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DIGITALLY VERIFIED RECORD

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NO.10, 9TH STREET, 2ND SECTOR, K.K.NAGAR, CHENNAI – 600078
CHARTERED CIVIL ENGINEER (M-165213-8)

02.01.2025
Chennai

STABILITY CERTIFICATE

(To be furnished while filling application for registration of building)

The detailed engineering and structure design of the proposed building comprising of **Basements + Stilt + 11 floors** at T.S No. 125/1, Old S.F No.252/2, 253/2, Block 37, Ward B, Thally Road, Hosur, Krishnagiri District – 635109 has been done by me/us based on the report of geotechnical investigation (soil test) done by Mars Synergy Geo Tech Pvt Ltd Report No. MSGTPL/SI-5888/23-24 Dated 15.07.2023 and considering the functional requirement of the building.

2. It is certified that among other factors, the proposed building has been designed to resist earthquake. I/we have checked various parameters and found that the proposed building would be safe.

3. I/We further certify that:

i) The minimum grade of concrete is M30

ii) The design and analysis has been done using the code of practice for plain and reinforced concrete as per IS 456, design loads as per IS Code No. 875 and design of earthquake resistant structure as per IS Code No. 1893 (Part 1) 2016.

4. The building will be safe and sound when used for the purpose for which it is designed.

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STRUCTURAL DESIGN STABILITY CERTIFICATE

I hereby certify that the Proposed Construction of Multi Storied Residential Apartment Building in T.S.NO:125/1, Old S.F.NO:252/2,253/2, Block 37, Ward B at Thally Road, Hosur Town, Krishnagiri District, that the building will with stand against the Earthquake, (Seismic Zone II as per IS 1893 (Part-I) - 2016) loading stress parameters are within limits of National building code and Bureau of Indian standards code of practice for concrete and loading. The R.C.C building frame of the structure is designed as per the Indian Standard code of practice for concrete and loadings. The structure will be constructed as per the structural design and detailing of reinforcements given in the drawing from foundation to roof slab and beam. For external and internal partition walls 200/100 thick Block walls are used. The structure is sound and stable.

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DESIGN BASIS REPORT FOR

PROPOSED RESIDENTIAL APARTMENT BUILDING FOR

M/s.SR GROUP'S AT HOSUR.

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1.0 OBJECTIVE

The Design basis covers the basic requirement that will be followed for the design of Proposed Residential Apartment Building for M/s.SR GROUP AT Hosur. Considering the length and shape of the building, the same is divided into two different blocks with expansion joint wherever necessary.

The building is designed for Stilt + 11 Floors. The structure is supported on columns in turn resting on Raft foundation. The structural system comprises columns, beams and slab structure.

3-D Analysis of all the building structures will be carried out using STAAD PRO software package and analysis results shall be used for designing the various elements.

2.0 DESIGN LOADS

2.1 Dead Loads

The Dead loads that are envisaged to act permanently are considered as per IS: **875 (Part 1) – 1987 – Dead loads.** Indian Standard **"Code of Practice for Design Loads (other than earthquake) for Buildings and Structures"**

1. Slab is assumed to be 125 mm thick – 3.125 KN/m²
2. Slab is assumed to be 150 mm thick – 3.75 KN/m²
3. Floor finish – 1.25 KN/m²
4. Toilet filling load(100mm) – 2 KN/m²
5. Block work masonry walls 200 & 150 mm thick are proposed to be used (location of walls as per Architectural drawings) Unit weight is taken as 20 KN/m^3
6. Weathering course in Terrace finish – 3 KN/m^2

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2.2 Imposed Loads

The imposed loads that are envisaged to act permanently are considered as per IS: **875 (Part 2) – 1987**. Indian Standard **"Code of Practice for Design Loads (other than earthquake) for Buildings and Structures"**.

1. Living = 2 KN/m^2
2. Staircase = 4 KN/m^2
3. Toilet = 2 KN/m^2

2.3 Wind Load

The wind pressure shall be calculated based on the provision laid in **IS : 875 (Part 3) – 2015.** The basic wind speed, terrain category, height factor and structures class etc. required for the wind pressure calculation can be furnished from this codal provisions.

