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DIGITALLY VERIFIED RECORD

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Date: 22-04-2025

STRUCTURAL STABILITY CERTIFICATE

This is to certify that the Structural design for Proposed Residential Building, Plot No: 146. Old Door No 63/9, New Door No :19, Gajapathy Street (Gajapathy Naidu Street), Lakshmipuram, Shenoy Nagar, Aminjikarai Chennai – 600 030, Chennai District had been made by us based on the following is designed for S+5 floors.

1. The minimum grade of concrete is M 20.
2. The minimum grade of steel is Fe 500.
3. The design analysis using the code of practice for loading standards as per IS 875 Part1, 2 & IS 456-2000.

M.N.DINESH
Structural Engineer

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DESIGN BASIS REPORT

1. DESIGN ASSUMPTION

a) STRUCTURAL SYSTEM

The structural design of the proposed residential building S+5. Plot No: 146. Old Door No 63/9, New Door No :19, Gajapathy Street (Gajapathy Naidu Street), Lakshmipuram, Shenoy Nagar, Aminjikarai Chennai – 600 030.

2. DESIGN LOADS

a) Imposed loads

The imposed loads that are envisaged to act permanently (wherever applicable) are as Following:-

Item	Intensity in KN/m² of plan area
Floor finish	1.5

The superimposed load or otherwise live load is assessed based on the occupancy classifications as per IS: 875 (Part-2)-1987 and are listed as below.

Name of Structure	Occupancy Classification	UDL (KN/m²)
Residential Buildings	All rooms, Kitchens, Toilet and Bath Rooms	2.00
Residential Buildings	Corridors, Passages & Staircases	3.00
Residential Buildings	Roof with Access	1.50

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3. DESIGN METHODOLOGY

All structures have been designed according to the Limit State Method as specified inIS: 456-2000. Appropriate loads and its combinations, as per relevant clauses in IS 456:2000 code, for the most unfavorable effects are chosen for design.

4. MATERIALS

The self-weight of the various elements are computed based on the built weight of materials as given below:-

Materials	**Unit Weight in KN/m^3**
Steel	78.50
Plain Concrete	24.00
Reinforced Concrete	25.00
Soil	18.00
Water	10.00
Block(Concrete Blocks)	18.00

5. CONCRETE

All the concrete items for the construction have the following characteristics

Grade of Concrete = M20 for Column, Beams, and Slabs.
M25 for Foundations.

Aggregate = 20mm and down size, mechanically crushed Aggregate.

6. STEEL.

Steel reinforcement shall be of Grade Fe500 conforming to IS: 1786-1985

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7. EXPOSURE CONDITION

Structural elements below Plinth level and Exterior External faces of walls are designedfor Moderate exposure condition and internal faces of walls, floor beams and slabs aredesigned for mild exposure condition as per Table 16 of IS 456-2000.

8. COVER TO REINFORCEMENT

The clear cover to main reinforcement shall be as follows.

Foundations	=	Bottom: 50mm, Sides: 50mm
Slab	=	20mm
Columns	=	40mm for min thk 225, 25mm for min thk 150
Plinth Beams	=	25mm
Floor Beams	=	25mm or diameter of largest bar, whichever is greater.

9. FOUNDATION SYSTEM

Foundation systems are based on recommendations given as per soil investigation report provided, by **Geo Engineering Consultants & Services, Chennai.**

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DESIGN OF PILE CAP

Spacing of pile = 1500 mm

Depth of pile cap, h = $2h_p$ + 100

= 2×600+100

= 1300mm

h = 1/3 (8 h_p+600)

= 1/3 (8×600+600)

