

STABILITY CERTIFICATE

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

Date: 25.02.2026

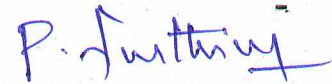
The detailed engineering and structure design of the proposed building comprising of Semi Basement Floor + Ground Floor + First Floor + Second Floor + Third Floor + Terrace Floor, Watchman Booth with 28 Dwelling Units at Ward No:25, Block No: 20, T.S.No:25/6 At Vilankurichi Village, North Taluk, Coimbatore Corporation has been done by me/us based on the report of geotechnical investigation (soil test) done by GEO DESIGN INDIA PVT LTD Report No. GEO-G-107-2023-24 Dated 19.08.2023 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 M20
- (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 Codes No IS 875-1987 Part(1 to 5) and Design of earth quake resistant structure as per IS Code No 4326-1993

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

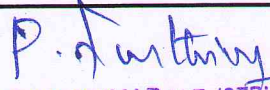


Stamp and Signature

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Encl.: Structural Design Calculation

PROJECT	NIVASAN VAKULAM APARTMENT-AT VILANKURICHI,COIMBATORE		
CONSULTANT	THE DESIGN ONE		
DESIGN OF COLUMN	C1		
DESIGN DATA:			
	Axial Load, P =	810 kN	
	Breadth of the column, b =	200 mm	
		0.2 m	
	Depth of the column, D =	450 mm	
		0.45 m	
	Unsupported length of the column in x-x axis, L _x =	3 m	
	Unsupported length of the column in y-y axis, L _y =	3 m	
	Bending Moment about x-x axis, M _x =	35.7 kNm	
	Bending Moment about y-y axis, M _y =	35.7 kNm	
	Effective length factor =	0.85	
	Grade of concrete, f _{ck} =	20 N/mm ²	
	Grade of steel, f _y =	500 N/mm ²	
EFFECTIVE LENGTH:			
	Effective length of the column in x-x axis, L _{ex}	=	2.55 m
		=	2550 mm
	Effective length of the column in y-y axis, L _{ey}	=	2.55 m
		=	2550 mm
CHECK FOR SLENDERNESS RATIO:			
	L _{ex} /D	=	5.6666667
			<12
	Hence, short column		
	L _{ey} /b	=	12.75
			>12
	Hence, long column		
CHECK FOR MINIMUM ECCENTRIES:			
	e _{ex, min.}	=	(L _{ex} /500)+(D/30)
		=	20.1 mm
		OR	20 mm
	e _{ey, min.}	=	(L _{ey} /500)+(b/30)
		=	11.766667 mm
		OR	20 mm
	Factored Bending moment in x-x axis, M _{ux}	=	53.55 kNm
	Factored Bending moment in y-y axis, M _{uy}	=	53.55 kNm
	Factored Load, P _u	=	1215 kN
		=	1215000 N
	M _{ux} /P _u	=	44.074074 mm
			>20 mm
	M _{uy} /P _u	=	44.074074 mm
			>20 mm
	Hence, design for uniaxial moment		
LONGITUDINAL REINFORCEMENT:			
	Hence, Factored Bending Moment, M _u	=	53.55 kNm
		=	53550000 Nmm
	Governing Axis for Bending is y-y axis		


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$M_u/f_{ck}bD^2$	=	0.14875
	=	0.149
$P_u/f_{ck}bD$	=	0.675
	=	0.68
Effective cover, d'	=	50
Therefore, d'/D	=	0.25
	=	0.2
From Interaction chart of SP 16		
p/f_{ck}	=	0.1
p	=	2 %
$0.8\% < p < 4\%$		
Hence O.K.		
A_s	=	1800 mm ²
Assume		20 mm dia bars
No. of bars, N	=	5.7324841
	=	6 Nos.
$A_{s \text{ provided}}$	=	1884 mm ²
Actual p	=	2.0933333 %
$0.8\% < p < 4\%$		
Hence O.K.		

Hence, provide

6 #

20 mm dia

But Provided 4Nos 20# and 4 Nos-16# bars uniformly distributed on four sides

LATERAL REINFORCEMENT:

Diameter of Lateral Ties:

Dia of Lateral Ties =	5 mm	(OR)
Dia of Longitudinal rft./4 =	5 mm	
Whichever is lesser		
Therefore Dia of lateral ties	=	5 mm
	=	8 mm

Spacing:

Least lateral dimension of the column	=	200 mm
16*Dia of the longitudinal bar	=	320 mm
	=	300 mm

Whichever is lesser

Required Spacing	=	200 mm
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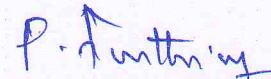
Therefore, adopt

