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Er J.SRIRAMULU, M.E.(Struct), M.I.E,
Structural Consultant &
Registered Grade –I Structural Engineer
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No. 51/1, Kujji Street
ANNA NAGAR EAST
CHENNAI - 600 102

STABILITY CERTIFICATE

The detailed engineering and structure design of the proposed construction of Residential Group Development with 2 Blocks; Block-1 Stilt Floor + 4 Floors (Height – 16.00m) Residential Building with 8 Dwelling units and Block-2 Stilt Floor + 4 Floors (Height – 16.00m) Residential Building with 8 Dwelling units, totally 16 Dwelling Units availing premium FSI at Door No.34, East Mada Street, Thiruvanmiyur, Chennai – 600041 comprised in Old S.No.193/42A, T.S.No.54, Block No.60 of Thiruvanmiyur Village, within the limits of Greater Chennai Corporation. have been designed by me based on the report of geotechnical investigation (soil test) done by T.J.ENGINEERS vide Project No. TJE/003114/2024 Dated 30.01.2024 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 have checked various parameters and found that the proposed building would be safe.

3. I 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 Code No.IS 875 and design of earthquake resistant structure as per IS Code No. IS 1893 & IS 13920.

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

Stamp and Signature

Encl.: Structural Design Calculation

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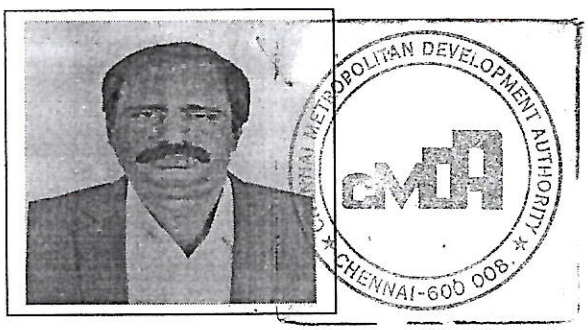
CHENNAI METROPOLITAN DEVELOPMENT AUTHORITY
'Thalamuthu Natarajan Building', No.1, Gandhi Irwin Road,
Egmore, Chennai-600 008.

PROFESSIONAL REGISTRATION CERTIFICATE

This is to certify that the **Thiru. J. SRIRAMULU** has enrolled as **Registered Structural Engineer Grade-I (SE)** with Chennai Metropolitan Development Authority (CMDA) who has the qualification of **M.E., (Structural Engg.)** and experience in the relevant field for **16years**.

He has been given the Registration No.**SE/GR-I/2019/06/161 Renewed** on **18.06.2024.** 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 **17.06.2029**.



18/6/24.

(A. MEGANATHAN)
Superintendent

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Reference

1. IS 456 (Latest Revision)	- For Concrete
2. IS 875 (part-1) (Latest Revision)	- For Dead Loads
3. IS 875 (part-2) (Latest Revision)	- For Imposed Loads
4. IS 1893 (part-1) (Latest Revision)	- For Earth quake
5. IS 875 (part-3) (Latest Revision)	- For Wind Loads

CALCULATION OF WIND SPEED

Design wind speed Vz. = Vb X k1 X k2 X k3 = 50X1.08X1.03X1.0 =55.52m/sec

Design wind pressure Pz = 0.60XVzxXVzy = 0.60X55.62X55.62 = 856.15N/Sq.mm

Vb Basic wind speed Vb = 50m/sec

CALCULATION OF HORIZONTAL SEISMIC CO-EFFICIENT

Name of City ; Chennai

Type of Building ; Residential

Building Frame system ; Special Moment Resisting Frame (SMRF)

Fundamental Natural Period(Ts) ; (0.075Xh^0.75)

Fundamental Natural Period in x direction ; 0.48 sec

Fundamental Natural Period in z direction ; 0.0.191 sec

Soil Condition at bearing ; Brownish grey silty sand with gravel

Zone Factor (refer Table 2) (Z) ; 0.16 (moderate)

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Importance Factor (refer Table 6) (I) ; 1.0

Response Reduction (refer Table 7) ;3.0

Average Response Acceleration co-efficient (Sa/g) ; 2.50

EARTH QUAKE ANALYSIS

Horizontal seismic coefficient (Ah) = (Z/2) (I/R) (Sa/g)

= (0.16/2) (1.0/3.0) (2.50)