= 1800 mm

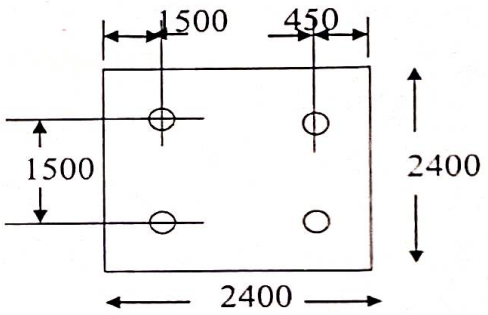
D = 750 mm

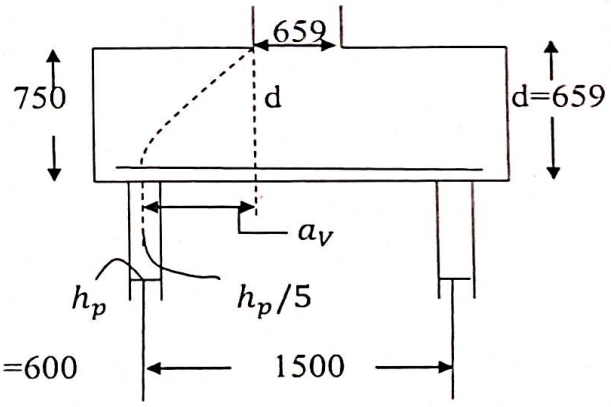
$d_c = 75 + 16 = 91mm$

d = 750-91 = 659 mm

$\frac{a_v}{d} = \frac{415}{659} = 0.63 < 2$

So truss action is predominant





Ultimate tensile force, $H_u = \frac{P_u}{24\,L.d}(3L^2 - a^2)$

$$H_u = \frac{1.5\times1015\times10^3}{24\times1350x659}(3 \times 1350^2 - 659^2)$$

$$= 360 \times 10^3 N = 360\ KN$$

$$A_{st} = \frac{H_u}{0.87 f_y} = \frac{360 \times 10^3}{0.87 \times 500} = 830 mm^2$$

$$(A_{st})min = \frac{0.12x2100X659}{100} = 1660 mm^2$$

Minimum steel is provided to resist temperature and shrinkage stresses.

Minimum steel is distributed equally on top and bottom faces of pile cap

$(A_{st})\ \min per\ face = \frac{1}{2} \times 1660 = 830 mm^2$

Spacing of 16mm bars = $\frac{2100\times201}{1660} = 254mm$

Provide 16mm at 150mm spacing both way at bottom

Provide 12mm at 150mm spacing both way at top

Check for one way shear failure at pile cap

Maximum load on each pile = 500 KN (DL+LL)

Maximum shear force on pile cap, V= 2×500

= 1000 KN

$$\tau_v = \frac{1.2 \times 1000 \times 10^3}{2400 \times 659} = 0.75\ N/mm^2$$

IS 456: Table 19 and 20 $\tau_c = 0.29$ $\tau_{c\ max} = 3.1$

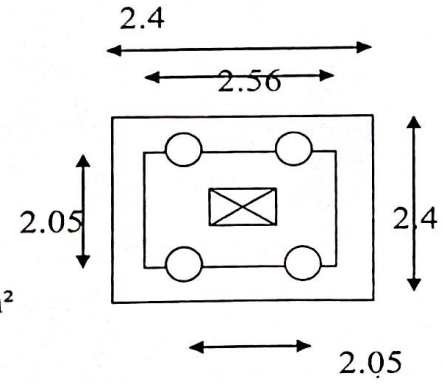
IS 456: 49.5.1, enhanced shear stress, τ_c'

$$\tau_c' = \tau_c \frac{2d}{av} = 0.29 \times \frac{2\times659}{415} = 0.92\ N/mm^2$$

$$\tau_v < \tau_c' < \tau_{c\,max}\ \ Hence\ safe$$

Check for Two Way Shear Failure (punching shear) of the pile cap

Critical section for two way shear (punching shear) is at a distance d/2 = 0.45 m from the face of column



Maximum punching shear force

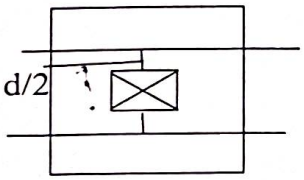
V= 1015 kN (DL + LL)

Shear stress, $\tau_{vv} = \frac{1.5\times1015\times10^3}{2\times2800\times659} = 0.3\ N/mm^2$

