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STRUCTURAL DESIGN BASIS REPORT

THE PROPOSED RESIDENTIAL BUILDING CONSIST OF STILT FLOOR + 5 FLOORS + ROOF WITH 15 DWELLING UNITS AVAILING PREMIUM FSI WITH TOD BENEFIT AT PLOT NO.8,NEW NO.23 , OLD DOOR NO.12 CHEVALIER SHIVAJI GANESAN ROAD (SOUTH BOAG ROAD),T.NAGAR,CHENNAI 600017,COMPRISED IN OLD S.NO.122/2,123/1,123/2,123/3,123/4&124/2 AND T.S.NO.6553/1&6553/2,BLOCK NO.141 OF T.NAGAR

CLIENT:	M/S AMARA HOMES, CHENNAI.
ARCHITECT:	ARCHITECTURE DIALOGUE BENGALURU
STRUCTURAL CONSULTANT:	**BURO ENGINEERS (I) PVT LTD,** CHENNAI.

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R0	21-11-2025	Design Basis Report	OKAY	PRATHAP	PERAM	PERAM
REV NO.	DATE	DESCRIPTION	STATUS	PREPARED BY	REVIEWED BY	APPRVD. BY

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- Design Information and criteria
- 3D Model & Analysis summary report
- Design of Pile cap
- Design of Shear Wall
- Design of Beam
- Design of Slab

DESIGN INFORMATION AND CRITERIA

1.0 INTRODUCTION

M/s. Amara Homes, proposed to construct a Residential building at T.Nagar, Chennai within the limits of Greater Chennai Corporation. Architecturally it is designed with ground floor +5 floors in which the ground are designed to facilitate car parking. All other floors are designed for Residential use.

1.1 Scope of the Report

This report provides the information on Codes of Practice, Design loads, Materials considered for the Design and Analysis of the building. In addition, this report summaries the main design criteria, Structural system, Foundation system, Parameters & Methodology to be adopted in the design.

1.2 Project Overview

The proposed Residential Apartment building comprises of stilt floor+ 5 floors + Roof. Plan dimension of the building at ground it is 55.25mx14.6m. Vertical access systems like Lift & Staircases are provided adequately & at the right location in order to fulfil the NBC norms and to satisfy the functional requirements as well. The building height & its storey details are as follows,

Sl. No.	No. Of Storey	Building Height	Plan dimension at Stilt /Typical floor Level	Remarks
1	Stilt Floor	18.6 (measuring from Stilt floor to roof)	55.25X14.6	With covered car parking
2	1st floors +Typical floor+ Roof	18.6 (measuring from Stilt floor to roof)	55.25X14.6	Without covered car parking

Building Floor Height Details	Stilt + 5 Floors + Roof
Stilt Floor (Car Parking)	3.475m
Typical Floors (1st Floor to 5th Floor) & Roof	3.025m
Head Room	3.025m
LMR	2.525m (from head room)

1.3 Proposed Structures and its Usage.

1.3.1 Structural Type

The building structures are mainly cast in situ reinforced concrete structure. The structural system comprises of R.C walls/Columns as vertical supporting structural elements with RC conventional Beam-slab system. Foundation is designed with Bored Cast In-situ Pile foundation as per sub-soil condition.

1.3.2 Foundation Type

The foundation system For the kind of proposed structure and the sub soil conditions, it is not possible to adopt any kind of open foundation system from both shear and settlement considerations. Hence, it is advisable to adopt deep pile foundation system.

The Foundation will be designed for the recommended Working compression Capacity as laid down in the Soil Investigation report no GEC-JC-GT-6056/2024-2025 dated 04-09-2024, is carried out by M/s. Geo Engineering Consultants situated at # 15, 2ndFloor, Murphy Das Street, Dr. Seethapathy Nagar, Velachery, Chennai.

1.4 Concrete

Characteristic concrete strength (concrete grade) for the project shall be based on exposure condition and forces to be supported by specified structural elements. The minimum cement content and maximum water–cement ratio shall be as per IS code 456:2000. The minimum 28-day compressive strength of concrete for specified structural elements shall be as follows

Table 1.4.1 Grade of Concrete for Individual Structural elements

Sl.No.	Structural Elements	Grade of Concrete
1.	Pile	M30
2.	Pile Cap	M30
3.	RC Shear wall	M30
4.	RC Columns	M30
5.	RC Beams	M30
6.	RC Beams	M30
7.	First floor PT BEAMS	M40

Table 1.4.2 Concrete Properties

Young's Modulus of Elasticity of Concrete	$5000\sqrt{fck}$
Poisson Ratio's Ratio v =	0.2
Coefficient of Thermal expansion	5.5x10-6

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1.4.3 Reinforcement

The characteristic tensile properties of steel used in design shall be as follows.

