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BBCL Ashraya Block-C, Flat-2C,

Pillayar koil street,

Thuraipakkam, Chennai-600 097.

7.01.2023

Stability Certificate

It is certified that the plan showing the proposed construction of residential building stilt + 5 floors with 75 units at Old S.No. 267/1, as per patta New S.No. 267/1B, Manimangalam 'A' village, Kundrathur taluk, Kanchipuram district. is designed to resist for earthquake. This design is made structurally safe and sound and I hereby certify that

1. The minimum grade of concrete is M25
2. The Minimum column size is 300 mm in stilt areas,
3. 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.


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Reg. No. CGLRGN/SE/GR-1/2019/05/008
No.117, Water Tank Street, Pattavarthi,
Tirunelveli - 627 357

PLAN SHOWING THE PROPOSED CONSTRUCTION OF RESIDENTIAL
BUILDING STILT + 5 FLOORS WITH 75 UNITS AT OLD S.NO. 267/1,
AS PER PATTAN NEW S.NO. 267/1B, MANIMANGALAM 'A' VILLAGE,
KUNDRATHUR TALUK, KANCHIPURAM DISTRICT.

TYPICAL STRUCTURAL DESIGN CALCULATION

1 **General:**

Proposed building is Stilt+5 upper floors for residential purpose.
Stilt floor is used for car parking. The floor height is 3.0m 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, windforce is
taken into account. Live load reduction factor is applied in design. isolated
foundation is proposed. Fe-500 steel is used
as main steel and M25 grade concrete.

3 **Earthquake consideration:**

For better stability during earthquake, 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

$$\begin{aligned} V_z &= V_b \times K_1 \times K_2 \times K_3 \\ V_b &= 50 \text{ m/sec in Chennai} \\ K_1 &= \text{Probability Factor} = 1 \\ K_2 &= \text{Terrain, Height Factor} = 1 \\ K_3 &= \text{Topography Factor} = 1 \\ p &= 0.6 \times V_z \times V_z \\ &= 0.6 \times 50 \times 50 \\ &= 1500 \text{ N/Sq.m} \end{aligned}$$

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5 Design Loads:

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

Say 6.50 KN/sq.m/floor for slab and beam design

Applying live load reduction of = 0.3 ,

For column and foundation design, 6.00 Kn/sqm is taken.

This value is also taken for frame analysis

Block work 200 thick for exterior walls

$$0.2 \times 2.4 \times 24 = 12 \text{ KN/m/floor}$$

$$\text{Beam } 0.2 \times 0.60 \times 25 = 3.0 \text{ KN/m/floor}$$

$$\text{Columns } 0.3 \times 0.60 \times 2.40 \times 25 = 10.8 \text{ KN/floor}$$

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


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6 SLAB DESIGN:

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 (3.3 x 6.5) m

One way slab Ly / Lx = 6.5 / 3.3 = 2.0

Support condition - Two long edge discontinuous

short span= a x = 0.000 (- BM at continuous edge) Table:26
 = 0.088 (+ BM at midspan) in IS-456-2000
 long span= a y = 0.045 (+ BM at continuous edge)
 = 0.035 (+ BM at midspan)

Designed for 0.088 co. efficient

Mu = 0.088 x 6.5 x 1.5 x 3.3 x 3.3 = 9.34 knm/m

Mu / b.d.d = $\frac{9.34 \times 1000 \times 1000}{1000 \times 105 \times 105} = 0.85$ N/sq.mm

From Table-3 of SP-16, Pt = 0.204 %

Minimum Pt = 0.12 % as per code, for Fe-500

At = 0.204 x 1000 x 105 / 100 = 214 sq.mm/m

Provide 8 dia @ 130 c/c = 387 sq.mm/m Short span

Provide 8 dia @ 230 c/c = 219 sq.mm/m Long span

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7 **Beam design:**

Effective span = 5.0 m Beam size 200 x 600
 $F_{ck} = M 25$ $d = 560$ mm

udl = 28 Kn/m

30 kn

5.0

Max. Bending Moment at mid span $udl = \frac{w.l^2}{12} + \frac{pl}{8}$

$= \frac{28 \times 5.00 \times 5.00}{12} + \frac{30 \times 5.0}{8} = 77 \text{ Knm}$

$M_u = 77 \times 1.5 \times 10^{-6} = 114.9 \times 10^{-6} \text{ Nmm}$

$M_u/b.d.d = \frac{115 \times 10^{-6}}{200 \times 560 \times 560} = 1.83 \text{ N/sq.mm}$