Allowable shear stress, $\tau_{cc} = 0.25\sqrt{25}=1.25\ N/mm^2$

$\tau_{vv} < \tau_{cc}$ Hence safe

Check for bond failure of pile rods embedded in pile cap



For M25 $\tau_{bd} = 1.4\frac{N}{mm^2}$ *IS* 456 : 26.2.1.1

Development length, $ld = \varphi \times 0.87f_y/4 \times \tau_{bd} = \frac{\varphi\times0.87\times500}{4\times(1.4\times1.6)}$

$$ld = 49\varphi$$

$$= 49 \times 16$$

$$= 784 \text{ mm}$$

Possible extension of pile rods into pile cap = 1000 -100

= 900 mm

All pile rods must be extended into pile

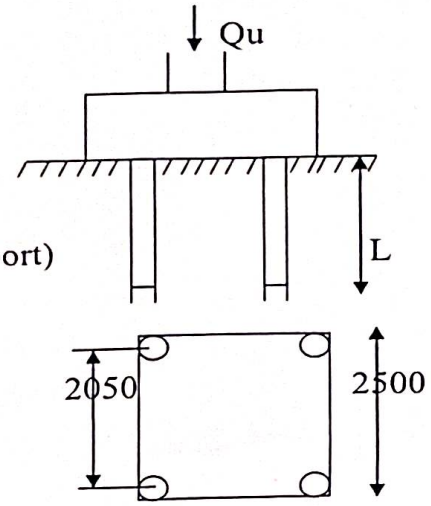
Cap for a minimum distance of ld = 784 mm say 800mm

<u>Bursting Reinforcement as SP 16</u>

Horizontal ties to resist bursting usually provided 12mm @150mmc/c.

Check for Block Failure of a 4 Pile Group

Block action



$$Q_u = Q_f + Q_b$$

$$= {}^{q}/_{f} \cdot A_f + {}^{q}/_{b} \cdot A_b$$

$q_f = 25.3\ kN/m^2$(Average value from soil report)

$q_b = 9.C_b$

$= 9\times 45 = 405\ \text{kN/m}^2$

$A_f = 2.4 \times 4 \times 20 = 192m^2$

$A_b = 2.4 \times 2.4 = 5.76m^2$

$Q_u = 25.3 \times 192 + 405 \times 5.76$

$= 7190$ Kn

$Q_s = \frac{7190}{3} = 2397\ kN$

a) Safe capacity of pile group based on group action is 2397 kN
b) Safe capacity of pile group based on individual action is $= 4\times 560 = 2240\ kN$
Allowable bearing capacity of pile group is lesser of the above two value

$$Q_s = 2240kN$$

Individual action governs.

Check for Lateral Load Carrying Capacity of a Pile

Load combination 4

$F_y = -372kN$ $\quad Mz = 1188kN - m$ $\quad F_x = -213\ kN$

Horizontal force per pile, $Q = \frac{F_y}{4} = \frac{213}{4} = 53kN$

Maximum compressive load on each pile

$$P = \frac{F_y}{4} + \frac{M.x}{\epsilon.x^2}$$

$$= -\frac{372}{4} + \frac{1188 \times 2.05}{4 \times 2.05^2}$$

$$= -93 + 145$$

$$= 52 \text{ kN}$$

Calculation of depth of fixity of pile (L_f)

IS 2911 Appendix C 5.5.2

K1 = 0.526 Kg/cm² (medium sand submerged)

K2 = 48.8 kg/cm² ($q_u = 10 \text{ to } 20\ t/m^2$)

$$c_u = \frac{q_u}{2} = 5 \text{ to } 10 \text{ t/m}^2$$

Average value of Cu for the top 5.5m at bore hole 3 is 7.5 t/m² Clearance

IS : 456, 6.2.3.1

$$E = 5000 \sqrt{f_{ck}}$$

$$= 5000 \sqrt{20}$$

$$= 25000 \text{ N/mm}^2$$

$$= 2500000 \text{ kg/cm}^2$$

$$I = \frac{\pi \times 45^4}{64} = 201.288x10^3 cm^4$$

As per National Building Code of India, 2016

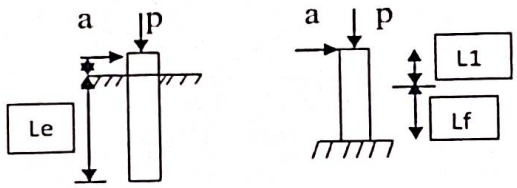
8.3.5.2.1, a pile in a group of three or more piles connected by a rigid cap shall be designed considering as fixed needed condition

$$T = 5\sqrt{\frac{EI}{K1}} = 5\sqrt{\frac{250000 \times 201.88X10^3}{0.526}} = 157cm$$

$$R = 4\sqrt{\frac{EI}{K2}} = 4\sqrt{\frac{250000 \times 201.88X10^3}{48.8}} = 179\ cm$$