Location	:	Hosur		
Wind Loads	:	As per IS 875		
As per IS 875 Part 3	:	Basic Wind speed	V_b	= 39 m/Sec.
		(Table 1)	K1	= 1.0
		(Table 2)	K2	= Terrain category -3
		Class – B	0 to 10m – K2 = 1.05	
			10 to 15m – K2 = 1.09	
			15 to 20m – K2 = 1.12	
			20 to 30m – K2 = 1.15	
			30 to 50m – K2 = 1.20	
		(Table 3)	K3 = 1	
Design Wind Speed (V_z)	:	V_b x K1 x K2x K3		
		39 x 1 x 1.05 x 1	=	40.95 m/Sec.
Design Wind Pr	:	0.6 x Vz^2		
Pz	:	0.6 x 40.95^2	=	1006 N /m^2
			Pz =	1.006 KN/m^2

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Design Wind Speed (Vz)	:	V_b x K1 x K2x K3		
		39 x 1 x 1.09 x 1	=	42.51 m/Sec.
Design Wind Pr	:	0.6 x Vz^2		
Pz	:	0.6 x 42.51^2	=	1084 N /m^2
		Pz	=	1.084 KN/m^2

Design Wind Speed (Vz)	:	V_b x K1 x K2x K3		
		39 x 1 x 1.12x 1	=	43.68 m/Sec.
Design Wind Pr	:	0.6 x Vz^2		
Pz	:	0.6 x 43.68^2	=	1144 N /m^2
		Pz	=	1.144 KN/m^2

Design Wind Speed (Vz)	:	V_b x K1 x K2x K3		
		39 x 1 x 1.15x 1	=	44.85 m/Sec.
Design Wind Pr	:	0.6 x Vz^2		
Pz	:	0.6 x 44.85^2	=	1207 N /m^2
		Pz	=	1.207 KN/m^2

Design Wind Speed (Vz)	:	V_b x K1 x K2x K3		
		39 x 1 x 1.2 x 1	=	46.8 m/Sec.
Design Wind Pr	:	0.6 x Vz^2		
Pz	:	0.6 x 46.8^2	=	1314 N /m^2
		Pz	=	1.314 KN/m^2

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2.4 Earthquake Load

The loading due to earthquake is assessed based on the provisions of **IS : 1893-2016.**

Hosur falls under Seismic Zone II

Zone factor = 0.1

Response reduction factor = 5

Importance factor = 1.2

As per **IS: 1893-2016**, percentage of imposed loads to be considered for seismic weight calculation is mentioned below:

Imposed Uniformity Distributed Floor Load Loads (kN/ m^2)	Percentage of Imposed
Up to & including 3.0	25
Above 3.0	50

2.5 Load Combinations

The various loads shall be combined in accordance with the stipulations in IS: 875 (Part 5) – 1987. Whichever combinations produced the most unfavorable effect in the building, foundations or structural member concerned shall be adopted. The various load combinations considered in the analysis are as follows:

1. 1.0 (DL+LL)
2. 1.0 DL+ 1.0 SQX+1
3. 1.0 DL+ 1.0 SQX-1
4. 1.0 DL+ 1.0 SQZ+1
5. 1.0 DL+ 1.0 SQZ-1
6. 1.0 DL+ 0.8 LL + 0.8 SQX+1
7. 1.0 DL+ 0.8 LL + 0.8 SQX-1
8. 1.0 DL+ 0.8 LL + 0.8 SQZ+1
9. 1.0 DL+ 0.8 LL + 0.8 SQZ-1

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10. 1.0 DL+ 1.0 WLX+1

11. 1.0 DL+ 1.0 WLX-1

12. 1.0 DL+ 1.0 WLZ+1

13. 1.0 DL+ 1.0 WLZ-1

14. 1.0 DL+ 0.8 LL + 0.8 WLX+1

15. 1.0 DL+ 0.8 LL + 0.8 WLX-1

16. 1.0 DL+ 0.8 LL + 0.8 WLZ+1

17. 1.0 DL+ 0.8 LL + 0.8 WLZ-1

18. 1.5 (DL+LL)

