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SF ENGINEERING SYSTEMS (INDIA) PVT. LTD.

SHIV FORCE GROUP

(Reliable Partner in Specialized Engineering)

Date: 29.03.2025

STABILITY CERTIFICATE

(To be furnished while filing application for registration of building)

The detailed engineering and structure design of the proposed building comprising of Stilt + 5 Floors + Head Room floors at Plot Nos. PP - VIII & IX, River View Residency, 6th Street and 5th Street, Karappakkam, Chennai 600097 comprised in S. No. 163/53 & 163/54, has been done by me/us based on the report of geotechnical investigation (soil test) done by Mars Synergy Geotech Pvt Ltd Report No. MSGTPL/SI-6317/24-25 dated Oct 2024 and considering the functional requirement of the building.

2. It is certified that among other factors, the proposed building has been designed to resist earthquake. I/We have checked various parameters and found that the proposed building would be safe.

3. I/We further certify that:

(i) The minimum grade of concrete is M25

(ii) The design and analysis has been done using the code of practice for plain and reinforced concrete as per IS 456, design loads as per IS Codes No IS: 875 (Part 1 - 5) and design of earthquake resistant structure as per IS Code No. IS:1893

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

Stamp and Signature

M. GEO DAMIN, M.E (Structures)
Registered Structural Engineer Grade-I
Reg. No: SE / GR - I / 19 / 08 / 196

Encl.: Structural Design Calculation

DESIGN BASIS REPORT

PROPOSED RESIDENTIAL BUILDING AT CHENNAI

Prepared by:	Checked by:	Approved By	Rev. No.	Date
PRAKASH	RAMAJEYAM	GEO DAMIN	A	11/21/2024

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1.INTRODUCTION:

This report sets out the basic parameters used for the structural design of the proposed "**Residential Building**" at Chennai. The project Structural consultancy is being provided by SF Engineering Systems (India) Pvt.Ltd, Chennai.

1.1 Structural System:

The structural system adopted is as below, based on preliminary analysis & design.

The building is basically a R.C.C framed structure comprising of Stilt floor + 5 slabs only.

2. DESIGN STANDARDS:

2.1 Codes of Practice

The design of the above structure is in accordance with the following latest design codes:

IS 875 Part 1-1987	: Unit weight of materials
IS 875 Part 2-1987	: Live Loads
IS 875 Parts 3-1987	: Wind Loads
IS 875 Part 5-1987	: Special loads and load combinations (second revision)
IS: 456 – 2000	: Plain& Reinforced Concrete - Code of Practice
IS 1080-1997	: Code of practice for Design and construction of shallow foundations
IS 1641-1998	: Fire safety of building (general): General principles of fire grading and classification.
IS 1642-1994	: Fire safety of buildings (general): Details of construction Code of practice
IS 1786-1990	: Specification for high strength deformed steel bars and Wires for concrete reinforcement (third revision)
IS 1893-2002	: Seismic loads
IS 1893-2005(Part4)	: Seismic code for Industrial Structures
IS 2502-1999	: Code of practice for bending and fixing of bars for concrete reinforcement

IS 3370 (Part I and Part II) -1999 : Code of practice for Concrete Structure for the Storage of Liquids.

IS 3414-1995 : Code of Practice for Design & Installation of Joints in Buildings.

IS 4326 -2002 : Code of practice for earthquake resistant design and construction of buildings.

SP-7(part IV)-1983 : National Building Code of India.

SP 16 -1980 : Design aid for reinforced concrete to IS 456.

SP 22-1982 : Explanatory handbook on code for Earthquake Engineering. SP23-1982: Handbook on Concrete mixes.

SP24-1983 : Explanatory handbook on Indian standard code of practice for Plain and Reinforced concrete.

SP 34-1987 : Handbook on Concrete Reinforcement & detailing.

SP 64-2001 : Explanatory hand book on Indian standard code of practice for Design loads (other than earthquake) for buildings and Structures - Part 3 wind loads

3. LOADS:

Following loads are considered while designing the structural elements apart from the dead loads as per code norms.

3.1 Dead Loads:

Weight of materials shall be calculated on the basis of unit weights given in I.S:875-PART 1.

* Unit weight of reinforced cement concrete = 25 kN/m^3
* Unit weight of plain cement concrete = 24 kN/m^3
* Unit weight of Solid block (with plaster) = 22 kN/m^3
* Unit weight of steel = 78.5 kN/m^3
* Unit weight of cement mortar/plaster = 22 kN/m^3
* Filling material of sunken floors = 6 kN/m^3
* Water load = 10 kN/m^3

Other Loads considered for Design (SDL):

* Floor finishes at Floors = 1.5kN/m^2

3.2 Imposed Live Loads:

(i) Rooms & Toilets …… 2.5 KN/m^2

(ii) Stairs, corridors and balconies …… 4.00 KN/m^2

(iii) Staircase Headroom & chejja …… 0.75 KN/m^2

3.3 Load Combinations:

Following load combinations shall be considered in the analysis of framed structures for buildings.

