700 3200 0600 / 300

Foundation under column :

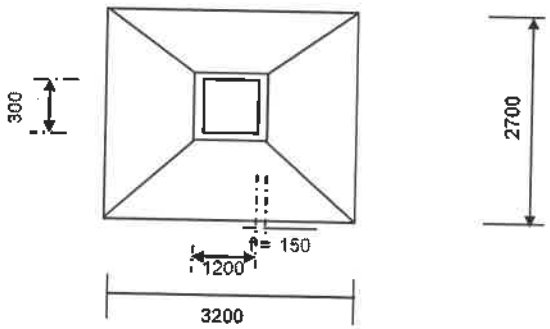
Column load on Foundation = 130 T

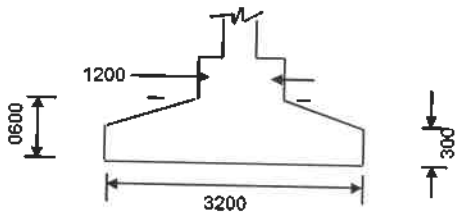
s/w of footing = 0

Total = 130 T SBC of Soil= 15.0 T/m2

Area Reqd = 8.667 8.67 m^2

Provided Area = 8.640 m^2





CHECK AGAINST MOMENT

Net Bearing Pressure = 15.05 T/m^2

Max Cantilever length = 0.850 m **O.K.**

Moment at the face of column = 462962962963 X 0.85 5.44 T-m/m run

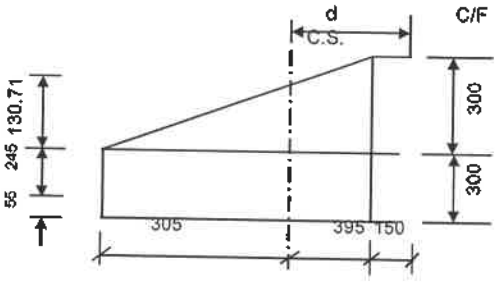
Effective depth of footing = 0600 - 50 - 5 = 545 mm.

Mu/bd^2 = 0.27 $N/mm.^2$

Required area of steel = 6.54 cm^2

Provide 12 Tor @ 150c/c = **7.54 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 545 mm

Depth of critical section = 352.65 mm 492.3529412

Shear at critical section = 4.59 T/m run

Shear stress at critical sectic τ_v = 0.20 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.21

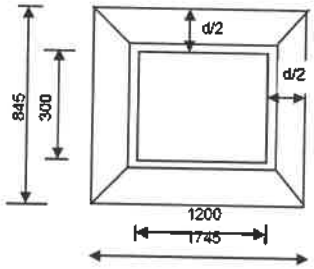
*(From Table 61, SP-16:1980)

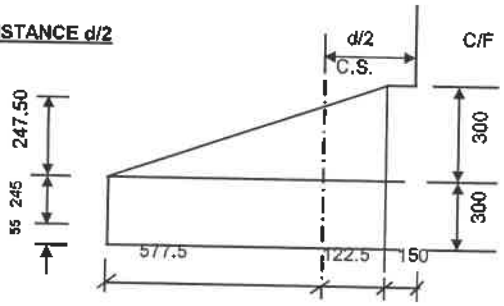
For pt = 0.21 τ_c = 0.34 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 5180 mm

Critical Depth = 491.50 mm

Shear at critical section = 130.00 T/m run

Shear stress at critical section τ_v = 0.77 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 0.9375

Where, $K_s = (0.5 + \beta_c) \not< 1$

β_c = short side of the col / long side of the col = 0.25 → K_s = 0.75

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 → τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-17)

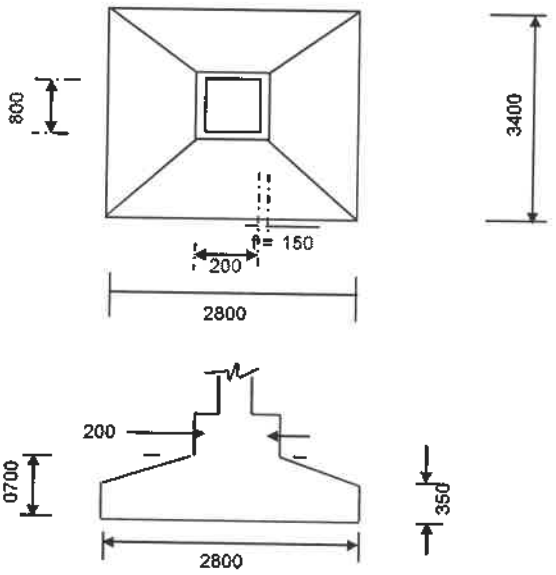
Foundation Marked :

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation Size : 3400 2800 0700 / 350

Foundation under column :

Column load on Foundation =	134	T		
s/w of footing =	0			
Total =	134	T	SBC of Soil=	15.0 T/m2
Area Reqd =	8.933	8.93	m^2	
Provided Area =	9.52	m^2		



CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 1.150 m **O.K.**

Moment at the face of column = (15 X 1.15^2)/2 9.92 T-m/m run

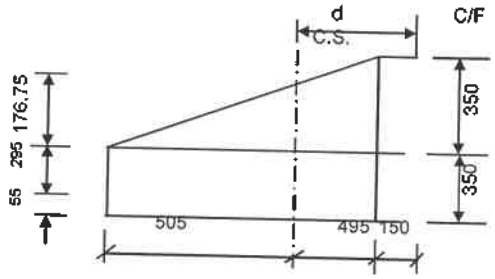
Effective depth of footing = 0700 - 50 - 5 = 645 mm.