19. 1.2 (DL+LL+EQX+1)

20. 1.2 (DL+LL-EQX-1)

21. 1.2 (DL+LL+EQZ+1)

22. 1.2 (DL+LL-EQZ-1)

23. 1.5 (DL+EQX+1)

24. 1.5 (DL+EQX-1)

25. 1.5 (DL+EQZ+1)

26. 1.5 (DL+EQZ-1)

27. 0.9 DL + 1.5 EQX+1

28. 0.9 DL + 1.5 EQX-1

29. 0.9 DL + 1.5 EQZ+1

30. 0.9 DL + 1.5 EQZ-1

31. 1.2 (DL+LL+WLX+1)

32. 1.2 (DL+LL+WLX-1)

33. 1.2 (DL+LL+WLZ+1)

34. 1.2 (DL+LL+WLZ-1)

35. 1.5 (DL+WLX+1)

36. 1.5 (DL-WLX-1)

37. 1.5 (DL+WLZ+1)

38. 1.5 (DL+WLZ-1)

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39. 0.9 DL + 1.5 WLX+1

40. 0.9 DL + 1.5 WLX-1

41. 0.9 DL + 1.5 WLZ+1

42. 0.9 DL + 1.5 WLZ-1

43. 1.0 DL+ 1.0 RSX+1

44. 1.0 DL+ 1.0 RSX-1

45. 1.0 DL+ 1.0 RSZ+1

46. 1.0 DL+ 1.0 RSZ-1

47. 1.0 DL+ 0.8 LL + 0.8 RSX+1

48. 1.0 DL+ 0.8 LL + 0.8 RSX-1

49. 1.0 DL+ 0.8 LL + 0.8 RSZ+1

50. 1.0 DL+ 0.8 LL + 0.8 RSZ-1

51. 1.2 (DL+LL+RSX+1)

52. 1.2 (DL+LL-RSX-1)

53. 1.2 (DL+LL+RSZ+1)

54. 1.2 (DL+LL-RSZ-1)

55. 1.5 (DL+RSX+1)

56. 1.5 (DL+RSX-1)

57. 1.5 (DL+RSZ+1)

58. 1.5 (DL+RSZ-1)

59. 0.9 DL + 1.5 RSX+1

60. 0.9 DL + 1.5 RSX-1

61. 0.9 DL + 1.5 RSZ+1

62. 0.9 DL + 1.5 RSZ-1

The above load combinations will be considered and effect of worst combinations will be taken for design of various building elements.

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3.0 ANALYSIS METHODS

The analysis of the structures is carried out using the STAAD PRO. The entire super-structure is modeled using frame elements as appropriate. Beams and columns are modeled as frame elements. Appropriate loads and its combination as per relevant IS code clauses are chosen for design.

4.0 DESIGN ASSUMPTION

4.1.1 The Base of the Foundation is assumed to be FIXED.

4.1.2 All Concrete elements shall be designed in accordance with IS 456: 2000 Limit State Design.

5.0 FOUNDATION DESIGN

1. Type of Foundation : Raft Foundation. (as per soil report)
2. Safe bearing Capacity

   At 2.5m depth from NGL : 200 kN/m^2
3. Depth of Foundation : 2.5 m from N.G.L

6.0 MATERIALS

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

S.no	Materials	Unit weight KN/m^3
1	Reinforced Cement Concrete	25
2	Solid Block / Brick	20
3	Steel	78.50

Structural concrete shall be of grade M30 for Raft.

Structural concrete shall be of grade M25 for all other structural Elements.

Steel reinforcement shall be of Grade Fe500 confirming to IS: 1786-2008.

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7.0 NOMINAL COVER TO REINFORCEMENT

From Durability requirement, exposure condition is assumed as mild for structural elements above ground level and moderate for structural elements below ground level.

