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# STABILITY CERTIFICATE

## FORM - A

1. Applicant : Mr .J RAMKUMAR (BEAVER CONSTRUCTION COMPANY)
2. Location of the Site : The proposed residential building  
For Mr J Ramkumar ( Beaver construction company)  
at Plot No.99 ganga nagar, 2 nd main road maduravoyal ,  
chennai- 600 095, comprised in old survey no 173/10 part,  
new survey no 178/102 and 173/5 of maduravoyal village,  
maduravoyal taluk, chennai district with in the limit of  
greater chennai corporation
3. Year of Construction : Proposed Construction
4. Approximate cost of construction  
As per current rates. : **Rs. 4,85,25,000 (Rupees Four Crore  
Eighty five Lakhs & twenty five thousand only)**
5. Purpose for which the Building is to  
be proposed : Residential Purposes
6. Details of Construction of the  
(Particulars of the foundation Soil,  
Specification of the various part under) : Silty sandy clay  
(From soil report)  
R. C. C. Framed Construction
  1. Foundation : Pile Foundation for a depth of 32 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
3. Period for which license required : Proposed Building
4. No. of persons to be accommodated : 150 Persons

*R. Deenagopalan*  
**R. Deenagopalan, B E CIVIL**  
 License No. RSE200322019  
 Corporation of Chennai  
 Cheralathan Associates  
 13, Shanti Enclave,  
 25 / 71, Venkatakrishna Road,  
 R.A. Puram, Chennai-600 028.  
 E-mail id: structural@earth.in Mobile: 7289911

**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 : Residential purposes
4. The period for which the building will be structurally sound : 50 YEARS
5. Number of persons to be accommodated : 150 Persons
6. Remarks : Is designed as per Indian Standard & Codes of Practice.



**R. Deenagopalan, B E CIVIL**  
License No. RSE200522019  
Corporation of Chennai  
Cheralathan Associates  
13, Shanti Enclave,  
25 / 71, Venkateskrishna Road,  
R.A. Puram, Chennai-600 028.  
E-mail: structural@earth.in Mobile: 728011063

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

1. Foundation
  - (i) Pile Depth below Existing Ground Lvl : 32 M
  - (ii) Nature of soil at which the Foundation is laid : Silty Sandy clay
  - (iii) Safe bearing capacity of the Pile met with at foundation :
    - 2490 KN (650 DIA OF PILE 32M DEPTH)
    - 1610 KN (600 DIA OF PILE 32 M DEPTH)
    - 1120 KN (500 DIA OF PILE 32 M DEPTH)
    - 920 KN (450 DIA OF PILE 32M DEPTH)
    - 730 KN (400 DIA OF PILE 32 M DEPTH)
  - (iv) Load to be transmitted by Column to Foundation : 1840 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 : 25 N/Sq.mm
 

Safe maximum permissible stress In RCC Structure. : 25 N/Sq.mm.

*R. Deenagopalan*

**R. Deenagopalan, S E CIVIL**

License No. R&E200522019

Corporation of Chennai

Cheralathan Associates

13, Shanti Enclave,

25 / 71, Venkatakrishna Road,

R.A. Puram, Chennai-600 028.

E-mail: structural@search.in Mobile: 7229911063

DESIGN ANALYSIS FOR THE PROPOSED RESIDENTIAL BUILDING  
FOR MR J RAMKUMAR ( BEAVER CONSTRUCTION COMPANY )  
PLOT NO.99 GANGA NAGAR, 2 ND MAIN ROAD MADURAVOYAL ,  
CHENNAI- 600 095, COMPRISED IN OLD SURVEY NO 173/10 PART,  
NEW SURVEY NO 178/102 AND 173/5 OF MADURAVOYAL VILLAGE,  
MANDURAVOYAL TALUK, CHENNAI DISTRICT WITH IN THE  
LIMIT OF GREATER CHENNAI CORPORATION