Mu/bd^2 = 0.36 $N/mm.^2$

Required area of steel = 7.74 cm^2

Provide 12 Tor @ 125c/c = **9.05 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 645 mm

Depth of critical section = 448.70 mm 546.3043478

Shear at critical section = 7.58 T/m run

Shear stress at critical sectio τ_v = 0.25 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.20

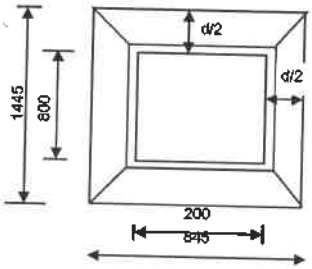
*(From Table 61, SP-16:1980)

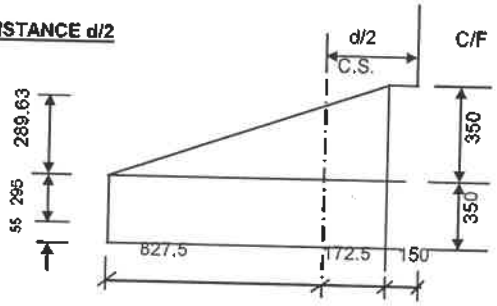
For pt = 0.20 τ_c = 0.33 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 4580 mm

Critical Depth = 583.63 mm

Shear at critical section = 134.00 T/m run

Shear stress at critical section τ_v = 0.75 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 0.9375

Where, $K_s = (0.5 + \beta_c) \not> 1$

β_c = short side of the col / long side of the col = 0.25 } K_s = 0.75

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 } τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-18)

Foundation Marked :

Foundation Size : 3200 3700 0700 / 350

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation under column :

Column load on Foundation = 165 T

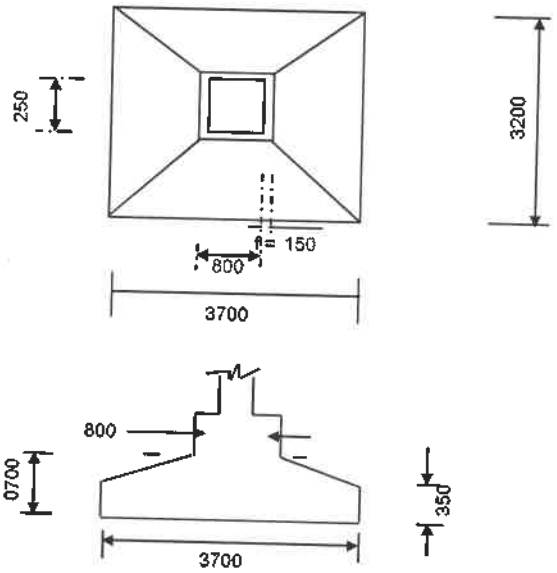
s/w of footing = 0

Total = 165 T

SBC of Soil= 15.0 T/m2

Area Reqd = 11.000 11.00 m^2

Provided Area = 11.84 m^2



CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 1.300 m **O.K.**

Moment at the face of column = (15 X 1.3^2)/2 12.68 T-m/m run

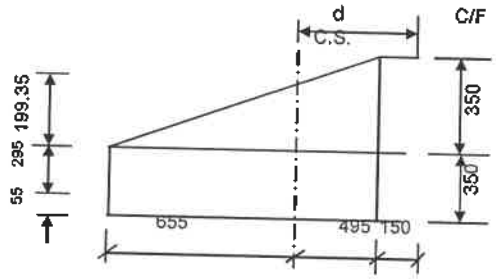
Effective depth of footing = 0700 - 50 - 5 = 645 mm.

Mu/bd^2 = 0.46 $N/mm.^2$

Required area of steel = 7.74 cm^2

Provide 12 Tor @ 125c/c = **9.05 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 645 mm

Depth of critical section = 471.35 mm 523.6538462

Shear at critical section = 9.83 T/m run

Shear stress at critical sectio τ_v = 0.31 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.19

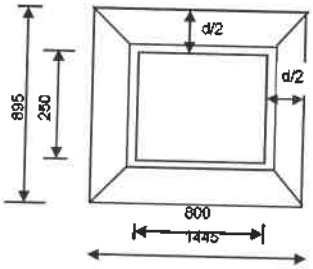
*(From Table 61, SP-16:1980)

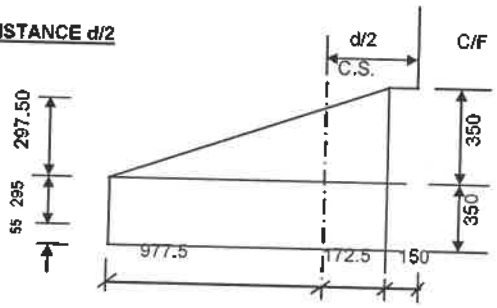
For pt = 0.19 τ_c = 0.33 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 4680 mm

Critical Depth = 591.50 mm

Shear at critical section = 165.00 T/m run

Shear stress at critical section τ_v = 0.89 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 1.015625

Where, $K_s = (0.5 + \beta_c) \not< 1$

β_c = short side of the col / long side of the col = 0.3125 } K_s = 0.8125

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 } τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-19)

Foundation Marked :

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation Size : 3800 3100 0700 / 350

Foundation under column :

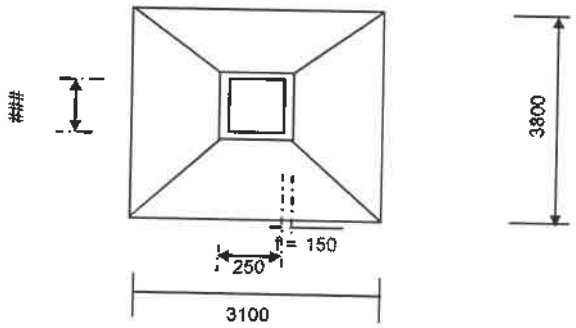
Column load on Foundation = 166 T

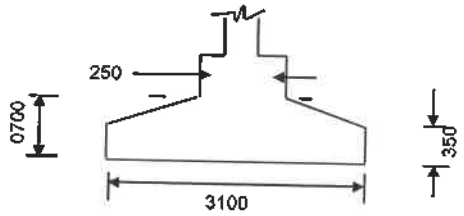
s/w of footing = 0

Total = 166 T SBC of Soil= 15.0 T/m2

Area Reqd = 11.067 11.07 m^2

Provided Area = 11.78 m^2





CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 1.275 m O.K.

