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Date : 16.07.2024

STRUCTURAL STABILITY CERTIFICATE

It is certified that the

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT+5 FLOORS RESIDENTIAL BUILDING WITH 45 DWELLING UNITS (HEIGHT - 18.30M) AFFORDABLE HOUSING AT MOOKAMBIGAI NAGAR 1ST MAIN ROAD, POONAMALLEE, CHENNAI - 600 077. COMPRISED IN OLD S.NO.106/13 & 110/6, NEW S.NO. 25/3A1A1A & AS PER PATTA S.NO. 25/80 & 25/81 OF NOOMBAL VILLAGE WITHIN THE LIMIT OF THIRUVERKADU MUNICIPALITY.

is designed to resist for earthquake. Check has been made

1. The minimum grade of concrete is M25
2. The design analysis using the code of practice for loading . standards as per BIS-875 and Seismic forces as per the latest code BIS-1893 & BIS-456
3. Least dimension of column is 300mm in stilt floor.
4. Proposed structure will be structurally safe and sound.

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TYPICAL STRUCTURAL DESIGN CALCULATION

1 **General:**

Proposed building is S+ 5 floors
Stilt floor is used for car parking. Other floors used for residential purpose. Floor height is 3.00m in upper floors

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 5 stories, wind force is not taken into account. Live load reduction factor is applied in design. Pile foundation is proposed as per soil test report. Fe- 500steel 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	125	=	3.13 KN/sq.m
Live load		=	2.00 KN/sq.m
Finishes		=	1.25 KN/sq.m
			6.38 KN/sq.m

Say 6.75 KN/sq.m/floor for slab and beam design
Applying live load reduction of = 0.1 ,
For column and foundation design, 6.18 Kn/sqm is taken.

This value is also taken for frame analysis

200mm thick aerocon block work used for exterior walls, 100mm thick aerocon block work used for internal partitions

	0.2	x	2.75	x	10			=	6 KN/m/floor
Beams	0.2	x	0.60	x	25			.=	3.00 KN/m/floor
Columns	0.3	x	0.60	x	2.75	x	25	.=	12.38 KN/floor

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

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6 **SLAB DESIGN:**

Thickness	=	125 mm	Concrete mix	Fck	= M	25	N/sq.mm
Cover	=	20 mm	Steel Grade	Fy	=Fe	500	N/sq.mm
Eff.Depth	=	100 mm					

Panel (3.4 x 7.32) m

=

Ly / Lx 7.32 / 3.4 .= 2.2

One way slab

$$Mu .= \frac{6.8 \times 1.5 \times 3.4 \times 3.4}{10} = 11.70 \text{ knm/m}$$

$$Mu / b.d.d = \frac{11.70 \times 1000 \times 1000}{1000 \times 100 \times 100} = 1.17 \text{ N/sq.mm}$$

From Table-3 of SP-16, Pt .= 0.293 %

Minimum Pt = 0.12 % as per code, for Fe-415

$$At = 0.293 \times 1000 \times 100 ./ 100 = \mathbf{293} \text{ sq.mm/m}$$

Provide 8 dia @ 110 c/c = **456.96** sq.mm/m Shorter span

Provide 8 dia @ 170 c/c = **295.68** sq.mm/m Longer span

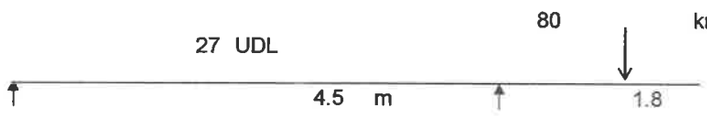
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7 **Beam design:** B-1

Effective span = 4.5 m Beam size 200 x 600

Fck = M 25 d = 520 mm



Max. Bending Moment at column support = w*l*l/10+(w*a^2*b)/l

= 290 Knm

Mu = 290.0 x 1.5 x 10-e6 = 435 x 10-e6 Nmm

$$Mu/b.d.d = \frac{435 \times 10\text{-e6}}{200 \times 520 \times 520} = 8.04 \text{ N/sq.mm}$$

From table-53 SP-16 for d'/d = 40 / 520 = 0.08

Pt = **1.300** % Pc = **0.000** %

At = 1.300 x 200 x 520 / 100 = **1352** sq.mm (bot)

Ac = 0.000 x 200 x 520 / 100 = **0** sq.mm (top)

provided 3 No 20 = 942 sq.mm

\+ 3 No 20 = 942 sq.mm

= **1885** sqmm Top of support

Shear Design:

Shear force = 60.8 Kn

Factored shear force = 1.5 x 60.75 = 91.125 KN

for 1.30 % steel Shear resisted by concrete section

from table-61 0.59 x 200 x 520 / 1000 = 61 KN

Balance shear (Vus) = 91.125 - 61 = 30 KN

Vus/d = 30 / 56 = 0.5 KN/cm

from table 62 of SP-16

Required 2 legged 8 stirrups @ 100 mm c/c

Provided 2 legged **10** stirrups @ **110** mm c/c

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8 **COLUMN DESIGN:** Column - A **COL SIZE** **300 X 600**