= 0.04

Design value of Seismic Base Shear = 0.04
On Efficient Ah

DESIGN CALCULATION

Seismic Base Shear (VB) = (Ah)x (wi)
= (0.04 X1029)
= 41.10 KN

I GENERAL LOADING CONDITIONS

1. Imposed loads on Roof = 1.50 KN/sq.m

2. Imposed Loads on Floors =2.0 KN/sq.m

3. Dead weight of concrete = 25 KN/cu.m

4. Dead weight of Brick work = 19 Kn/ cu,m

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II. LOADS ON SLABS

1. Loading on Roof Slab

Roof finished with lime concrete = (0.12X(20) = 2.40 KN/sq.m
weathering course

Self weight of slab 140 mm thick = (0.14)X(25) = 3.50 Kn/sq.m

Total Dead Load = 5.90 KN/sq.m

Live Load = 1.50/KN/sq.m

Total Load on Roof = 7.40 KN/sq.m

2. Loading on Floor Slab

Floor Finish = 1.0 KN/sq.m

Self weight of slab 140mm thick = (0.14)X(25) = 3.50 Kn/sq.m

Total Dead Load = 4.50 KN/sq.m

Live Load = 2.0 /KN/sq.m

Total Load on Floors = 6.50 KN/sq.m

DESIGN OF CRITICAL COLUMN -C6

Grade of Concrete : M25

Grade of Steel : Fe 500

Width of Column b : 300mm

Depth of Column D : 534mm

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Unsupported Length of Column	lx	: 3000mm
Unsupported Length of Column	ly	: 3000mm
Clear cover for reinforcements		: 40mm
Diameter of bar to be used		: 25mm
Factored Load	Pu	:1029KN
Factored moment Mux		: 90 KN.M
Factored moment Muz		: 40 KN.M
Effective Length of Column	lex	: 3000mm
Effective Length of Column	lez	: 3000mm
Lex/D		= 5.61 <12 – Short column
Lez/b		= 10 =12 – Short column
Additional moment due to slenderness of column	Max	= 0
Additional moment due to slenderness of column	Maz	= 0
Percentage of reinforcement		= 2.33%
Gross Area of Cross section		=160290 Sq.mm

P/fck = 2.33/25 = 0.09

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Pu / (fckXbXD) = (1029 X 10^3) / (25 X 30 x 53 x 100)

= 0.26

Uni axial Moment capacity of Section about xx axis

Refer Chart 36

Mu / (fck X b x D^2) = 0.10

Mux1 = (0.1 x 25 X 30 x 53 x 53 X 10^3) / 10*6

= 211 KN.M

Uni axial Moment capacity of Section about yy axis

Refer Chart 37

Mu / (fck X b^2 x D) = (.0..07 X 25 X 53 X 30 x 30 x 10^3) / 10^6

= 83.48 KN.M

Refer Chart 63

Puz/ As = 16 N/Sq.mm

Puz = 16 x Ag = 2160 KN

Pu / Puz = 1029 / 2160 = 0.5

Mux / Mux1 = 90/ 211 = 0.43

Muy / Muy1 = 40 / 83.48 = 0.48

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Refer Chart 64

Pu / Puz = 0.50 < 1 Hence O K

DESIGN OF TWOWAY SLAB - S5

Panel size = 4.57 X 4.17

fck = 25 N / Sq.mm

fy = 500 N / Sq.mm

Edge condition - Interior panel

Ly / lx = 1.10

Thickness of slab = 140mm

Loads on Slab

Self weight of slab = 3.50 KN / Sq.m

Floor finishes = 1.0 KN / Sq.m

Live Load = 2.0 KN / Sq.m

Total Loads = 6.50 KN / Sq.m

ax (-ve) = 0.05

ax (+ve) = 0.038

ay (-ve) = 0.032

ax (-ve) = 0.034

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	moment in KN.m	Spacing of 10mm dia bars
Mx (-ve) = ax (-ve) X w X lx X lx X 1.50	= 11.77	20cm
Mx (+ve) = ax (+ve) X w X lx X lx X 1.50	= 8.94	20cm
My (-ve) = ay (-ve) X w X lx X lx X 1.50	= 7.53	20cm
My (+ve) = ay (+ve) X w X lx X lx X 1.50	= 8.0	20cm

