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DIGITALLY VERIFIED RECORD

**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 | Residential Apartment at Syno,66/1A,&3A, Siruseri Village, Vandalur Taluk, Chengalpattu District | |
| 2 | Name of Owner | | |
| 3 | Name of Registered Developer along with the Registration Number | M/S. KADAVANTHARA BUILDERS PVT.LTD | |
| 4 | Name of Registered Architect/Engineer along with the Registration Number | Mr. SIVA ANBARASAN TVLR/RA/Gr-1/2019/08/003 | |
| 5 | Name of Registered Structural engineer along with the Registration Number | K.MAGESH,M.E., STRUCTURAL ENGINEER GRADE-I (SE)-SE/GR.I/002/2025 | |
| 6 | Use of the building | Residential | |
| 7 | Number of stories above ground level (including storeys to be added later, if any) | G+9 Floors | |
| 8 | Number of basements below ground level | NIL | |
| 9 | Type of structure<br>Load bearing walls<br>R.C.C. frame<br>R.C.C. frame and Shear Walls<br>Steel frame | R.C.C Frames with RC Shear Walls. | |
| 10 | Soil data<br>Type of soil<br>Design safe bearing capacity | Medium Dense<br>200kN/m$^2$. | IS:1893<br>C1.6.3.5.2<br>IS: 1904<br>IS: 1892<br>IS: 2131<br>IS: 2720 |
| 11 | Dead loads (unit weight adopted)<br>• Earth<br>• Water<br>• Brick masonry<br>• Plain cement concrete<br>• Reinforced cement concrete<br>• Floor finish<br>• Other fill materials | <br>18 KN/M3<br>10KN/M3<br>19 KN/M3<br>24 KN/M3<br>25 KN/M3<br>20 KN/M3<br>20 KN/M3 | <br><br>IS: 875 Part 1 |
| 12 | Imposed (live) loads | | |

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Phone: 9600888896

| | | | |
|---|---|---|---|
| | Floor loads<br>Roof loads | $2kN/m^2$<br>$3kN/m^2$ | IS: 875 Part 2 |
| 13 | Cyclone/Wind<br>• Speed<br>• Design pressure intensity | 50m/sec | IS: 875 Part 3 |
| 14 | Seismic zone | III | IS: 1893 (2002) |
| 15 | Importance factor | 1.2 | IS:1893(2002) Table 6 |
| 16 | Seismic zone factor (Z) | 0.16 | IS:1893 Table 2 |
| 17 | Response reduction factor | 5 | IS:1893 Table 7 |
| 18 | Fundamental natural period – approx. | Ta=1.37sec. | IS:16700 C.6.3.4 |
| 19 | Design horizontal acceleration spectrum value ($A_h$) | 0.023 | IS: 1893 C1.6.4.2 |
| 20 | ♠ Expansion/Separation Joints | Separate | |
| 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 | Does not arise | IS: 4326 C1.7<br>Read with IS:1893<br>Zone / Bldg. \| II \| III \| IV \| V<br>Ordinary \| B \| C \| D \| E<br>Important \| C \| D \| E \| E |
| 2 | Basement Provided | Does not arise | |
| 3 | Number of floors including Ground Floor (all floors including stepped floors in hill slopes) | Does not arise | |
| 4 | Type of wall masonry | Does not arise | |
| 5 | Type and mix of Mortar | Does not arise | IS: 4326 C1.8.1.2 |
| 6 | Re: size and position of openings (See note No.[i])<br>• Minimum distance (b5)<br>• Ratio $(b_1+b_2+b_3)/1_1$ or $(b_6+b_7)/1_2$<br>• Minimum pier width between consequent opening ($b_4$)<br>• Vertical distance ($h_3$)<br>• Ratio of wall height to thickness 4<br>Ratio of wall length between cross wall to thickness | Does not arise | IS: 4326 Table 4, Fig.7 |

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| | | | | | |
|---|---|---|---|---|---|
| 7 | Horizontal seismic band<br>• at plinth level<br>• at window sill level<br>• at lintel level<br>• at ceiling level<br>• at eave level of sloping roof<br>• at top of gable walls | P<br>ϒ<br>ϒ<br>ϒ<br>ϒ<br>ϒ<br>ϒ | IP<br>ϒ<br>ϒ<br>ϒ<br>ϒ<br>ϒ<br>ϒ | NA<br>ϒ<br>ϒ<br>ϒ<br>ϒ<br>ϒ<br>ϒ | (see note No.2)<br>IS:4326 C1 8.4.6<br>IS: 4326 C1 8.3<br>IS: 4326 C1 8.4.2<br>IS: 4326 C1 8.4.3<br>IS: 4326 C1 8.4.3<br>IS: 4326 C1 8.4.4 |
| | • at top of ridge walls | ϒ | ϒ | ϒ | |
| 8 | Vertical reinforcing bar<br>at corners and T junction of walls<br>at jambs of doors and window openings | ϒ<br>ϒ | ϒ<br>ϒ | ϒ<br>ϒ | IS: 4326 C1 8.4.8.<br>IS: 4326 C1 8.4.9 |
| 9 | Integration of prefab roofing/flooring elements through reinforced concrete screed. | ϒ | ϒ | ϒ | 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 | ϒ<br>ϒ | ϒ<br>ϒ | ϒ<br>ϒ | |

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<br>• Regular frames<br>• Regular frames with Shear Walls<br>• Irregular frames<br>• Irregular frames with Shear Walls<br>• Soft storey | Regular frames with Shear Walls | IS: 1893 C1 7.1 |
| 2 | Number of basements | NIL | |
| 3 | Number of floors including ground floor | 10floors | |
| 4 | Horizontal floor system<br>• Beams and slabs<br>• Waffles<br>• Ribbed floor<br>• Flat slab with drops<br>• Flat plate without drops | Beams and Slab. | |