Reinforcement Characteristic yield strength f_{yk} (N/mm²)	**550 N/mm²**
Welded Steel Fabric yield strength $f_{0.2k}$ (N/mm²)	485 N/mm²
Young's Modulus E (kN/mm²)	200 kN/mm²
Poisson's ratio	0.3
Coefficient of Thermal expansion, α (°C⁻¹)	$12x10^{-6}$

1.4.4 Structural steel

All structural steel shall conform to Indian standard IS: 2062-2011.

Structural steel	Grade E=250	Grade E-350
Tensile strength	410 N/mm^2	490 N/mm^2
Yield stress t<20mm	250 N/mm^2	350 N/mm^2
Yield stress t = 20mm to 40mm	240 N/mm^2	330 N/mm^2
Yield stress t> 40mm	230 N/mm^2	320 N/mm^2
Young's Modulus (E)	200,000 N/mm^2	200,000 N/mm^2
Density	78.5 kN/m^3	78.5 kN/m^3

1.5 SUB-SOIL CONDITION

Soil Investigation report no. GEC-JC-GT-6056/2024-2025 dated 04-09-2024 was carried out by M/s. Geo Engineering Consultants, Chennai. Field investigation carried out for four (4) soil investigation boreholes of 150mm diameter up to 24m depth or up to the refusal strata with SPT>100 Taking the recommendation given by the soil consultant in to consideration, the building is designed with deep pile foundation system i.e. Bored Cast in situ piles are recommended as the suitable foundation system.

As per the evaluation reported by the geotechnical consultant the sub-soil in the project site is not susceptibility to "Liquefaction".

Refer the soil report for detailed profile of boreholes and the sub soil conditions.

2.0 DESIGN CRITERIA

2.1 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 and thermal insulation, facades etc. Hence periodic maintenance/refurbishment is required for all replaceable materials.

2.2 CODES, STANDARDS & REFERENCES

All design of structures shall comply with the requirements specified in the following.

a. Relevant Indian Standard Codes of Practice
b. National Building Code.
c. Local Building regulations.
d. Other relevant International codes where required.

All applicable latest editions of codes and standards will be referred and adopted in the analysis of structures and the design and detailing of structural members. All structural elements design shall be carried out primarily based on Indian Standards and Codes with latest revision, with amendments if any, as on date. In addition, other international codes and standards shall also be referred when required and relevant.

In the analysis, design and detailing of the building, the following Indian Standard codes of latest amendment will be used.

Table 2.2.1 Codes and Standards for Design Loads (Other Than Earthquake loads)

IS Code	Description
IS 875 (Part 1): 1987	Dead Loads (Unit Weight of Building Material and Stored Material)
IS 875 (Part 2): 1987	Imposed Load
IS 875 (Part 3): 2015	Wind Load
IS 875 (Part 5): 1987	Special Loads and Combinations

Table 2.2.2 Codes and Standards for Design of Earthquake Resistance structures

IS Code	Description
IS 1893(Part-1) :2016	Criteria for Earthquake Resistance design of structures.
IS 4326: 1993	Earthquake Resistant Design and Construction of Buildings – Code of Practice
IS 13920: 2016	Ductile Detailing of Reinforced Concrete Structures subject to Seismic Forces - Code of Practice.

Table 2.2.3 Codes and Standards for Design of Concrete Structures

IS Code	Description
IS 456: 2000	Plain and Reinforced Concrete - Code of practice
IS 6403 -1981	Code of practice for determination of bearing capacities of shallow foundations.
IS 8009-1976 (Part I):	Code of practice for calculation of settlement of foundations – Shallow foundation

IS 1904-1986(RA-2015)	Indian Standard Code of practice for design & construction foundations in Soil: General Requirements
IS 2950-1981(RA-2018)	Code of practice for design and construction of raft foundations : Part 1 Design (second revision).
IS 1080-1985(Raf.2011)	Code of Practice for Design and Construction of Shallow foundation in Soils
IS 6403-1981(Raf.2011)	Code of practice for determination of bearing capacity of Shallow foundations
IS 2950-1981(Raf.2011)	Code of Practice for Design and Construction of Raft foundations
SP 16	Structural use of concrete, Design charts for singly reinforced beams, doubly reinforced beams and columns.
SP 34	Hand book on Concrete Reinforcement & Detailing
SP 7(Part IV)	National Building code of India
IS 1786-2008(RA-2018)	Specification for high strength deformed bars and wires for concrete Reinforcement.
IS 432 (Part 2) 1982	Specification for Mild Steel and Medium Tensile Steel Bars and Hard Drawn Steel Wire for concrete reinforcement – Hard Drawn Steel Wire
IS 3370 (part I)-2009	Code of practice for concrete structure for the storage of liquids

The building is a RCC structure designed with Structural wall System. The slabs of all floor is used as diaphragms in redistribution of lateral forces.

