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Architecture Interiors Landscape

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STRUCTURAL STABILITY CERTIFICATE

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

It is certified that the proposed construction of Stilt Floor+ 5 Floor(Height 18.30m) Residential Building with 10 Dwelling Units and Availing Premium FSI at Plot No.2 & 3, New Door No.3, Old Door No.1, Judge Jumbulingam Road, Mylapore, Chennai 600004, comprised in R.S.No.1063/23(As per Document) / R.S.No.1063/60 (As per Patta), Block No.22 of Mylapore Village within the limit of Greater Chennai Corporation is designed to resist earthquake. Check has been made and found safe and I hereby certify that:

1. The minimum grade of concrete is **M 35 CONCRETE**

2. The design and analysis using the code of practice for plain and reinforced concrete as per IS 456, Design Loads as per **IS 875-1987** and Design of Earthquake resistant Structure as per **IS 1893-2016** are carried out.

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

R Deenagopalan

Stamp and Signature

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Encl.: Structural Design Calculation

STABILITY CERTIFICATE

FORM – A

1. Applicant	:	Mr.N. KANNAN
2. Location of the Site	:	Proposed Residential Building of Stilt + 5 floors for Mr.N Kannan with 8 dwelling units availing premium F.S.I at Plot No.2 and Plot no 3 Door No 3 Judge Jambulingam Road , Mylapore Chennai - 600004 comprised in R.S.No : 1063/60 Block No : 22 Mylapore Village within the Limit of Greater Chennai Corporation Zone – IX Division 119
3. Year of Construction	:	Proposed Construction
4. Approximate cost of construction As per current rates.	:	**Rs. 5, 71,56,000 (Rupees Five Crore Seventy One Lakhs Fifty six Thousand Only)**
5. Purpose for which the Building is to Be Proposed.	:	Proposed Residential building
6. Details of Construction of the (Particulars of the foundation Soil, Specification of the various part under)	:	Very Dense Soil
1. Foundation	:	Pile Foundation for a depth of 20.M
2. Basement	:	No
3. Super Structure	:	R. C. C. Framed Structure
4. Floor and Roof		
(a) Stilt Floor /	:	Beam & Slab System
(b) First Floor /	:	Beam & Slab System
(c) Second Floor /	:	Beam & Slab System
(d) Third Floor /	:	Beam & Slab System
(e) Fourth Floor /	:	Beam & Slab System
(f) Fifth Floor /	:	Beam & Slab System
7. Period for which license required	:	Proposed Building
8. No. of persons to be accommodated	:	100 Persons

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FORM -- B

Form of Certificate of structural soundness under Sub-section (4) of the Tamil Nadu public buildings (Licensing) Act 1965

(Tamil Nadu Act 13 of 1965) referred it is rule 4 of the Tamil Nadu public building (license) rules 1966.

STATEMENT OF ACCOMPANY THE CERTIFICATE OF STRUCTURAL SOUNDNESS

1. Location of the building	:	PROPOSED (REFER FORM –A)
2. Age of the Building	:	PROPOSED BUILDING
3. Purpose for which the building will be structurally sound	:	PROPOSED RESIDENTIAL BUILDING
4. The period for which the building will be structurally sound	:	50 YEARS
5. Number of persons to be accommodated	:	100 Persons
6. Remarks	:	Is designed as per Indian Standard & Codes of Practice.

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FORM -- C

C Form of Certificate of Structural soundness under sub – section (4) of section 4 of the Tamil Nadu public buildings (Licensing) Act 1965

(Tamil Nadu Act 13 if 19650 referred it is rule 4 of the Tamil Nadu public building (license) rules 1966.

1. Foundation

(i) Pile Depth below Existing ground Lvl	:	20 M
(ii) Nature of soil at which the pIle is laid	:	Very Dense Soil
(iii) Load capacity of the Pile	:	2150 KN 750 Dia at a Depth of 20.0 M
(iv) Load to bc transmitted by Column to Foundation	:	1920 KN

2. Super Structure

a) Maximum stress in the most Critical section of masonry	:	0.60 Kg./Sq.m.
Permissible maximum stress In masonry	:	3.0 Kg./Sq.m.
b) Maximum stress in the most Critical section RCC Structure	:	23 N/Sq.mm
c) Safe maximum permissible stress In RCC Structure.	:	25 N/Sq.mm.

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DESIGN ANALYSIS FOR THE PROPOSED RESIDENTIAL BUILDING OF STILT + 5 FLOORS FOR Mr. N KANNAN WITH 8 DWELLING UNITS AVAILING PREMIUM F.S.I AT PLOT NO.2 AND PLOT NO 3 DOOR NO 3 JUDGE JAMBULINGAM ROAD, MYLAPORE CHENNAI - 600004 COMPRISED IN R.S.NO: 1063/60 BLOCK NO: 22 MYLAPORE VILLAGE WITHIN THE LIMIT OF GREATER CHENNAI CORPORATION ZONE – IX DIVISION 119

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LOAD CALCULATION FOR RESIDENTIAL APARTMENT

FOR STILT + FIVE FLOORS

The Load Calculation is done for the Proposed Residential Building of Stilt + 5 floors for Mr.N Kannan with 8 dwelling units availing Premium F.S.I at Plot No.2 and Plot no 3 Door No 3 Judge Jambulingam Road , Mylapore Chennai - 600004 comprised in R.S.No: 1063/60 Block No : 22 Mylapore Village within the Limit of Greater Chennai Corporation Zone – IX Division 119

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	- 20 Mts.
Load Capacity of Pile	- 960 KN (500 Dia Pile for Depth of 20 M) 1380 KN (600 Dia Pile for Depth of 20 M) 2150 KN (750 Dia Pile for Depth of 20 M)