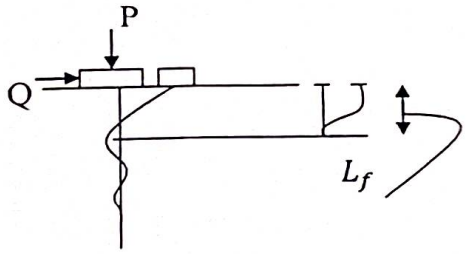
L1=0, Le = 20m

$\frac{L1}{R} = 0, \frac{L1}{T} = 0$



From fig.2

For fixed headed pile



$\frac{L_f}{R} = 2.15$ $\frac{L_f}{T} = 2.15$

$\frac{L_f}{163} = 2.15$ $\frac{L_f}{145} = 2.15$

$L_f = 385\ cm$ For clay $L_f = 314\ cm\ for\ sand$

From soil report, soil profile consists sand layer followed by clay layer. So taking average value of $L_f = \frac{385+331}{2} = 358$ cm

Calculation of BM in pile due to lateral load

$$M_f = \frac{Q(L1+L_f)}{2} = \frac{53(0+3.58)}{2} = 95kN.m$$

From fig.3.B for fixed headed pile

m=0.82

BM in the pile due to horizontal force

M = m x M_f

= 0.82 × 95

= 78 kN-m

Pile head is connected to rigid pile cap. So pile head is restrained against rotation. Hence pile is considered as fixed headed pile. Pile head is assumed to translate under horizontal force.

Calculation of reinforcement in pile to resist direct load and moment due to horizontal force

Load combination 4 (D.L + L.L)

Direct load on pile, P = 52kN

Moment on pile M = 78kN

$P_u = 1.5 \times 52 = 78$ kN

$M_u = 1.5 \times 78 = 117$ kN

IS 456; Table – 18, Partial Safety factor for loads

For D.L + L.L combination load factor is 1.5

$$\frac{P_U}{fck\, D^2} = \frac{78 \times 10^3}{25 \times 600^2} = 0.01$$

$$\frac{M_U}{fck\, D^3} = \frac{117 \times 10^6}{25 \times 600^3} = 0.02$$

$$\frac{d}{D} = \frac{50}{600} = 0.1$$

From SP – 16, Tables short column subjected to direct load & B.M

$$\frac{P}{fck} = 0.02$$

$P = 0.025 \times 25 = 0.5\%$

$$A_{sc} = \frac{0.5}{100} \times \frac{\pi \times 600^2}{4} = 1414 \text{ mm}^2$$

Provide Reinforcement 8 – Y16 $A_{sc} = 1608\text{mm}^2$

Use 8mm spiral/ ties at 150mm spacing

Percentage of steel provided is 0.6%

Design of column with Biaxial Moment **SHORT COLUMN**

The values are Displayed in Blue color are the Input values

Column No = C1, STAAD - 17

1 Design Forces From STAAD

Load Case = 100

1. Axial Load on column	=	2000 KN			
2. Bending moment along x-x, Mux	=	140 KN.m	Load Case	=	111
3. Bending moment along y-y, Muy	=	90 KN.m	Load Case	=	110

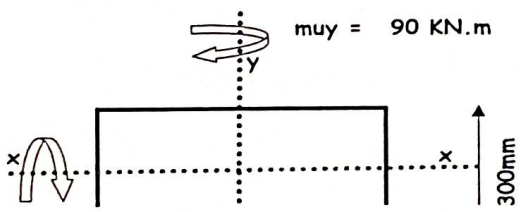
2 Design Datas

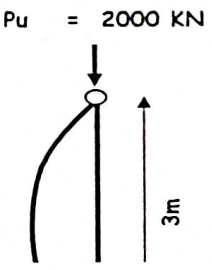
1. Compressive strength of Concrete, Fck	=	20 N/mm^2
2. Yield Strength of steel, Fy	=	500 N/mm^2
3.Diameter of Longitudinal Reinforcement,	=	25 mm
4.Diameter of lateral Reinforcement,	=	8 mm
5. Clear cover to the reinforcement, C	=	40 mm
6. Type of column	=	Rectangular
7. Size of Column	=	b x d
	=	300 x 600 mm
8. Unsupported Length of Column along x-x,L_x	=	3 m
9. Unsupported Length of Column along y-y,Ly	=	3 m
10. Effective length factor,	=	1
11. Effective Length of Column, along x-x, L_x	=	3 m
12. Effective Length of Column, along y-y, Ly	=	3 m