Materials specified will 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.

2.3 LOADS

Table A: Unit Weight of Materials:

Material	Density
Reinforced Cement Concrete	25.00 kN/m^3
Plain Cement Concrete	24.00 kN/m^3
Screed Concrete	24.00 kN/m^3
Cement Mortar	20.00 kN/m^3
AAC	**7.5 kN/m^3**
Structural Steel	78.50 kN/m^3
Cinder Concrete (Filling material)	08.00 kN/m^3
Dry soil	18.00 kN/m^3
Wet Soil	22.00 kN/m^3
Landscape soil	16.00 kN/m^3
Glass	28.00 kN/m^3
water	10.00 kN/m^3

2.3.1 Superimposed Dead Loads and Live Loads

The following are the imposed loads such as SDL and LL to be considered for the design of floor system depending usage floor. In addition to these loads, self-weight of structural elements will be considered depending on member sizes shown in the floor plans.

First Floor (1st Floor) to (5th floor) (Living/Bedroom/Dining/Kitchen)		
	SDL (kN/Sq.mt.)	LL (kN/Sq.mt.)
Finishes	1.5	0.0
Services load (ceiling)	0.0	0.0
Live Load	0.0	2.0
Partition/Filling Load	0.0	0.0
Total	**1.5**	**2.0**
First Floor (1st Floor) to (5th floor) (Toilet)		
	SDL (kN/Sq.mt.)	LL (kN/Sq.mt.)
Finishes + Filling Load	3	0.0
Services load (ceiling)	0.0	0.0
Live Load	0.0	2.0
Partition Load	0.0	0.0
Total	**3**	**2.0**
First Floor (1st Floor) to (5th floor) (Corridor/Lobby)		
	SDL (kN/Sq.mt.)	LL (kN/Sq.mt.)
Finishes	1.5	0.0

Services load (ceiling)	0.0	0.0
Live Load	0.0	3.0
Partition Load	0.0	0.0
Total	**1.5**	**3.0**
First Floor (1st Floor) to (5th floor) (Servant Room)		
	SDL (kN/Sq.mt.)	LL (kN/Sq.mt.)
Finishes + Filling Load	1.5	0.0
Services load (ceiling)	0.0	0.0
Live Load	0.0	2.0
Partition Load	0.0	0.0
Total	**1.5**	**2.0**
First Floor (1st Floor) to (5th floor) (Balcony)		
	SDL (kN/Sq.mt.)	LL (kN/Sq.mt.)
Finishes + Filling Load	3.0	0.0
Services load (ceiling)	0.0	0.0
Live Load	0.0	3.0
Partition Load	0.0	0.0
Total	**3.0**	**3.0**
Roof		
	SDL (kN/Sq.mt.)	LL (kN/Sq.mt.)
Finishes (weathering courses)	3.0	0.0
Services load (ceiling)	0.0	0.0

Live Load	0.0	3.0
Partition Load	0.0	0.0
Total	**3.0**	**3.0**
LMR		
	SDL (kN/Sq.mt.)	LL (kN/Sq.mt.)
Finishes	15.0	0.0
Services load (ceiling)	0.0	0.0
Live Load	0.0	2.0
Partition Load	0.0	0.0
Total	**15.0**	**2.0**
OHT		
	SDL (kN/Sq.mt.)	LL (kN/Sq.mt.)
Finishes	25.0	0.0
Services load (ceiling)	0.0	0.0
Live Load	0.0	2.0
Partition Load	0.0	0.0
Total	**25.0**	**2.0**

In the analysis and design reduction to imposed load (Live load) shall be considered as per IS 875 Part (2), clause.3.2 where it is applicable.

2.4 WIND LOAD

Design wind load for the buildings shall be estimated as per IS 875 (Part 3): 2015. Design wind speed (Vz) is based on such as location, basic wind speed, terrain, cyclone condition and topography.

Location of the building	Chennai
Basic Wind speed - Vb m/sec	50 m/sec
Risk Coefficient (Probability factor) -k1	1.0
Terrain factor (Terrain-2) – k2	1.062
Topography factor – k3	1.0
Importance factor (Cyclonic region) – k4	1.0

Design wind speed (Vz) = Vb*k1*k2*k3*k4 =50x1.0x1.062x1.0x1.0 = 53.1m/sec

Wind pressure (Pz) = 0.6 Vz^2 = 0.6x 53.1^2 =1692 N/m^2

For design of building wind pressure 1.69 kN/m^2 is considered.