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| | | | |
|---|---|---|---|
| 5 | Soil data<br>• Type of soil<br>• Recommended type of foundation<br>-Independent footings<br>-Raft<br>-Piles<br>• Recommended bearing capacity of soil<br>• Recommended type, length, diameter and load capacity of piles<br>• Depth of water table<br>• Chemical analysis of ground water<br>• Chemical analysis of soil | Medium Dense Isolated, Combined and Raft.<br><br>200kN/$m^2$ and 300kN/$m^2$ | IS: 1498 |
| 6 | Foundations<br>Depth below ground level<br>Type<br>Independent<br>Interconnected<br>Raft<br>Piles | 1.5m<br><br>Isolated, Combined. | |
| 7 | System of interconnecting foundations<br>Plinth beams<br>Foundation beams | Foundations and Plinth Beams. | IS: 1893 C1 7.12.1 |
| 8 | Grades if concrete used in different parts of building | M45 to M25. | |
| 9 | Method of analysis used | Finite Element Method. | |
| 10 | Computer software used | ETABS and SAFE. | |
| 11 | Torsion included | Designed | IS: 1893 C1 7.9 |
| 12 | Base shear<br>a. Based on approximate fundamental period<br>b. Based on dynamic analysis<br>c. Ratio of a/b | EQX / EQY<br>2264.9 / 2264.9<br>2260.5 / 2263.24<br>1.00 / 1.00 | IS: 1893 Cl. 7.5.3 |
| 13 | Distribution of seismic forces along the height of the building. | | IS:1893 Cl.7.7<br>(Provide sketch) |
| 14 | The Column of soft ground storey specially designed. | Designed | IS: 1893 Cl.7.10 |
| 15 | Clear minimum cover provided in<br>• Footing<br>• Column<br>• Beams<br>• Slabs<br>• Walls | 50mmm<br>40mm<br>30mm<br>25mm<br>40mm | IS: 456 Cl. 26.4 |

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| | | | |
|---|---|---|---|
| 16 | Ductile detailing of RC frame<br>• Type of reinforcement used<br>• Minimum dimension of beams<br>• Minimum dimension of columns<br>• Minimum percentage of reinforcement of beams at any cross section<br>• Maximum percentage of reinforcement at any section of beam<br>• Spacing of transverse reinforcement in 2-d length of beams near the ends<br>• Ratio of capacity of beams in shear to capacity of beams in flexure<br>• Maximum percentage of reinforcement in column<br>• Confining stirrups near ends of columns and in beam-column joints<br>Diameter<br>Spacing<br>• Ratio of shear capacity of columns to maximum seismic shear in the storey. | TMT FE550<br>200X450<br>200X900<br>0.24%<br>2.0%<br>d/4<br>0.5%<br>2.8%<br>8 and 10mm<br>100 and 150mm | IS: 456 Cl. 5.6<br>IS: 13920 Cl.6.1<br>IS: 13920 Cl.7.1.2<br>IS: 456 Cl.26.5.1(a)<br>IS: 13920 Cl.6.2.1<br>IS: 456 Cl.26.5.1.1(b)<br>IS: 13920 Cl.6.2.2<br>IS: 13920 Cl.6.3.5<br>IS: 456 Cl.26.5.3.1<br>IS: 13920 Cl. 7.4 |
| | | | |
| 17 | Does the features require clearance by SDRP<br>Example: High rise building<br>Prefab building<br>Building in hazard prone areas | Does not Arise | |

**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 | ○ Ductile Design | IS:800 Cl 3.4.4<br>IS:800 Cl.3.4.5<br>IS:800 Cl.3.5.6 |
| 2 | Design based on | ○ Elastic analysis | IS: 800 Section-9<br>SP;6 (6) |

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| | | | |
|---|---|---|---|
| 3 | Floor construction | ○ Fe550 | IS: 800 |
| 4 | Roof construction | ○ Fe550 | IS: 800 |
| 5 | Horizontal force resisting system adopted | 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, Slabs | IS:800 Cl.3.13 |
| 8 | Structural members | Column and Beam | IS: 800 Section-10 |
| 9 | Proposed material | ○ General weld-able<br>○ High strength<br>○ Cold formed<br>○ Tubular | IS: 2062<br>IS: 8500<br>IS: 801, 811<br>IS: 806 |
| 10. | Minimummetal thickness Specified for corrosion protection | | IS: 800, Cl.3.8<br>Cl.3.8.1 to Cl.3.8.4<br>Cl.3.8.5 |
| 11 | Structural connections | ○ Framed Connections | IS: 800, Section-8<br>IS: 1929, 2155, 1149<br>IS 6639, 1367<br>IS 3757, 4000<br>IS: 1363, 1367<br>IS: 816, 814,1395, 7280, 3613, 6419, 6560, 813, 9595 |
| 12 | Minimum Fire rating proposed, with method | ○ Rating 02 hours | 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.

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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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# *PROPOSED MSB DEVELOPMENT IN SURVEY NOS 66/1A&3A, SIRUSERI VILLAGE, VANDALUR TALUK, CHENGALPATTU DISTRICT, TAMILNADU.*

# *CHENNAI*

## PRELIMINARY DESIGN BRIEF REPORT

| | | |
|---|---|---|
| Client | : | **M/S, KADAVANTHARA BUILDERS PRIVATE LTD,**<br>PACIFICA AURUM, VEERANAM ROAD (OMR),<br>Chennai-603103 |
| Architects | : | **DESIGN BIM STUDIO**<br>506,Palladium business Hub,<br>Opp.4d Square, Above Pantaloons,<br>Sabarmati-Gandhinagar<br>Highway,Motera,Ahmedabad-380005,<br>Gujarat,India. |
| Structural Consultants | : | **Design Tree Service Consultants Pvt Ltd**<br>3rd Floor, GJ Complex, 17/8, CIT 1st Main Rd,<br>CIT Nagar, Chennai, Tamil Nadu 600035. |

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# 1.0 STRUCTURAL SERVICE

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NOVEMBER 2025

ISSUE RECORD

| | | |
|---|---|---|
| PROJECT | : | PROPOSED RESIDENTIAL AND CLUBHOUSE |
| TITLE | : | Preliminary Design Brief Report |
| DOCUMENT NO | : | DTSC/ M/S, KADAVANTHARA Builder Limited, Chennai. |