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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

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

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MATERIALS USED

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

1. M 25 grade concrete for Pile & Pile cap Foundation .
2. M 35 grade concrete for Column 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
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 = 375.00 Kg / M^2

Live load = 200 .00 Kg / M^2

Floor finish = 120 .00 Kg / M^2

= **695.00 Kg / M^2**

Say = 6.95 KN/ M^2

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DESIGN OF PILE

Load carrying capacity of 750 mm dia pile = 2150 KN

Pu =0.4 fck Ac + 0.67 fy Ast

$2150 \times 1.5 \times 10^3 = 0.4 \times 25 \times [\pi \times 750^2/4] + 0.67 \times 500$ Ast

$3225 \times 10^3 = 10 \times 441786.4 + 335$ Ast

Ast $= 3225 \times 10^3 - 4417864$

Ast $= (-1192864) / 335$

Ast $= -3560 mm^2$

For pile minimum percentage 0.4%

$0.4/100 = 0.4 \times (\pi \times 75^2)/100$
4
$= 17.67 cm^2$

Provide 10 Nos. of 16 mm dia bar .

Provide 8mm dia elliptical binder .

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DESIGN OF PILE CAP IN FOUNDATION

Load on column = 1450 KN

Size of pile = 750 dia

Structural capacity of pile of 750 dia = 2150 KN

Numbers of pile required for column = 1450/2150

= 0.67

Say 2 number of piles

Spacing of piles 3 times of dia = 3 x 750 = 2250 mm

Load on each side of pile cap = 1450/2 =725

Moment on pile cap = wl/4

= 1450x 2.25/4 = 816 KN-m

Effective Size of pile cap = 2250x1000x1150mm

Mu /bd^2 =816x1.5x10^6 / 1000x1150^2

=0.72

Pt =0.179

Ast =0.179x100x115 /100

=20.59 cm^2

Provide 25 dia bar 100 mm spacing @ Bottom Bothways

(Top) 0.17x100x115 = 1955/100 = 19.55+

Provide 16 dia bar 100 mm spacing @ Top Bothways

Check for shear

Shear force = 1450/2 = 725 KN

Shear stress = 725x1.5x1000 /1000x1150

= 0.94 < 3.1 (For M25 Concrete)

DESIGN OF COLUMN

Size of Column	= 300 x 1050 mm
Axial load	= 1820 KN
Addition load for earthquake	= 290 KN
Total	**= 2110 KN**
Moment due to DL + LL	= 158KN-m
Moment due to EQ	= 30 KN-m
Total	**= 188KN-m**

Pu/FckBd = 2110 x 1.5 $X10^3$ / 35 x 300 x 1050 = 0.28

Mu/$FckBd^2$ =188x 1.5 x 10^6 / 35 x 300 x 1050^2 = 0.024

From SP 16 Chart 47 P/Fck = 0.06

P = 0.06 x 35 =2.1%

0.8% Minimum

Ast = 2.1 x 30x 115 / 100 = 72.45Cm^2

Provide 16 Nos. of 25 mm dia bar (78.4 Cm^2) Hence ok.

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

DESIGN OF BEAMS

Span of Beam 2.39 **M**

Load from Slab = 1.06 x 6.95 x 1 = 7.36 KN/m

Load from Slab =0.815x 6.95x 1 = 5.66 KN/m

Self weight of Beam = 0.20x 0.450 x 25x1 = 2.25KN/m

Wall load = 2.39x0.20x16.5x1 = 7.89 KN/m

Total **= 23.16 KN/m**

Maximum BM = $WL^2/8$= 23.16x $2.39^2/8$ = 16.53 KN – m

Mu/Bd^2 = 16.53 x 1.5 x 10^6 / 200 x 400^2 = 0.77

Pt = 0.191

Ast = 0.191x 20x 40/ 100 =1.53 Cm^2

Area of steel provided 2-12Tor @ Bottom

Area of steel provided 2–12 Tor @ Top

Shear force at each support = 23.16x2.39/2 = 27.67 KN

Shear stress = 27.67x 1.5x 1000/(200x400) =0.52<3.7

Hence ok.

Vertical stirrups for shear = 27.67x1.5/40= 1.04 KN/cm

Provided 2 Legged 8Tor@ 150MM c/c

Hence Ok.

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DESIGN OF SLABS

Panel size of Slab **2.49m x 2.13m**

Ly / Lx = 2.49/ 2.13 = 1.16 (Two way Slab)

W = 6.81 KN/M^2

Lx/35 = 2.13*1000/35 = 60.85 Lx = 2.13 M α_x = 0.108 α_y = 0.0415

Provide Slab thickness = 150mm

$M=\alpha_x WL_x^2$ =0.108x6.95x2.13^2 = 3.405kN-m

Mu/Bd^2 = 3.405 x 1.5 x 10^6 / 1000 x 130^2 =0.30

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

$M=\alpha_y WL_x^2$ =0.0415x6.95x2.13^2 = 1.31 kN-m

Mu/Bd^2 = 1.31x 1.5 x 10^6 / 1000 x 130^2 =0.116

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.

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

PROFESSIONAL REGISTRATION CERTIFICATE

This is to certify that the **Thiru. R. DEENAGOPALAN** has enrolled as **Registered Structural Engineer Grade-II (SE)** with Chennai Metropolitan Development Authority (CMDA) who has the qualification of **B.E.,(Civil Engg.)** and experience in the relevant field for**24 years**.

He has been given the Registration No.**SE/GR-II/2019/04/045 Renewed on 12.04.2024**. 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 **11.04.2029**.



12/4/24

(A. MEGANATHAN)
Superintendent

R Deenagopalan

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