The Clear cover to reinforcement to meet durability requirement shall be as follows:

Column	–	40mm
Raft	–	50mm
Beam	–	25mm
Slab	–	20mm

8.0 LIST OF CODES & REFERENCES:

- IS: 456 2000: Code of practice for Plain and Reinforced Concrete.
- IS: 875 Part 1: Code of Practice for Design of Dead Loads for buildings and structures.
- IS: 875 Part 2: Code of Practice for Design of imposed Loads for buildings.
- IS: 875 Part 3: Code of Practice for Design Loads (Wind loads) for buildings & structures (other than Earthquake).
- IS: 1893 (Part 1)-2016: Criteria for Earthquake resistant Design of structures.
- IS: 13920-2016: Ductile detailing of reinforced concrete structures subjected to seismic forces.
- IS 1786-1985: code of practice for steel.
- SP 16: Design aids for reinforced concrete to IS: 456- 1978.
- SP 34: Hand book on concrete reinforcement detailing.

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DESIGN OF RAFT

Total Load from Building = 96874 kN

Total Load including self-weight = Total load x 1.1

= 106561 kN

SBC of Soil = 200 kN/m^2

Required Area = Total Load including self-weight / SBC

= 106561/200

= 532.80 m^2

≈ 531 m^2

Area provided = 662.79 m^2

≈ 662 m^2

HENCE SAFE

Pressure of Soil = Total load / Area provided

= 96874 / 662

= 146 kN/m^2

Depth of Raft (D) = 800 mm

Bending Moment at TOP = 146 x 5.69^2 / 10

= 472 kNm

Factored Moment = 472 x 1.5

= 709 kNm

R = (709 x 10^6)/(1000 x 740^2)

= 1.29

Pt/100 =Ast/bd = fck/2fy [1-Sq.rt (1-4.598xR/fck)\

fck = 30 N/mm^2

fy = 500 N/mm^2

Pt = 0.313%

Ast required = 2316 mm^2

Provide 20Y @ 125 mm C/C

Ast provided = 2512 mm^2

Hence safe.

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Bending Moment at BOTTOM = $146 \times 5.69^2 / 10$

= 472 kNm

Factored Moment = 472×1.5

= 709 kNm

Bending moment at mid span, Mu = 709kNm

R = $(709 \times 10^6)/1000 \times 740^2)$

= 1.29

Pt = 0.313%

Ast required = 2316 mm^2

Provide 20Y @ 125mm C/C

Ast provided = 2512 mm^2

Hence Safe.

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DESIGN OF COLUMN - (1'-0" X 3'-0")

Length of column	D	900	mm
Breadth of column	b	300	mm
Unsupported length (longer direction)	L_x	3000	mm
Unsupported length (shorter direction)	L_y	3000	mm
Eff. Length (longer direction)	L_{ex}	2400	mm
Eff. Length (shorter direction)	L_{ey}	2400	mm
Factored Load	P_u	3240	kN
Factored moment (longer direction)	Mux	135	kNm
Factored moment (shorter direction)	Muz	50	kNm
Charac. comp strength of concrete	f_{ck}	25	N/mm^2
Yield stress of steel	f_y	500	N/mm^2
Dia of bar used	Φ	20	mm
Clear cover		40	mm
Effective cover	d'	50	mm
Effective depth	d	850	mm
Check for slenderness			
Longer Direction			
Slenderness ratio	L_{ex}/D	2.67	**short**
Additional moment due to slenderness	M_{ax}	0	kN-m
Shorter Direction			
Slenderness ratio	L_{ey}/b	8.00	**short**
Additional moment due to slenderness	M_{ay}	0	kN-m
Calculation of P_{uz}			
No of bars used		16	
Area of reinforcement	Ast	5024	
Provided steel		16 nos Y20	
Percentage of reinforcement	p_t	1.861	%
Area of concrete	Ag	270000	mm^2
Ultimate axial load (without moments)	P_{uz}	4865	kN
Calculation of P_b:			
Longer Direction			
	d'/D	0.056	
Coefficient k_1(from TABLE 60 of SP:1980)	k_{1x}	0.218	From Sp16
Coefficient k_2(from TABLE 60 of SP:1980)	k_{2x}	0.532	
Axial load corresponding to balanced failure	P_{bx}	1736	kN
Reduction factor for additional moments	k_x	1.000	
Moment due to slenderness	M_{ax}	**0.00**	kN-m
Shorter Direction			
	d'/b	0.167	
Coefficient k_1(from TABLE 60 of SP:1980)	k_{1y}	0.191	
Coefficient k_2(from TABLE 60 of SP:1980)	k_{2y}	0.265	
Axial load corresponding to balanced failure	P_{by}	1422	kN
Reduction factor for additional moments	k_y	0.472	
Moment due to slenderness	M_{ax}	**0.00**	kN-m