Provide slab thickness of 140 mm

Provide 10mm dia bars at 150mm spacing in shorter direction and

10 mm dia bars at 150 mm spacing in longer direction

CHECK FOR DEFLECTION

Percentage of Tension reinforcement at mid span section =0.40

Fs = 0.58 fy X area of steel required / Area of steel provided = 60 N / Sq.mm

Basic Span/ eff. Depth ratio for continuous slab = 26

Modification Factor = 2

Coefficient for maximum span / eff. Depth = 52

Effective Depth required = 78 < 130 mm

Hence Safe

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DESIGN OF RCC FLOOR BEAM - B12

Grade of Concrete		= M25
Width of Beam	b	= 230mm
Depth of Beam	D	= 590mm
Factored Moment (Span)	Mu	= 209 KN.m
Factored Moment (Support)	Mu	= 220 KN.m
Dia. of bars (mid span Bottom)		= 25mm
Dia. of bars (mid span Top)		= 25mm
Dia. of bars (extra at support top)		= 25mm
Clear cover for main reinforcement		=25mm
Max. allowable Shear Stress		= 2.80 N / Sq.mm
Effective depth of beam		= 552.5mm

From Table D

For fck 25 and fy 500

Mu,limit / bd^2 = 3.10 N / sq.mm

Mu,limit = 3.10 X 230 X 552 X552 / 10^ 6 = 217.25 KN.m

i.e. Mu,limit > Mu The section has to be designed as singly reinforced section

Mu / bd^2 = 220 / (0.23 X 0.552 X 0.552 X 10^3) = 3.14

d'/d = 0.066 say 0.10

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Refer Table 55

Pt = 1.20%

Pc = 0.49 %

Area of steel required at mid span bottom = 1524 sq.mm

Provide 2 Nos. of 25 mm dia rods + 2 Nos. 20 mm rods at mid span bottom

Area of steel provided at mid span bottom = 1610 sq.mm

Area of steel required at mid span top = 520 sq..mm

Provide 2 Nos. of 20 mm dia rods mid span top

Area of steel provided at mid span top = 628 sq.mm

Area of steel required at end span top = 1490 sq.mm

Provide 3 Nos. of 20 mm dia rods extra at end span top

Area of steel provided at end span top = 1570 sq.mm

In addition to the above Provide 10 mm dia two legged stirrups at 150 mm c/c for

Shear force

Hence OK

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DESIGN OF ISOLATED FOOTINGS

Maximum Load from the critical column = 1029 KN

SBC of soil asper soil report = 240 KN/ Sq.m

Area of footing required = 1029/240 = 4.29 Sq.m

Size of footing provided =2.13 m X 2.2.13 m

Area of footing provided = 4.54 Sq./m

Hence Ok

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Annexure – XIV

[See rule 51 (3)]

Form 1

Structural Design Basis Report

(1) This report to accompany the application for Building Developments

Part1	General Data		
S.No.	Description	Information	Notes
1.	Site Address at Door No.34, East Mada Street, Thiruvanmiyur Ch.-600.041		
2	Name of Owner		
3	Name of Registered Developer along with the Registration Number		
4	Name of Registered Architect/Engineer along with the Registration Number		
5	Name of Registered Structural engineer along with the Registration Number	J.SRIRAMULU SE/GR-I/2019/06/161	
6	Use of the building	Residential	
7	Number of stories above ground level (including storeys to be added later, if any)	Stilt + 4 Floors	
8	Number of basements below ground level	Nil	
9	Type of structure Load bearing walls R.C.C. frame R.C.C. frame and Shear Walls Steel frame	RCC Framed Structure	
10	Soil data Type of soil Design safe bearing capacity	Coarse sand 240 kN/m²	IS:1893 C1.6.3.5.2 IS: 1904 IS: 1892 IS: 2131 IS: 2720
11	Dead loads (unit weight adopted) • Earth • Water • Brick masonry • Plain cement concrete • Reinforced cement concrete • Floor finish • Other fill materials	13 kN/m³ 10 kN/m³ 19 kN/m³ 23 kN/m³ 25 kN/m³ 1 kN/m²	IS: 875 Part 1
12	Imposed (live) loads Floor loads Roof loads	2.0 kN/m² 1.50 kN/m²	IS: 875 Part 2
13	Cyclone/Wind • Speed • Design pressure intensity	50m/sec 856.15 N/mm²	IS: 875 Part 3
14	Seismic zone	NIL	IS: 1893 (2002)

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15	Importance factor	1.0	IS:1893(2002) Table 6
16	Seismic zone factor (Z)	0.16	IS:1893 Table 2
17	Response reduction factor	3.0	IS:1893 Table 7
18	Fundamental natural period – approx.	0.48 sec	IS:1893 C1.7.6
19	Design horizontal acceleration spectrum value (A_h)	0.04	IS: 1893 C1.6.4.2
20	♠ Expansion/Separation Joints	Nil.	
21	Building is regular/irregular	Regular	IS 1893

