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06-03-25

STRUCTURAL STABILITY CERTIFICATE

1. The detailed engineering and structure design of the proposed building comprising of **Stilt+5** floors at **Old No. 10 & 10a, New No.12 & 14, Norton 2nd Street, Mandaveli, Chennai - 600 028 And Bearing Plot No.49 Comprised in T.S. No. 4311/49, Block No. 97 Of Mylapore Village, Mylapore Taluk and Within the Limits of Greater Chennai Corporation. Zone-IX; Division-126** has been done by me based on the report of geotechnical investigation (soil test) done by **GEOMINES ENGINEERS Pvt Ltd** Report No. **GMEPL/RAMAKRISHNAN & 2 OTHERS/391/2023-24** Dated **06-11-2023** 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 have checked various parameters and found that the proposed building would be safe.

3. I further certify that:
   (i) The minimum grade of concrete is **M25**
   (ii) The design and analysis have been done using the code of practice for plain and reinforced concrete as per IS 456, design loads as per **IS Codes No 875** and design of earthquake resistant structure as per **IS Code No 1893**

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

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Encl.: Structural Design Calculation

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 5 FLOORS RESIDENTIAL BUILDING WITH 15 DWELLING UNITS (WITH HEIGHT 18.00M) AVAILING PREMIUM FSI WITH TOD BENEFIT AT OLD NO. 10 & 10A, NEW NO.12 & 14, NORTON 2ND STREET, MANDAVELI, CHENNAI - 600 028 AND BEARING PLOT NO.49 COMPRISED IN T.S. NO. 4311/49, BLOCK NO. 97 OF MYLAPORE VILLAGE, MYLAPORE TALUK AND WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION. ZONE:-IX ; DIVISION:-126 .

TYPICAL STRUCTURAL DESIGN CALCULATION

1 **General:**

Proposed building is a Stilt + 5 upper floors for residential use. Stilt floor is used for car parking.

2 **Design Basis:**

Latest Design codes of BIS-456, 875 and 1893 are followed with SP-16 Design Aid book. A typical Frame was taken for analysis to arrive at the bending moment for column design. Since the building is 6 stories, wind force is taken into account. Live load reduction factor is applied in design. Isolated foundation is proposed as per soil report. Fe- 500 steel is used as main steel and M25 grade concrete.

3 **Earthquake consideration:**

For better stability during earhquake, the columns are tied with plinth beams. Continuous lintels are specified for outer walls and column ties are closely spaced for better ductility. For building on stilt, minimum size of column is taken as 300 mm(12")

4 **WIND LOAD**

Vz	=	Vb x K1 x K2 x k3				
Vb	=	50 m/sec	in Chennai			
K1	=	Probability Factor		=		1
K2	=	Terrain, Height Factor =				1
K3	=	Topography Factor		=		1
p	=	0.6 x Vz x Vz				
	=	0.6	x 50	x	50	
	=	1500	N/Sq.m			

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5 **Design Loads:**

Slab thk	130	=	3.25	KN/sq.m
Live load		=	2.00	KN/sq.m
Finishes		=	1.25	KN/sq.m
			6.50	KN/sq.m

Say 6.50 KN/sq.m/floor for slab and beam design
Applying live load reduction of = 0.1 ,
For column and foundation design, 6.30 Kn/sqm is taken.

This value is also taken for frame analysis

AAC Blocks 200 thick for exterior walls

	0.2	x	2.6	x	8			=	4 KN/m/floor
Beams	0.2	x	0.45	x	25			.=	2.25 KN/m/floor
Columns	0.2	x	0.45	x	3.00	x	25	.=	6.75 KN/floor

These are taken for analysis with WL+LL+DL combination.

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6 **SLAB DESIGN:** S1 Refer sheet - 1 of drawing

Thickness	=	130 mm	Concrete mix	Fck	= M	25	N/sq.mm
Cover	=	25 mm	Steel Grade	Fy	=Fe	500	N/sq.mm
Eff.Depth	=	100 mm					

Panel (3.7 x 4.3) m
=

Twoway slab Ly / Lx 4.3 / 3.7 .= 1.16

Support condition - ONE SHORT EDGE DISCONTINUOUS

short span=	α x	=	0.034	(- BM at continuous edge)	Table:26
		=	0.046	(+ BM at midspan)	in IS-456-2000
long span=	α y	=	0.028	(- BM at continuous edge)	
		=	0.037	(+ BM at midspan)	

Designed for 0.046 co.efficient

Mu .= 0.046 x 6.5 x 1.5 x 3.7 x 3.7 = 6.14 knm/m

$$\text{Mu / b.d.d} = \frac{6.14 \times 1000 \times 1000}{1000 \times 100 \times 100} = 0.61 \text{ N/sq.mm}$$