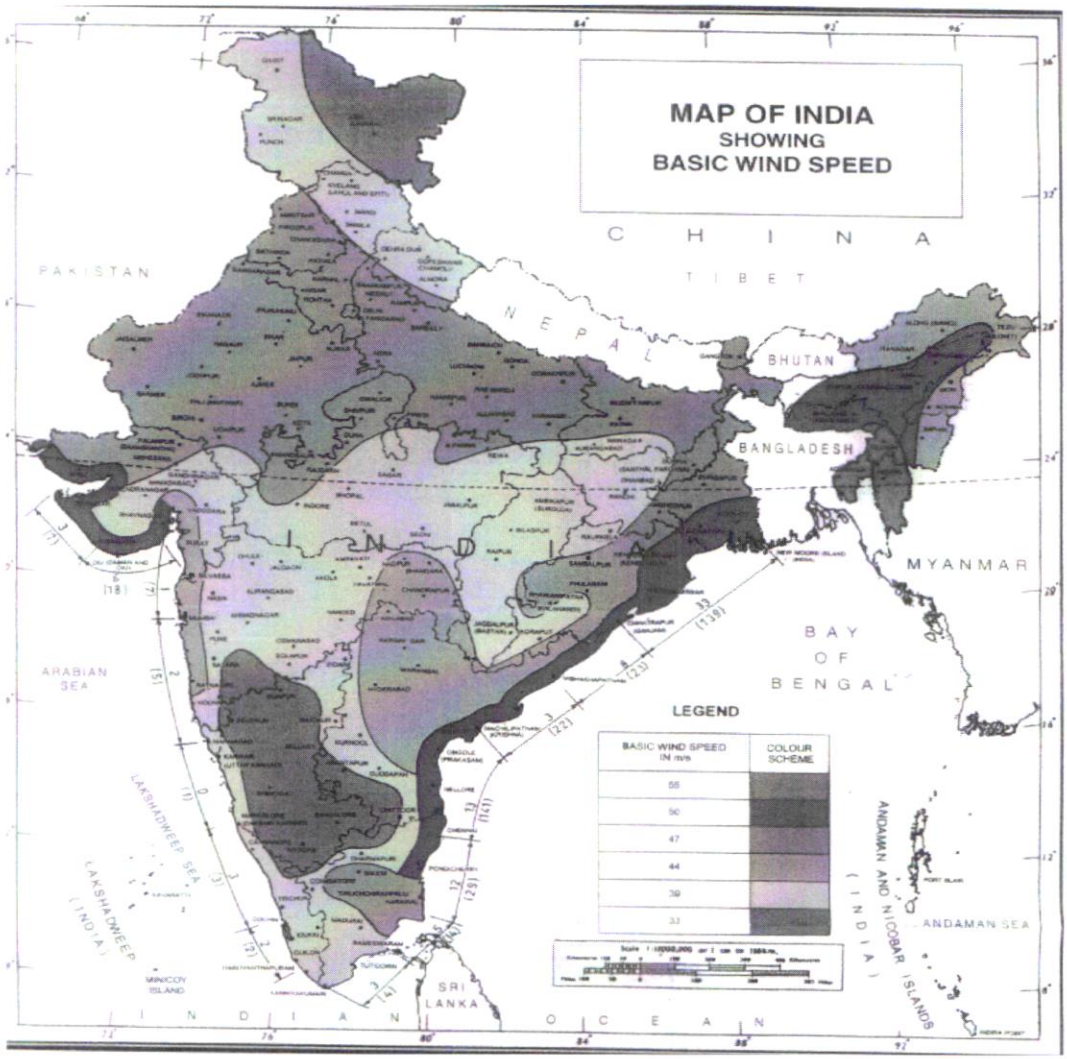
Design wind pressure (P_d) = K_d*K_a*K_c*P_z

Where K_d - Wind Directionality factor = 1.0

Ka – Area averaging factor = 0.9

Kc – Combination factor = 0.9

Design Wind pressure = 2.05x1.0x0.9x0.9 = 1.66 kN/m^2



2.5 SEISMIC LOAD

Design of lateral force under seismic condition shall be as per IS1893 – 2016. Total lateral force (base shear) of the building shall be estimated as per clause 7.2.1 of IS1893 – 2016 which provides by