Load Combination	**Limit State of Collapse**			**Limit state of Serviceability**		
	DL	LL	WL/EL	DL	LL	WL/EL
DL+LL	1.5	1.5	---	1.0	1.0	---

Notations

DL - Dead Load

LL - Live Load

4. MATERIALS:

4.1 Concrete:

- Foundation M30/M25
- Column/Pedestals M40
- Beams M25
- Slabs M25
- Staircase M25
- Retaining wall M25

5. SOIL DATA AND WATER

The Foundation is designed as a Pile Foundation as suggested by the provided Soil Report

6. DESIGN METHODOLOGY

All RCC Structures shall be designed according to Limit State Method as specified in IS: 456-2000.

7. SERVICEABILITY CRITERIA

7.1 Deflection:

Dead Loads & Live Loads

The maximum allowable live load deflection will be limited to span/350 or 20mm whichever is less. And the overall deflection including the effects of creep and shrinkage will be limited to span/250.

7.2 Crack Width:

The crack width shall be limited to 0.2mm for normal exposure conditions & 0.1mm for severe exposure conditions.

DESIGN OF SLAB

TF GL (7-4) (A-C)

S1

DESIGN OF SLAB No:

Grade of concrete			=	25.00	N/mm^2
Grade of steel			=	500.00	N/mm^2
Cover to reinforcement			=	25.00	mm
Diameter of bar				10.00	mm
Aspect ratio $\frac{l_y}{l_x}$ =	6.70	6.85		1.540	< 2
	4.30	4.45			
Edge condition:	One Short Edge Discontinuous			Two way slab	
Modification factor assumed				1.50	
	128.84				
Depth required for deflection:			D =	175.00	mm
				175.00	mm
			d =	145.00	mm
Dead Load			=	4.20	kN/m^2
Live load			=	2.50	kN/m^2
Partitions & FF			=	1.50	kN/m^2
Total load			=	8.20	kN/m^2
Factored load			=	12.30	kN/m^2

Case No:	2	
D+(C-D)*(E-A)/(B-A)		
	Negative	Positive
A	1.50000	1.50000
B	1.75000	1.75000
C	0.05700	0.04400
D	0.06400	0.04800
E	1.53993	1.53993
Value	0.05812	0.04464

ok

Details	S- SPAN		L-SPAN	
	(-ve) support(α_x)	(+ve) span(α_x)	(-ve) support(α_y)	(+ve) span (α_y)
Co-efficent (IS:456, Table :26)	0.058	0.045	0.037	0.028
M_u=Co-efficient*w* l_x^2	14.12	10.85	8.99	6.80
K= Mu/bd2	0.67	0.52	0.43	0.32
Percentage of steel required	0.16	0.12	0.10	0.08
Ast required(in mm^2)	231.32	176.29	145.49	109.54
Ast min (in mm^2)	210.00	210.00	210.00	210.00
Ast to be provided (in mm2)	231.32	210.00	210.00	210.00
Provided bars spacing (c/c)	339.67	374.15	374.15	374.15
max spacing	250.00	250.00	250.00	250.00
spacing	250.00	250.00	250.00	250.00
Reqd bars spacing (c/c)	**250.00**	**250.00**	**250.00**	**250.00**
Pvd bars spacing (c/c)	175.00	175.00	175.00	175.00
Ast Provided(in mm^2)	**448.98**	**448.98**	**448.98**	**448.98**
Percentage of steel provided	**0.31**	**0.31**	**0.31**	**0.31**

STEPII

F_s=0.58 *f_y * (Ast required/ Ast provided)			
F_s		113.87	
M.F		1.50	
if assumed modification factor is less than or equal to calculated the section is safe for deflection		safe	

OVERALL DEPTH	**D**	**175.00**	**mm**
EFFECTIVE DEPTH	**d**	**145.00**	**mm**

STEPIII **Crack width calculation**

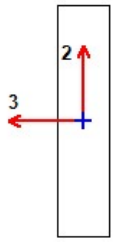
m	=	8.0	
E_s	=	200000.0	
Ec	=	25000.0	
Pt	=	0.3	
k	=	0.2	
x	=	28.9	
A_{st}	=	449.0	
I_{cr}	=	56460967.15	
M	=	10.8	
f_{st}	=	178.5	
ε_m	=	0.0	
Spacing		175.0	
a_{cr}	=	91.0	
ω_{cr}	=	0.06	
		<	
		0.20	mm (safe)