From Table-3 of SP-16, Pt .= 0.150 %
Minimum Pt = 0.12 % as per code, fo 3

At = 0.150 x 1000 x 100 ./ 100 = **150** sq.mm/m

Provide 8 dia @ 150 c/c = **335.1** sq.mm/m Short span

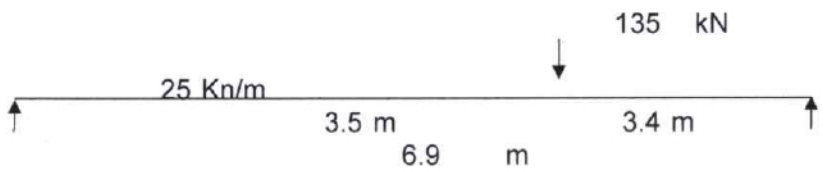
Provide 8 dia @ 175 c/c = **287.2** sq.mm/m Long span

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7 **Beam design:** B1 Refer sheet - 1 of drawing

Effective span = 6.9 m Beam size 200 x 750

Fck = M 25 d = 710 mm



Max. Bending Moment at support =

$$= \frac{25 \times 6.9 \times 6.9}{12} + 175.0 = 274 \text{ Knm}$$

Mu = 274.2 x 1.5 x 10-e6 = 411.3 x 10-e6 Nmm

$$Mu/b.d.d = \frac{411 \times 10\text{-e6}}{200 \times 710 \times 710} = 4.08 \text{ N/sq.mm}$$

From table-55 SP-16 for d'/d = 40 / 710 = 0.06

Pt = **1.100** % Pc = **0.250** %

At = 1.100 x 230 x 710 / 100 = **1796** sq.mm (bot)

Ac = 0.250 x 230 x 710 / 100 = **408.3** sq.mm (top)

provided 3 No 20 = 942 sq.mm

\+ 3 No 20 = 942 sq.mm

1885 sqmm Top support

Shear Design:

$$\text{Shear force} = \frac{25 \times 6.9}{2} + 70 = 156 \text{ KN}$$

Factored shear force = 1.5 x 156 = 234.4 KN

for 0.65 % steel Shear resisted by concrete section

from table-61 0.6 x 230 x 710 / 1000 = 98 KN

Balance shear (Vus) = 234.38 - 98 = 136 KN

Vus/d = 136 / 56 = 2.4 KN/cm

from table 62 of SP-16

Required 2 legged	8 stirrups	@	150	mm c/c
Provided 2 legged	**10** stirrups	@	**150**	mm c/c

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8 **COLUMN DESIGN:** C1 **COL SIZE** 300 X 750

Maximum load on column in basement P = 180 t

Pu = 1.5 x 180 x10 = 2700 KN

Max.Bending Moment = 20 t.m Mu = 1.5 x 20.0 x10= 300 Kn.m

Cover = 40 mm

d'/d = 0.05

Fck = 30 N/sq.mm

Provide bars equaly all sides

Refer chart 48 of SP-16

$$\frac{Pu}{Fck\ b\ d} = \frac{2700 \times 1000}{30 \times 300 \times 750} = 0.4$$

$$\frac{Mu}{Fck\ b\ d^2} = \frac{300 \times 10^6}{30 \times 300 \times 710 \times 710} = 0.07$$

$$\frac{p}{Fck} = 0.04 \quad p\% = 0.04 \times 30 = 1.2\ \%$$

Minimum steel = 0.8 %

$$As = \frac{1.2 \times 300 \times 750}{100} = 2700\ \text{sq.mm}$$

Provided 12 Nos 20 dia = **3770 sq.mm**

Ties 8 @ 100 C/C AND 175 C/C

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9 **FOOTING DESIGN** F1 for **C1** Refer sheet - 1 of drawing

Maximum load on column type " A P = 180 t Fck = 25

Max.Bending Moment = 2 t.m

S.B.C of Soil at 22 t/sqm at depth = 2.5 m
Assume footing base of 3.2 X 3.2 m and depth = 800 mm
So pressure on soil is Eff. Depth = 750 mm

$$\frac{180}{3.2 \times 3.2} = 17.6 \text{ t/sqm} < 22 \text{ t/sqm}$$

Cantilever projection of footing = $\frac{3.2 - 0.30}{2} = 1.45$ m

B.M on footing at face of column pedestal

BM = $17.58 \times 1.45 \times \frac{1.45}{2} = 18.48$ tm

Mu = 18.48 x 1.5= 27.72 tm

Mu/b.d.d = $\frac{27.72 \times 1000 \times 10000}{1000 \times 750 \times 750} = 0.49$ N/sqm

Fck = 25 n/sqmm
From Table-3 of SP-16, Pt 0.123 % min pt% .= 0.120 %

At = $\frac{0.123 \times 1000 \times 750}{100} =$ **922.5** sq.mm

Provide 12 dia @ 100 c/c = **2319** sq.mm

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