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Check for moments due to min. eccentricity					
Longer Direction					
Minimum eccentricity			e_x	36.00	mm
Moment due to min. eccentricity			M_x	116.64	kN-m
Moment in longer direction			M_{ux}	135.00	kNm
Shorter direction					
Minimum eccentricity			e_y	16.00	mm
Moment due to min. eccentricity			M_y	51.84	kN-m
Moment in shorter direction			M_{uy}	51.84	kNm
Final design moments					
Moment in longer direction			M_{ux}	**135.00**	kNm
Moment in shorter direction			M_{uy}	**51.84**	kNm
Check for interaction					
			d'/D	0.056	
			d'/b	0.167	
p/f_{ck}			p/f_{ck}	0.074	
$P_u/f_{ck}bD$ value			$P_u/f_{ck}bD$	0.480	
$M_{ux1}/f_{ck}bD^2$ value (from SP 16:1980 charts)			$M_{ux1}/f_{ck}bD^2$	0.095	
Uniaxial moment capacity (longer direction)			M_{ux1}	**577.125**	kNm
$M_{uy1}/f_{ck}bD^2$ value (from SP 16:1980 charts)			$M_{uy1}/f_{ck}bD^2$	0.080	
Uniaxial moment capacity (shorter direction)			M_{uy1}	**162**	kNm
P_u/P_{uz} ratio			P_u/P	**0.666**	
Value of exponent				1.778	
Interaction ratio				**0.208**	
Percentage reinforcement satisfactory or not				**safe**	

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Design of Roof Beam

Client Name : M/s. SR GROUP

Project Name : PROPOSED RESIDENTAIL APARTMENT AT HOSUR

Description		Formula / Variable		Result	Unit
General Input Data					
Clear span		l	=	5330	mm
Total depth of beam		D	=	450	mm
Width of beam		b	=	200	mm
Width of left side support			=	300	mm
Width of right side support			=	300	mm
Assumed diameter of bar		Φ	=	25	mm
Clear cover to main reinforcement			=	25	mm
Effective cover to main reinforcement		d'	=	37.5	mm
Effective depth of beam		d	=	412.5	mm
Effective span of beam		L_{eff}	=	5630	mm
Factored bending moment	at end span1	M_u From Staad O/P	=	125	kNm
	at midspan	M_u From Staad O/P	=	65	kNm
	at end span2	M_u From Staad O/P	=	125	kNm
Factored shear force	at end span1	V_u From Staad O/P	=	110	kN
	at midspan	V_u From Staad O/P	=	0	
	at end span2	V_u From Staad O/P	=	110	
Material Data					
Grade of Concrete		f_{ck} M25	=	25	N/mm^2
Yield Strength of Reinforcement		f_y	=	500	N/mm^2
Unit Weight of Concrete		w_c	=	25	kN/m^3
Youngs modulus of steel		E_s	=	200000	N/mm^2
Check for bending moment					
Ultimate limiting of bending moment		$M_{u,lim} = 0.133 \times f_{ck} \times b \times d^2$ (From SP16, Table C, P.No:10)	=	113.15391	kNm

End span 1	M_u >	Mu,lim	Hence	doubly	reinforced section is required	
Mid span	M_u <	Mu,lim	Hence	singly	reinforced section is required	
End span 2	M_u >	Mu,lim	Hence	doubly	reinforced section is required	