1. STRUCTURAL SERVICES

| DATE | ISSUE | PREPARED | CHECKED | REVISION |
|---|---|---|---|---|
| 07.11.25 | Preliminary report | Hariprasad | S.Rao | R0 |
| | | | | |
| | | | | |

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## 1.0 STRUCTURAL SERVICE

1.1 Introduction

1.1.1 Objective of the Report

1.2 Design standard

1.2.1 IS Standards - Material

1.3 Design Data

1.3.1 Dead loads

1.3.2 Live loads

1.3.3 Wind load

1.3.4 Seismic forces

1.3.5 Environmental conditions, Corrosion and Fire protection for concrete and structural steel

1.3.6 Temperature and shrinkage effect:

1.3.7 Temperature Loads:

1.3.8 Exceptional Loads:

1.4 Materials

1.4.1 Concrete

1.4.2 Reinforcement steel

1.5 Structural concept

1.5.1 Structural analysis and design

1.5.2 Déflection limits

1.5.3 Cracking limits

1.5.4 Load combinations

1.5.5 SOIL Data

1.5.6 Water Proofing

1.6 Design Philosophy

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# 1.0 STRUCTURAL SERVICE

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PROJECT BRIEF

## 1.1 Introduction

The client M/S **KADAVANTHARA BUILDERS PRIVATE LIMITED,** intends to develop a Residential Building at Veeranam Road, Chennai. Project is architecture by DESIGN BIM STUDIO Gujarat, India. Chennai. Structures Engineering Services are provided by M/S Design Tree Service Consultants Pvt. Ltd, Chennai.

### 1.1.1Objective of the Report

The objective of the report is to identify and record all the pertinent input requirements, analysis & design criteria for structural design of the various buildings in the proposed commercial cum residential project at Chennai. It is aimed at consolidating the basis of the work that the structural designer is going to carry out in delivering the structural framework of the buildings which will be compatible with the architectural theme, satisfy the functional needs, adhering to the building norms and Indian Standards provisions and which will be safe, stable, strong and yet optimally economical.

This report covers the minimum design requirement to establish the unified design basis that will form the overall design philosophy to be adopted in the structural design of the RCC buildings.

The design basis will aim to achieve:

- Structural & functional integrity.
- Desirable Structural performance under characteristic service design loadings.
- Ability to sustain design basis loads due to natural phenomena such as wind, earthquakes, seasonal variation in ground water table and thermal effects.
- Structural durability & maintainability.

**Brief of the project**

This project consists of Residential Building.

Plan showing the proposed construction of Residential Building .Ground Floor (Parking), 1st Floor to 9th Floor (Balcony, Dining, Utility, Kitchen, Master Bedroom, Bedroom, Toilet), Terrace.

The height of the proposed Residential Area (Tower A, B&C) is 30.000 meter from Stilt Floor to Terrace Floor

Building floor heights as below for Residential Area:

| | |
|---|---|
| Ground to 1st Floor | - 3.0 m |
| 1st Floor to 2nd Floor | - 3.0 m |
| 2nd Floor to 3rd Floor | - 3.0 m |
| 3rd Floor to 4th Floor | - 3.0 m |
| 4th Floor to 5th Floor | - 3.0 m |
| 5th Floor to 6th Floor | - 3.0 m |
| 7th Floor to 8th Floor | - 3.0 m |
| 8th Floor to 9th Floor | - 3.0 m |
| 9th Floor to Terrace | - 3.0 m |

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The proposed Residential Area has

- Ground floor consists of Parking.
- 1st Floor to 9TH Floor consists of Balcony, Dining, Utility, Kitchen, Master Bedroom, Bedroom, Toilet,
- Terrace.

**Statutory Requirements:**

The design of structural and other building services will comply with the following requirements:

- National Building Code
- The Building Regulations
- The Environmental Protection Act in liaison with the Environmental Agency.
- Fire prevention and detection in compliance with the local Fire Regulation.

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## 1.2 DESIGN STANDARDS:

Specific applicable codes and standards will be identified and adopted in the design philosophies as appropriate to the structural elements. The latest editions of the Codes and Standards will be used in designs. All design work shall be based on Indian Standards and Codes with latest revision, with amendments if any, as on date.

### Loads:

IS:875 -1997 Code of Practice for design loads for Buildings and structure (Part- 1, 2, 4 & 5)
IS:875 -2015 Code of Practice for design loads for Buildings and structure (Part- 3 - Wind Loads)
IS:1893 -2016 Criteria for earthquake resistant design of structure (Part-1)

### Foundations:

| | |
|---|---|
| IS:1080-1997 | Code of Practice for design and construction of shallow foundations on soils |
| IS:1904-2021 | Code of Practice for design and construction of foundations in soils general requirement |
| IS:2950-1998 | Code of Practice for design and construction of raft foundations |
| IS:2974-1998 | Code of Practice for design and construction of machine foundations (All parts) |
| IS:8009-1998 | Code of Practice for calculation of settlement of foundations (All parts) |

### RCC:

| | |
|---|---|
| IS:456 -2000 | Code of Practice for plain and reinforced concrete |
| IS:16700 -2023 | Criteria for structural safety of tall concrete buildings |
| IS:458 -2021 | Specification for precast concrete pipes |
| IS:3370-2021 | Code of Practice for concrete structures for the storage of liquids: (All parts) |
| IS:4326-2013 | Code of Practice for earthquake resistant design and construction of buildings |
| IS:5525-1999 | Recommendation for detailing of reinforced concrete works |
| IS:1786-2008 | Specification for high strength deformed steel bars and wires for concrete reinforcement |
| IS:10262-2019 | Recommended guidelines for concrete mix design |
| IS 13920-2016 | Ductile detailing of reinforced concrete structures subjected to seismic forces - code of practice |

