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RE REGULATORY RECORD

# RERA Document

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DIGITALLY VERIFIED RECORD

# STABILITY CERTIFICATE

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

1.The detailed engineering and structure design of the proposed building comprising of Stilt+**5** floors at Tirunelveli in Plot No: A-72, 5th Cross Street, Maharaja Nagar, Approved layout No: L.P.H/D.T. P No:56/62, New T.S.No:22 T.S. Ward: BS, Block :09, (Old T.S.No:88, T.S. Ward: BS, Block :9), Old S.No: 318 & 339/2 part, V.M Chathiram Village, Palayamkottai Ward Office, Tirunelveli City Municipal Corporation has been done by me/us based on the report of geotechnical investigation (soil test) done by **Bala Geo Tech** 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 load as per IS code No.875 and design earthquake resistant structure as per IS code No.1893

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

Stamp and Signature

A. Sivakumar
DCE.,B.E.,MBA.,M.E.(Structure)
Registered Structural Engineer
Reg.No: RSE/Gr-II/TVL/JUNE/2019/027
Ark Builders
& Properties Promoters (P) Ltd.
6/9, Art of Ark, First Cross Street,
Maharajanagar, Tirunelveli-627011

Encl.: Structural Design Calculation

**PLAN SHOWING THE PROPOSED CONSTRUCTION OF 30 DWELLING UNITS HOUSE BUILDING IN PLOT NO : A-72 , 5TH CROSS STREET, MAHARAJA NAGAR, APPROVED LAYOUT NO: L.P.H/D.T.P NO:56/62 , NEW T.S.NO:22 T.S.WARD :BS , BLOCK :09 , (OLD T.S.NO:88, T.S.WARD :BS, BLOCK :9), OLD S.NO: 318 & 339/2 PART , V.M CHATHIRAM VILLAGE , PALAYAMKOTTAI WARD OFFICE , TIRUNELVELI CITY MUNICIPAL CORPORATION.**

## TYPICAL STRUCTURAL DESIGN CALCULATION

1 **General:**

Proposed building is S+ 5 upper floors for residential purpose.
Stilt floor is used for car parking. The floor height is 3.03 m in upper floors.Typical calculation is given.

2 **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 6 stories, wind force is neglible effect. Live load reduction factor is applied in design. Isolated foundation is proposed as per soil report. Fe- 500 steel is used as main steel and M30 grade concrete.

3 **Earthquake consideration:**

For better stability during earhquake, the columns are tied with plinth beams. Continuous lintels are specified for outer walls and column ties are closely spaced for better ductility. For building on stilt, minimum size of column is taken as 300 mm(12")

## EARTHQUAKE LOAD

Design horizontal Seismic coeff. Ag = $\frac{Z}{2} \times \frac{I}{R} \times \frac{Sa}{g}$

Z = Zone Factor = 0.10 for Thirinelveli

I = Importance Factor = 1.0

R = Response reduction Factor = 3

$\frac{Sa}{g}$ = Avg. response acc.coeff. Depends on Ta

Ta = Fundamental natural period

= $\frac{0.09\ h}{\sqrt{d}}$ for infill walls

h = height of the building

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d = Width of the building

= 0.09x18/ sqrt 96.9

= 0.43

= 0.075 h $^{0.75}$ for office building

W = seismic weight of building

= 100% D.L + 25% L.L for residential <=300

= 100% D.L + 50% L.L for residential >300

Base Seismic Shear Vb = Ag x W

## 4. WIND LOAD

Vz = Vb x K1 x K2 x k3

Vb = 50 m/sec in tirunelveli

K1 = Probability Factor = 1.08

K2 = Terrain, Height Factor = 1

K3 = Topography Factor = 1

p = 0.6 x Vz x Vz

= 0.6 x 12 x 12

= 86.4 N/Sq.m

8.64 Kg/Sq.m

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5 **Design Loads:**

| | | | |
|---|---|---|---|
| Slab thk | 130 | = | 3.25 KN/sq.m |
| Live load | | = | 2.00 KN/sq.m |
| Finishes | | = | 1.50 KN/sq.m |
| | | | 6.75 KN/sq.m |

Say 6.75 KN/sq.m/floor for slab and beam design
Applying live load reduction of = 0 ,
For column and foundation design, 6.75 Kn/sqm is taken.