From table-55 SP-16 $d'/d = \frac{40}{560} = 0.07$

$P_t = 0.470 \%$ for $P_c = 0.000 \%$

$A_t = 0.470 \times 200 \times \frac{560}{100} = 526 \text{ sq.mm (bot)}$

$A_c = 0.000 \times 200 \times \frac{560}{100} = 0 \text{ sq.mm (top)}$

provided 2 No 16 = 402 sq.mm

+ 2 No 16 = 402 sq.mm

804 sqmm bot

provided 2 No 16 = 402 sq.mm

+ 2 Nc 16 = 402 sq.mm

804 sqmm top of support

Shear Design:

Shear force = $\frac{28 \times 5}{2} + \frac{30}{2} = 84 \text{ KN}$

Factored shear force = $1.5 \times 84.4 = 127 \text{ KN}$

for 0.47 % steel

Shear resisted by concrete section

from table-61 $0.49 \times \frac{230}{126.6} \times \frac{560}{1000} = 63 \text{ KN}$

Balance shear $(V_{us}) = 126.6 - 63 = 64 \text{ KN}$

$V_{us}/d = \frac{64}{41} = 1.5 \text{ KN/cm}$

from table 62 of SP-16

Required 2 legged

8 stirrups

@

200 mm c/c

Provided 2 legged

8 stirrups

@

150 mm c/c

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8 COLUMN DESIGN:

COL SIZE 300 X 600

Maximum load on column in basement

$$P = 115 \text{ t}$$

$$P_u = 1.5 \times 115 \times 10 = 1725 \text{ KN}$$

Max. Bending Moment = 7 t.m

$$M_u = 1.5 \times 7.0 \times 10 = 105 \text{ Kn.m}$$

$$\text{Cover} = 40 \text{ mm}$$

$$d'/d = 0.07$$

$$F_{ck} = M 25 = 25 \text{ N/sq.mm}$$

$$F_y = Fe500$$

Provide bars equally all sides

Refer chart 48 of SP-16

$$\frac{P_u}{F_{ck} b d} = \frac{1725 \times 1000}{25 \times 300 \times 600} = 0.38$$

$$\frac{M_u}{F_{ck} b d^2} = \frac{105 \times 10^6}{25 \times 300 \times 600 \times 600} = 0.04$$

$$\frac{p}{F_{ck}} = 0.03 \text{ p\%} = 0.03 \times 25 = 0.75 \%$$

Minimum steel = 0.8 %

$$A_s = \frac{0.8 \times 300 \times 600}{100} = 1440 \text{ sq.mm}$$

$$\text{Provided } 8 \text{ Nos } 25 \text{ dia} = 3927 \text{ sq.mm}$$

$$3927 \text{ sq.mm}$$

Ties 8 @ 110c/c and 8 @ 190c/c

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9 FOOTING DESIGN

Maximum load on column $P = 115 \text{ t}$ $F_{ck} = \text{M25}$
 Add 10% footing load $= 126.5 \text{ t}$
 Max. Bending Moment $= 7 \text{ t.m}$

S.B.C of Soil at 22 t/sqm at depth $= 2.8 \text{ m}$
 Assume footing base of $2.8 \times 2.8 \text{ m}$ and depth $= 950 \text{ mm}$
 So pressure on soil is Eff. Depth $= 900 \text{ mm}$

$$\frac{127}{2.65 \times 2.65} = 18.01 \text{ t/sqm} < 22 \text{ t/sqm}$$

$$\text{Cantilever projection of footing} = \frac{2.65 - 0.30}{2} = 1.18 \text{ m}$$

B.M on footing at face of column pedestal

$$\text{BM} = \frac{18.01 \times 1.18 \times 1.18}{2} = 12.43 \text{ tm}$$

$$\text{Mu} = 12.43 \times 1.5 = 18.65 \text{ tm}$$

$$\text{Mu/b.d.d} = \frac{18.65}{450 \times 900} \times \frac{1000 \times 10000}{900} = 0.51 \text{ N/sqm}$$

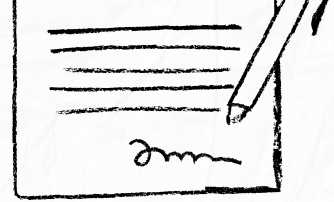
$$F_{ck} = 25 \text{ n/sqmm}$$

From Table-3 of SP-16, $P_t \text{ } 0.13 \% \text{ min } p_t \% = 0.120 \%$

$$A_t = \frac{0.130 \times 450 \times 900}{100} = 526.5 \text{ sq.mm}$$

$$\text{Provide } 12 \text{ dia } @ 130 \text{ c/c} = 2366 \text{ sq.mm}$$

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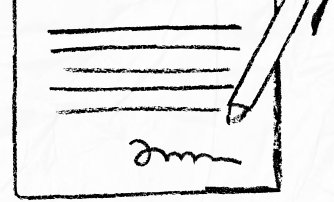
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