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DESIGN ANALYSIS REPORT FOR THE PROPOSED CONSTRUCTION OF GROUP DEVELOPMENT CONSISTING 5 BLOCKS; BLOCK A-STILT FLOOR+5 FLOORS(HEIGHT 18.00M) RESIDENTIAL BUILDING WITH 40 DWELLING UNITS ; BLOCK B T0 D - S T I L T F L O O R + 5 FLOORS (HEIGHT18.0M) RESIDENTIAL BUILDING WITH 85 DWELLING UNITS AT NAGALAKSHMI NAGAR 1ST MAIN ROAD,GOPARASANALLUR, CHENNAI-600056, COMPRISED IN S.NO.83/1,84/1A, 84/2, 85/1, 91/3, 91/4B, 92/2&92/3 OF GOPARASANALLUR VILLAG E WITHIN THE LIMIT OF POONAMALLEE PANCHAYAT UNION

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LOAD CALCULATION FOR RESIDENTIAL APARTMENT

FOR STILT + FIVE FLOORS

The Load Calculation is done for the Proposed Construction Of Group Development considering of 5 Blocks , Block A – Stilt floor + 5 floors (height 18.00 M) Residential Building with 40 Dwelling units Block B to D (Stilt floor + 5 floors (height 18.0M) Residential Building with 85 Dwelling units Block at Nagalakshmi Nagar 1st Main road , Goparasanallur, Chennai – 600056 Comprised in S No 83/1a, 84/2, 85/1, 91/3, 92/2. & 92/3 of Goparasanallur, Village within the limits of Poonamallee Panchayat Union

The load coming over the individual column is distributed through Pile Foundations

Codes Referred:-

- **I.S. 875-1987** CODE OF PRACTICES for design loads (part 1,2 & 3)
- **I.S. 456-2000 & SP – 16** CODE OF PRACTICES for Plan and Reinforced Concrete
- **I.S. 1786-1985** CODE OF PRACTICES specified for high strength deformed steel bars & wires for concrete reinforcement.
- **I.S. 1904-1986** CODE OF PRACTICES for design of construction of foundation in soils.

Concrete Strength assumed	- M-25 for Pile & Pile Cap foundation
Concrete Strength assumed	- M-35 for column , Roof slab & Roof Beams
Steel	- Fe500
Zone	- III
Live Load for Residential	- 200 kg/Sqm
Depth of Pile Foundation	- 26 Mts.
Safe Bearing Capacity of Pile	- 1500 KN (600 Dia Pile for Depth of 26 M)

DESIGN CONCEPT

Limit state concept of design will be used as per IS : 456-2000 & SP– 16.

The detailing of reinforcement shall be done satisfying the requirements of IS 456-2000, SP-16 , IS :13920, IS 4326-1993 and SP-34

The slabs and beams are checked for deflection as per IS 456-2000

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LOAD CASES

1. Dead load (DL)
2. Live load (LL)
3. Earthquake Load (EQ)

LOAD COMBINATIONS

The following combinations of loads as per IS 1893 is considered in the analysis

1. DL+LL
2. 1.5DL+1.5LL
3. 1.2DL+1.2LL +1.2 EQX
4. 1.2DL+1.2LL -1.2 EQX
5. 1.2DL+1.2LL +1.2 EQZ
6. 1.2DL+1.2LL -1.2 EQZ
7. 0.9DL+0.9EQX
8. 0.9DL-0.9EQX
9. 0.9DL+0.9EQZ
10. 0.9DL-0.9EQZ

MATERIALS USED

Following materials are generally used in the design of the various components of the structure

1. M 25 grade concrete for Foundation .
2. M 35 grade concrete for Roof Slabs & Roof beams.
3. Fe 500 grade reinforcement steel for all reinforced concrete members

COVER FOR REINFORCEMENT

Cover for reinforcement is considered as per table 16A of NBC , for a fire resistance of 2 hrs

1. Pile foundation = Not less then 50 mm
2. Columns = 40 mm
3. Roof slabs = 20 mm

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4. Roof Beams = 25 mm

DEAD LOAD, LIVE LOAD AND FLOOR FINISH LOADS FOR RESIDENCE

Self weight of 150 thk slab = 15.0 x 25 = 312.5 Kg / M^2

Live load = 200 .00Kg / M^2

Floor finish = 120 .00 Kg / M^2

= **632.5 Kg / M^2**

Say = 6.302 KN/ M^2

DESIGN OF PILE

Load carrying capacity of 600mm dia pile = 1500 KN

Pu =0.4 fck Ac + 0.67 fy Ast

$1500x1.5x10^3 = 0.4x25x[\pi \times 600^2/4]+0.67x500$ Ast

$2250x10^3 = 2827433.3 + 335$ Ast

Ast $= 2250x10^3 - 2827433.3$

Ast = (-5774333) / 335

Ast = -17236.8 mm^2

For pile minimum percentage 0.4%

$0.4/100 = 0.4 \times (\pi \times 60^2)/100$
4
$= 11.30\ cm^2$

Provide 12 Nos. of 12 mm dia bar .

