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1121

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DATE : 05-09-2023

STRUCTURAL STABILITY CERTIFICATE

It is certified that the

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 5 FLOORS RESIDENTIAL BUILDING WITH 19 DWELLING UNITS (WITH HEIGHT 18.30M) AVAILING PREMIUM FSI AT OLD DOOR NO. 16-H, NEW DOOR NO. 54, BHEEMANNA MUDALI GARDEN STREET, ALWARPET, CHENNAI-600 018 AND COMPRISED IN R.S. NO. 3628/1 PART (AS PER DOCUMENT), AS PER PATTA NEW R.S. NO. 3628/11, BLOCK NO. 72 OF MYLAPORE VILLAGE, MYLAPORE TALUK AND WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION.
ZONE:- IX; DIVISION:-123.

is designed to resist for earthquake. Check has been made and found safe and I hereby certify that

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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1/123

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TYPICAL STRUCTURAL DESIGN CALCULATION

1 **General:**

Proposed building consists of Stilt + 5. Stilt floor used for parking, Upper floors for residencial purpose. The floor height is 3.05 m 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 6 stories, wind force is taken into account. Live load reduction factor is applied in design. Deep foundation (pile) is proposed. 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")

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1125

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			

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

200mm	thick brick work								
	0.2	x	2.60	x	20		=	10	KN/m/floor
Beams	0.2	x	0.45	x	25		=	2.25	KN/m/floor
Columns	0.3	x	0.60	x	2.55	x 25	=	11.48	KN/floor

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

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6 SLAB DESIGN: S1

Thickness	=	135	mm	Concrete mix	Fck	= M 25	N/sq.mm
Cover	=	20	mm	Steel Grade	Fy	= Fe 500	N/sq.mm
Eff.Depth	=	110	mm				

Panel = (4.1 x 6.3) m

Two way slab Ly / Lx = 6.3 / 4.1 .= 1.5

Support condition - Four edges discontinuous

short span=	α x	=	.-	(- BM at continuous edge)	Table:26
		=	0.089	(+ BM at midspan)	in IS-456-2000
long span=	α y	=	.-	(- BM at continuous edge)	
		=	0.056	(+ BM at midspan)	

Designed for 0.089 co.efficient

Mu .= 0.089 x 6.5 x 1.5 x 4.1 x 4.1 = 14.59 knm/m

$$\text{Mu / b.d.d} = \frac{14.59 \times 1000 \times 1000}{1000 \times 110 \times 110} = 1.21 \text{ N/sq.mm}$$

From Table-3 of SP-16, Pt .= 0.414 %

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

At = 0.414 x 1000 x 110 ./ 100 = **455.4** sq.mm/m

Provide 10 dia @ 150 c/c = **523.6** sq.mm/m Shorter span

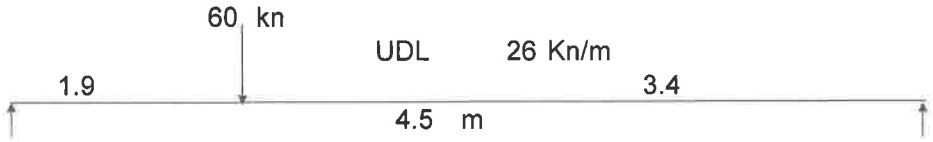
Provide 10 dia @ 175 c/c = **448.8** sq.mm/m Longer span

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7 **Beam design:** **BEAM B-A**

Effective span = 4.5 m Beam size 230 x 450

Fck = M 30 d = 400 mm



Max. Bending Moment at column support = W*L*L / 10 + P1*a*b*b / l*l

= 53 + 65.1

= 118 Kn-m

Mu = 118 x 1.5 x 10-e6 = 177 x 10-e6 Nmm

Mu/b.d.d = 177 x 10-e6 / 230 x 400 x 400 = 4.80 N/sq.mm

From table-53 SP-16 for d'/d = 40 / 400 = 0.10

Pt = **1.321** % Pc = **0.409** %

At = 1.321 x 230 x 400 / 100 = **1215** sq.mm (bot)

Ac = 0.409 x 230 x 400 / 100 = **376.28** sq.mm (top)

provided 3 No 20 = 942 sq.mm

\+ 2 No 20 = 628 sq.mm

= **1571** sqmm top of support

Shear Design:

Shear force = 103.83 Kn

Factored shear force = 1.5 x 103.8 = 155.8 KN

for 1.32 % steel Shear resisted by concrete section

from table-61 0.72 x 230 x 400 / 1000 = 66 KN

Balance shear (Vus) = 155.8 - 66 = 90 KN

Vus/d = 90 / 45 = 2.0 KN/cm

from table 62 of SP-16

Required 2 legged 8 stirrups @ 135 mm c/c

Provided 2 legged **8** stirrups @ **115** mm c/c

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8 **COLUMN DESIGN:** Column - A **COL SIZE** **300** **X** **450**

Maximum load on column in basement — P = 75 t

Pu = 1.5 x 75 x 10 = 1125 KN

Max.Bending Moment = 5.9 t.m — Mu = 1.5 x 5.9 x 10 = 88.2964 Kn.m

Cover = 40 mm

d'/d = 0.09

= 30 N/sq.mm

Provide bars equaly all sides

Refer chart 44 of SP-16

$$\frac{Pu}{Fck\ b\ d} = \frac{1125 \times 1000}{30 \times 300 \times 450} = 0.27778$$

$$\frac{Mu}{Fck\ b\ d^2} = \frac{88 \times 10^6}{30 \times 300 \times 450 \times 450} = 0.05$$

$$\frac{p}{Fck} = 0.05 \quad p\% = 0.05 \times 30 = 1.5\ \%$$

Minimum steel = 0.8 %

As = $\frac{1.5 \times 300 \times 450}{100}$ = 2025 sq.mm

Provided 8 Nos 20 dia = **2513 sq.mm**

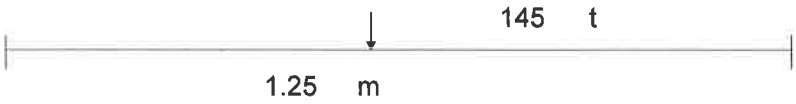
Col. Ties 8 @ 100 C/C and 8@ 170 c/c

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9 Pile cap and pile

As per soil report, 24 m Bored pile can be adopted.
M30 concrete

500 Dia. Bored pile of safe capacity			=	110	t	Rebar 5 nos 16	
Col-A carries maximum load of			=	145	t		
So No of piles provided			=	2	Nos		
Pile cap size	=	800	x	x	2050		
M-30 grade	=	30	N/sq.mm				





Section of pile cap

Pile to pile distance = 1.25 m

Max. Bending Moment at column support = W*L / 6

= 302 Kn-m LE

Mu = 302 x 1.5 x 10-e6 = 453 x 10-e6 Nmm

Mu/b.d.d = 453 x 10-e6 / (800 x 675 x 675) = 1.24 N/sq.mm

From table-53 SP-16 for d'/d = 60 / 675 = 0.09

Pt = **0.306** % Pc = **0.000** %

At = 0.306 x 800 x 750 / 100 = **1836** sq.mm (bot)

Ac = 0.000 x 800 x 750 / 100 = **0** sq.mm (top)

Provided 6 No 20 = 1885 sq.mm

Shear Design:

Shear force = 725 Kn

Factored shear force = 1.5 x 725 = 1088 KN

for 0.31 % steel Shear resisted by concrete section

from table-61 0.45 x 800 x 675 / 1000 = 243 KN

Balance shear (Vus) = 1088 - 243 = 845 KN

Vus/d = 845 / 68 = 12.5 KN/cm

3.867

from table 62 of SP-16

Required 6 legged	10 stirrups	@	120	mm c/c
Provided 6 legged	**10** stirrups	@	**110**	mm c/c

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1135

CHENNAI METROPOLITAN DEVELOPMENT AUTHORITY
'ThalamuthuNatarajan Building', No.1, Gandhi Irwin Road,
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PROFESSIONAL REGISTRATION CERTIFICATE

This is to certify that **Thiru S.NAGESH** has enrolled as **Registered Structural Engineer Grade-I (SE)** with Chennai Metropolitan Development Authority (CMDA) who has the qualification of **Master of Applied Science (Equivalence Certificate issued by Association of Indian Universities) vide E.C.No. 028272 dated 18.03.2020** and experience in the relevant field for **32 years.**

He has been given the Registration No.**SE/GR-I/2020/08/276** on **12.08.2020.** He shall be required to comply with the duties and responsibilities prescribed by the Government of Tamil Nadu 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 04.02.2019.

This Registration is valid upto **11.08.2025.**



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12/08/2020

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