DESIGN OF BEAM

BEAM NO : RB-1

ETABS Concrete Frame Design

IS 456:2000 Beam Section Design



Beam Element Details Type: Ductile Frame (Summary)

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF
1	B107	917	RB-200-900 M30	ULTIMATE	5675	10875	0.791

Section Properties

b (mm)	h (mm)	b_f (mm)	d_s (mm)	d_{ct} (mm)	d_{cb} (mm)
200	900	200	0	40	40

Material Properties

E_c (MPa)	f_{ck} (MPa)	Lt.Wt Factor (Unitless)	f_y (MPa)	f_{ys} (MPa)
29580.4	30	1	500	500

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} kN-m	Factored T_u kN-m	Factored V_{u2} kN	Factored P_u kN
1042.283	0.0203	39.476	0

Design Moments, M_{u3} & M_t

Factored Moment kN-m	Factored M_t kN-m	Positive Moment kN-m	Negative Moment kN-m
1042.283	0.0657	1042.3487	0

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment kN-m	Design +Moment kN-m	-Moment Rebar mm²	+Moment Rebar mm²	Minimum Rebar mm²	Required Rebar mm²
Top (+2 Axis)	0		1026	1026	0	73
Bottom (-2 Axis)		1042.3487	3269	3269	0	488

Shear Force and Reinforcement for Shear, V_{u2} & T_u

Shear V_e kN	Shear V_c kN	Shear V_s kN	Shear V_p kN	Rebar A_{sv}/s mm²/m
39.476	145.1919	68.8	0	221.69

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u kN-m	V_u kN	Core b_1 mm	Core d_1 mm	Rebar A_{svt}/s mm²/m
0.0203	39.476	140	840	0

DESIGN OF COLUMN

COLUMN NO : C-8

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (mm)	Centroid Y (mm)	Length (mm)	Thickness (mm)	LLRF
Stilt	P7	3500	29127	1350	200	0.453

Material Properties

E_c (MPa)	f_{ck} (MPa)	Lt.Wt Factor (Unitless)	f_y (MPa)	f_{ys} (MPa)
31622.78	40	1	500	415

Design Code Parameters

Γ_S	Γ_C	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 mm	Left Y_1 mm	Right X_2 mm	Right Y_2 mm	Length mm	Thickness mm
Top	Leg 1	2825	29127	4175	29127	1350	200
Bottom	Leg 1	2825	29127	4175	29127	1350	200

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (mm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u kN	M_{u2} kN-m	M_{u3} kN-m	Pier A_g mm²
Top	8182	0.0303	0.0026	ULTIMATE	5456.2858	125.899	278.2706	270000
Bottom	8284	0.0307	0.0026	ULTIMATE	5486.6518	126.5822	279.8192	270000

Shear Design

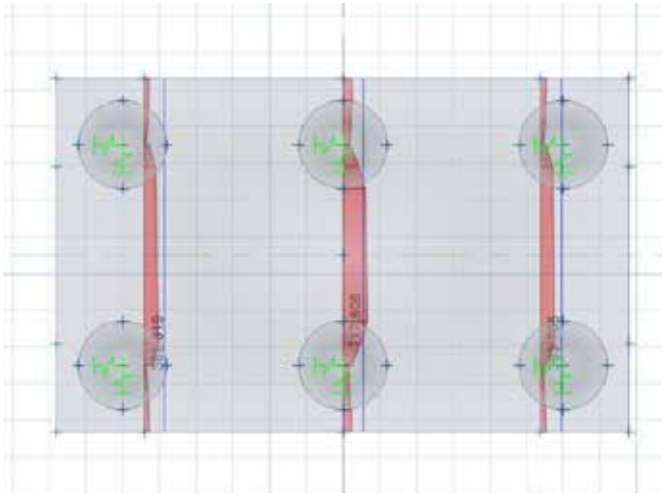
Station Location	ID	Rebar mm²/m	Shear Combo	P_u kN	M_u kN-m	V_u kN	V_c kN	$V_c + V_s$ kN
Top	Leg 1	400	ULTIMATE	5456.2858	215.3738	-48.4597	162.0696	317.9653
Bottom	Leg 1	400	ULTIMATE	5486.6518	69.9947	-48.4597	162.0696	317.9653