This value is also taken for frame analysis

Aerocon block 200 thick for exterior walls

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | x | 2.6 | x | 8 | | | = | 4 KN/m/floor |
| Beams | 0.2 | x | 0.60 | x | 25 | | | .= | 3.00 KN/m/floor |
| Columns | 0.6 | x | 0.60 | x | 3.00 | x | 25 | .= | 27.00 KN/floor |

These are taken for analysis with WL+LL+DL combination.

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6 **SLAB DESIGN:**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Thickness | = | 130 mm | Concrete mix | Fck | = M | 25 | N/sq.mm |
| Cover | = | 25 mm | Steel Grade | Fy | =Fe | 500 | N/sq.mm |
| Eff.Depth | = | 100 mm | | | | | |

Panel ( 3.65 x 3.2 ) m

=

Twoway slab Ly / Lx 3.2 / 3.7 .= 0.9

Support condition - ONE SHORT EDGE DISCONTINUOUS

| | | | | | |
|---|---|---|---|---|---|
| short span= | $\alpha$ x | = | 0.055 | ( - BM at continuous edge ) | Table:26 |
| | | = | 0.046 | ( + BM at midspan ) | in IS-456-2000 |
| long span= | $\alpha$ y | = | 0.047 | ( - BM at continuous edge ) | |
| | | = | 0.035 | ( + BM at midspan ) | |

Designed for 0.055 co.efficient

Mu .= 0.055 x 6.8 x 1.5 x 3.7 x 3.7 = 7.42 knm/m

$$\text{Mu / b.d.d} = \frac{7.42 \times 1000 \times 1000}{1000 \times 100 \times 100} = 0.74 \text{ N/sq.mm}$$

From Table-3 of SP-16, Pt .= 0.154 %

Minimum Pt = 0.12 % as per code, for Fe-500

At = 0.154 x 1000 x 100 ./ 100 = **154** sq.mm/m

Provide 8 dia @ 150 c/c = **335.1** sq.mm/m Short span

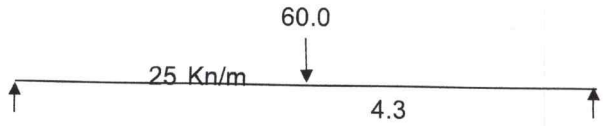
Provide 8 dia @ 165 c/c = **304.6** sq.mm/m Long span

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7 **Beam design:**

Effective span = 4.3 m  Beam size 230 x 600

Fck = M 25  d = 560 mm




Max. Bending Moment at support = w.l.l / 12+P*a*b/L

$$= \frac{25 \times 4.3 \times 4.3}{12} + 112.5 = 151 \text{ Knm}$$

Mu = 153.0 x 1.5 x 10-e6 = 229.5 x 10-e6 Nmm

$$Mu/b.d.d = \frac{230 \times 10\text{-e6}}{230 \times 560 \times 560} = 3.18 \text{ N/sq.mm}$$

From table-55 SP-16 for d'/d = 40 / 560 = 0.07

Pt = **1.000** %  Pc = **0.050** %

At = 1.000 x 230 x 560 / 100 = **1288** sq.mm (bot)

Ac = 0.050 x 230 x 560 / 100 = **64.4** sq.mm (top)

provided 3 No 20 = 942 sq.mm

\+ 2 No 20 = 628 sq.mm

**1571** sqmm Top support

**Shear Design:**

Shear force = $\frac{120 \times 4.3}{2}$ + = 258 KN

Factored shear force = 1.5 x 258 = 387 KN

for 1.00 % steel  Shear resisted by concrete section

from table-61 0.69 x 230 x 560 / 1000 = 89 KN

Balance shear (Vus) = 387 - 89 = 298 KN

Vus/d = 298 / 56 = 5.3 KN/cm

from table 62 of SP-16

Required 2 legged 8 stirrups @ 150 mm c/c

Provided 2 legged **8** stirrups @ **110** mm c/c

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8 **COLUMN DESIGN:** **COL SIZE** **750** **X** **900**