Moment at the face of column = (15 X 1.275^2)/2 12.19 T-m/m run

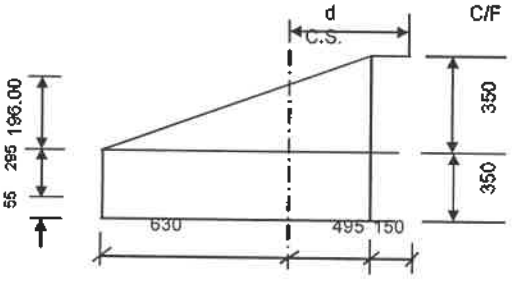
Effective depth of footing = 0700 - 50 - 5 = 645 mm.

Mu/bd^2 = 0.44 $N/mm.^2$

Required area of steel = 7.74 cm^2

Provide 12 Tor @ 125c/c = **9.05 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 645 mm

Depth of critical section = 467.94 mm 527.0588235

Shear at critical section = 9.45 T/m run

Shear stress at critical sectk τ_v = 0.30 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.19

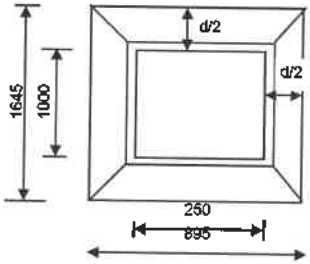
*(From Table 61, SP-16:1980)

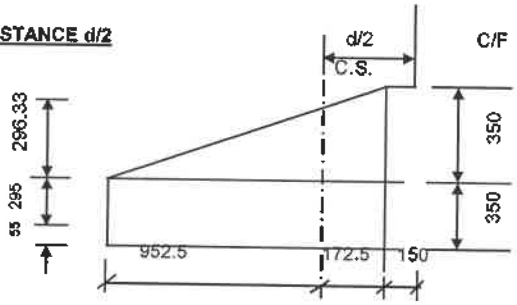
For pt = 0.19 τ_c = 0.33 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 5080 mm

Critical Depth = 590.33 mm

Shear at critical section = 166.00 T/m run

Shear stress at critical section τ_v = 0.83 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 0.9375

Where, $K_s = (0.5 + \beta) \not< 1$

β_c = short side of the col / long side of the col = 0.25 K_s = 0.75

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

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DESIGN OF ISOLATED FOOTING (F-20)

Foundation Marked :

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation Size : 3500 3000 0700 / 350

Foundation under column :

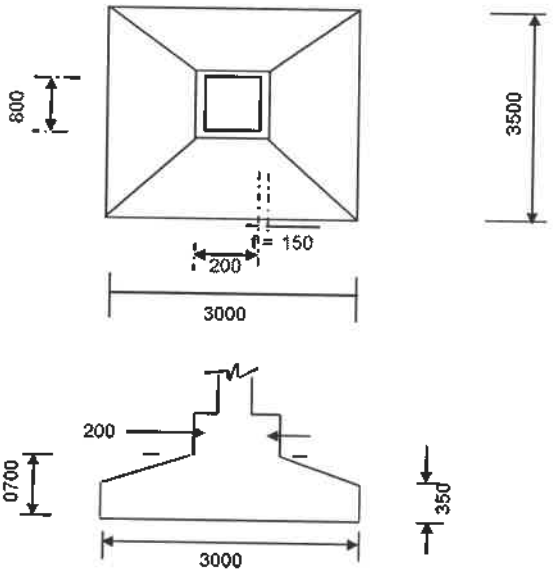
Column load on Foundation = 151 T

s/w of footing = 0

Total = 151 T SBC of Soil= 15.0 T/m2

Area Reqd = 10.067 10.07 m^2

Provided Area = 10.5 m^2



CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 1.250 m **O.K.**

Moment at the face of column = (15 X 1.25^2)/2 11.72 T-m/m run

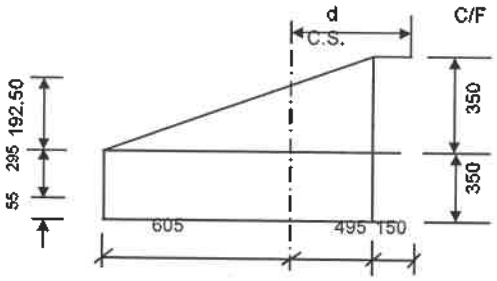
Effective depth of footing = 0700 - 50 - 5 = 645 mm.

Mu/bd^2 = 0.42 $N/mm.^2$

Required area of steel = 7.74 cm^2

Provide 12 Tor @ 125c/c = **9.05 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 645 mm

Depth of critical section = 464.40 mm 530.6

Shear at critical section = 9.08 T/m run

Shear stress at critical sectic τ_v = 0.29 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.19

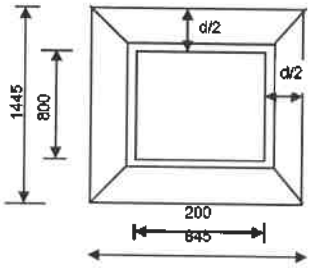
*(From Table 61, SP-16:1980)

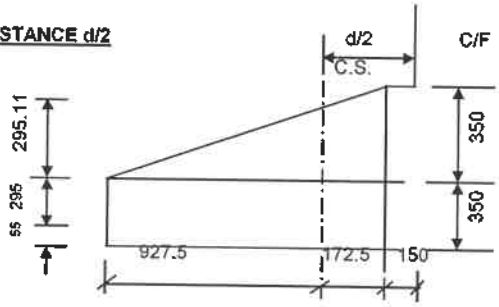
For pt = 0.19 τ_c = 0.33 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 4580 mm

Critical Depth = 589.11 mm

Shear at critical section = 151.00 T/m run

Shear stress at critical section τ_v = 0.84 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 0.9375