♥ Enclose detailed drawings drawn to scale for each floor

♦ In case terrace garden is provided, indicate additional fill load and live load along with the detailed drawings drawn to scale

Part 2	Load bearing masonry buildings				
Sl.No.	**Description**	**Information**			**Notes**
1	Building category				IS: 4326 C1.7 Read with IS:1893 Zone / Bldg. | II III IV V Ordinary | B C D E Important | C D E E
2	Basement Provided				
3	Number of floors including Ground Floor (all floors including stepped floors in hill slopes)				
4	Type of wall masonry				
5	Type and mix of Mortar				IS: 4326 C1.8.1.2
6	Re: size and position of openings (See note No.[i]) • Minimum distance (b5) • Ratio $(b_1+b_2+b_3)/l_1$ or $(b_6+b_7)/l_2$ • Minimum pier width between consequent opening (b_4) • Vertical distance (h_3) • Ratio of wall height to thickness 4 Ratio of wall length between cross wall to thickness				IS: 4326 Table 4, Fig.7
7	Horizontal seismic band	P	IP	NA	(see note No.2)
	• at plinth level	☐	☐	☐	IS:4326 C1 8.4.6
	• at window sill level	☐	☐	☐	IS: 4326 C1 8.3
	• at lintel level	☐	☐	☐	IS: 4326 C1 8.4.2
	• at ceiling level	☐	☐	☐	IS: 4326 C1 8.4.3
	• at eave level of sloping roof	☐	☐	☐	IS: 4326 C1 8.4.3 IS: 4326 C1 8.4.4
	• at top of gable walls	☐	☐	☐	

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	• at top of ridge walls	⊔	⊔	⊔	
8	Vertical reinforcing bar at corners and T junction of walls at jambs of doors and window openings	⊔ ⊔	⊔ ⊔	⊔ ⊔	IS: 4326 C1 8.4.8. IS: 4326 C1 8.4.9
9	Integration of prefab roofing/flooring elements through reinforced concrete screed.	⊔	⊔	⊔	IS:4326 C1 9.1.4
10	Horizontal bracings in pitched truss in horizontal plane at the level of ties in the slopes of pitched roofs	⊔ ⊔	⊔ ⊔	⊔ ⊔	

Notes: (i) Information in Item 6 should be given on separate A4 sheets for all walls with large number of openings

(ii) IP indicated "Information Provided"

IP indicates "Information to be provided"

NA indicates "Not Applicable"

Tick mark one box

Part 3	Reinforced concrete framed buildings		
Sl. No.	**Description**	**Information**	**Notes**
1	Type of building • Regular frames • Regular frames with Shear Walls • Irregular frames • Irregular frames with Shear Walls • Soft storey	Regular Frame	IS: 1893 C1 7.1
2	Number of basements	Nil	
3	Number of floors including ground floor	Stilt + 4 Floors	
4	Horizontal floor system • Beams and slabs • Waffles • Ribbed floor • Flat slab with drops • Flat plate without drops	Beams and Slabs	
5	Soil data • Type of soil • Recommended type of foundation -Independent footings -Raft -Piles • Recommended bearing capacity of soil • Recommended type, length, diameter and load capacity of piles • Depth of water table • Chemical analysis of ground water • Chemical analysis of soil	Coarse Sand Isolated Footings 240 kN/m² – 4.0 m	IS: 1498