**R. Deenagopalan, B E CIVIL**  
License No. RS6200522019  
Corporation of Chennai  
Cheralathan Associates  
13, Shanti Enclave,  
25 / 71, Venkatesh Road,  
R.A. Puram, Chennai-600 028.  
E-mail: structural@carch.in Mobile: 7200911063

**LOAD CALCULATION FOR RESIDENTIAL APARTMENT**  
**FOR STILT + FIVE FLOORS**

The Load Calculation is done for the Proposed Residential Building for Mr J Ramkumar ( Beaver Construction Company) Plot no. 99 Ganga nagar, 2<sup>nd</sup> main road maduravoyal chennai- 600 095, comprised in old survey no 173/10 part, new survey no 178/102 and 173/5 of maduravoyal village, manduravoyal taluk, chennai district with in the limit of greater chennai corporation

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-25 for column , Roof slab & Roof Beams  |
| Steel                         | - Fe500                                     |
| Zone                          | - III                                       |
| Live Load for Residential     | - 200 kg/Sqm                                |
| Depth of Pile Foundation      | - 32 Mts.                                   |
| Safe Bearing Capacity of Pile | - 2490 KN ( 650 Dia Pile for Depth of 32 M) |
|                               | 1610 KN (600 Dia Pile for Depth of 32 M)    |
|                               | 1120 KN (500 Dia Pile for Depth of 32 M)    |
|                               | 920 KN (450 Dia Pile for Depth of 32 M)     |
|                               | 730 KN (400 Dia Pile for Depth of 32 M)     |

  
**R. Deenagopalan, B E CIVIL**  
 License No. RS6200522019  
 Corporation of Chennai  
 Cheralathan Associates  
 13, Shanti Enclave,  
 25/ 71, Venkatkrishna Road,  
 R.A. Puram, Chennai-600 028.  
 E-mail: structural@earth.in Mobile: 7299911063

## 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

*R. Deenagopalan*

**R. Deenagopalan, B E CIVIL**  
 License No. RS8200522019  
 Corporation of Chennai  
 Cheralathan Associates  
 13, Shanti Enclave,  
 25 / 71, Venkatakrisna Road,  
 R.A. Puram, Chennai-600 028.  
 E-mailId: structural@search.in Mobile: 7289911063

### 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 25 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. Footing    | = | 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 125 thk slab =  $12.5 \times 25 = 312.50 \text{ Kg / M}^2$

Live load =  $200.00 \text{ Kg / M}^2$

Floor finish =  $150.00 \text{ Kg / M}^2$

=  $632.50 \text{ Kg / M}^2$

Say =  $6.62 \text{ KN / M}^2$

*R. Deenagopalan*  
**R. Deenagopalan, B E CIVIL**  
 License No. RSE200522019  
 Corporation of Chennai  
 Cheralathan Associates  
 13, Shanti Enclave,  
 25 / 71, Venkateshkrishna Road,  
 R.A. Puram, Chennai-600 028.  
 E-mail: structural@earth.in Mobile: 7200911063

### DESIGN OF PILE

Load carrying capacity of 450 mm dia pile = 920 KN

$$P_u = 0.4 f_{ck} A_c + 0.67 f_y A_{st}$$

$$920 \times 1.5 \times 10^3 = 0.4 \times 25 \times [\pi \times 450^2 / 4] + 0.67 \times 500 A_{st}$$

$$1380 \times 10^3 = 10 \times 159043 + 335 A_{st}$$

$$A_{st} = - (-210430) / 335$$

$$A_{st} = 628.11 \text{ mm}^2$$

For pile minimum percentage 0.4%

$$\begin{aligned} 0.4/100 &= 0.4 \times (\pi \times 45^2) / 100 \\ &= 6.36 \text{ cm}^2 \end{aligned}$$

Provide 8Nos. of 12 mm dia bar .

Provide 8mm dia elliptical binder .