8 mm dia lateral ties @
200 mm c/c

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PROJECT	NIVASAN VAKULAM APARTMENT- AT VILANKURICHI ,COIMBATORE				
CONSULTANT	THE DESIGN ONE				
DESIGN OF BEAM	Beam -B1				
DESIGN DATA:					
Breadth of the beam, b	=	200 mm	=	0.2 m	
Effective depth of the beam, d	=	480 mm	=	0.48 m	
Width of the supports	=	200 mm	=	0.2 m	
Grade of concrete, f _{ck}	=	20 N/mm ²			
Grade of steel, f _y	=	500 N/mm ²			
Moment of Resistance, M	=	97 kNm			
Uniformly Distributed Load, W	=	58.1 kN/m			
Length of the beam,L	=	5.1 m	=	5100 mm	
PRELIMINARY DIMENSIONS OF THE BEAM:					
Assume effective cover of the beam,c'	=	30 mm	=	0.03 m	
Therefore,overall depth of the beam, D	=	510 mm	=	0.51 m	
a)Effective Span, L _{eff} .	=	L+d	=	5.58 m	
b)Effective Span, L _{eff} .	=	L+W	=	5.3 m	
Therefore, adopt Effective Span, L _{eff} .	=	5.3 m (minimum)			
ULTIMATE MOMENTS:					
x _{u lim.} /d	=	0.48			33
Therefore, x _{u lim.}	=	230.4 mm			
M _u '	=	0.36*f _{ck} *b*x _u *(d-0.42x _u)			
	=	127147180 Nmm			
	=	127.14718 kNm			
Ultimate moment, M _u	=	1.5*M =		145.5 kNm	
M _u ''	=	M _u -M _u '			
	=	18.35282 kNm			
	=	18352820 Nmm			
TENSILE REINFORCEMENT:					
From I.S. 456:2000, pg.no. 96, Annex-G,section G-1.1 a)					
x _{u lim.} /d	=	(0.87*f _y *A _{st})/(0.36*f _{ck} *b*d)			
Therefore, A _{st 1}	=	762.703448 mm ²			
M _u ''	=	f _{sc} *A _{st 2} *(d-d')			
where d'	=	distance from top fibre to the centre of compression reinforcement.			
	=	50 mm			

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$$\begin{aligned}
 \text{Therefore, } A_{st2} &= 98.1171877 \text{ mm}^2 \\
 \text{Total } A_{st} &= 860.820636 \text{ mm}^2 \\
 \text{Assume } 16 \text{ mm dia bars.} \\
 a_{st} &= 200.96 \text{ mm}^2 \\
 \text{Number of bars, } n &= 4.28354218 = 5 \text{ Nos.} \\
 \text{Spacing} &= 40 \text{ mm} \\
 \text{Therefore adopt } 5 \text{ nos. of } 16 \text{ mm dia bars @ } 40 \text{ mm c/c. in tension zone.} \\
 A_{st \text{ provided}} &= 1607.68 \text{ mm}^2
 \end{aligned}$$

COMPRESSION REINFORCEMENT:

$$\begin{aligned}
 A_{st2} &= (A_{sc} * f_{sc}) / (0.87 * f_y) \quad (\text{In pg.no. 56 in R.C.C. book}) \\
 \epsilon_{sc} &= 0.0035 * ((x_u - d') / x) \quad \text{By interpolating:} \\
 f_{sc} &= 353.725 \text{ N/mm}^2 \quad \epsilon_{sc} \quad f_{sc} \\
 A_{sc} &= 120.661465 \text{ mm}^2 \quad \begin{array}{cc} 0.00276 & 351.8 \\ 0.00298 & 353.725 \\ 0.0038 & 360.9 \end{array} \\
 \text{Assume } 16 \text{ mm dia bars.} \\
 a_{st} &= 200.96 \text{ mm}^2 \\
 \text{Number of bars, } n &= 0.60042528 = 1 \text{ Nos.} \\
 \text{Spacing} &= 100 = 100 \text{ mm} \\
 \text{Therefore adopt } 2 \text{ nos. of } 16 \text{ mm dia bars @ } 100 \text{ mm c/c. in compression zone.} \\
 A_{sc \text{ provided}} &= 401.92 \text{ mm}^2
 \end{aligned}$$

CHECK FOR SHEAR:

From I.S. 456:2000, pg.no. 73, Annex-B-5.1)

$$\begin{aligned}
 \text{Nominal shear stress, } \tau_v &= v_u / bd \\
 \text{where shear force, } v_u &= 222.2325 \text{ kN} \\
 &= 222232.5 \text{ N} \\
 \tau_v &= 2.31492188 \text{ N/mm}^2
 \end{aligned}$$