2 Check for leff/D

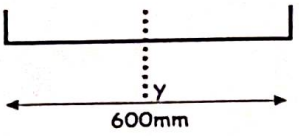
Effective length,lex/Lateral dimensions	=	L_{ex} / D
	=	5
	=	5< 12
	=	Short Column
Effective length,ley/Lateral dimensions	=	L_{ex} / b
	=	10
	=	10< 12
	=	Short Column

3 Section Geometry





mux = 140 KN.m





4 **Check for Minimum Eccentricity**

As

Applied eccentricties

$ex = Mux/Pu$
$= 140/2000$
$= 70 \text{ mm}$

$ey = Muy/Pu$
$= 90/2000$
$= 45 \text{ mm}$

Minimum eccenticity

$e_{xx} = (lex/500)+(D/30)$
$= (3000/500) + (600/30)$
$= 26 \text{ mm or } 20 \text{ mm}$
$= 26 \text{ mm}$

$e_{yy} = (ley/500)+(D/30)$
$= (3000/500) + (300/30)$
$= 16 \text{ mm or } 20 \text{ mm}$
$= 20 \text{ mm}$

5 **Moment due to Eccentricity**

$m_{uex} = Pu \times e_{xx}$
$= (2000x26)/1000$
$= 52 \text{ KN.m}$

$m_{uey} = Pu \times e_{yy}$
$= (2000x16)/1000$
$= 40 \text{ KN.m}$

6 **Design Moment**

$mux = Mux \text{ or } muex$
$= 140 \text{ KN.m}$

$muy = Mux \text{ or } muey$
$= 90 \text{ KN.m}$

7 **Calculation of Longitudinal reinforcement**

Assume percentage of reinforcement = 3 %

Asc, required = 3/100x 300x600

		=	5400 mm^2	
	No of bars	=	12 Nos	
	Asc, Provided	=	5888 mm^2	
	pt, provided	=	3.271 %	

Moment Capacity Along x Direction

(Pu/fck b D)	=	(2000000/20 x 300 x 600)	
	=	0.56	
p/fck	=	3.271/20	
	=	0.16	
d'/D	=	40/600	
	=	0.07	

From interaction chart, SP16 [chart 48]

$Mux1/fck\ b\ D^2$	=	0.13	
Mux1	=	0.13 x 300x600x600x20	
	=	280.8 KN.m	

Moment Capacity Along y Direction

(Pu/fck b D)	=	(2000000/20 x 300 x 600)	
	=	0.56	
p/fck	=	3.271/20	
	=	0.1636	
b'/D	=	40/300	
	=	0.13	

From interaction chart, SP16 [chart 50]

$Muy1/fck\ b\ D^2$	=	0.12	
Muy1	=	0.12 x 300x600x300x20	
	=	129.6 KN.m	

8 **Check for Moment Capcity**

$$(Mux/Mux1)^{an} + (Muy/Muy1)^{an} < 1$$

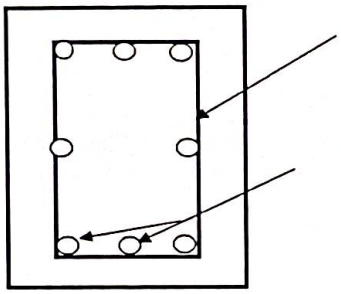
Puz	=	(0.45 fck.Ac) +(0.75 fy -0.45fck)Asc	
Ac	=	180000 mm^2	
Puz	=	3775.008 KN	For
Pu/Puz	=	0.53	an v
an	=	1.55	
$(Mux/Mux1)^{an} + (Muy/Muy1)^{an}$	=	0.908	
		0.908< 1	
		O.K	

9 **Calculation of Lateral Reinforcement**

Spacing of ties

1. Least Lateral Dimensions of column	=	300 mm
2. Sixteen times the least dia of Longi bar	=	400 mm
3. 300mm	=	300 mm
Adopt Spacing	=	300 mm

10 **Details**



No of bars = 25mm 12 Nos

Design of Rectangular Beam

The values which are Displayed in Red color are the Input values

Beam No = 1 From Staad (Envelope value)