Maximum load on column at foundation P = 110 t

Pu = 1.5 x 110 x10 = 1650 KN

Max.Bending Moment = 10 t.m Mu = 1.5 x 10.0 x10= 150 Kn.m

Cover = 40 mm

d'/d = 0.07

Fck = 30 N/sq.mm

Provide bars equaly all sides

Refer chart 44 of SP-16

$$\frac{Pu}{Fck\ b\ d} = \frac{1650 \times 1000}{30 \times 300 \times 600} = 0.31$$

$$\frac{Mu}{Fck\ b\ d^2} = \frac{150 \times 10^6}{30 \times 300 \times 600 \times 600} = 0.05$$

$$\frac{p}{Fck} = 0.045 \quad p\% = 0.05 \times 30 = 1.35\ \%$$

Minimum steel = 0.8 %

$$As = \frac{1.35 \times 300 \times 600}{100} = 2430 \text{ sq.mm}$$

Provided 10 Nos of 20 dia = 3142 sq.mm

Col. Ties 8 @ 110 C/C and 8@ 170 c/c

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

Maximum load on column type " A P = 110 t
Add 10% footing load = 121 t
S.B.C of Soil at 1.8 m depth = 12.5 t/sqm
Assume footing base 3.2 x 3.2 m footing.
and depth = 600 mm
Eff. Depth = 530 mm

So pressure on soil is

$$\frac{121}{3.2 \times 3.2} = 11.8 \text{ t/sqm}$$

11.8 < 12.5 t/sqm

Cantilever projection of footing = $\frac{3.2 - 0.45}{2}$ = 1.38 m

B.M on footing at face of column

$$BM = \frac{11.8 \times 1.38 \times 1.375 \times 3.2}{2} = 35.7 \text{ tm}$$

Mu = 35.7 x 1.5= 53.62 tm

$$Mu/b.d.d = \frac{53.6 \times 1000 \times 1000}{3200 \times 530 \times 530} = 0.6 \text{ N/sqmm}$$

Fck = 25 N/sqmm

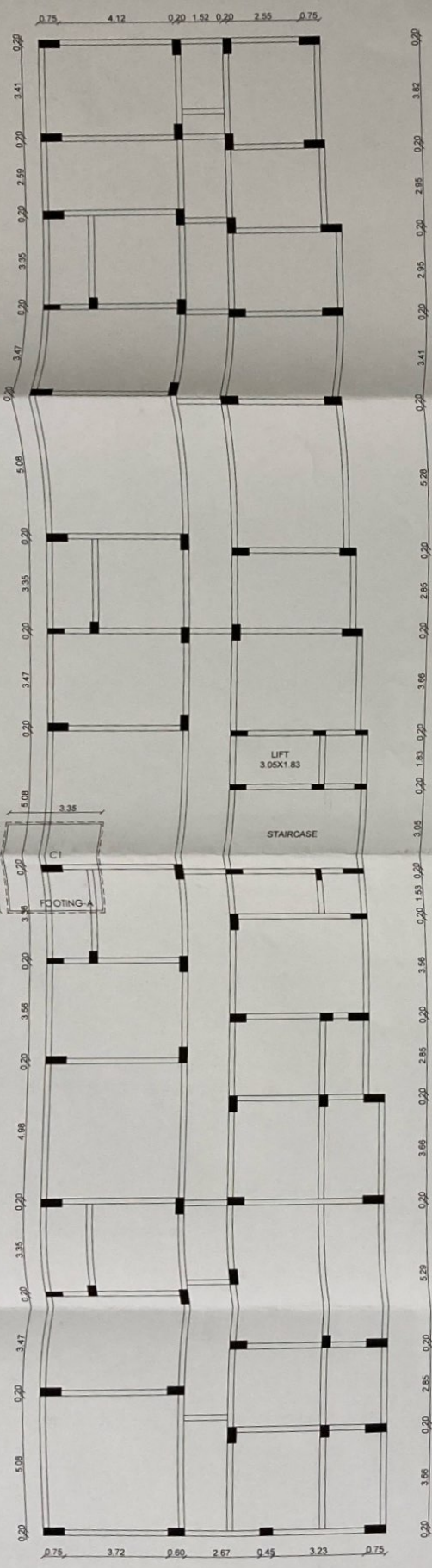
From Table-4 of SP-16, Pt 0.229 pt% = 0.12 %