Maximum load on column in basement P = 365 t

Pu = 1.5 x 365 x10 = 5475 KN

Max.Bending Moment = 18 t.m Mu = 1.5 x 18.0 x10= 270 Kn.m

Cover = 40 mm

d'/d = 0.04

Fck = 30 N/sq.mm

Provide bars equaly all sides

Refer chart 48 of SP-16

$$\frac{Pu}{Fck\ b\ d} = \frac{5475 \times 1000}{30 \times 750 \times 900} = 0.27037$$

$$\frac{Mu}{Fck\ b\ d^2} = \frac{270 \times 10^6}{30 \times 750 \times 900 \times 900} = 0.01$$

$$\frac{p}{Fck} = 0.035 \quad p\% = 0.06 \times 30 = 1.65\ \%$$

Minimum steel = 0.8 %

$$As = \frac{1.65 \times 750 \times 900}{100} = 11138 \text{ sq.mm}$$

Provided 22 Nos 25 dia = **10799 sq.mm**

Ties 8 @ 115 C/C AND 175 C/C

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9 **FOOTING DESIGN** for **COL-A** refer sheet - 1 of drawing

Maximum load on column type " A P = 365 t Fck = 30
Add 10% footing load = 401.5 t
Max.Bending Moment = 1 t.m

S.B.C of Soil at 23 t/sqm at depth = 1.8 m
Assume footing base of 4.3 X 4.3 m and depth = 900 mm
So pressure on soil is Eff. Depth = 842 mm

$$\frac{402}{4.3 \times 4.3} = 21.7 \text{ t/sqm} < 23 \text{ t/sqm}$$

Cantilever projection of footing = $4.3 - \frac{0.15 + 0.30}{2} = 0.63$ m

B.M on footing at face of column pedestal

BM = $21.71 \times 0.63 \times \frac{0.63}{2} = 4.24$ tm

Mu = 4.24 x 1.5= 6.36 tm

Mu/b.d.d = $\frac{6.36 \times 1000 \times 10000}{1000 \times 842 \times 842} = 0.09$ N/sqm

Fck = 30 n/sqmm
From Table-3 of SP-16, Pt 0.16 % min pt% .= 0.120 %

At = $\frac{0.160 \times 1000 \times 842}{100} =$ **1347** sq.mm

Provide 16 dia @ 125 c/c = **3297** sq.mm

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THE LANDLENS SUITE

# Eight ways to know a piece of land before you pay for it.

This report covers one part of the picture. These cover the rest, drawn from the same government records, for any property in Tamil Nadu.

### LandLens One
Ask anything about a property and get an answer grounded in live government records, with the sources shown.
**/landlens/one**

### Verify My Land
Every record check run on one property and returned as a single report.
**/landlens/verify-my-land**

### Legal Opinion
An advocate's written opinion on the title, built on the records we pull for it.
**/landlens**

### One Map
Every layer on one map: the parcel, its boundary, zoning, water bodies and what sits around it.
**/landlens/one/map**

### PriceMap
What land actually changed hands for around this plot, taken from the registered deeds.
**/landlens/pricemap**

### Build Scope
What you are allowed to build here: floor space, height, coverage and setbacks.
**/landlens/build-scope**

### Property Tracker
Watch a property and hear about it when something new is registered against it.
**/landlens/property-tracker**

### Deal Room
Run the transaction in one place: documents, stamping, signatures and the parties.
**/landlens/deal-room**

FREE TOOLS · NO ACCOUNT NEEDED

# Twenty-four checks you can run yourself, at no cost.

## Records and verification

The registers themselves, read for you.

- Encumbrance Certificate
- Patta and Chitta
- Field Measurement Sketch
- EC Analyzer
- Bank charge check
- Court case search
- Seller background check
- Approval check by survey

## Value and duty

What it is worth and what it costs to register.

- Guideline value by street
- Guideline value by survey
- Stamp duty and registration fees
- Capital gains
- Floor space index
- Area unit converter

## Zoning and land use

What the plan says can happen on this land.

- Land use zone finder
- CMDA land use check
- Coastal regulation zone
- Master plan check
- Water bodies finder
- Airport height clearance

## Registers and directories

Who holds it, and which office keeps the record.

- Find your registering office
- Temple property check
- Waqf property check
- RERA register

**Every free tool**
/tools

**Services we run for you**
/services

**The LandLens suite**
/landlens/one

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# Every claim in this document traces back to a government record.

- Legal opinions, due diligence and title verification
- Building plan, layout and sub-division approvals
- Completion and occupancy certificates, regularisation
- Escrow, negotiation and NRI property management
- Land survey, soil testing, architecture and construction

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Prepared from the registers named on the page each finding sits on. Where a register could not be read, this document says so in its place rather than leaving the gap to be read as a clean result.