### Structural steel:

| | |
|---|---|
| IS:800 -2007 | Code of Practice for general construction in steel |
| IS:806 -1968 | Code of Practice for use of steel tubes in general building construction |
| IS:808 -2021 | Dimensions for hot rolled steel beam, column channel and angle section |
| IS:816 -1969 | Code of Practice for use of metal arc welding for general construction in mild steel |
| IS:1161-2014 | Steel tubes for structural purposes |
| IS:4000-1992 | High Strength bolts in steel structures - Code of Practice |
| IS:7215-1974 | Tolerances for fabrication of steel structures |

### Miscellaneous:

IS: 432(part 2)-1995Specification for mild steel and medium tensile steel bars and hard-drawn steel wire for concrete reinforcement
IS: 6313(part II)-2022 Standards for anti-termite treatment
IS:1905-1987 Code of Practice for structural use of unreinforced masonry

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IS:3067-1988 Code of Practice for general design details and preparatory works for damp proofing and water proofing of buildings

SP:6 -1998 Handbook for structural engineers (All parts)

SP:7 -2016 National Building Code of India

SP:16-1980 Design Aids for reinforced concrete to IS:456-1978

SP:22-1982 Explanatory handbook on codes for earthquake engineering (IS:1982-1975 and IS:4326-1976)

SP:24-1983 Explanatory handbook on Indian Standard code of Practice for plain and reinforced concrete

SP:34-1987 Handbook of concrete reinforcement and detailing (SCIP)

Wherever appropriate Indian Regulation does not exist for any particular item, appropriate British standards or American will be used.

**Material:**

IS: 269 -2015 Specification for Ordinary, rapid hardening and low heat Portland cement.

IS: 455 -2015 Specification for Portland blast furnace slag cement.

IS: 1489-2015 Specification for Portland pozzolana cement

IS: 4031 Method of physical tests for Portland cement.

IS: 383 - 2016 Specification for coarse and fine aggregates from natural sources for concrete.

IS: 516 - 2021 Method of test for strength of concrete.

IS: 1199-2018 Method of sampling and analysis of concrete.

IS: 1566-1982 Specification for plain hard drawn steel wire fabric for concrete reinforcement.

IS: 4990-2024 Specification for plywood for concrete shuttering works.

IS: 2645-2003 Specification for integral cement water proofing compounds.

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## 1.3 DESIGN DATA:

### 1.3.1 Dead loads:

Dead load shall include weight of all structural and Architectural components. Self-weight of the materials shall be calculated on the basis of unit weights given in IS: 875.

### Dead loads:

- Floor finish of 50mm thick for Residential floors : Tiles -0.05x24=1.2 kN/sq.m.
- Floor finish of 50mm thick for Guest Rooms : Tiles -0.05x24=1.2 kN/sq.m.
- Floor finish of 75mm thick for Hotel Amenities : Tiles -0.075x24=1.8 kN/sq.m.
- Floor finish of 100mm thick for Parking Areas : 240 kg/sq.m (0.1x24=2.4 kN/sq.m).
- False ceiling/Ceiling Finish for Residential floors : 15 kg/sq.m (0.15 kN/sq.m).
- False ceiling & Ducting Finish for Hotel floors : 50 kg/sq.m (0.50 kN/sq.m).
- Ducting + Sprinklers for Basements : 50 kg/sq.m (0.5 kN/sq.m).
- Partition walls : As per actuals.
- Wall loads : As per actuals.
- Staircase load including step weight : As per actuals.

  Sunken loads :
- Toilets & Balconies/Utilities : 100mm/150mm

  : For 100mm (0.10x20) +1.35 = 3.35kN /sq.m.

  For 150mm (0.15x20) +1.35 = 4.35kN /sq.m.

### Material Density

- Density of Plain concrete : 2400 kg/cu.m (24 kN/cu.m).
- Density of Cement mortar : 2000 kg/cu.m (20 kN/cu.m).
- Density of RCC : 2500 kg/cu.m (25 kN/cu.m).
- Solid block masonry : 2000 kg/cu.m (20 kN/cu.m).
- Brick Wall : 1900 kg/cu.m (19 kN/cu.m).
- Aerated block masonry : 865 kg/cu.m (8.65 kN/cu.m).
- Soil (Dry) : 1800 kg/cu.m (18 kN/cu.m).
- Soil (Wet) : 2000 kg/cu.m (20 kN/cu.m).
- Water : 1000 kg/cu.m (10 kN/cu.m).
- Glass : 2800 kg/cu.m (28 kN/cu.m).
- Structural steel : 7850 kg/cu.m (78.5 kN/cu.m).
- Masonry with plastering : 2200 kg/cu.m (22 kN/cu.m).
- Filling for sunken portion : 2000 kg/cu.m (20 kN/cu.m)
- Waterproofing (membrane). : 15kg/sq.m (0.15kN/sq.m).
- Floor finishes including WPC@terrace lvl : 360kg/sq.m (3.6kN/sq.m).

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- Staircase steps load : 387.5kg/sq.m (3.875kN/sq.m)
  : (0.5x0.15x25)+2 = 3.875 kN/sq.m

**1.3.2 Live loads:**

The superimposed loads shall be calculated in accordance with IS: 875(Part-2) based on Occupancy Classification. For multiple occupancies of use in the building shall be referred with the other appropriate comparable occupancy classification as per Table.1 of IS 875(Part-2)-1987.