Calculation of limiting neutral axis depth				
Neutral axis depth	$X_{u,lim} = 0.46 \times d$ (From IS456:2000, clause 38.1, P.No:70)	=	189.75	mm

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Calculation of tension reinforcement for end and mid span

Tension reinforcement	$A_{st} = A_{st1} + A_{st2}$ $A_{st1} = (P_{t,lim} \times b \times d) / 100$ $A_{st2} = (M_{u2}) / (0.87 \times f_y \times (d-d'))$ $P_{t,lim} = (18.87 \times f_{ck}) / (f_y)$ $M_{u2} = (M_u - M_{u,lim})$ (From SP16, Table C, P.No:10)		

End span 1 (top)

Required tension reinforcement = 851 mm^2

		Nos.	Dia.(mm)	% Rft.		
Provided tension reinforcement	Main	2	16	1.25	= 1030	mm^2
	Extra	2	20			

Provided area > Required area HENCE SAFE

Mid span (bottom)

Required tension reinforcement = 483 mm^2

		Nos.	Dia.(mm)	% Rft.		
Provided tension reinforcement	Main	2	16	0.73	= 603	mm^2
	Extra	1	16			

Provided area > Required area HENCE SAFE

End span 2 (top)

Required tension reinforcement = 851 mm^2

		Nos.	Dia.(mm)	% Rft.		
Provided tension reinforcement	Main	2	16	1.25	= 1030	mm^2
	Extra	2	20			

Provided area > Required area HENCE SAFE

Calculation of compression reinforcement

Required compression reinforcement	$A_{sc} = [M_{u2}] / [(f_{sc} - f_{cc}) \times (d - d')]$ $M_{u2} = (M_u - M_{u,lim})$		
Strain at the level of centroid of compression steel	$\varepsilon_{sc} = [0.0035 \times (x_u - d')] / [x_u]$	= 0.00281	
Here value of ε_{sc} is greater than $(0.696 \times f_y)/(E_s)$			
Stress in compression steel	f_{sc} is get from Interpolate ε_{sc} value in Table A, Clause 1.4, SP16, P.No:6	= 414.44005	N/mm^2
Stress in concrete at the level of the centroid of the compression steel	$f_{cc} = 0.447 \times f_{ck}$	= 11.175	N/mm^2

End span 1 (bottom)

Required compression reinforcement = 78.334543 mm^2

		Nos.	Dia.(mm)	% Rft.		
Provided compression rft.	Main	2	16	0.49	= 402	mm^2
	Extra	0	0			

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Provided area	>	Required area		HENCE SAFE		
Mid span (top)						
Required compression reinforcement					= -318.4268	mm^2
		Nos.	Dia.(mm)	% Rft.		
Provided compression rft.	Main	2	16	0.49	= 402	mm^2
	Extra	0	0			
Provided area	>	Required area		HENCE SAFE		
End span 2 (bottom)						
Required compression reinforcement					= 78.334543	mm^2
		Nos.	Dia.(mm)	% Rft.		
Provided compression rft.	Main	2	16	0.49	= 402	mm^2
	Extra	0	0			
Provided area	>	Required area		HENCE SAFE		
Check for ductlity						
End span 1 (bottom)						
Compression rft. limit	$P_{c,limit} = (0.87 \times f_y \times (p_t - p_{t,limit})) / (f_{sc} - (0.447 \times f_{ck}))$				= 0.33	%
$P_{c,limit}$	<	$P_{c,provided}$		HENCE SAFE		
Mid span (top)						
Compression rft. limit	$P_{c,limit} = (0.87 \times f_y \times (p_t - p_{t,limit})) / (f_{sc} - (0.447 \times f_{ck}))$				= -0.23	%
$P_{c,limit}$	<	$P_{c,provided}$		HENCE SAFE		
End span 2 (bottom)						
Compression rft. limit	$P_{c,limit} = (0.87 \times f_y \times (p_t - p_{t,limit})) / (f_{sc} - (0.447 \times f_{ck}))$				= 0.33	%
$P_{c,limit}$	<	$P_{c,provided}$		HENCE SAFE		
Check for deflection						
Condition	$(L/d)_{max} > (L/d)_{actual}$					
	$(L/d)_{max} = (L/d)_{basic} \times K_t \times K_c$					
	$(L/d)_{basic}$ (From IS456:2000, Clause 23.2.1, P.No:37				= 20	
Modification factor for tension rft.	$K_t = 1 / ((0.225) + (0.00322 \times f_s) - (0.625 \times \log10(1/p_t)))$				= 1.126	
Modification factor for compression rft.	$K_c = (1)+((P_c)/(P_c+3)) <= 1.5$				= 1.140	
Steel stress of service loads	$f_s = (0.58 \times f_y \times$ Area of steel req.)/(Area of steel pro.)				= 232	N/mm^2
Maximum allowable deflection	$(L/d)_{max}$				= 25.67	mm