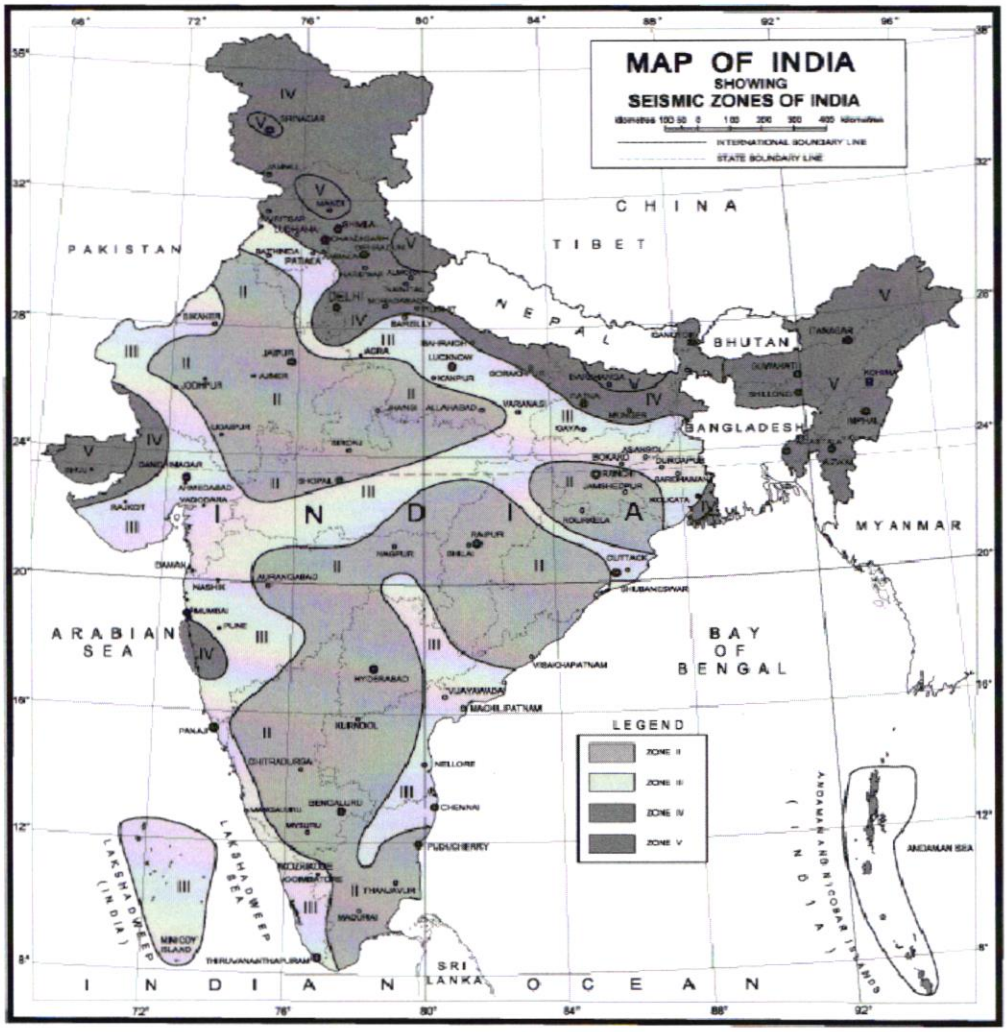
Base shear $V_b = A_h W$

A_h is horizontal seismic coefficient and W is seismic weight of the building, Horizontal seismic coefficient depends on location of the building (Zone factor Z), usage of the building (Importance factor, I), building lateral resisting system (Response reduction factor, R) and design acceleration coefficient (Sa /g) which is based on subsoil condition and fundamental natural period (Ta).

For the proposed development is for residential use. Considering it, the seismic weight is summation of total dead load and 25% of live load where live load is less than 3 kN/sq.mt. The fundamental natural period (Ta) for building

$Ta = 0.09h/(d)^{0.5}$

Where h- height of the building & d – width of the building under consideration of earthquake.



2.5.1 Design Parameters for estimation of seismic loading

Sl.No.	Description	Parameters as per IS-1893-2016
1.	Location - Chennai	Seismic zone III
2.	Seismic Zone Factor	0.16
3.	Response Reduction Factor: Structural Wall System	4
4	Importance factor	1.2
5	Type of Soil (Medium)	Type II
6	Damping coefficient	5%

2.5.2 Base Shear

Height of the building (h) (measured from Stilt floor)
d (along the length of the building)
b (along the breadth of the building)

a) Ta (along x) = Refer - 2.6.2

b) Ta (along y) = Refer - 2.6.2

From IS 1893: 2002, Clause 6.4.2, Design horizontal seismic coefficient

$$Ah = \frac{Z}{2} x \frac{I}{R} x \frac{Sa}{g}$$

Where,

Z for Zone III = 0.16
I for Residential Building = 1.2 (Refer to IS 1893-2016, Table.9)
R for Structural wall system = 4.0 as per (Table 9)
Sa/g (For Rocky) x direction = (Refer to IS 1893-2016, page 13, Fig 1)

Sa/g (For Rocky) y direction = (Refer to IS 1893-2016, page 13, Fig 1)

Design horizontal seismic coefficient and base shear

X- direction Vbx = Ahx * W
Y- direction Vby = Ahy * W

2.5.3 Dynamic Analysis

Response spectrum method of Dynamic Analysis carried out with following parameters pertaining to dynamic analysis.