### DESIGN OF PILE CAP IN FOUNDATION

Load on column = 1840 KN

Size of pile = 450 dia

Structural capacity of pile of 600 dia = 920 KN

Numbers of pile required for column = 1840/960

$$= 1.91$$

Say 2 number of piles

Spacing of piles 3 times of dia = 3 x 450 = 1350 mm

Load on each side of pile cap = 1840/2 = 920

Moment on pile cap =  $wl/4$

$$= 1840 \times 1.3/4$$

*R. Deenagopalan*  
**R. Deenagopalan, B.E CIVIL**  
 License No. RSE100522019  
 Corporation of Chennai  
 Cheralathan Associates  
 13, Shanti Enclave,  
 25 / 71, Venkatakrisna Road,  
 R.A. Puram, Chennai-600 028.  
 E-mail: structural@carch.in Mobile: 7220911063

$$=598 \text{ KN-m}$$

Say 600 KN-m

$$\text{Effective Size of pile cap} = 2236 \times 914 \times 700 \text{ mm}$$

$$\mu / bd^2 = 600 \times 1.5 \times 10^6 / 914 \times 650^2$$

$$=2.33$$

$$P_t = 0.624$$

$$A_{st} = 0.624 \times 91 \times 65 / 100$$

$$= 37/4.9 = 7.55 \text{ say } 8 = 1000/8 = 125$$

Provide 25dia 8 nos @ Bottom Both ways

$$(\text{Top}) 0.17 \times 91 \times 65 = 1005.5/100 = 10.05/1.12 = 8.97$$

Provide 12dia 8 nos @ Top Both ways

### Check for shear

$$\text{Shear force} = 1840/2 = 920 \text{ KN}$$

$$\text{Shear stress} = 755 \times 1.5 \times 1000 / 1350 \times 650$$

$$= 1.57 < 3.1 \text{ (For M25 Concrete)}$$

*R. Deenagopalan*

**R. Deenagopalan, B.E. CIVIL**

License No. RS2200522019

Corporation of Chennai

Cheralathan Associates

13, Shanti Enclave,

25 / 71, Venkatakrishna Road,

R. A. Puram, Chennai-600 028.

E-mail: structural@carch.in Mobile: 7209911063

**DESIGN OF COLUMN**

Size of Column = 300 x 600 mm  
 Axial load = 1050 KN  
 Addition load for earthquake = 520 KN

**Total = 1570 KN**

Moment due to DL + LL = 30.0 KN-m  
 Moment due to EQ = 20.0 KN-m

**Total = 50 KN-m**

$$P_u / F_{ck} B_d = 1570 \times 1.5 \times 10^3 / 25 \times 300 \times 600 = 0.52$$

$$M_u / F_{ck} B_d^2 = 50 \times 1.5 \times 10^6 / 25 \times 300 \times 600^2 = 0.027$$

From SP 16 Chart 48  $P / F_{ck} = 0.04$

$$P = 0.04 \times 25 = 1.0 \%$$

$$A_{st} = 1.0 \times 30 \times 60 / 100 = 18 \text{ cm}^2$$

**Provide 4 Nos. of 20mm dia bar and 4 Nos. of 16mm dia bar (20.56  $\text{cm}^2$ ) Hence ok.**

**Provided 4L 8Tor @ 200 c/c as Column ties**



**R. Deenagopalan, B.E CIVIL**  
 License No. RS220522019  
 Corporation of Chennai  
 Cheralathan Associates  
 13, Shanti Enclave,  
 25 / 71, Venkateskrishna Road,  
 R.A. Puram, Chennai-600 028.  
 E-mail: structural@search.in Mobile: 7289911063