Where, $K_s = (0.5 + \beta_c) \not> 1$

β_c = short side of the col / long side of the col = 0.25 } K_s = 0.75

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 } τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-21)

Foundation Marked :

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation Size : 3200 2700 0700 / 350

Foundation under column :

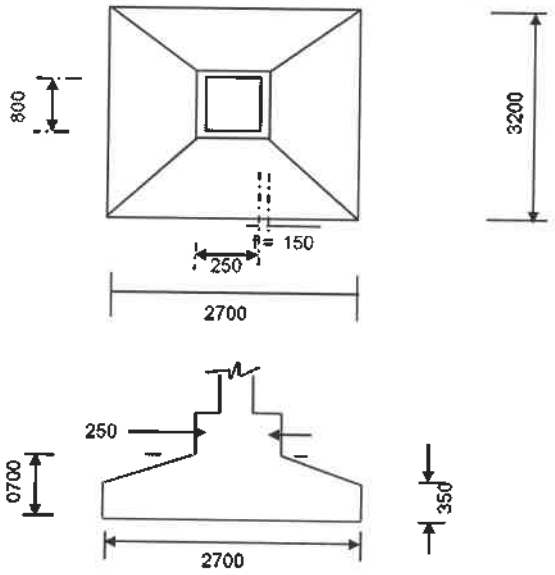
Column load on Foundation = 122 T

s/w of footing = 0

Total = 122 T SBC of Soil= 15.0 T/m2

Area Reqd = 8.133 8.13 m^2

Provided Area = 8.64 m^2



CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 1.075 m **O.K.**

Moment at the face of column = (15 X 1.075^2)/2 8.67 T-m/m run

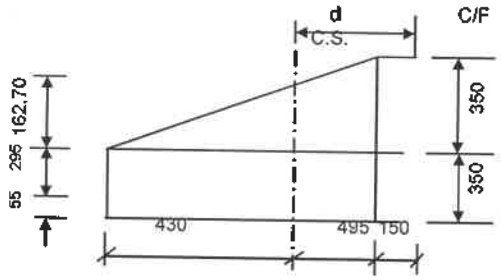
Effective depth of footing = 0700 - 50 - 5 = 645 mm.

Mu/bd^2 = 0.31 $N/mm.^2$

Required area of steel = 7.74 cm^2

Provide 12 Tor @ 125c/c = **9.05 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 645 mm

Depth of critical section = 435.00 mm 560

Shear at critical section = 6.45 T/m run

Shear stress at critical sectic τ_v = 0.22 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.21

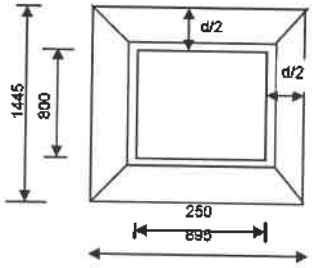
*(From Table 61, SP-16:1980)

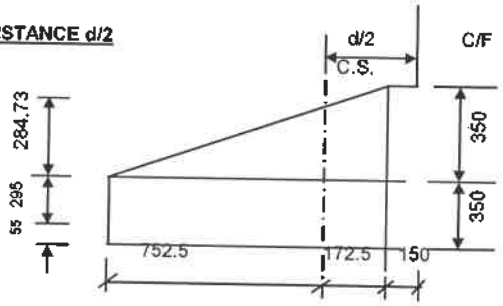
For pt = 0.21 τ_c = 0.33 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 4680 mm

Critical Depth = 578.73 mm

Shear at critical section = 122.00 T/m run

Shear stress at critical section τ_v = 0.68 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 1.015625

Where, $K_s = (0.5 + \beta_c) \not< 1$

β_c = short side of the col / long side of the col = 0.3125 K_s = 0.8125

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-22)

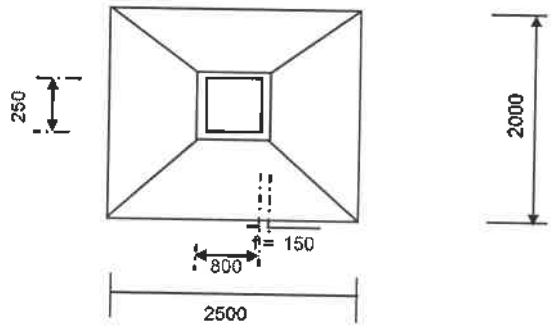
Foundation Marked :

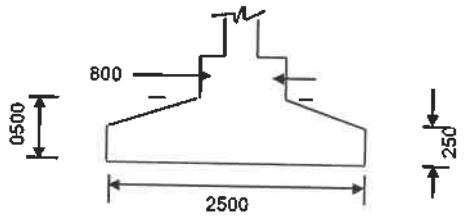
Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation Size : 2000 2500 0500 / 250

Foundation under column :

Column load on Foundation =	72	T		
s/w of footing =	0			
Total =	72	T	SBC of Soil=	15.0 T/m2
Area Reqd =	4.800	4.80	m^2	
Provided Area =	5	m^2		





CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 0.700 m **O.K.**

Moment at the face of column = (15 X 0.7^2)/2 3.68 T-m/m run

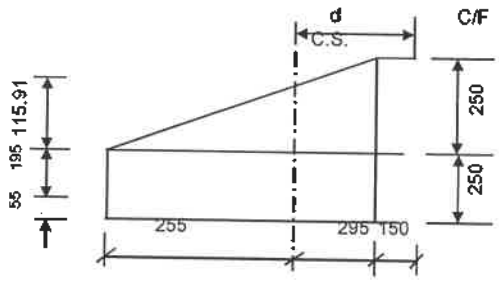
Effective depth of footing = 0500 - 50 - 5 = 445 mm.