Time period	: Calculated with the assumption of wall system
Number of modes Considered	: 12 Numbers (Min)
Modal Combination Method Used	: Complete Quadratic combination (CQC).
Spatial Combination Method used	: Square root of the sum of Square (SRSS).
Modal case type	: Ritz Method.
Orthogonal directional seismic effect	: Not applicable.

3.0 Structural Analysis and design

3.1 Assumptions considered in the design

The assumptions for structural analysis and design are as below

- Elastic analysis (plane remains plane).
- Structure shall be analysed for the most adverse load conditions and envelope of forces shall be designed for.
- Cracked section properties of structural RC structural elements are used in the analysis as per IS 16700-2023, clause 7.2, Table 6.

3.2 Concrete Cover

Concrete cover to the reinforcement in structural elements is based on durability and fire rating. The fire rating of 2hrs is considered for structural elements for the commercial development.

Sl. No.	Structural Elements	Cover in mm
1.	Pile/Pile Cap	75
2.	RC Wall	30
3.	Column	40
4.	RC Beams/PT Beam	30/40
5.	Slabs/PT Slab	25/40
6.	UG Tank Base Slab/Wall	40

3.3 Method for analysis

Computer-aided analysis using finite element method (FEM) shall be carried out for the design of structural elements. For 3D or 2D structural frame analysis latest version of software ETABS, SAFE shall be used, Prokon, RCDC and verified in-house spread sheets will be used for the design of reinforced concrete (RC) and steel elements in consideration of flexure, shear and axial forces.

3.4 Assumptions for 3D model analysis using ETABS

Column: Frame Element
RC Wall: Wall (Shell) Element
Beam Element: Frame Element
Slab: membrane Element

The following are general parameters adopted in the analysis and design,

Modulus of Elasticity of Concrete -5000√fck

Consideration of Diaphragm - Rigid Diaphragm.

Slab element considered as membrane element

Stiffness modification factors are adopted in the analysis as per IS -16700-2023, Table.6.

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	$1.0\ A_g$	$0.9\ I_g$	$1.00\ A_g$	$0.70\ I_g$

The following parameters and methods are adopted in creating ETABS 3D model for the buildings and design of structural elements.

- The 3D ETABS model generated based on the preliminary floor plans (shuttering drawings) prepared using preliminary sizes.
- Sectional properties are assigned to all the structural elements as per the preliminary floor plans (shuttering drawings).
- External & Internal in fill wall loads are assigned as uniformly distributed line load on beams and as area load if the wall is intend to distribute on slab directly. These loads are assigned under SIDL type load case.
- Slabs are modelled as shell element if floor system is Flat slab and the slab has been modelled as membrane in Beam-slab as floor system and slabs are assigned with horizontal diaphragms.
- Live Load reduction is considered in the design of Foundation and Column as per the Code: IS 875-1987 (Part-II), clause.3.2.1.
- Area design load i.e. Live load/SIDL or any other load is applied at floor relevant to its usage.
- All lateral loads & parameters are assigned as per Codes IS 1893-2016 & IS 875-2015.
- Temperature loads are applied on to the terraces and to areas directly exposed to sun.
- Beams under Torsion is required to maintain Equilibrium will be designed for Torsion in accordance with IS 456-2000, clause 41.1 to 41.4 and for all other beams torsional stiffness is neglected in the analysis by applying stiffness modifier as 0.0001 to torsional constant "J". Hence no specific design for Torsion is required for these beams.
- Chennai falls under zone-III. Hence ductile detailing is followed in the design and detailing of structural elements.
- Concrete cover to reinforcement complied accordance with IS 456-2000, Tabl.16 & 16A.
- UG Sump is designed for the crack width of 0.2mm.
- Secondary beams are not designed for ductile detailing.
- Long term deflections are checked by manual calculation using excel spread sheet wherever necessary. Crack width calculation will be done using spread sheet wherever necessary.

Area Load & Application: Applied as uniformly distributed area load with intensity proportionate to its usage as mentioned in the Loading items in the DBR.

Line (Wall) Load & Application: non load bearing or infill wall loads are calculated appropriately and Applied as uniformly distributed line load.

Lateral Load Resisting Systems: The proposed structure is a Structural RC wall with Beam-slab system.

4.0 LOAD COMBINATIONS

The various loads shall be combined in accordance with the stipulations in IS 875 (Part 5) 1987 and IS 456: 2000. The structure will be checked for serviceability Limit State and Ultimate Limit State (Limit State of Collapse) conditions. The load factors to be used for the load combinations are shown in the Table below. The structural elements shall be designed and checked for the critical forces from the combinations.