Design Forces From STAAD

From Staad ,

1 Top moment, Mut	=	100	kNm	load case
2 Bottom moment, Mub	=	150	kNm	
3 Shear force, Vu	=	100	kN	

Design data

1. Span	=	4	m	
2. Size of the beam	=	b x	D	
		230	450	mm
3. Compressive strength of concrete, fck	=	20	N/mm²	
4. Yield strength of concrete, fy	=	500	N/mm²	
5. Clear cover, c	=	25	mm	
6. Effective depth of the beam, d	=	415	mm	
7. d'	=	43		
8. Max Diameter of top Main reinforcement, dbt	=	20	mm	
9. Max Diameter of bottom Main reinforcement, dbb	=	20	mm	
10. Factor for checking eff depth, F	=	0.133	(Based on steel gra	

Check for depth

As per 456:2000

d = √Mu,max/(F*fck*b)

= √150/0.133x20x230

d = 495.1547 mm > D, Hence not safe

As per 13920:1993

width/depth ratio	=	0.511111	Satisfied
width of the member	=	230	ok
Depth/span ratio	=	0.1125	Satisfied

Design of Top Reinforcement

Mu/b*d²	=	2.525	N/mm²	d'/d	=
R lim	=	2.676		fsc	=
Mu lim	=	106.001			

Singly Reinf

Pt lim	=	0.758			
Pt	=	0.70		Pc	=
Pt (Final)	=	0.70		Ast lim	=
Required Ast1	=	672.5595	mm²	Required Asc2	=

Bar dia	16	16		Bar dia	16	
Nos.	2	2		Nos.	2	
Provided Ast	=	804	mm²	Provided Asc	=	

Provided Reinf OK | **Provided I**

Min As required	=	162.265	mm²	0.85*b*d/fy
Max As	=	4140	mm²	
Provided Asc	=	1206.372	mm²	< Max As, Hence ok

Hence Safe

Design of Bottom Reinforcement

Mu/b*d²	=	3.787	N/mm²		

Doubly Reinf

Pt	=	1.28		Pc	=
Pt (Final)	=	0.76		Ast lim	=
Required Ast1	=	723.511	mm²	Required Asc2	=

Bar dia	16	16
Nos.	3	2

Provided Ast	=	1005	mm²	Provided Asc	=

Provided Reinf OK | **Provided I**

Min As required	=	162.265	mm²	0.85*b*d/fy
Max As	=	4140	mm²	
Provided Asc	=	1407.434	mm²	< Max As, Hence ok

Hence Safe

Check for Shear

Shear Stress, τ v	=	Vu/b*d		
τ v	=	1.05	N/mm²	
ζ	=	100*Ast req/b*d		
		0.70462		

From Table 19, IS 456:2000

B	=	2.76	
τ c	=	0.58	N/mm²

From Table 20, IS 456:2000

τ c,max	=	2.8	N/mm²

Provide shear Reinforcement as per IS 456:2000

Safe in Shear,No need to revise the beam sizes

Design of Vertical Shear Reinforcement

Vus	=	44861.5	N	
Diameter of Shear reinforcement	=	8		
Number of legged stirrups	=	2		
Area of shear Reinforcement, Asv	=	100.531	mm²	
Spacing of Stirrups, Sv	=	0.87*fy*Asv*d/Vus		
	=	405	mm	

Spacing of Shear Reinforcement

1	0.75*d	=	311.25	mm	(As per Cl 26.5.1.5 of IS 456:2000)
2	300	=	300	mm	

Spacing as per IS 456:2000	=	300	mm
As per 13920:1993			
2*d distance from supports	=	0.83	m
Spacing	=	104	mm

Provide 103.75 mm c/c spacing for 0.83 m from support on either side

Remaining Distance	=	2.34	m
Spacing	=	207.5	mm

Provide 207.5 mm c/c spacing for 2.34 m in mid span

Check for Side face Reinforcement

Not required

Area of reinforcement	=	0	mm²
No of bars	=	4	
Spacing of bars	=	0	mm
Dia of bar	=	12	mm
Area Provided	=	452.3893	mm²

Check for Deflection

l/d provided	=	9.64	mm
(l/d)basic	=	20	mm

As per IS 456:2000 Cl 23.2.