Mu/bd^2 = 0.28 $N/mm.^2$

Required area of steel = 5.34 cm^2

Provide 12 Tor @ 150c/c = **7.54 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 445 mm

Depth of critical section = 286.07 mm 408.9285714

Shear at critical section = 3.83 T/m run

Shear stress at critical sectk τ_v = 0.20 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.26

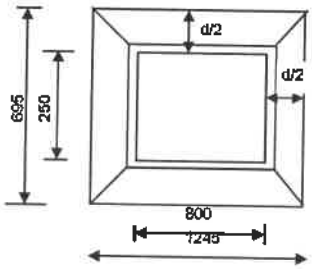
*(From Table 61, SP-16:1980)

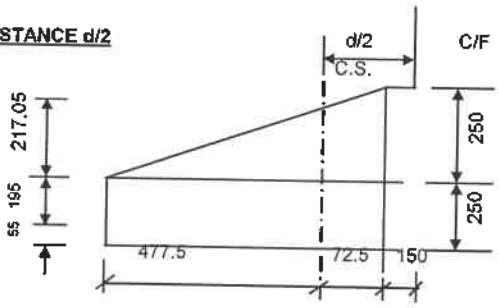
For pt = 0.26 τ_c = 0.37 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 3880 mm

Critical Depth = 411.05 mm

Shear at critical section = 72.00 T/m run

Shear stress at critical section τ_v = 0.68 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 1.015625

Where, $K_s = (0.5 + \beta_c) \not< 1$

β_c = short side of the col / long side of the col = 0.3125 } K_s = 0.8125

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 } τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-23)

Foundation Marked :

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation Size : 2800 2300 0500 / 250

Foundation under column :

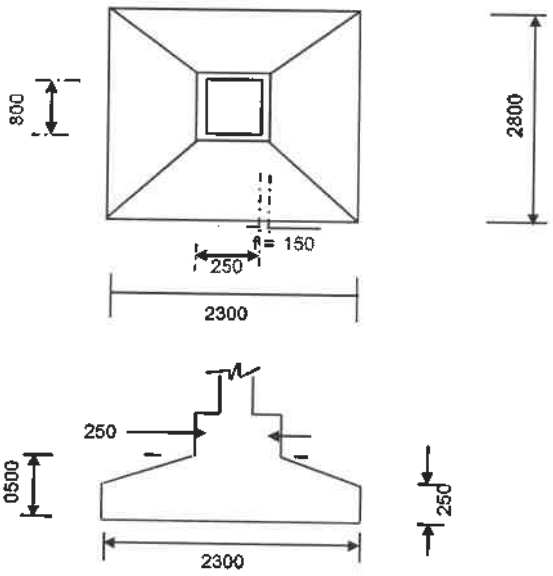
Column load on Foundation = 93 T

s/w of footing = 0

Total = 93 T SBC of Soil= 15.0 T/m2

Area Reqd = 6.200 6.20 m^2

Provided Area = 6.44 m^2



CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 0.875 m **O.K.**

Moment at the face of column = (15 X 0.875^2)/2 5.74 T-m/m run

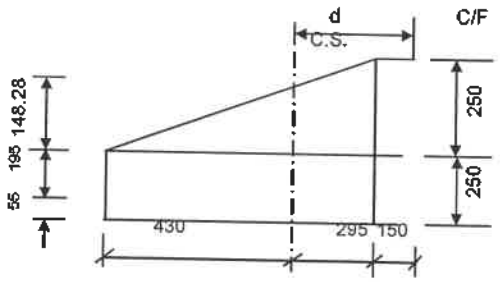
Effective depth of footing = 0500 - 50 - 5 = 445 mm.

Mu/bd^2 = 0.43 $N/mm.^2$

Required area of steel = 5.34 cm^2

Provide 12 Tor @ 150c/c = **7.54 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 445 mm

Depth of critical section = 317.86 mm 377.1428571

Shear at critical section = 6.45 T/m run

Shear stress at critical secti τ_v = 0.30 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.24

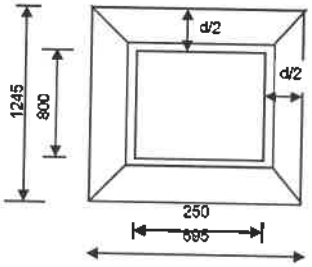
*(From Table 61, SP-16:1980)

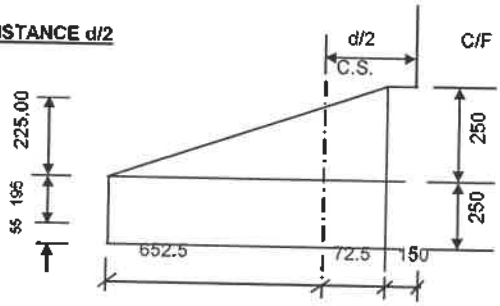
For pt = 0.24 τ_c = 0.35 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 3880 mm

Critical Depth = 419.00 mm

Shear at critical section = 93.00 T/m run

Shear stress at critical section τ_v = 0.86 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 1.015625

Where, $K_s = (0.5 + \beta_c) \not> 1$

β_c = short side of the col = 0.3125 } K_s = 0.8125
long side of the col

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 } τ_c = 1.25

$\tau_v < K_s \tau$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-24)

Foundation Marked :

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation Size : 4300 3600 0900 / 450

Foundation under column :