Load Combination	LOAD FACTORS								
	D.L.	I.L.	T.L	EQX	EQY	SPECX	SPECY	WX	WY
Limit State Of Serviceability (LSS) Combinations									
LC1	1.0	-	1.0	-	-	-	-	-	-
LC2	1.0	1.0	1.0	-	-	-	-	-	-
LC3	1.0	-	1.0	1.0	-	-	-	-	-
LC4	1.0	-	1.0	-1.0	-	-	-	-	-
LC5	1.0	-	1.0	-	1.0	-	-	-	-
LC6	1.0	-	1.0	-	-1.0	-	-	-	-
LC7	1.0	-	1.0	-	-	-	-	1.0	-
LC8	1.0	-	1.0	-	-	-	-	-1.0	-
LC9	1.0	-	1.0	-	-	-	-	-	1.0
LC10	1.0	-	1.0	-	-	-	-	-	-1.0
LC11	1.0	-	1.0	-	-	1.0	-	-	-
LC12	1.0	-	1.0	-	-	-1.0	-	-	-
LC13	1.0	-	1.0	-	-	-	1.0	-	-
LC14	1.0	-	1.0	-	-	-	-1.0	-	-
LC15	1.0	0.8	1.0	0.8	-	-	-	-	-
LC16	1.0	0.8	1.0	-0.8	-	-	-	-	-
LC17	1.0	0.8	1.0	-	0.8	-	-	-	-
LC18	1.0	0.8	1.0	-	-0.8	-	-	-	-
LC19	1.0	0.8	1.0	-	-	-	-	0.8	-
LC20	1.0	0.8	1.0	-	-	-	-	-0.8	-
LC21	1.0	0.8	1.0	-	-	-	-	-	0.8
LC22	1.0	0.8	1.0	-	-	-	-	-	-0.8
LC23	1.0	0.8	1.0	-	-	0.8	-	-	-
LC24	1.0	0.8	1.0	-	-	-0.8	-	-	-
LC25	1.0	0.8	1.0	-	-	-	0.8	-	-
LC26	1.0	0.8	1.0	-	-	-	-0.8	-	-
Limit State Of Collapse (LSC) Combinations									
COMB1	1.5	-	1.0	-	-	-	-	-	-
COMB2	1.5	1.5	1.0	-	-	-	-	-	-
COMB3	1.2	1.2	1.0	1.2	-	-	-	-	-
COMB4	1.2	1.2	1.0	-1.2	-	-	-	-	-
COMB5	1.2	1.2	1.0	-	1.2	-	-	-	-
COMB6	1.2	1.2	1.0	-	-1.2	-	-	-	-
COMB7	1.2	1.2	1.0	-	-	-	-	1.2	-
COMB8	1.2	1.2	1.0	-	-	-	-	-1.2	-
COMB9	1.2	1.2	1.0	-	-	-	-	-	1.2
COMB10	1.2	1.2	1.0	-	-	-	-	-	-1.2
COMB11	1.2	1.2	1.0	-	-	1.2	-	-	-
COMB12	1.2	1.2	1.0	-	-	-1.2	-	-	-
COMB13	1.2	1.2	1.0	-	-	-	1.2	-	-
COMB14	1.2	1.2	1.0	-	-	-	-1.2	-	-
COMB15	1.5	-	1.0	1.5	-	-	-	-	-
COMB16	1.5	-	1.0	-1.5	-	-	-	-	-
COMB17	1.5	-	1.0	-	1.5	-	-	-	-
COMB18	1.5	-	1.0	-	-1.5	-	-	-	-

COMB19	1.5	-	1.0	-	-	-	-	1.5	-
COMB20	1.5	-	1.0	-	-	-	-	-1.5	-
COMB21	1.5	-	1.0	-	-	-	-	-	1.5
COMB22	1.5	-	1.0	-	-	-	-	-	-1.5
COMB23	1.5	-	1.0	-	-	1.5	-	-	-
COMB24	1.5	-	1.0	-	-	-1.5	-	-	-
COMB25	1.5	-	1.0	-	-	-	1.5	-	-
COMB26	1.5	-	1.0	-	-	-	-1.5	-	-
COMB27	0.9	-	1.0	1.5	-	-	-	-	-
COMB28	0.9	-	1.0	-1.5	-	-	-	-	-
COMB29	0.9	-	1.0	-	1.5	-	-	-	-
COMB30	0.9	-	1.0	-	-1.5	-	-	-	-
COMB31	0.9	-	1.0	-	-	-	-	1.5	-
COMB32	0.9	-	1.0	-	-	-	-	-1.5	-
COMB33	0.9	-	1.0	-	-	-	-	-	1.5
COMB34	0.9	-	1.0	-	-	-	-	-	-1.5
COMB35	0.9	-	1.0	-	-	1.5	-	-	-
COMB36	0.9	-	1.0	-	-	-1.5	-	-	-
COMB37	0.9	-	1.0	-	-	-	1.5	-	-
COMB38	0.9	-	1.0	-	-	-	-1.5	-	-

5.0 ACCEPTANCE CRITERIA

Under Serviceability Limit State the limiting structural deflection shall be as follows.