For Residential Block :

- Parking Area : 250 kg/ sq.m (2.5 kN/sq.m) + 25% Impact(3.125KN per sqm )
- Fire tender Loading : 2000 kg/sq.m (20.0 kN/sq.m).
- Living/dining/kitchen/bed rooms/Foyer : 200 kg/sq.m (2.0 kN/sq.m)
- Stairs : 300 kg/sq.m (3.0 kN/sq.m)
- Utility : 300 kg/sq.m (3.0 kN/sq.m)
- Corridors/Balcony/Utility : 300 kg/sq.m (3.0 kN/sq.m)
- Toilets : 200 kg/sq.m (2.0 kN/sq.m)
- Lift Machine room : 1000 kg/ sq.m or as per actuals.
- Terraces : 300 kg/ sq.m (3 kN/sq.m).
- Pump & Electrical Rooms : 750 kg/ sq.m (7.5 kN/sq.m)
- Gardening / Landscape Loads : 600mm filling - (0.6*20=12 kN/sq.m) 1200 kg/sq.m or as per actuals.
- DG Room : 1000 kg/ sq.m (10 kN/sq.m)
- Refuge Floor Load : 300 kg/sq.m (3.0 kN/sq.m)
- Overhead Tank Top : 200 kg/sq.m (2.0 kN/sq.m)

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### 1.3.3 Wind Loads

**The Wind pressure shall be calculated in accordance with IS: 875 (Part-3).**

**Chennai, which is located in Tamil Nadu, is having wind speed of 50m/sec.**




- Basic Wind Speed Vb : 50 m/sec
- Risk Coefficient K1 : 1.00 (k1 corresponds to 50 years Mean Probable Design Life of Structure)
- Terrain, height, structure size factor K2 : To suit the height of the structure for terrain Category 2 and also it varies with the height of the structure.
- Topography factor K3 : 1.00
- Importance factor for the cyclonic region K4 : 1.00
- The external and internal pressure co-efficient shall be as per respective clauses of IS: 875 (Part 3)
- Design wind speed Vz : $Vb \times k1 \times k2 \times k3 \times k4$
- Design wind pressure Pz : $0.6 \times Vz^2$

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**NOTE: Refer ANNEX -A for the wind load calculation**

| Height of the building (m) | K2 | Vz = Vb x k1 x k2 x k3 xk4 (m/s) | Pz = 0.6 x $Vz^2$ ($kN/m^2$) |
|---|---|---|---|
| 10 | 1.00 | 50.00 | 1.50 |
| 15 | 1.05 | 52.50 | 1.65 |
| 20 | 1.07 | 53.50 | 1.72 |
| 30 | 1.12 | 56.00 | 1.88 |
| 50 | 1.17 | 58.50 | 2.05 |
| 100 | 1.24 | 62.00 | 2.31 |
| 150 | 1.28 | 64.00 | 2.46 |
| 200 | 1.30 | 65.00 | 2.54 |
| 200 | 1.32 | 66.00 | 2.61 |

**Dynamic wind response** - Along wind response (Gust Factor Analysis) and across wind response as per Clause10 of IS 875 (part 3)-2015 shall be followed. If

a) Buildings and closed structures with a height to minimum lateral dimension ratio of more than about 5.0 or
b) Buildings and structures whose natural frequency in the first mode is less than 1.0 Hz.

For Residential Block Tower- A,B&C

Case (a) - Height to minimum lateral dimension ratio = 30.00/62.190=0.636 < 5.

Case (b) - Natural frequency = 1/Ta
Time period = 0.0644 H^0.9 = 0.0644*(30.000)^0.9 = 1.37 seconds.
Natural frequency = 1/1.37 = 0.72 Hz < 1.0Hz.

Hence, for the given building heights & size, dynamic Effects of wind need is considered in the analysis.

### 1.3.4 Seismic Forces

**Chennai falls under seismic zone III as per IS 1893-2016 (Part 1) (Fifth Revision) and has the following factors to be considered for designs. Ductile detailing is not required. (Please refer attached map)**

- Seismic Zone : III (Annexure E) : IS 1893 (Part-1) : 2016
- Seismic Zone factor, Z : 0.16 (Annexure E) : IS 1893 (Part-1) : 2016
- Design horizontal seismic coefficient (Ah) : (Z/2)*(Sa/g)*(I/R).
- I -Importance factor : 1.2 (Ref Table 6-IS: 1893-2016)
- Response reduction Factor : 5 (SMRF)
- Soil type : 1
- Damping Ratio for RCC : 5 %
- R as per Table 9 of IS: 1893-2016 is based on Ductile RC Structural Walls with RC SMRFs.



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- Sa/g - Average response acceleration coefficient for soil sites as per Fig.2 of IS: 1893-2016 and it is arrived based on approximate fundamental natural time period as per clause 6.3.4 of IS: 16700-2023.

  Clause: 6.3.4 - Approximate fundamental natural time period of structure is

  Ta = 0.0672 H^0.75 for all other concrete structural systems.

  Where, h = Height of the building in meters.

- Design horizontal seismic coefficient (Ah) : (Z/2)*(Sa/g)*(I/R).
  : (0.16/2)*(1.2/5) * (Sa/g).
  Ah : 0.0192 * (Sa/g).
- Design seismic base shear, Vb : Ah * W where, W - seismic weight of building.
- Detailing as per IS 13920:2016, IS 456:2000 & SP 34 : Special moment resistant frame with ductile detailing.

**Vertical Dynamic Analysis:**

- Since the building is regular in geometry, So Vertical acceleration shall not be consider as per IS 1893-2016(Part-01).