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Actual deflection	$(L/d)_{actual}$	=	13.648	mm
$(L/d)_{max}$ > $(L/d)_{actual}$	HENCE SAFE			
Check for shear				
Maximum shear force @ end span	V_u	=	110	kN
Nominal shear	$\tau_v = V_u / (b \times d)$ (From IS456:2000, Clause 40.1, P.No:72)	=	1.33	N/mm^2
Design shear strength of concrete	τ_c (From IS456:2000, clause 31.6.3, P. No:58)	=	0.700	N/mm^2
τ_v > τ_c	HENCE SHEAR RFT. REQUIRED			
Provide 8 mm dia of 2 legged vertical stirrup rod				
Strength of shear reinforcement	$V_{us} = V_u - (\tau_c \times b \times d)$	=	52269.4	N
Spacing of stirrups	$S_v = (0.87 \times f_y \times A_{sv} \times d) / (V_{us})$	=	345	mm
Maximum spacing, (0.75 d)		=	309	mm
		=	300	mm
Hence provide 100 mm c/c spacing				

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DESIGN OF TYPICALFLOOR SLAB S1

DESIGN CALCULATIONS

Design of two way Slab **S1**

Basic Data

Grade of concrete (fck)		=	M 25	
Grade of steel (fy)		=	Fe 500	
Thickness of slab (D)		=	125	mm
Clear cover (cc)		=	20	mm
Effective thickness of slab (deff)	= 125 - 20 - 8 /2	=	101	mm
Unit weight of concrete		=	25	KN/m^3
Effective Shorter Span (Lx)		=	3.3	m
Effective Longer Span (Ly)		=	3.6	m
Aspect ratio Ly/Lx		=	1.09	**Two way slab**

Edge Condition : **Three Edges Discontinuous (One Long Edge Continuous)**

Load Data

Dead Load	= 0.13 x 25	=	3.125	KN/m^2
Floor finish		=	1.25	KN/m^2
Imposed Load		=	2.00	KN/m^2
Total load		=	6.38	KN/m^2
Design load (Wu) = 1.5 x 6.375		=	**9.56**	KN/m^2

Moment and Shear Calculations

Short Span Direction

ax for positive moment			1	→	0.043	
			1.1	→	0.048	
		for 1.09	αx	=	0.048	
Positive moment Mx :	0.048 x	9.56 x	3.3 ^2	=	**4.95**	KN-m
ax for negative moment			1	→	0.057	
			1.1	→	0.064	
		for 1.09	αx	=	0.063	
Negative moment Mx :	0.063 x	9.56 x	3.3 ^2	=	**6.60**	KN-m

Long Span Direction

For positive moment			αy	=	0.043	
Positive moment My :	0.043 x	9.56 x	3.3 ^2	=	**4.48**	KN-m

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For negative moment αy = 0.000