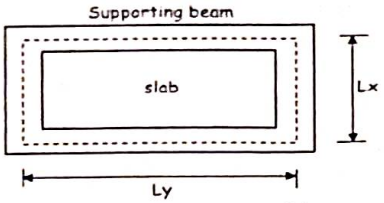
Modification factors

k1	fs =	208.71	pt	=	0.76	k1	=	1
k2			pc	=	0	k2	=	1
k3						k3	=	1

l/d max	=	20	mm

Safe in deflection

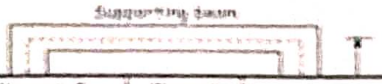
	Design of Two way Slab	The values are Displayed in Blue color are the Input values	References
1	**Design Datas**		



1. Eff Shorter span between c/c support, Lx	=	3.3	m	(Eff. Span,As per IS456:2000, clause 22.2 (b))
2. Eff Longer span between c/c support, Ly	=	5.3	m	
3. Compressive strength of Concrete, Fck	=	20	N/mm^2	
4. Yield Strength of steel, Fy	=	500	N/mm^2	
5 Diameter of Reinforcement, (Shoter span)	=	10	mm	
6 Diameter of Reinforcement, (Longer span)	=	10	mm	
7. Fire resistance in hours	=	1.5	hrs	(Nominal cover, As per IS456:2000, Table 16A, clauses 21.4 and 26.4.3 and Fig 1
8. Nominal cover to the reinforcement, C	=	20	mm	
2 Assume trial depth of slab				
Span/depth, ratio l/d (Basic value)	=	26		(Span/depth ratio,As per IS:456:2000, Clause 23.2.1)
Assume modification factor, M.F	=	1.5		
depth of slab	=	(Span/B.V x M.F)		
	=	(3.3 x 1000) / (26 x 1.5)		
	=	84.62	mm	
Overall depth required, D	=	(d+cc+1/2 dia of bars)		
	=	84.62 + 20+ 10 /2		
	=	109.62	mm	
	=	125	mm	
Eff. Depth,d	=	**100**	mm	
3 Load Calculations				
Unit weight of Concrete	=	25	KN/m^3	
Dead load of Slab	=	3.13	KN/m^2	
Floor finishes	=	2	KN/m^2	
Partitions	=	0	KN/m^2	
Extra loads due to filling, surki , etc., if any	=	0	KN/m^2	
Live Load	=	2	KN/m^2	
Total Load	=	**7.13**	KN/m^2	
Design Load	=	**10.695**	KN/m^2	
4 Calculation of Bending Moment				
Edge condition of Slab	=	9 9.Four Edges discontineous		Edge conditions As per IS456 2000 D-1 1and 24 4 1
Ly/Lx, ratio	=	5.3 / 3.3		
	=	**1.6061**		
	=	**The slab is Two way Slab**		

Design of Two way Slab	The values are Supplyed in Blue color are the Input values	References

1 Design Datas



S.No	Direction & Sign	Moment Co-efficients	Moment KN.m	
1	X - Negative	0	0	(alpha x * wu *lx²)
2	X - Positive	0.097	11.3	(alpha x * wu *lx²)
3	Y- Negative	0	0	(alpha y * wu *lx²)
4	Y- Positive	0.056	6.52	(alpha y * wu *lx²)

(B M co-eff from Annex D, clause D.1.1, IS:456:2000)

Mx max = 11.3 KN/m

5 Effective depth required

Mu lim = (0.36 x Fck x (xu max/d) x (1- 0.42(xu max/d)) x bd²

xu max/d = 0.46

Mu lim = 2.67 bd²

d reqd = (Mu lim/Qb)^1/2

= (11300000 / (2.67 x 1000))^1/2

= 65.06 mm

65.06 < 100

O.K

(IS:456:2000, Annex G, clause G.1.1.c)

6 Reinforcement Calculations

S. N	Dn & Sign	Mu/bd²	pt from SP16	pt, min	pt,provided	Ast, mm²
1	x -ve	0	0	0.12	0.12	120
2	x +ve	1.13	0.279	0.12	0.279	279
3	y -ve	0	0	0.12	0.12	120
4	y +ve	0.65	0.155	0.12	0.155	155

pt = 100Ast/bd

Ast = (pt/100)xbd

(Minimum reinforcement of slab shall be provide as per IS456:2000, clause 26.5.2.1)