Provide 8mm dia elliptical binder .

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DESIGN OF PILE CAP IN FOUNDATION

Load on column = 3000 KN

Size of pile = 600 dia

Structural capacity of pile of 600 dia = 1500 KN

Numbers of pile required for column = 3000/1500

=2

Say 2 number of piles

Spacing of piles 2.5 times of dia =2.5 x 600 = 1500 mm

Load on each side of pile cap = 3000/2 =1500

Moment on pile cap = wl/4

= 3000x 1.5/4

= 1125 KN-m

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Effective Size of pile cap = 1500x1200x850 mm

Mu /bd^2 =1125x1.5x10^6 / 1000x850^2

=2.33

Pt =0.609

Ast =0.609x100x75 /100

=51.76 cm^2

Provide 25 dia bar 90 mm spacing @ Bottom Bothways

(Top) 0.17X100X85 = 1445/100 = 14.45/2=6.37

Provide 16 dia bar 125 mm spacing @ Top Bothways

Check for shear

Shear force = 3000/2 = 1500 KN

Shear stress = 1500x1.5x1000 /1000x850

= 2.6 < 3.1 (For M25 Concrete)

Provided 6L 12 Tor @ 100 c/c as beam shear bar

DESIGN OF COLUMN

Size of Column	= 300 x 750 mm
Axial load	= 1161.03 KN
Addition load for earthquake	= 1180 KN
Total	**= 2341.3 KN**
Moment due to DL + LL	= 237.90KN-m
Moment due to EQ	= 24.26 KN-m
Total	**= 262.16KN-m**

$Pu/FckBd = 2341.3x\ 1.5\ Xx10^3 / 35 \times 300 \times 750 = 0.44$

$Mu/FckBd^2 = 262.16x\ 1.5 \times 10^6 / 35 \times 300 \times 750^2 = 0.066$

From SP 16 Chart 47 P/Fck = 0.02

P = 0.044 x 35 =1.54%

$Ast = 1.54x\ 30x\ 75 / 100 = 34.65Cm^2$

Provide 10 Nos. of 25mm dia bar ($49Cm^2$) Hence ok.

Provided 8L 8Tor @ 200 c/c as Column ties

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DESIGN OF BEAMS

Span of Beam 3.14 **M**

Load from Slab = 1.24 x 3.14 x 1	= 3.89KN/m
Load from Slab =0.69x 3.14x 1	= 2.166KN/m
Self weight of Beam = 0.20x 0.450 x 25x1	= 2.25KN/m
Wall load = 2.74x0.10x0.65x1	= 0.174 KN/m
Total	**= 8.48 KN/m**
Maximum BM $= WL^2/8 = 8.48X\ 3.14^2/8$	= 10.45 KN – m
$Mu/Bd^2 = 10.45\ X\ 1.5\ X\ 10^6 /\ 200\ X\ 400^2$	= 0.48

Pt = 0.17 % minmum for fy500

Ast = 0.17x 20x 40/ 100 $= 1.36\ Cm^2$

Area of steel provided 2-12Tor @ Bottom

Area of steel provided 2–12 Tor @ Top

Shear force at each support = 8.48 x3.14/2 = 13.31KN

Shear stress = 13.31x 1.5x 1000/(200x400) =0.24<3.7

Hence ok.

Vertical stirrups for shear = 13.31X1.5/40= 0.499 KN/cm

Provided 2 Legged 8Tor@ 150MM c/c

Hence Ok.

DESIGN OF SLABS

Panel size of Slab **3.55m x 3.55m**

Ly / Lx = 3.55 / 3.55 = 1 (Two way Slab)

W = 6.302 KN/M^2

Lx/35 = 3.55*1000/35 = 101.42 Lx = 3.55 M α_x = 0.062 α_y = 0.062

Provide Slab thickness = 150mm

$M=\alpha_x WL_x^2$ =0.062x6.302x3.55^2 = 4.924kN-m

Mu/Bd^2 = 4.924 X 1.5 X 10^6 / 1000 X 130^2 =0.437

Minimum percentage 0.17

Pt = 0.17

Ast = 0.17X100X13/100 =2.21 Cm^2

Area of steel required 8 Tor @ 200mm C/C as Main reinforcement

$M=\alpha_y WL_x^2$ =0.062x6.302x3.55^2 = 4.924 kN-m

Mu/Bd^2 = 4.924X 1.5 X 10^6 / 1000 X 130^2 =0.437

Minimum percentage 0.17

Pt = 0.17

Ast = 0.17X100X13/100 = 2.21 Cm^2

Area of steel required 8 Tor @ 200 mm C/C as Main reinforcement

Hence Ok.

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

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