At = 0.23 x 3200 x 530 /100 = 2035 sq.mm

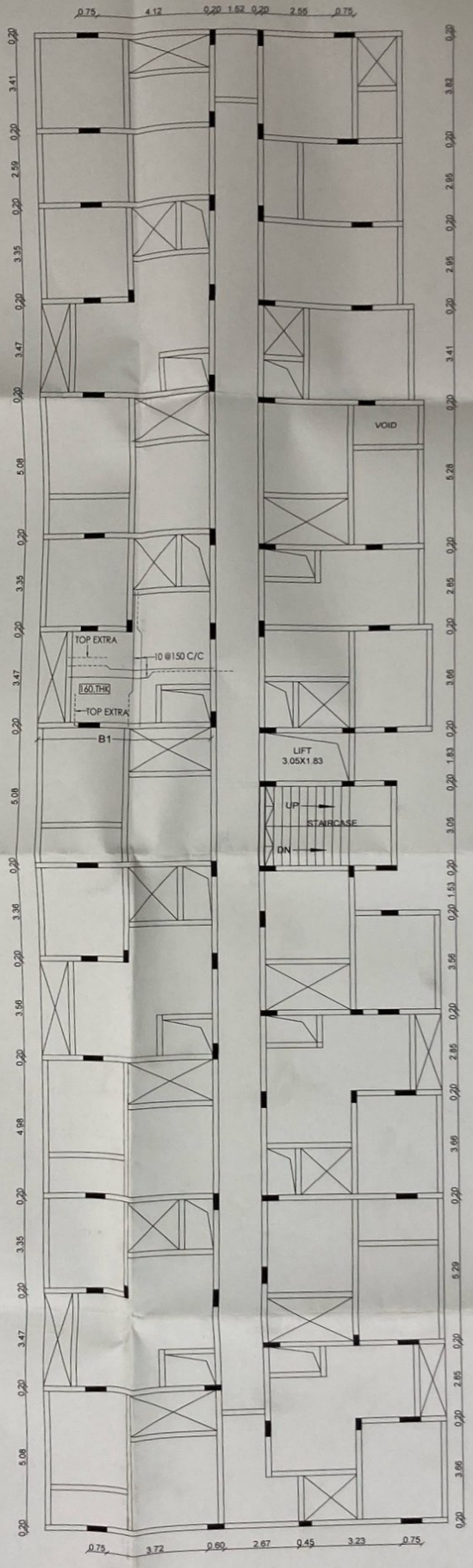
Provide 12 dia @ 100 c/c for Short span BOTH WAYS

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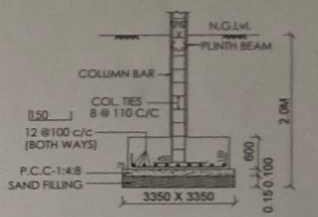
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FOUNDATION AND PLINTH BEAM LAYOUT

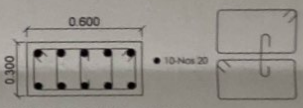


TYPICAL FLOOR ROOF BEAM LAYOUT

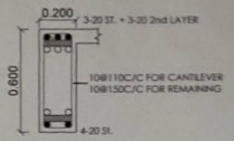


WELL COMPACTED EARTH PROCTOR DENSITY 0.97 (REFER SOIL TEST REPORT FOR EXCAVATION INSTRUCTION)

FOUNDATION DETAIL -A
M-25



COLUMN - C1 (300 x 600)
M-30



B-1 (200 x 600) M-25

SUBMISSION DRAWING

NOTES:

* CONCRETE MIX SHOULD BE M-25 WITH MINIMUM CEMENT CONTENT 340 Kg/Cu.m. FOR FOOTING AND FOR COLUMN REFER COLUMN SCHEDULE.
* IF M-SAND IS USED, IT SHOULD BE TESTED AS PER IS 383 BEFORE USING IT INTO CONCRETE. IF THE QUALITY IS LESS CEMENT CONTENT SHOULD BE INCREASED BY 10 Kg/Cu.m. FROM THE ABOVE SPECIFICATION.
* CLEAR COVER TO THE MAIN REINFORCEMENT FOR FOUNDATION - 60MM, COLUMN - 40MM, R.C.C. WALL - 30MM, PLINTH BEAM-30MM, ROOF BEAM - 30MM, ROOF SLAB - 25MM.
* STEEL SHOULD BE OF GRADE Fe500.
* LAP LENGTH FOR REINFORCEMENT : COLUMN - 40d, PLINTH BEAM - 50d, NO LAP FOR FOOTINGS.
* NOT MORE THAN 50% OF BARS LAPPED AT ONE POINT.
* CONDUIT PIPES SHOULD NOT GO THROUGH COLUMNS HORIZONTALLY & VERTICALLY.
* ONLY WRITTEN DIMENSIONS TO BE FOLLOW. DO NOT SCALE THE DRAWING.
* S.B.C = 12.5 tons / Sq.m. AT 1.80m AS PER M/S. T.J. ENGINEERS.
* S.B.C. TO BE CONFIRMED AT SITE AFTER EXCAVATION.
* DESIGNED FOR SEISMIC ZONE - III.
* FOUNDATION DESIGNED FOR STILT+5 FLOORS.
* BUILDING DESIGNED FOR 8" THICK AEROCON BLOCK WORKS.

REVISION:		
NO:	DESCRIPTION	DATE
1.		
2.		

TITLE:

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FOUNDATION, PLINTH BEAM AND TYPICAL FLOOR ROOF LAYOUT AND DETAILS

DATE : 16-07-2024	SCALE : ****
DESIGN : PRABAKAR	DRG NO : *****
DRAWN : HARI	SHEET NO : 1

STRUCTURAL ENGINEER

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Home Vastu Shastra, Plot Vastu Shastra, Property Management

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