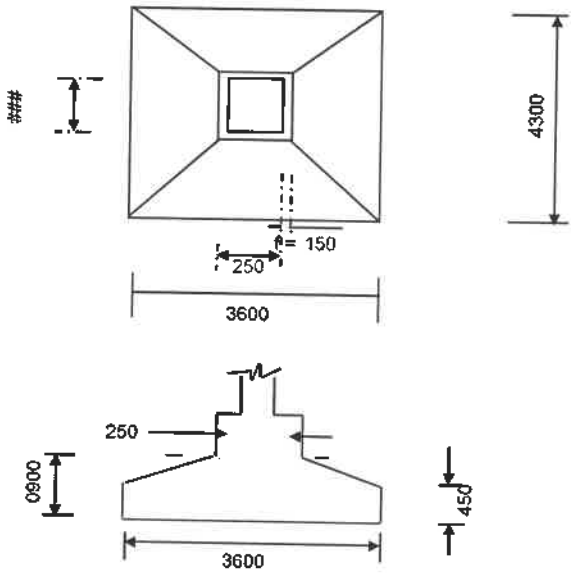
Column load on Foundation = 228 T

s/w of footing = 0

Total = 228 T SBC of Soil= 15.0 T/m2

Area Reqd = 15.200 15.20 m^2

Provided Area = 15.48 m^2



CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 1.525 m **O.K.**

Moment at the face of column = (15 X 1.525^2)/2 17.44 T-m/m run

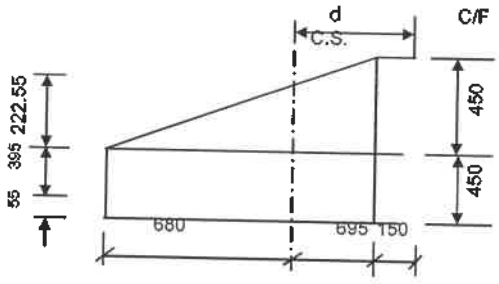
Effective depth of footing = 0900 - 50 - 5 = 845 mm.

Mu/bd^2 = 0.37 $N/mm.^2$

Required area of steel = 10.14 cm^2

Provide 12 Tor @ 100c/c = **11.31 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 845 mm

Depth of critical section = 595.66 mm 699.3442623

Shear at critical section = 10.20 T/m run

Shear stress at critical sectix τ_v = 0.26 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.19

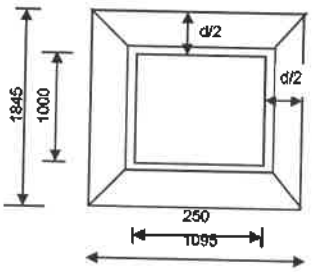
*(From Table 61, SP-16:1980)

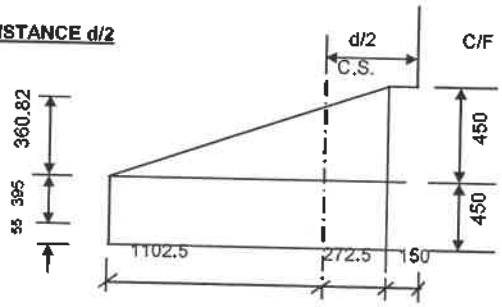
For pt = 0.19 τ_c = 0.32 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 5880 mm

Critical Depth = 754.82 mm

Shear at critical section = 228.00 T/m run

Shear stress at critical section τ_v = 0.77 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 0.9375

Where, $K_s = (0.5 + \beta_c) \not< 1$

β_c = short side of the col / long side of the col = 0.25 → K_s = 0.75

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 → τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-25)

Foundation Marked :

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation Size : 2500 3300 0600 / 300

Foundation under column :

Column load on Foundation = 122 T

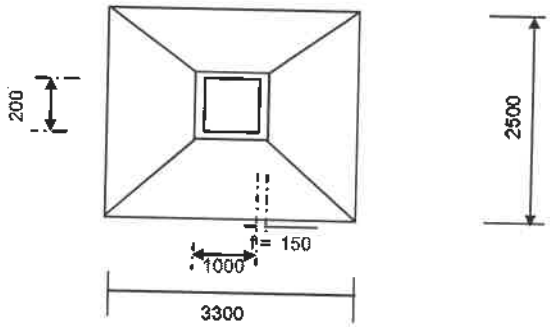
s/w of footing = 0

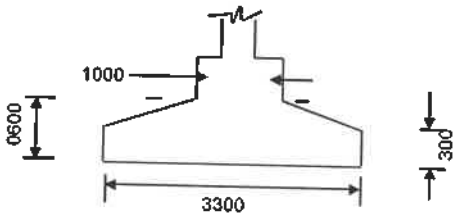
Total = 122 T

SBC of Soil= 15.0 T/m2

Area Reqd = 8.133 8.13 m^2

Provided Area = 8.25 m^2





CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 1.000 m **O.K.**

Moment at the face of column = (15 X 1^2)/2 7.50 T-m/m run

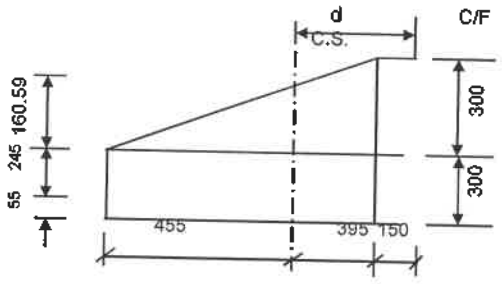
Effective depth of footing = 0600 - 50 - 5 = 545 mm.

Mu/bd^2 = 0.38 $N/mm.^2$

Required area of steel = 6.54 cm^2

Provide 12 Tor @ 150c/c = **7.54 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 545 mm

Depth of critical section = 381.50 mm 463.5

Shear at critical section = 6.83 T/m run

Shear stress at critical secti τ_{v} = 0.27 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.20

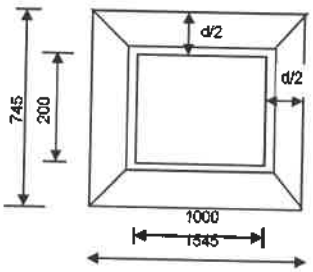
*(From Table 61, SP-16:1980)

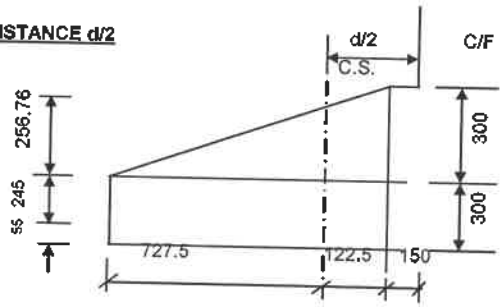
For pt = 0.20 τ_c = 0.33 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 4580 mm

Critical Depth = 500.76 mm

Shear at critical section = 122.00 T/m run

Shear stress at critical section τ_{v} = 0.60 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 0.875