Total deflection under all imposed loads including temperature, creep and shrinkage shall not exceed **L/250.**
In the above limiting value, the deflection contribution due to temperature, creep and shrinkage shall not be more than **L/350**.

Lateral deflection (sway) due to wind shall not exceed **H/500 (0.002 H)** where H is the height of the building above ground.

5.1 Crack width Limits

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

- In general, for slabs crack width is limited to 0.3mm.
- For water retaining structures, sump slab crack width is limited to 0.2mm

6.0 Design of Structural Elements and Foundation

6.1. Pile Foundation

The load intensity of column is moderate and it is proportionate to the no. of stories. Bored Cast In-situ Pile Foundation is designed taking the sub-soil condition reported in the soil investigation report

report no. GEC-JC-GT-6056/2024-2025 dated 04-05-2024, was carried out by M/s. Geo Engineering Consultants, Chennai. The working compression capacity used as 800KN, 1000KN for Pile diameters of 500mm, 600mm respectively. The expected pile length shall be 21m from EGL.

6.2. RC Walls/Column

RC walls/Columns which are supporting both vertical loads and lateral forces are designed for the most adverse load conditions and envelope of the forces which will be the maximum for that structural element from the load combinations considered in the 3D analysis. The design of structural elements are designed in ETABS for the maximum forces obtained from the load combinations. As the buildings are located in Zone III, ductile design & detailing is followed in the design & detailing.

6.3. Beams

Each Beam will be designed for maximum forces from the 3D analysis using ETABS or RCDC concrete design software shall be used to design of RC members. Also, the detailing shall be followed as per SP-34 & IS-456 etc.

6.4. Slabs

Slabs are designed using SAFE 20 for irregular shaped slabs and regular slabs are designed using in house spread sheet formed as per IS-456 Annexe-D, Table-26.

6.5 P T Design

6.5.1 PRESTRESSING SYSTEMS (1ST FLOOR PT GIRDER BEAMS ONLY)

The pre-stressing system is incorporating strands with 12.70 mm dia. strand /15.20 mm dia strand. Prestressing strands shall be of class-2, confirming to IS 14268-1995

Materials Data

Strands	0.5"	0.6"
Nominal Diameter	12.7mm	15.2mm
Nominal Area	98.7mm	141mm^2
Nominal weight	0.775 kg/m	1.15 kg/m
Tensile strength	1860 N/mm^2	1860 N/mm^2
Modulus of elasticity	195 N/mm^2	195 N/mm^2
Min breaking load of strand	184kN	263kN

Strand quality in accordance with IS 14268 IS 14268

6.5.2 GENERAL ASSUMPTIONS FOR PT BEAM DESIGN

1) Strength design of prestressed member for flexure and axial loads shall be based on assumptions given in IS1343/ Clause 18.3 (Chapter 18) ACI-318

2) Design moment strength of flexural members shall be computed by the strength design method of the code IS1343/ACI-318

3) Prestressed flexural members shall be classified as class U, Class T or Class C based on extreme fiber stress (Ft) in tension in pre compressed tensile zone calculated at service loads.

4) Serviceability Design Requirements are as per clause 18.3 ACI-318/ IS1343

5) Deflection of prestressed flexural members shall be calculated in accordance with Clause

18.3.5- ACI-318 / IS1343

6) Permissible tensile stresses in flexural member are as per Class-C (Table 18.3.3- ACI-318) / IS1343

7) Permissible stresses in prestressing steel shall not exceed the following

a. Due to prestressing steel jacking force 0.94 Fpy (specified yield strength of prestressing steel in psi) but not greater than the lesser of 0.80(Fpu specified tensile strength of Prestressing steel)and the maximum value recommended by the manufacturer of prestressing steel or anchorage devices.

b. Immediate after prestress transfer 0.82 Fpy but not greater than 0.74 Fpu (specified tensile strength of prestressing steel)

8) Minimum Bonded reinforcement shall be provided in all prestressed flexural members is as per Clause 18.9-ACI-318 / IS1343.

9) Minimum average effective prestress of 125 psi on the slab section tributary to the tendon or tendon group.

10) Required elongation shall be determined from average load-elongation curves for the prestressing steel used. Generally 7% tolerance in prestressing steel force determined by gauge pressure and elongation measurements for post tension construction.

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3D MODEL

&

ANALYSIS SUMMARY REPORT

DESIGN OF PILE CAP

DESIGN OF COLUMN

DESIGN OF SHEAR WALL

DESIGN OF BEAM

DESIGN OF SLAB

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
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- 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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