7 Spacing of reinforcement

Spacing, mm		Spacing provided, mm	Ast provided, mm²
Actual	Maximum		
654.17	300	150	523.33
281.36	300	150	523.33
654.17	300	150	523.33
506.45	300	150	523.33

Spacing = (ast x 1000)/Ast

where,
ast= C/s area of bar
Ast=Area of reinforcement provided

max distance of tension reinforcement bars 3d or 300mm which ever is less As per IS:456:2000, Clause 26.3.3.b

8 Check for deflection

close

close

lx/d, Actual = 33

l/d, Max = B.V x M.F

pt, = 100Ast/bd

= 0.5233

fs = 0.58x fyx(Ast required/Ast provided)

fs = 154.61 N/mm²

Modification Factor = 1.83

l/d, Max = 1.83 X 26

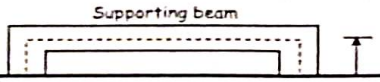
= 47.58

47.58>33

O.K

From Fig 4, IS456:2000

	Design of Two way Slab	The values are Displayed in Blue color are the Input values	References
1	**Design Datas**		



9 Torsional Reinforcement

As per IS456:2000, ANNEX D, clause D-1.8

		lx		ly	
Size of torsinal reinforcement mesh (lx/5 and ly/5)	=	660	x	1060	mm
Ast required to resist the torsion	=	3/4 times of mid-span Ast			
	=	209.25	mm^2		
dia of torsional reinforcement	=	8	mm		
Spacing required	=	240	mm		
Spacing Provided	=	200	mm		
No of layers	=	4	Nos (Each 2 top and bottom)		

NOTE:

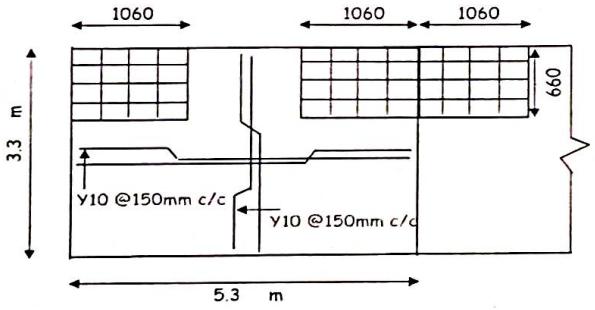
1. Torsion reinforcement shall be provided at any corner where the slab is simply supprted on both edges meeting at that corner

2. Torsion reinforcement equal to half that described above shall be provided a at corner contained by edges over only one of which the slab is continuous

3. Torsion reinforcements need not be provided at any corner contained by edges over both of which the slab is continuous

9 Reinforcement Details

Direction	Reinforcement
X	**Y10 @150mm c/c**
Y	**Y10 @150mm c/c**



THE LANDLENS SUITE

Eight ways to know a piece of land before you pay for it.

This report covers one part of the picture. These cover the rest, drawn from the same government records, for any property in Tamil Nadu.

LandLens One
Ask anything about a property and get an answer grounded in live government records, with the sources shown.
/landlens/one

Verify My Land
Every record check run on one property and returned as a single report.
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Legal Opinion
An advocate's written opinion on the title, built on the records we pull for it.
/landlens

One Map
Every layer on one map: the parcel, its boundary, zoning, water bodies and what sits around it.
/landlens/one/map

PriceMap
What land actually changed hands for around this plot, taken from the registered deeds.
/landlens/pricemap

Build Scope
What you are allowed to build here: floor space, height, coverage and setbacks.
/landlens/build-scope

Property Tracker
Watch a property and hear about it when something new is registered against it.
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Deal Room
Run the transaction in one place: documents, stamping, signatures and the parties.
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- Patta and Chitta
- Field Measurement Sketch
- EC Analyzer
- Bank charge check
- Court case search
- Seller background check
- Approval check by survey

Value and duty

What it is worth and what it costs to register.

- Guideline value by street
- Guideline value by survey
- Stamp duty and registration fees
- Capital gains
- Floor space index
- Area unit converter

Zoning and land use

What the plan says can happen on this land.

- Land use zone finder
- CMDA land use check
- Coastal regulation zone
- Master plan check
- Water bodies finder
- Airport height clearance

Registers and directories

Who holds it, and which office keeps the record.

- Find your registering office
- Temple property check
- Waqf property check
- RERA register

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