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6	Foundations Depth below ground level Type Independent. Interconnected Raft Piles	2.0m	
7	System of interconnecting foundations Plinth beams Foundation beams	Grade Beams	IS: 1893 C1 7.12.1
8	Grades if concrete used in different parts of building	M25	
9	Method of analysis used	Moment Distribution	
10	Computer software used	–	
11	Torsion included	–	IS: 1893 C1 7.9
12	Base shear a. Based on approximate fundamental period b. Based on dynamic analysis c. Ratio of a/b	41.10KN 45 kN 0.91	IS: 1893 Cl. 7.5.3
13	Distribution of seismic forces along the height of the building.	Joints of Each Floor	IS:1893 Cl.7.7 (Provide sketch)
14	The Column of soft ground storey specially designed.	Yes	IS: 1893 Cl.7.10
15	Clear minimum cover provided in • Footing • Column • Beams • Slabs • Walls	50mm 40mm 25mm 15mm 15m	IS: 456 Cl. 26.4
16	Ductile detailing of RC frame • Type of reinforcement used • Minimum dimension of beams • Minimum dimension of columns • Minimum percentage of reinforcement of beams at any cross section • Maximum percentage of reinforcement at any section of beam • Spacing of transverse reinforcement in 2-d length of beams near the ends • Ratio of capacity of beams in shear to capacity of beams in flexure • Maximum percentage of reinforcement in column • Confining stirrups near ends of columns and in beam-column joints Diameter Spacing • Ratio of shear capacity of columns to maximum seismic shear in the	Fe 500 230mm 230mm 0.70% 1.10% 130mm 1.20 2.20% 8mm 130m 1.50	IS: 456 Cl. 5.6 IS: 13920 Cl.6.1 IS: 13920 Cl.7.1.2 IS: 456 Cl.26.5.1(a) IS: 13920 Cl.6.2.1 IS: 456 Cl.26.5.1.1(b) IS: 13920 Cl.6.2.2 IS: 13920 Cl.6.3.5 IS: 456 Cl.26.5.3.1 IS: 13920 Cl. 7.4

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	storey.		
17	Does the features require clearance by SDRP Example: High rise building Prefab building Building in hazard prone areas		

Foundation

i. In case raft foundation has been adopted, indicate K value used for analysis of the raft.

ii. Incase pile foundations have been used, give full particulars of the piles, type, dia, length, capacity

iii. In case of high water table, indicate system of countering water pressure, and indicate the existing water table, and that assumed to design foundations.

Idealization for Earthquake analysis

i. In case of composite system of shear walls and rigid frames, give distribution of base shear in the two systems on the basis of analysis, and that used for design of each system

ii. Indicate the idealization of frames and shear walls adopted in the analysis with the help of sketches.

iii. Submit framing plans of each floor

iv. In case of basements, indicate the system used to contain earth pressures.

Part 4	**Buildings in structural steel**		
1	Adopted method of design	o Simple o Semi-rigid o Rigid	IS:800 Cl 3.4.4 IS:800 Cl.3.4.5 IS:800 Cl.3.5.6
2	Design based on	o Elastic analysis o Plastic analysis	IS: 800 Section-9 SP;6 (6)
3	Floor construction	o Composite o Non composite o Boarded	
4	Roof construction	o Composite o Non composite o Metal o Any other	
5	Horizontal force resisting system adopted	Frames Braced frames Frames & shear walls	Note: Seismic force As per IS:1893 Would depend on system
6	Slenderness ratios maintained	Members defined in Table 3.1, IS:800	IS 800; Cl.3.7
7	Member deflection limited to	Beams, Rafters Crane Girders, Purlins Top of columns	IS:800 Cl.3.13
8	Structural members	o Encased in concrete Not encased	IS: 800 Section-10
9	Proposed material	o General weld-able o High strength o Cold formed o Tubular	IS: 2062 IS: 8500 IS: 801, 811 IS: 806
10.	Minimum metal	o Hot rolled sections	IS: 800, Cl.3.8

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	thickness Specified for corrosion protection	o Cold formed sections o Tubes	Cl.3.8.1 to Cl.3.8.4 Cl.3.8.5
11	Structural connections	o Rivets o CT Bolts o S H F G Bolts o Black Bolts o Welding field Shop (Specify welding type proposed) Composite	IS: 800, Section-8 IS: 1929, 2155, 1149 IS 6639, 1367 IS 3757, 4000 IS: 1363, 1367 IS: 816, 814,1395, 7280, 3613, 6419, 6560, 813, 9595
12	Minimum Fire rating proposed, with method	o Rating.....hours o Method proposed. -In tumescent painting -Spraying -Quilting -Fire retardant boarding	IS: 1641, 1642, 1643

Part-5

Any special weakness in the building making it vulnerable for stability related failure and the precaution to be taken during execution/completion and finishing to be indicated.

Part-6

Recommendations of structural Engineer with respect to special requirements needed with respect to structural safety and stability to be taken note of by competent authority feature like incorporation of swimming pool, heavy load on roof ,prefabricated structure or any other hazardous features should be included.

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Zoning & Land Use Analysis

Land Use Zone Finder, CRZ Zone Check, Aquifer Zone Check, CBA Check, EWS Check, Road Width Check, Proposed Road Widening Check, FSI Calculator

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