% of tensile reinforcement, $p_t = 1.67466667$
FROM IS 456:2000 pg.no.:73 table 19:

p_t	τ_c
1.5	0.75
1.67466667	0.76397333
2	0.79

$$\text{Design shear stress, } \tau_c = 0.76397333 \text{ N/mm}^2$$

$$\tau_v > \tau_c$$

Hence not safe

Hence provide shear reinforcement

$$\begin{aligned}
 V_{us} &= v_u - \tau_c bd \\
 &= 148891.06 \text{ N} \\
 &= 148.89106 \text{ kN} \\
 \text{Use } 2 \text{ legged } 8 \text{ mm dia bars} \\
 A_{sv} &= 100.48 \text{ mm}^2
 \end{aligned}$$

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$$\begin{aligned}
 S_v &= (0.87 \cdot f_y \cdot A_{sv} \cdot d) / v_{us} \\
 &= 140.909897 \text{ mm} \\
 &= 140 \text{ mm} \\
 S_v &> 0.75d \\
 &= 360 \text{ mm} \\
 \text{Adopt} & \quad 2 \quad \text{legged} \quad 8 \text{ mm dia bars} \\
 & @ \quad 140 \text{ mm c/c near the support \& } \\
 & \quad 350 \text{ mm c/c at mid-span.}
 \end{aligned}$$

CHECK FOR DEFLECTION:

$$\begin{aligned}
 (l/d)_{act} &= 10.625 \\
 (l/d)_{max} &= (l/d)_{basic} \cdot k_t \cdot k_c \cdot k_f \\
 p_t &= 1.67466667 \\
 p_c &= 0.41866667 \\
 \text{Referring the diagram,} \\
 k_t &= 0.93 \\
 k_c &= 1.1 \\
 k_f &= 1 \\
 \text{Therefore, } (l/d)_{max} &= 20.46
 \end{aligned}$$

Hence safe against deflection

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PROJECT	NIVASAN VAKULAM APARTMENT-AT VILANKURICHI, COIMBATORE
CONSULTANT	THE DESIGN ONE
DESIGN OF SLAB	5.1X2.3m

DESIGN DATAS:

Length of the slab in x-direction, L_x	=	2.3 m	=	2300 mm
Length of the slab in y-direction, L_y	=	5.1 m	=	5100 mm
Thickness of the supporting wall, t	=	200 mm	=	0.2 m
Live load on the slab	=	3 kN/m ²		
Floor Finish	=	1 kN/m ²		
Grade of concrete, f_{ck}	=	20 N/mm ²		
Grade of steel, f_y	=	500 N/mm ²		

TYPE OF SLAB:

$$L_y/L_x = 2.2173913 > 2$$

Hence the given slab is a one-way slab

LOAD CALCULATION:

Assume overall depth, D	=	125 mm	=	0.125 m
Unit weight of concrete	=	25 kN/m ³		
Self-weight of the slab	=	3.125 kN/m ²		
Live load on the slab	=	2 kN/m ²		
Floor Finish	=	1 kN/m ²		
Total load, W	=	6.125 kN/m ²		
Factored load, W_u	=	9.1875 kN/m ²		

EFFECTIVE SPAN:

$L_{eff.}$	=	$L_x + d$		
Effective cover to the slab, c'	=	25 mm	=	0.025 m
Effective Depth of the slab, d	=	100 mm	=	0.1 m
$L_{eff.}$	=	2.4 m		
(OR)				
$L_{eff.}$	=	$L_x + t$	=	2.5 m
whichever is smaller				
Required $L_{eff.}$	=	2.4 m		

BENDING MOMENT:

Bending Moment, M	=	$(W_u * L_{eff.}^2)/8$
	=	6.615 kNm
	=	6615000 Nmm

CHECK FOR EFFECTIVE DEPTH:

$M_{u \text{ lim.}}$	=	$0.138 * f_{ck} * b * d^2$
Consider	=	1 m width of the slab
	=	1000 mm width of the slab
Effective depth, d	=	48.956502 mm
Slab Depth is correct		