Where, $K_s = (0.5 + \beta_c) \not< 1$

β_c = short side of the col / long side of the col = 0.2 ⇒ K_s = 0.7

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 ⇒ τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-26)

Foundation Marked :

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation Size : 3200 3800 0700 / 350

Foundation under column :

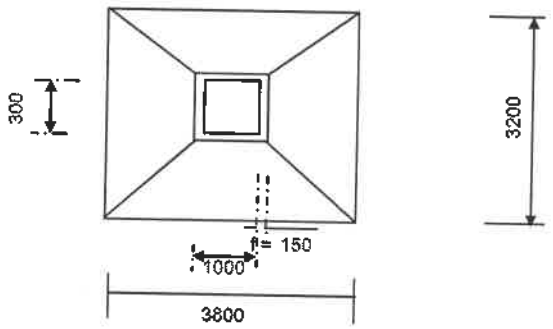
Column load on Foundation = 178 T

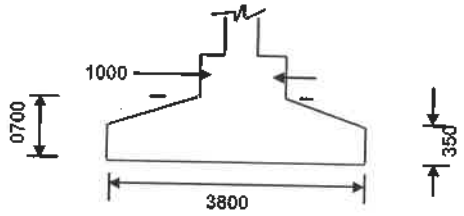
s/w of footing = 0

Total = 178 T SBC of Soil= 15.0 T/m2

Area Reqd = 11.867 11.87 m^2

Provided Area = 12.16 m^2





CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 1.250 m **O.K.**

Moment at the face of column = (15 X 1.25^2)/2 11.72 T-m/m run

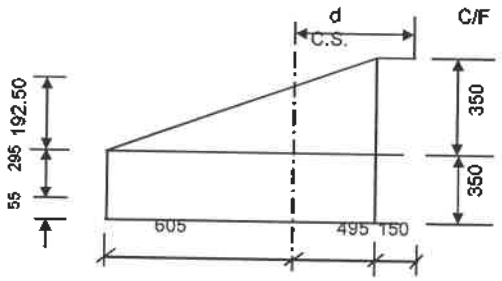
Effective depth of footing = 0700 - 50 - 5 = 645 mm.

Mu/bd^2 = 0.42 $N/mm.^2$

Required area of steel = 7.74 cm^2

Provide 12 Tor @ 125c/c = **9.05 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 645 mm

Depth of critical section = 464.40 mm 530.6

Shear at critical section = 9.08 T/m run

Shear stress at critical sectic τ_v = 0.29 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.19

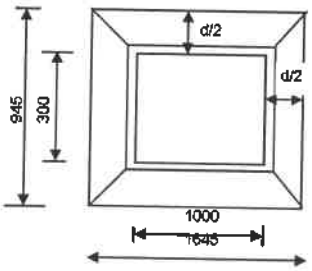
*(From Table 61, SP-16:1980)

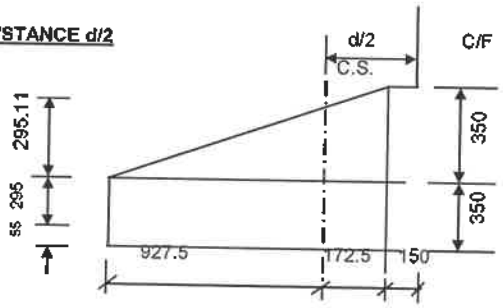
For pt = 0.19 τ_c = 0.33 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 5180 mm

Critical Depth = 589.11 mm

Shear at critical section = 178.00 T/m run

Shear stress at critical section τ_v = 0.67 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 1

Where, $K_s = (0.5 + \beta_c) \not> 1$

β_c = short side of the col = 0.3 → Ks = 0.8
long side of the col

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 → τ_c = 1.25

$\tau_v < K_s \tau$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-27)

Foundation Marked :

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation Size : 2500 3000 0600 / 300

Foundation under column :

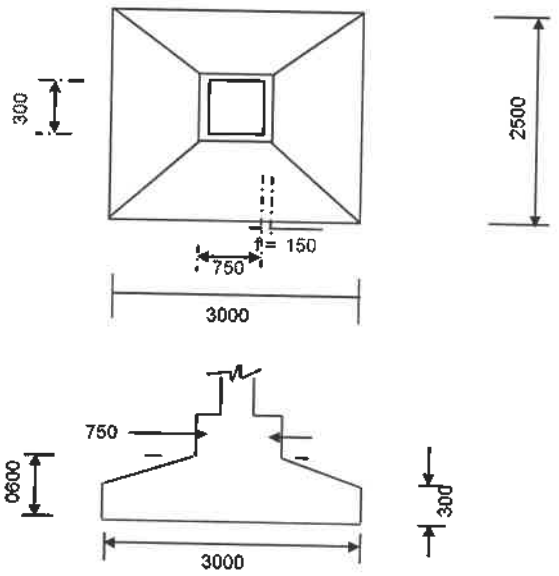
Column load on Foundation = 106 T

s/w of footing = 0

Total = 106 T SBC of Soil= 15.0 T/m2

Area Reqd = 7.067 7.07 m^2

Provided Area = 7.5 m^2



CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 0.975 m **O.K.**

Moment at the face of column = (15 X 0.975^2)/2 7.13 T-m/m run

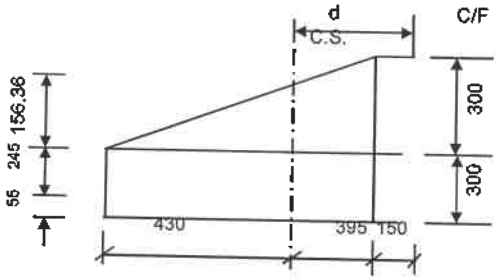
Effective depth of footing = 0600 - 50 - 5 = 545 mm.

