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Date : 20, AUG 2024

STRUCTURAL STABILITY CERTIFICATE

It is certified that the

PLAN SHOWING THE PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING AT PLOT NO. 2, DOOR NO. 4 , SANTHANAKRISHNA STREET, NEHRU NAGAR, HASTINAPURAM, CHROMPET, CHENNAI - 600044. COMPRISED IN T.S.NO.41, BLOCK 3, WARD NO. F OF HASTINAPURAM VILLAGE, PALLAVARAM TALUK.

is designed to resist for earthquake. Check has been made

1. The minimum grade of concrete is M30
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 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. Isolated foundation is proposed as per soil test report. Fe- 500steel is used as main steel and M30 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 6.38 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 solid weight block work used for exterior walls, 150mm thick for internal partitions

	0.2	x	2.75	x	20		=	11 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:** **S1A**

Thickness	=	130 mm	Concrete mix	Fck	= M	25 N/sq.mm
Cover	=	20 mm	Steel Grade	Fy	=Fe	500 N/sq.mm
Eff.Depth	=	105 mm				

Panel (4.8 x 6) m

=

Twoway slab Ly / Lx 6 / 4.8 .= 1.3

Support condition - Interior panels

short span=	α x	=	0.051	(- BM at continuous edge)	Table:26
		=	0.039	(+ BM at midspan)	in IS-456-2000
long span=	α y	=	0.037	(- BM at continuous edge)	
		=	0.028	(+ BM at midspan)	

Designed for 0.051 co.efficient

Mu .= 0.051 x 6.4 x 1.5 x 4.8 x 4.8 = 11.24 knm/m

$$\text{Mu / b.d.d} = \frac{11.24 \times 1000 \times 1000}{1000 \times 105 \times 105} = 1.02 \text{ N/sq.mm}$$

From Table-3 of SP-16, Pt .= 0.255 %

Minimum Pt = 0.22 % as per code, for Fe-415

At = 0.255 x 1000 x 105 ./ 100 = **268** sq.mm/m

Provide 8 dia @ 125 c/c = **402.125** sq.mm/m Short span

Provide 8 dia @ 150 c/c = **335.104** sq.mm/m Long span

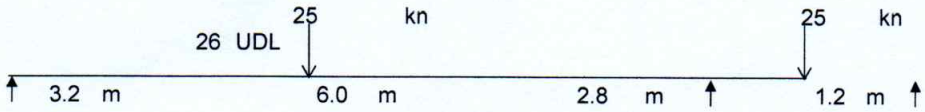
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7 **Beam design:** **B-1**

Effective span = 6.0 m Beam size 200 x 600

Fck = M 30 d = 520 mm



Max. Bending Moment at column support = w*l*l/2+p*a

= 115 Knm

m

Mu = 115.0 x 1.5 x 10-e6 = 173 x 10-e6 Nmm

Mu/b.d.d = $\frac{173 \times 10\text{-e6}}{200 \times 520 \times 520}$ = 3.19 N/sq.mm

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

Pt = **0.760** % Pc = **0.000** %

At = 0.760 x 200 x 520 / 100 = **790** sq.mm (bot)

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

provided 2 No 25 = 982 sq.mm

\+ 2 No 25 = 982 sq.mm

= **1964** sqmm Top of support

Shear Design:

Shear force = 91.3 Kn

Factored shear force = 1.5 x 91.3333 = 137 KN

for 0.76 % steel Shear resisted by concrete section

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

Balance shear (Vus) = 137 - 61 = 76 KN

Vus/d = 76 / 56 = 1.4 KN/cm

from table 62 of SP-16

Required 2 legged 10 stirrups @ 150 mm c/c

Provided 2 legged **10** stirrups @ **125** mm c/c

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8 **COLUMN DESIGN:** **Column - C3** **COL SIZE** **300 X 600**

Maximum load on column at foundation P = 117 t

Pu = 1.5 x 117 x10 = 1755 KN

Max.Bending Moment = 8.5 t.m Mu = 1.5 x 8.5 x10= 128 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

$$\frac{Pu}{Fck\ b\ d} = \frac{1755 \times 1000}{30 \times 300 \times 600} = 0.33$$

$$\frac{Mu}{Fck\ b\ d^2} = \frac{128 \times 10^6}{30 \times 300 \times 600 \times 600} = 0.04$$

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

Minimum steel = 0.8 %

As = $\frac{1.2}{100} \times 300 \times 600 =$ 2160 sq.mm

Provided 10 Nos 20 dia = 3142 **sq.mm**

Col. Ties 8 @ 110 C/C and 8@ 175 c/c

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9 **FOOTING DESIGN** for **F-4** Refer sheet - 1 of drawing

Maximum load on column type " A P = 117 t
Add 10% footing load = 128.7 t
S.B.C of Soil at 2.5 m depth = 40 t/sqm
Assume footing base 1.9 x 1.9 m footing.
and depth = 650 mm
Eff. Depth = 580 mm

So pressure on soil is

$$\frac{129}{1.9 \times 1.90} = 35.7 \text{ t/sqm}$$

35.7 < 40 t/sqm

Cantilever projection of footing = $\frac{1.9 - 0.3}{2}$ = 0.8 m

B.M on footing at face of column

BM = $\frac{35.7 \times 0.8 \times 0.8 \times 1.9}{2}$ = 22 tm

Mu = 21.7 x 1.5= 32.51 tm

Mu/b.d.d = $\frac{32.5 \times 1000 \times 1000}{1900 \times 580 \times 580}$ = 0.5 N/sqmm

Fck = 30 N/sqmm

From Table-4 of SP-16, Pt 0.62 pt% .= 0.1 %

At = 0.62 x 1000 x 580 /100 = 1322 sq.mm

Provide 16 dia @ 125 c/c for shorte and longer span BOTHWAYS

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