**DESIGN OF BEAMS**

Span of Beam 3.25 M

$$\text{Load from Slab} = 0.71 \times 6.625 \times 1 = 4.70 \text{ KN/m}$$

$$\text{Load from Slab} = 1.75 \times 6.625 \times 1 = 11.59 \text{ KN/m}$$

$$\text{Self weight of Beam} = 0.20 \times 0.325 \times 25 \times 1 = 1.625 \text{ KN/m}$$

$$\text{Wall load} = 2.74 \times 0.20 \times 6.5 \times 1 = 3.562 \text{ KN/m}$$

$$\text{Total} = 21.477 \text{ KN/m}$$

$$\text{Maximum BM} = WL^2/8 = 21.477 \times 3.25^2/8 = 28.35 \text{ KN-m}$$

$$Mu/Bd^2 = 28.35 \times 1.5 \times 10^6 / 200 \times 400^2 = 1.328$$

$$Pt = 0.332$$

$$Ast = 0.332 \times 20 \times 40 / 100 = 2.656 \text{ Cm}^2$$

$$Asc = 0.332 \times 20 \times 40 / 100 = 2.656 \text{ Cm}^2$$

**Area of steel provided 3-12 Tor @ Bottom**

**Area of steel provided 3 – 12 Tor @ Top**

$$\text{Shear force at each support} = 21.477 \times 3.25 / 2 = 34.90 \text{ KN}$$

$$\text{Shear stress} = 34.90 \times 1.5 \times 1000 / (200 \times 400) = 0.65 < 3.1$$

Hence ok.

$$\text{Vertical stirrups for shear} = 34.90 \times 1.5 / 40 = 1.30 \text{ KN/cm}$$

**Provided 2 Legged 8Tor@ 100MM c/c**

Hence Ok.

*Deenago Patel*

### DESIGN OF SLABS

Panel size of Slab **3.15m x 3.15m**

$$Ly / Lx = 3.15 / 3.15 = 1.0 \text{ (Two way Slab)}$$

$$W = 6.625 \text{ KN/M}^2$$

$$L_x/35 = 3.15 \times 1000/35 = 90$$

$$L_x = 3.15 \text{ M} \quad \alpha_x = 0.062 \quad \alpha_y = 0.062$$

Provide Slab thickness = 125mm

$$M = \alpha_x W L_x^2 = 0.062 \times 6.625 \times 3.15^2 = 4.07 \text{ kN-m}$$

$$M_u/Bd^2 = 4.07 \times 1.5 \times 10^6 / 1000 \times 105^2 = 0.55$$

$$P_t = 0.131$$

$$A_{st} = 0.131 \times 100 \times 10.5/100 = 1.375 \text{ Cm}^2$$

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

$$M = \alpha_y W L_x^2 = 0.062 \times 6.625 \times 3.15^2 = 4.075 \text{ kN-m}$$

$$M_u/Bd^2 = 4.075 \times 1.5 \times 10^6 / 1000 \times 105^2 = 0.55$$

$$P_t = 0.131$$

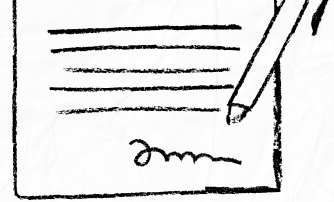
$$A_{st} = 0.131 \times 100 \times 10.5/100 = 1.74 \text{ Cm}^2$$

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

Hence Ok.

*R. Deenagopalan*

**R. Deenagopalan, B E CIVIL**  
 License No. RSE200522019  
 Corporation of Chennai  
 Cheralathan Associates  
 13, Shanti Enclave,  
 25 / 71, Venkatakrishna Road,  
 R.A. Puram, Chennai-800 028,  
 E-mail: structural@arch.in Mobile: 7209911063



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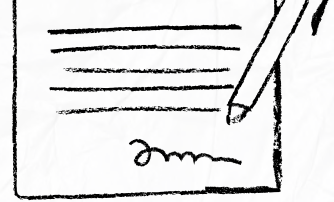
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3/350/2 Mettukuppam,  
OMR Thoraipakkam,  
Chennai, India

[hello@verified.realestate](mailto:hello@verified.realestate)  
[+91 9996 12 9996](tel:+919996129996)  
[www.verified.realestate](http://www.verified.realestate)