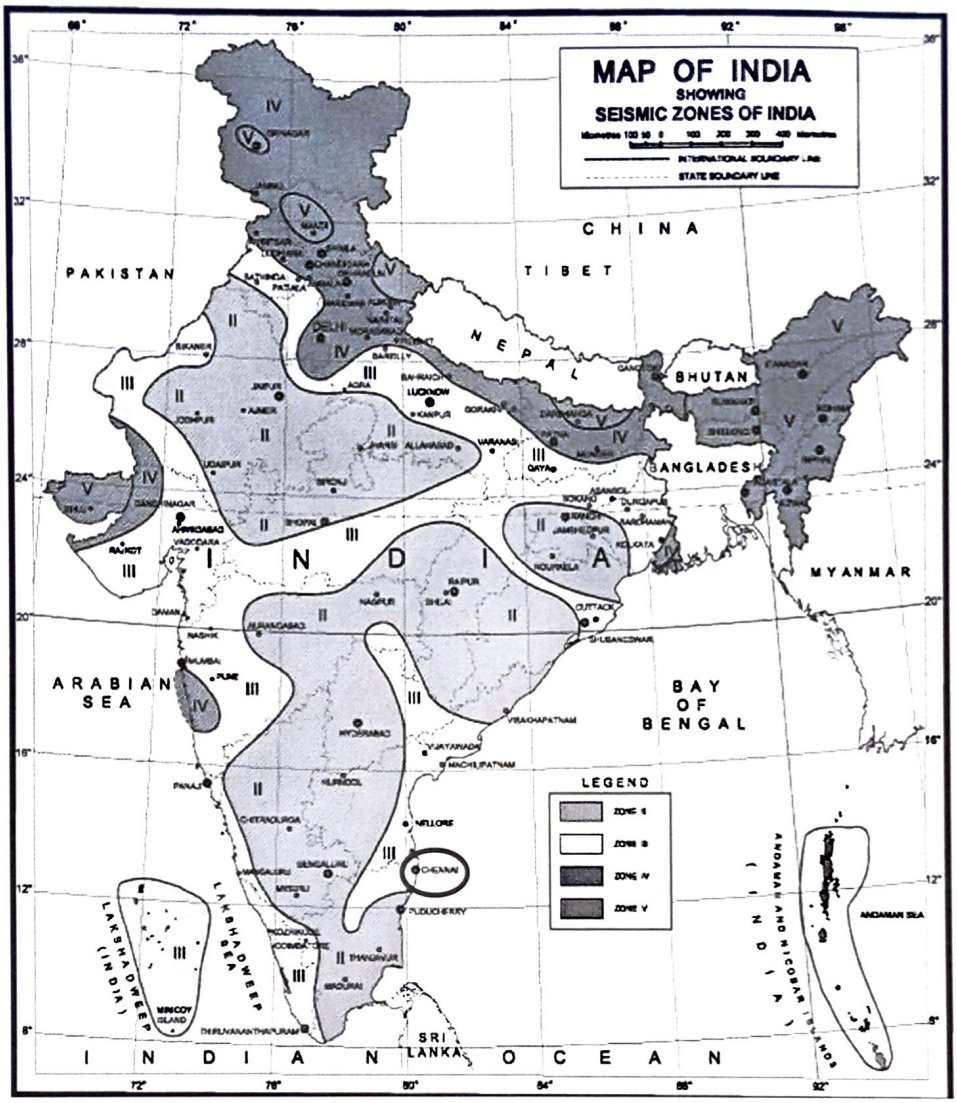
- **Seismic weight :**

| Sl No. | Imposed Uniformity Distributed Floor Loads kN/m² | Percentage of Imposed Load |
|---|---|---|
| (1) | (2) | (3) |
| i) | Up to and including 3.0 | 25 |
| ii) | Above 3.0 | 50 |

- When fire tender load is combined with gravity loads partial safety factor shall be considered 1.05 times. This is not combined with lateral loads as per NBC-2016.

| Table No : 02 | | | | |
|---|---|---|---|---|
| Zone Factor, Z | | | | |
| ( Clause 6.4.2 ) | | | | |
| Seismic Zone | II | III | IV | V |
| Seismic Intensity | Low | Moderate | Severe | Very Severe |
| Z | 0.10 | 0.16 | 0.24 | 0.36 |

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### 1.3.5 Environmental conditions, Corrosion and Fire protection for concrete and structural steel

| | | |
|---|---|---|
| ➢ Environment | : | Mild for Super Structure and Moderate for Sub Structure. |
| ➢ Exposure conditions | : | Concrete surfaces sheltered from severe rain or freezing whilst wet environment |
| ➢ Fire protection | : | Thickness of the structural elements as per table 15, 16 & 16A clause 26.4 of IS 456-2000. |
| ➢ Minimum grade of concrete | : | M30 Grade for Tower area & podium area. |
| ➢ Nominal cover to reinforcement | : | For Moderate Exposure Nominal cover should not be less than 30 mm |
| ➢ Nominal covers for 2 hr. fire resistance | : | As per IS 456:2000, Table 16A Clause 21.4 & 26.4.3 |



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| Nominal Cover | | | | | | |
|---|---|---|---|---|---|---|
| Beams | | Slabs | | Ribs | | Columns |
| Simply supported | Continuous | Simply supported | Continuous | Simply supported | Continuous | |
| 40 mm | 30 mm | 35 mm | 25 mm | 45 mm | 35 mm | 40 mm |

### 1.3.6 Temperature and shrinkage effect:

Horizontal floor displacement due to differential temperatures and shrinkage is of importance in concrete buildings. It can be taken care of by either providing expansion joints at an appropriate spacing or designing structural members for the additional moments caused by the temperature and shrinkage effects. Pour strips at suitable locations shall also be considered where required.

### 1.3.7 Temperature Loads:

The effect of temperature will be considered wherever applicable in accordance with relevant Indian Codes. The coefficient for thermal expansion and contraction will be in accordance with IS: 456 and IS: 800 for concrete and steel respectively.

The design temperature Differential is given by Indian road congress (IRC: SP:62-2014) at ± 17 degree centigrade for moderate climates and at ±25degree centigrade for extreme climates.

Controlling of temperature stress we are providing shrinkage strips at every 40 mts.

### 1.3.8 Exceptional Loads:

Loads due to the following catastrophe scenarios are not considered in the design.

- Exceptional loads due to terrorist attacks (Explosions)
- Accidental loads (Falling of aircraft on the building)
- Accidental hitting of vehicle on the façade
- Snow Load.

## 1.4. MATERIALS

Materials specified conform to the latest edition of the relevant Indian Standard or other accepted standard. Specifications for materials will include sampling and testing as stipulated in the design standards. Detailed material specifications will be included in the Technical Specification.

### 1.4.1. Concrete

- All structural concrete shall have cube crushing strength of M45 to M25 N/sq.mm at 28 days.
- Plain cement concrete shall have cube crushing strength of 10 N/sq.mm (M10) at 28 days.

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Concrete Mix

| Concrete item | Grade |
|---|---|
| Foundation | M30 |
| Tower Columns & Walls | M45 to M25 |
| Slab, beams | M25 |
| Retaining walls, Grade slab, & Ramps | M25 |

**Puddling of concrete:**

- Flat Slabs- Grade of Drops shall be same as column grade below.
- Flat Plate/Beam/Slab Junction-Grade of concrete for 600 mm all-round from face of column/Shear wall shall be same as Column or Shear wall Grade. Concrete shall be well integrated with Beam/Slab and Column( as per IS 16700-2017 Annex B -4).