Negative moment My : 0.000 x 9.56 x 3.3 ^2 = **0.00** KN-m

Shear force V_u = 9.56 x 3.3 x 0.5 = **15.78** KN

Check Effective Depth for Bending

Depth required = $(M_x / (0.133x \text{ fck x b}))^{1/2}$ = 44.55 mm

Depth provided = 125 - 20 - 8 /2 = 101 mm

Hence O.K

Reinforcement calculations

Short Span Direction @ Support

Mu/bd^2 = 6.60 x 10 ^ 6 / (1000 x 101 x 101) = **0.647**

Pt = **0.15** %

Area of steel Ast = 0.00153 x 1000 x 101 = 155.019 mm^2

Minimum area of steel: 0.0012 x 1000 x 125 = 150.00 mm^2

Spacing of Y **8** bars 50.27 x 1000 / 155.02 = 324.088 mm

Ast provided = 335.104 mm^2

Check for Spacing

Minimum of 1) 3d = 303 mm

2) = 300 mm

3) = 324.09 mm

Therefore provide Y **8** @ **150** mm C/C

Short Span Direction @ Mid Span

Mu/bd^2 = 4.95 x 10 ^ 6 / (1000 x 101 x 101) = 0.485

Pt = 0.114 %

Area of steel Ast = 0.00114 x 1000 x 101 = 115.386 mm^2

Minimum area of steel: 0.0012 x 1000 x 125 = 150.00 mm^2

Spacing of Y **8** bars 50.27 x 1000 / 150.00 = 334.933 mm

Ast provided = 335.104 mm^2

Check for Spacing

Minimum of 1) 3d = 303 mm

2) = 300 mm

3) = 334.93 mm

Therefore provide Y **8** @ **150** mm C/C

Provided % of Tension Reinforcement (pt) = **0.332** %

100

Long Span Direction @ Support

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Mu/bd^2 = 0.00 x 10 ^ 6 / (1000 x 101 x 101) = 0.000

Pt = 0.000 %

Area of steel Ast	=	0.00000	x	1000 x	101	=	0	mm^2
Minimum area of steel:		0.0012	x	1000 x	125	=	0.00	mm^2
Spacing of Y **8** bars		50.27	x	1000 /	0.00	=	0	mm
Ast provided						=	335.104	mm^2

Check for Spacing

Minimum of	1) 3d	=	303	mm
	2)	=	300	mm
	3)	=	0.00	mm

Therefore provide Y **8** @ **150** mm C/C

Long Span Direction @ mid Span

Mu/bd^2 = 4.48 x 10 ^ 6 / (1000 x 101 x 101) = 0.439

Pt = 0.103 %

Area of steel Ast	=	0.00103	x	1000 x	101	=	104.117	mm^2
Minimum area of steel:		0.0012	x	1000 x	125	=	150.00	mm^2
Spacing of Y **8** bars		50.27	x	1000 /	150.00	=	334.933	mm
Ast provided						=	402.125	mm^2

Check for Spacing

Minimum of	1) 3d	=	303	mm
	2)	=	300	mm
	3)	=	334.93	mm

Therefore provide Y **8** @ **125** mm C/C

Check for Deflection:

Basic Span/depth Ratio	=	20	
% of Tension Reinforcement provided (pt)	=	0.332	%
Service stress of steel (fs) : 0.58fy(Ast_r/Ast_p)	=	99.86	N/mm^2
Modification Factor for Tension Reinforcement (F1)	=	2.00	
Allowable Span/Eff Depth Ratio	=	40	
Actual Span/Eff Depth Ratio = 3.3 x 1000 / 101	=	32.67	

Hence O.K

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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.
/landlens/verify-my-land

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.
/landlens/property-tracker

Deal Room
Run the transaction in one place: documents, stamping, signatures and the parties.
/landlens/deal-room

FREE TOOLS · NO ACCOUNT NEEDED

Twenty-four checks you can run yourself, at no cost.

Records and verification

The registers themselves, read for you.

- Encumbrance Certificate
- 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

Every free tool
/tools

Services we run for you
/services

The LandLens suite
/landlens/one

Verified RealEstate™

Every claim in this document traces back to a government record.

- Legal opinions, due diligence and title verification
- Building plan, layout and sub-division approvals
- Completion and occupancy certificates, regularisation
- Escrow, negotiation and NRI property management
- Land survey, soil testing, architecture and construction

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Prepared from the registers named on the page each finding sits on. Where a register could not be read, this document says so in its place rather than leaving the gap to be read as a clean result.