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AREA OF STEEL REINFORCEMENT:

$$\begin{aligned}
 M_u &= 0.87 * f_y * A_{st} * d * (1 - ((f_y * A_{st}) / (b * d * f_{ck}))) \\
 \text{By Quadratic Equation } A &= f_y / (b * d * f_{ck}) = 0.0003 \\
 B &= -1 \\
 C &= M_u / (0.87 * f_y * d) = 152.07 \\
 A_{st1} &= (-B + \sqrt{B^2 - 4AC}) / 2B = 3841.7 \text{ mm}^2 \\
 A_{st2} &= (-B - \sqrt{B^2 - 4AC}) / 2B = 158.34 \text{ mm}^2 \\
 \text{Required } A_{st} &= 158.33658 \text{ mm}^2 \\
 \text{Assume } &10 \text{ mm dia bars} \\
 a_{st} &= 78.5 \text{ mm}^2 \\
 \text{No. of bars} &= 2.0170265 \text{ Nos.} \\
 &= 3 \text{ Nos.} \\
 \text{Spacing} &= 333.33333 \text{ mm} \\
 &(\text{OR}) \\
 &= 3d = 147 \text{ mm} \\
 &(\text{OR}) \\
 &= 300 \text{ mm} \\
 \text{Whichever is smaller} &= 150 \text{ mm} \\
 \text{Required Spacing} &= 150 \text{ mm} \\
 \text{Provide } &10 \text{ mm dia bars @} \\
 &150 \text{ mm c/c.}
 \end{aligned}$$

CRANK DISTANCE:

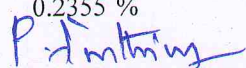
$$\begin{aligned}
 L_{eff}/4 &= 0.6 \text{ m} \\
 &= 600 \text{ mm}
 \end{aligned}$$

DISTRIBUTORY REINFORCEMENT:

$$\begin{aligned}
 A_{stD} &= 0.12\% * c/s \text{ area} = 150 \text{ mm}^2 \\
 \text{Assume } &8 \text{ mm dia bars} \\
 a_{st} &= 50.24 \text{ mm}^2 \\
 \text{No. of bars} &= 2.9856688 \text{ Nos.} \\
 &= 3 \text{ Nos.} \\
 \text{Spacing} &= 333.33333 \text{ mm} \\
 &= 334 \text{ mm} \\
 &(\text{OR}) \\
 &= 5d \\
 &= 500 \text{ mm} \\
 &(\text{OR}) \\
 &= 300 \text{ mm} \\
 \text{Whichever is smaller} &= 300 \text{ mm} \\
 \text{Required Spacing} &= 300 \text{ mm} \\
 \text{Provide } &8 \text{ mm dia bars @} \\
 &300 \text{ mm c/c.}
 \end{aligned}$$

CHECK FOR SHEAR STRESS:

$$\begin{aligned}
 \text{Nominal shear stress, } \tau_v &= V_u / b * d \\
 V_u &= (W_u * L_{eff}) / 2 \\
 &= 11.025 \text{ kN} \\
 \tau_v &= 0.11025 \text{ N/mm}^2 \\
 A_{st \text{ provided}} &= 235.5 \text{ mm}^2 \\
 (100 * A_{st \text{ provided}}) / (b * d) &= 0.2355 \%
 \end{aligned}$$


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Interpolation from I.S. 456-2000

τ_c (for $f_{ck}=25 \text{ N/mm}^2$)	$(100 \cdot A_{st \text{ provided}})/(b \cdot d)$
0.36	0.25
0.35246	0.236
0.49	0.5

Permissible Shear stress, τ_c = 0.35246 N/mm^2

Hence safe against shear

CHECK FOR DEFLECTION:

From I.S. 456-2000, pg.no.: 38, fig. 4:

Steel Stress of service, f_s = $0.58 \cdot f_y \cdot (A_{st \text{ required}}/A_{st \text{ provided}})$
= 194.97923 N/mm^2
 p_t = 0.2355 %
Modification factor, M = 1.4
Allowable deflection, δ_{all} = $k_f \cdot k_c \cdot k_t \cdot M$
 k_f = 1
 k_c = 1
 k_t = L_{eff}/d = 24
 δ_{all} = 33.6 mm
But actual deflection, δ_{act} = L_x/D = 18 mm

Hence safe against deflection

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GOVT. OF TAMILNADU

DIRECTORATE OF TOWN & COUNTRY PLANNING

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PROFESSIONAL REGISTRATION CERTIFICATE

This is to certify that the Thiru. P.SENTHIL KUMAR has enrolled as **Structural Engineer Grade –I (SE)** with District Town and country Planning ,Coimbatore who has the qualification of **M.E(Structural Engineering)** and experience in the relevant field for 26 years.

He has been given the Registration No. Coimbatore LPA/SE/GR-I /050/2024 on 01.07.2024. He shall be required to comply with the duties and responsibilities prescribed by the government of tamilnadu in part V, "Registration of Professionals " ,Tamil Nadu Combined Development and Building Rules ,2019 approved vide G.O (Ms) No .18 MAWS (MA1) Dept.Dated .04.02.2029

This Registration Certificate is valid upto 30.06.2029



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[Signature]
17/7/24.
JOINT DIRECTOR (I/C)

DISTRICT TOWN AND COUNTRY PLANNING,

COIMBATORE
[Signature]