Mu/bd^2 = 0.36 $N/mm.^2$

Required area of steel = 6.54 cm^2

Provide 12 Tor @ 150c/c = **7.54 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 545 mm

Depth of critical section = 377.31 mm 467.6923077

Shear at critical section = 6.45 T/m run

Shear stress at critical sectio τ_v = 0.26 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.20

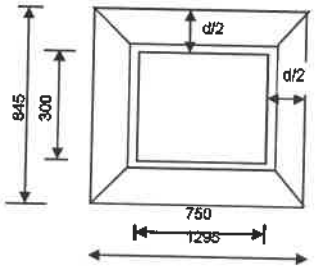
*(From Table 61, SP-16:1980)

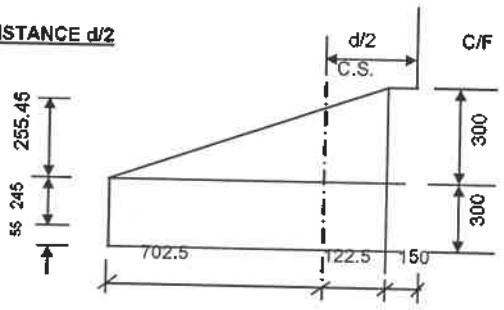
For pt = 0.20 τ_c = 0.33 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 4280 mm

Critical Depth = 499.45 mm

Shear at critical section = 106.00 T/m run

Shear stress at critical section τ_v = 0.74 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 1.125

Where, $K_s = (0.5 + \beta_c) \not< 1$

β_c = short side of the col / long side of the col = 0.4 → K_s = 0.9

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 → τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

DESIGN OF ISOLATED FOOTING (F-28)

Foundation Marked :

Grade of Conc = M 25
Grade of Steel = Fe 500

Foundation Size : 3000 2300 0600 / 300

Foundation under column :

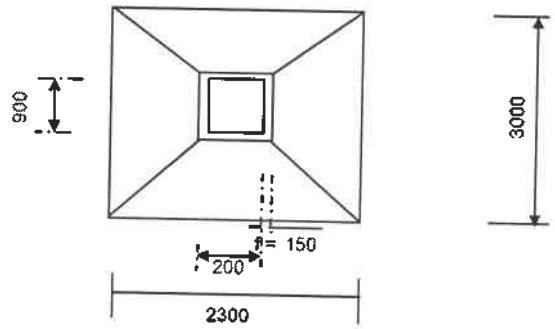
Column load on Foundation = 97 T

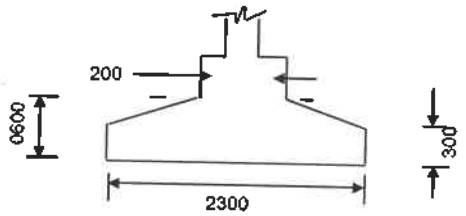
s/w of footing = 0

Total = 97 T SBC of Soil= 15.0 T/m2

Area Reqd = 6.467 6.47 m^2

Provided Area = 6.9 m^2





CHECK AGAINST MOMENT

Net Bearing Pressure = 15.00 T/m^2

Max Cantilever length = 0.900 m **O.K.**

Moment at the face of column = (15 X 0.9^2)/2 6.08 T-m/m run

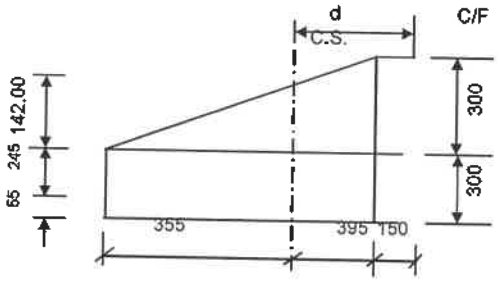
Effective depth of footing = 0600 - 50 - 5 = 545 mm.

Mu/bd^2 = 0.31 $N/mm.^2$

Required area of steel = 6.54 cm^2

Provide 12 Tor @ 150c/c = **7.54 cm2** (BOTHWAYS)

CHECK FOR ONEWAY SHEAR AT A DISTANCE d



Distance of critical section from face of the Col. = 545 mm

Depth of critical section = 363.33 mm 481.6666667

Shear at critical section = 5.33 T/m run

Shear stress at critical sectio τ_v = 0.22 N/mm²/m width

Percentage of steel provided, pt_{prov} = 0.21

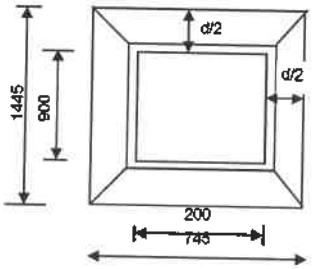
*(From Table 61, SP-16:1980)

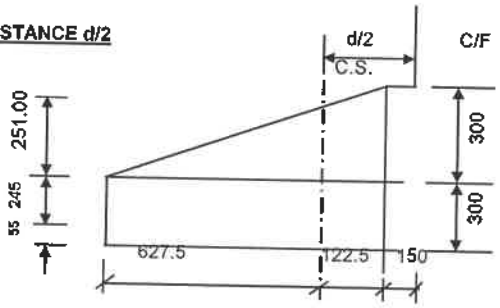
For pt = 0.21 τ_c = 0.33 N/mm²/m width

$\tau_v < \tau_c$ [Hence OK]

CHECK FOR TWOWAY SHEAR OR PUNCHING AT A DISTANCE d/2

Punching Shear cross-section area : Plan View





Critical Perimeter = 4380 mm

Critical Depth = 495.00 mm

Shear at critical section = 97.00 T/m run

Shear stress at critical section τ_v = 0.67 N/mm²/m width

(Ref Clause 31.6.3.1 IS456:200)

Permissible Shear Stress $K_s \tau_c$ = 0.902778

Where, $K_s = (0.5 + \beta) \not< 1$

β_c = short side of the col / long side of the col = 0.22222 } K_s = 0.722222222

$\tau_c = 0.25\sqrt{f_{ck}}$ = 1.25 } τ_c = 1.25

$\tau_v < K_s \tau_c$ [Hence OK]

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Structural Engineer Grade-II (SE)
Reg. No. CGLDIST/SE/Gr-II/2023/04/004



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