### 1.4.2. Reinforcement steel

1) All reinforcement shall confirm to IS: 1786 - 2008 having minimum yield strength of 500D N/sq.mm. (Fe 550 rebars can be looked into)
2) Shear reinforcement to be designed for Fe-415 N/sq.mm.

**Structural Steel**

All structural steel shall confirm to IS: 2062 and shall be grade of E350 preferably, else E250.

**Cement:**

- Cement for the construction shall be chosen as per the guidelines of IS456 and based on thorough soil investigation.
- For general works, ordinary Portland cement (OPC) of either 43 Grade or 53 Grade with C3A content ranging from 5-8%, conforming to IS 8112 and IS 12269, respectively shall be used.
- It shall be insured that the cement used must be of one brand and from same source, as far as possible. The cement shall conform to all the specifications laid down in IS codes.
- If the concrete is exposed to Sulphate attack, Sulphate Resisting Portland Cement (SRPC) confirming to IS12230 shall be used as per IS 456 guidelines.
- In all cases, the cement shall meet the 28 day strength requirement of IS 8112 or IS 12269.
- In Case of Slag cement additional Mineral Admixtures like Fly ash, Silica fume, or Granulated Slag cement are not to be used.

Use of bulk cement can be permitted only with the approval of the engineer

**Water Proofing Material**

Waterproofing for Basement including retaining walls shall be done by using 2mm thick, self-adhesive self-protected and self-healing type waterproofing membrane depending on the water table and site conditions.

**Mechanical Splicing Material**

Moment Coupler - Threaded Type (As per IS 16172: 2014)

As per IS16700:2023 clause 5.7.2.3 no lapping of bars is allowed in RC columns and walls, when diameter of bars is 20mm or higher



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## 1.5. STRUCTURAL CONCEPT

- The Structural System for the residential towers comprises of RCC slabs supported by RC Structural walls. Floor slabs and walls are considered to act as a rigid diaphragm to transfer the lateral forces to the lateral load resisting elements
- The extended podium area apart from tower portion has been proposed with flat slab system
- The slabs for toilet areas are sunk as per PHE requirement. The cut outs in slab are based on the provisions given in Clause 31.8 of IS 456-2000. Predetermined sleeves shall be considered to accommodate utility services. Staircases are provided with mid-landing between the floors as per architectural layout.

This structure has physical interface with almost all the disciplines like Geotechnical, MEP Services and Landscape etc. The Structure proposed is of cast in-situ concrete construction with walls/columns suitably placed. The core walls around lifts, stairs are of cast in-situ concrete to resist lateral forces. The Structural design of the proposed project is based on Indian Standard Codes and is analyzed for Dead, Live, Wind and Seismic Load conditions taking into relevant load combinations recommended by the codes. The Vertical Loads including the dead and super imposed loads are transferred to the soil through columns, core walls and footings. Footings are sized with consideration to the safe bearing capacity of soil at the level of transfer of load recommended by specialist soil investigation consultants. The Lateral loads due to wind and seismic forces are dissipated to soil through the proposed Reinforced Concrete Core Walls/shear walls/moment resisting frame.

| | Description | Tower |
|---|---|---|
| b) | Structural system | RCC Beam & Slab with Shear Wall |
| c) | Slab thickness | 125/150/175/200mm |
| e) | Column size | As per the design ( varies ) |
| g) | Rc walls | 200 X 900 |

## STRUCTURAL ANALYSIS AND DESIGN

### 1.5.1. General

All R.C.C structures shall be designed according to the Limit State Method as specified in IS: 456 - 2000.

- The structure is idealized as 3D space frame and analyzed using ETABS software package for both vertical and lateral loads.
- Forces and moments from the 3D analysis output for the worst combinations are used for the design of the structure.
- The foundations are designed for critical load combination.
- The structure is analyzed for specific loads like dead load, live load, wind and seismic loads and for the load combinations as given in the relevant codes.
- The slab is analyzed as two-way and one way slabs.

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### 1.5.2. Deflection Limits:

For Reinforced concrete works:

- Limiting values of deflection (Short and Long term) as per clause 35.3 of IS: 456-2000 is followed in the design.
- Limiting value for short term deflection is considered as span/250 and for the long term deflection is considered as span/350 or 20mm whichever less as per IS 456 - 2000.
- As per IS 1893 (Part1):2016, Story drift in any storey due to minimum specified design seismic lateral force shall not exceed 0.004 times the storey height design.
- Lateral sway due to earthquake load should not exceed H/250 (H is the total height of structure).
- Lateral sway due to wind load should not exceed H/500 (H is the total height of structure).

### 1.5.3. Cracking Limits:

Limiting values of crack width as per clause 35.3 of IS: 456-2000 is followed in the design.

In general for slabs and beams, the crack width is limited to 0.3mm.

For basement retaining wall and water retaining structures, crack width is limited to 0.2mm.

### 1.5.4. Load Combinations:

The various loads are combined in accordance with the stipulations in IS: 875 (Part 5)-2015; whichever combination produces the most unfavorable effect in the building foundation or structural member concerned may be adopted.

| | *Limit State of Collapse* | | | | *Limit State of Serviceability* | | |
|---|---|---|---|---|---|---|---|
| | *DL* | *LL* | *WL/EL/TL* | *SPEC* | *DL* | *LL* | *WL/EL/TL* |
| DL + LL | 1.5 | 1.5 | – | | 1 | 1 | – |
| DL + WL | 1.5 or 0.9* | – | 1.5 | | 1 | – | 1 |
| DL + SPEC | 1.5 or 0.9* | - | | 1.5 | | | |
| DL + TL | 1.5 | – | 1.5 | | 1 | – | 1 |
| DL+LL+WL | 1.2 | 1.2 | 1.2 | | 1 | 0.8 | 1 |
| DL+LL+SPEC | 1.2 | 1.2 | | 1.2 | | | |
| DL+LL+TL | 1.2 | 1.2 | 1.2 | | 1 | 0.8 | 1 |
| DL+WL+TL | 1.2 | – | 1.2 | | 1 | – | 1 |
| DL+SPEC+TL | 1.2 | – | 1.2 | 1.2 | | | |
| DL+LL+SPEC+TL | 1.2 | 1.2 | 1.2 | 1.2 | | | |