DESIGN OF FOOTING

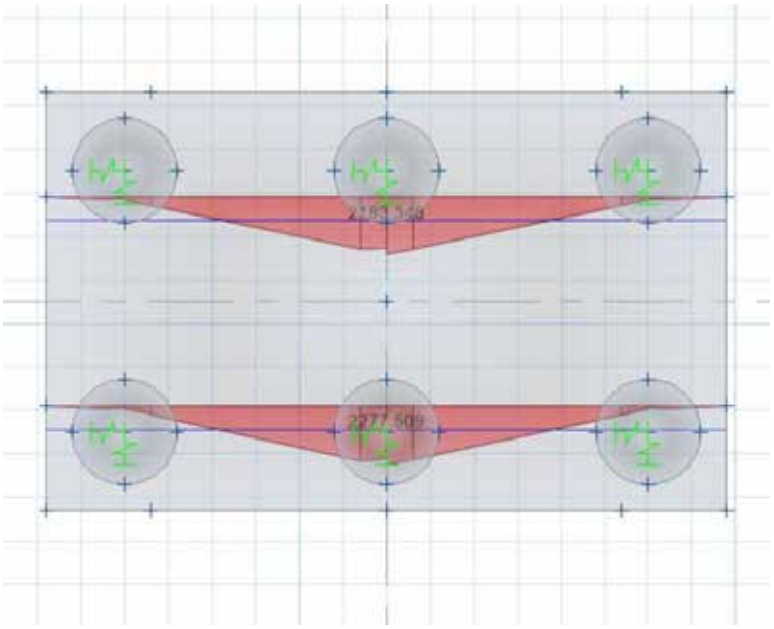
FOOTING NO: PC6

Pile Termination Depth (m)	Pile Dia (mm)	Safe Vertical Capacity (Tones)	Safe Uplift Capacity (Tones)	Safe lateral Capacity with 5mm deflection	
				Free Head (Tones)	Fixed Head (Tones)
15	450	55	30	1.3	3.3
	500	60	35	1.5	3.9
	600	85	40	2.0	5.2

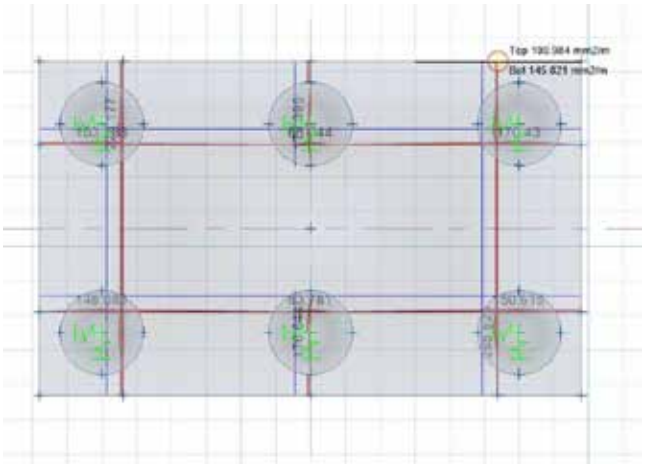
Report Recommended Pile depth and Capacity



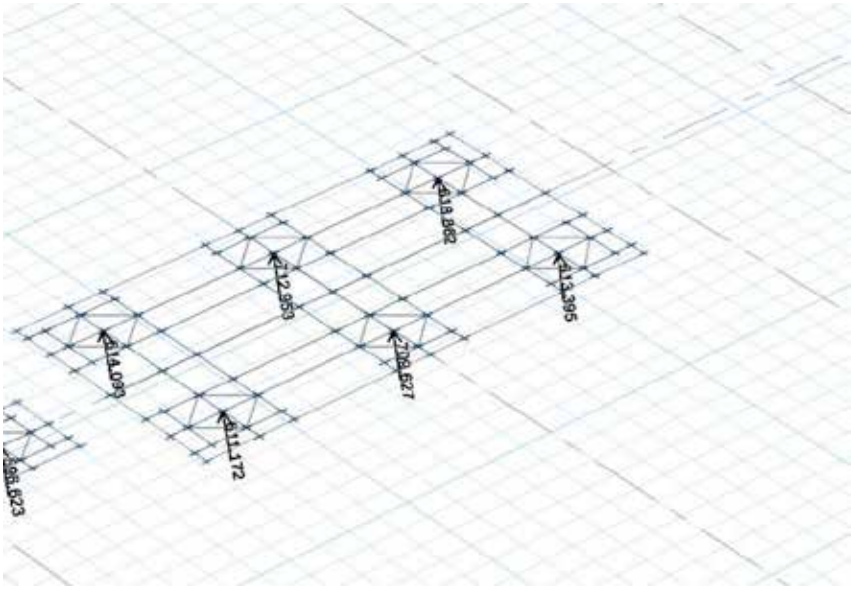
PC8- Bottom Reinforcement Y Direction



PC8- Bottom Reinforcement X Direction



PC8- Top Reinforcement X and Y Direction



PC8- Designed Pile capacity



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Vastu & Property Management Tools

Home Vastu Shastra, Plot Vastu Shastra, Property Management

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