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JAYAM CONSULTANTS PRIVATE LIMITED

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STABILITY CERTIFICATE

It is certified that the plan showing the proposed Stilt + 3 floors, Residential building with 9 dwelling units comprised in S.No-396/1A,9 396/2 greater Chennai corporation, Division no 195, Zone-XV, at plot no-64, Sakthi garden, Vivekananda nagar, Okkiyam thoraipakkam, Chennai-600097 and it is designed to resist for earthquake. Check has been made and found safe and I hereby certify that:

The minimum grade of concrete is M25

The Minimum column size if 300 mm in stilt floor areas

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.

I.S.456	-	2000 (Code of practice for PCC & RCC)
I.S.875	-	2015 (Code of practice for design loads for buildings & structures)
S.P.16 & S.P.34-		2002 (Code of practice for design and detailing)
I.S.13920	-	2016 (Code of practice for design and detailing for earthquake)
I.S.1893	-	2016 (Criteria for earthquake resistant building)
I.S.4236	-	1993 (Code of practice for design earthquake resistant building)
NBC	-	2016.

Signature of Structural engineer,

J.S PADMANABHAN
S. PADMANABHAN
Registered Structural Engineer
Grade - 1 (SE)
Regn. No. SE/GR-I/19/05/123

PLAN SHOWING THE PROPOSED STILT + 3 FLOORS, RESIDENTIAL BUILDING WITH 9 DWELLING UNITS COMPRISED IN S.NO-396/1A,9 396/2 GREATER CHENNAI CORPORATION, DIVISION NO 195, ZONE-XV, AT PLOT NO-64, SAKTHI GARDEN, VIVEKANANDA NAGAR, OKKIYAM THORAIPAKKAM, CHENNAI – 600097.

TYPICAL STRUCTURAL DESIGN CALCULATION

01. General

Proposed Residential Building S+3 upper floors for residential purpose. Stilt Floor is provided for car parking.

02. 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 S+3 stories; wind force is taken in to account. Live Load reduction factor is applied in design. Strip footing foundation is proposed as per soil report. Fe-550 steel is used as main steel and 8 mm bars for distributors.

03. Earthquake consideration.

For better stability during earthquake, the columns are braced in both directions with beams, continuous lintels are specified for outer walls and column ties are closely spaced for better ductility. For Building on stilt, Minimum size is taken as 300 mm (12")

04. WIND LOAD

Vz = Vb x K1 x K2 X K3 X K4
Vb = 50m/sec in chennai
K1 = Probability Factor = 1
K2 = Terrain, Height Factor = 1.05
K3 = Topography Factor = 1
K4 = Cyclonic Factor = 1.15

Reduction factors
Kd = 1.0
Kc = 0.85
Ka = 0.9

Vz = 52.5 M/sec.

Pz = 0.6 x Vz x Vz x Ka x Kd x Kc
= 0.6 x 52.5 x 52.5 x 1.0 x 0.85 x 0.9
= 1265 N / Sq.m

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FLOOR LOADS :

DEAD LOADS

Assuming 5''thk slab dead load	=	313 kg/sqm
Weight of floor finish, partitions etc.,	=	131 kg/sqm
Total dead load	=	444 kg/sqm

LIVE LOADS

Live load on typical floor	=	200 kg/sqm
Total load on typical floor	=	644 kg/sqm

ROOF LOADS

Assuming 5''thk slab dead load	=	313 kg/sqm
Weight of weathering course	=	273 kg/sqm
Total dead load	=	586 kg/sqm
Live load on roof with success assumed	=	150 kg/sqm
Total roof load	=	736 kg/sqm
Staircase loading liable to overcrowding	=	500 kg/sqm
Wind load considering height of building	=	200 kg/sqm

BRICK LOADS

Weight of brick per sqm	=	1890 kg/cum
Assuming beam size of 9''x24''	=	335 kg/rm
R.C.C Mix to be adopted	=	M25

LOAD ON TYPICAL COLUMN

Slab load of stilt floor	=	9.02 ton
Slab load for three floors	=	27.06 ton
Roof load	=	10.31 ton
Beam load	=	9.43 ton
Brick work load	=	28.13 ton

3.8 P

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Self weight of column assuming (12''x18'')		=	3.8 ton
Total load on column		=	87.75 ton
	Say	=	88 ton

Provide 10-Y20

Safe capacity of above section = 120 ton.

Hence safe

TYPICAL FOUNDATION

SBC of soil = 450 Dia 14.0m deep.
As per soil report

Capacity of pile = 50mt.

No of Piles required = 1.76 Nos.

Area provided = 2 Nos.

Hence safe

TYPICAL SLAB Ly/Lx = 4.0/3.5 =1.14

Hence two way slab

Provide 5''thk slab

Provide Y10 @ 6'' C/C (shorter direction)

Provide Y10 @ 7'' C/C (longer direction)

TYPICAL BEAM

Span	=	5.965m
Slab load	=	1805kg/m
Self weight	=	350 kg/m

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Total load	=	2155kg/m
Bending moment	=	8028.01kg-m
B.M due to conc 1	=	6545.3kg-m
B.M due to conc 2	=	3145.00kg-m
Total bending moment	=	17718.31kg-m

EARTHQUAKE ANALYSIS

Calculation of horizontal seismic coefficient
As per code I.S.1893/2016

Ah = ZI/2R x Sa/g

Zone factor (Chennai zone) z = 0.16

Importance factor I = 1.2

Response reduction factor R = 5.0

Natural period

Ta = 0.075h

= 0.075x12

= 0.9 secs

H = (Ht of buildg)

Sa/g = 1.67/t

Sa/g = 1.67/0.9 = 1.85

$$Sa/g = \frac{0.16 \times 1.2}{2 \times 5.0} \times 1.85$$

= 0.035

3.5

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CALCULATION OF BASE SHEAR/SEISMIC FORCES

Floor	Wi	Hi	Wi x Hi^2
Terrace	87.108	12	12543.55
3	113.483	9	9192.12
2	113.483	6	4085.38
1	113.483	3	1021.34
Stilt	14.691	0.3	1.33
EWI	442.248		26843.72

Base shear V = Ah EWI

= 0.035 x 26843.72 = 9.39 ton

Seismic force per column = 9.39/4 =2.35

Seismic moment per column = 2.35x3/2 =3.52

Column provided is safe against the additional seismic moment of 3.52mt.

CHECK FOR FOUNDATION

$P/N + M/X^2$

88 3.52
---- +- --------
1.76 0.781

50 +- 4.5

=54.5
=1.25 x 50
=62.5 ton

Hence safe.

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