***This value is to be considered when stability against overturning and stress reversal is critical where DL/LL/WL/EL denotes,**

**DL - Dead Load; LL - Live Load; TL-Temperature Load; WL - Wind Load; EL - Earthquake Load**



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Wind load and earthquake loads are considered for both X & Y directions. Whenever imposed load is combined with earthquake load, the appropriate part of imposed load as specified in IS: 1893-2002 / Clause 7.3.1 of seismic code will be used both for evaluating earthquake effect and for combined load effects used in such combination.

### 1.5.5 SOIL DATA

Foundations are designed based on Geo Technical investigation report and will dissipate all the vertical and horizontal loads safely to the soil below. Isolated and Combined footings are envisaged depending on the soil load bearing capacity.

### 1.5.6 WATERPROOFING:

**Basements / Retaining wall / Underground**

Basements / Retaining walls / Underground tanks waterproofing with Providing and application of Integral Crystaline waterproofing treatment to the entire quantity of the concrete for basement Grade Slab by using Admix having resistance to 20 bar hydrostatic water head @ 0.8 % by weight of cementatious content. The material must qualify as PRAH grade Permeability Reducing Admixture for Hydrostatic conditions and meet the following requirements Specified in ACI-212-3R-2010, when tested as per DIN 1048 (after applying 4 cycles of hydrostatic pressure) and permeability co-efficient calculated as per Valenta / Darcy's formula & U -sign approved as per DIN 18998 with chloride content less than 0.1%, alkali content less than 9.3% and no negative effect on corrosion of steel reinforcement & providing post construction repair with Catalyst Crystaline waterproofing treatment to construction joints / cold joints of the Grade slab and at the junctions of Grade slab with the retaining walls etc by making of U shape groove (25mm x 25mm) should fill with repair mortar and with premier and finishing coat & honycomb area as per the manufacturer's specifications and as detailed in technical specification, complete work and methodology approved by Consultants. (Test certificates shall be provided by the manufacturer. Approved makes Penetron / Percept / Fosroc or equivalent).

For retaining wall shrinkage strips should be provided at regular interval

**Roof Waterproofing:**

The first part consists of application of first layer of micro fibre reinforced acrylic polymer modified cementitious waterproof coating in two components, after base preparation of cleaning, brushing and removal of flaky materials, grouting the porous area with cementetious grout, fixing of weep holes, grouting of pipe outlets etc and applying in two coats @ 750 Gms/Sqm/Coat. The coatings shall be applied at intervals and as per the manufacturer's specifications approved by Consultants. Cost to include the treatment along wall up to min 300 mm and no extra measurements shall be accounted for the wall treatment.

The second part consisting Providing and laying 75mm thick (average) M20 grade concrete protection screed mixed with Water proofing admixture conplast X 421 IC of Fosroc make or equivalent as per manufacturers specifications approved by consultants. Concrete shall laid be in panels along with polypropylene fibres( 0.90kg/Cum), 12mm and down size aggregates and coarse sand over waterproofing to proper Slopes including top surface shall be finished with 12mm thick waterproof plaster with CM 1:3. The groves to be made about 6mmX10mm size at 5mX5m intervals including filling the same with weather resistant sealent like (Colpor - 200 from Fosroc chemicals or (Pedilite / Polyplus / BASF) or equivalent). Measurements shall be considered as floor area only. Contractor shall provide a minimum guarantee period of 10 years.

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## 1.6 DESIGN PHILOSOPHY:

### Design Life

The design life of the building is assumed as 50 years. This requirement is applicable only for concrete works and not applicable to replaceable finishing materials, water proofing membrane and thermal insulations (if any). Hence periodic maintenance / refurbishment is required for all replaceable material for longer life.

### Design Interface:

- This structure has physical interface with almost all the disciplines like Geotechnical, MEP Services and Landscape etc.
- The Structure proposed is of cast in-situ concrete construction with columns suitably placed. The core walls around lifts, stairs are of cast in-situ concrete to resist lateral forces.
- The Structural design of the proposed project is based on Indian Standard Codes and is analyzed for Dead, Live, Wind and Seismic Load conditions taking into relevant load combinations recommended by the codes.
- The Vertical Loads including the dead and super imposed loads are transferred to the soil through columns, core walls and footings. Footings are sized with consideration to the safe bearing capacity of soil at the level of transfer of load recommended by specialist soil investigation consultants.
- The Lateral loads due to wind and seismic forces are dissipated to soil through the proposed Reinforced Concrete Core Walls/columns.
- The type of footings proposed is either individual, combined or raft depending on the Soil investigation report

➢ **CRACKED RC SECTION PROPERTIES AS PER IS 16700(2023):**

**Table 6 Cracked RC Section Properties**

*(Clause 7.2)*

| Sl No. | Structural Element | Un-factored Loads | | Factored Loads | |
|---|---|---|---|---|---|
| | | Area | Moment of Inertia | Area | Moment of Inertia |
| (1) | (2) | (3) | (4) | (5) | (6) |
| i) | Slabs | 1.0 $A_g$ | 0.35 $I_g$ | 1.00 $A_g$ | 0.25 $I_g$ |
| ii) | Beams | 1.0 $A_g$ | 0.7 $I_g$ | 1.00 $A_g$ | 0.35 $I_g$ |
| iii) | Columns | 1.0 $A_g$ | 0.9 $I_g$ | 1.00 $A_g$ | 0.70 $I_g$ |
| iv) | Walls | 1.0 $A_g$ | 0.9 $I_g$ | 1.00 $A_g$ | 0.70 $I_g$ |

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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.