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STRUCTURAL DESIGN BRIEF REPORT



The detailed engineering and structure design of the Proposed Construction of Residential Non High Rise Building Villa No.1 to 110 Consists of Ground Floor + First Floor. comprised in Survey Nos.1009/12A, 1009/12B, 1009/12C, 1009/12D, 1009/12E, 1009/12F, & 1009/13A, 1009/13B, 1009/13C, 1009/14, 1009/17A, 1009/17B, 1010/1, 1010/2, 1010/3, 1011/1, 1011/2, 1011/3. 1439/2C, 1439/2C, 1439/2D, 1439/3A1 & 1439/3B of Thaiyur B Village, Thiruporur Taluk, Chengalpattu District. Totally 110 D/U, with Amenity Block to Residential Building Consist of Ground Floor with Swimming Pool on the first Floor Level comprised in Survey No.1009/12A, 1009/12B, 1009/12C1 & 1009/13A3, in DTCP Approved Layout No: L.P/MLPA No. 289/2025 Dated:05.11.2025, of Thaiyur B Village, Thiruporur Taluk, Chengalpattu District.

Quadrometry Engineering (OPC) Pvt. Ltd. Bangalore

QUADOMETRY
ENGINEERING

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Sl. No.	CONTENTS	Pg. No.
1	INTRODUCTION	01
2	PROJECT DESCRIPTION	01
3	CONSTRUCTION TYPE	02
4	STRUCTURAL SYSTEM	02
4.1	FOUNDATION	02
4.2	SUPER STRUCTURE	02
5	STRUCTURAL DESIGN STANDARDS AND CODES CONSIDERED	03
6	DESIGN LOADS	05
6.1	DEAD LOADS	05
6.2	Wall LOADS	06
6.3	LIVE LOADS	06
6.4	WIND LOADS	06
6.5	SEISMIC LOADS	07
6.6	TEMPERATURE LOADS	08
6.7	PRIMARY LOADS AND LOAD COMBINATIONS	09
7	FIRE RESISTANCE OF ELEMENTS	09
8	ENVIRONMENTAL EXPOSURE	10
9	COVER TO REINFORCEMENTS	10
10	MATERIALS	11
11	ANALYSIS OF STRUCTURE	11
12	DESIGN OF STRUCTURE	12
13	ACCEPTANCE CRITERIA	13
14	WATERPROOFING	14
	ANNEXURE	15

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1. INTRODUCTION

Quadometry Engineering Pvt. Ltd. has been appointed as Structural Consultants by **M/s CASAGRAND CHENNAI** to develop structural schemes and design for proposed Construction of Residential Non High Rise Building Villa No.1 to 110 Consists of Ground Floor + First Floor. comprised in Survey Nos.1009/12A, 1009/12B, 1009/12C, 1009/12D, 1009/12E, 1009/12F, & 1009/13A, 1009/13B, 1009/13C, 1009/14, 1009/17A, 1009/17B, 1010/1, 1010/2, 1010/3, 1011/1, 1011/2, 1011/3. 1439/2C, 1439/2C, 1439/2D, 1439/3A1 & 1439/3B of Thaiyur B Village, Thiruporur Taluk, Chengalpattu District. Totally 110 D/U, with Amenity Block to Residential Building Consist of Ground Floor with Swimming Pool on the first Floor Level comprised in Survey No.1009/12A, 1009/12B, 1009/12C1 & 1009/13A3, in DTCP Approved Layout No: L.P/MLPA No. 289/2025 Dated:05.11.2025, of Thaiyur B Village, Thiruporur Taluk, Chengalpattu District.

The objectives of these reports are stated as follows:

- Define the engineering strategy and parameters in relation to the building structure and Architectural concept.
- Identify and record all input requirements, Analysis and design criteria.
- Develop structural scheme compatible with Architectural vision, services requirements and client's needs.
- Prepare structural design that will aim to actual structural durability and integrity.
- Desirable structural performance under characteristic services load.
- Fast-track construction and cost effectiveness

2. PROJECT DESCRIPTION

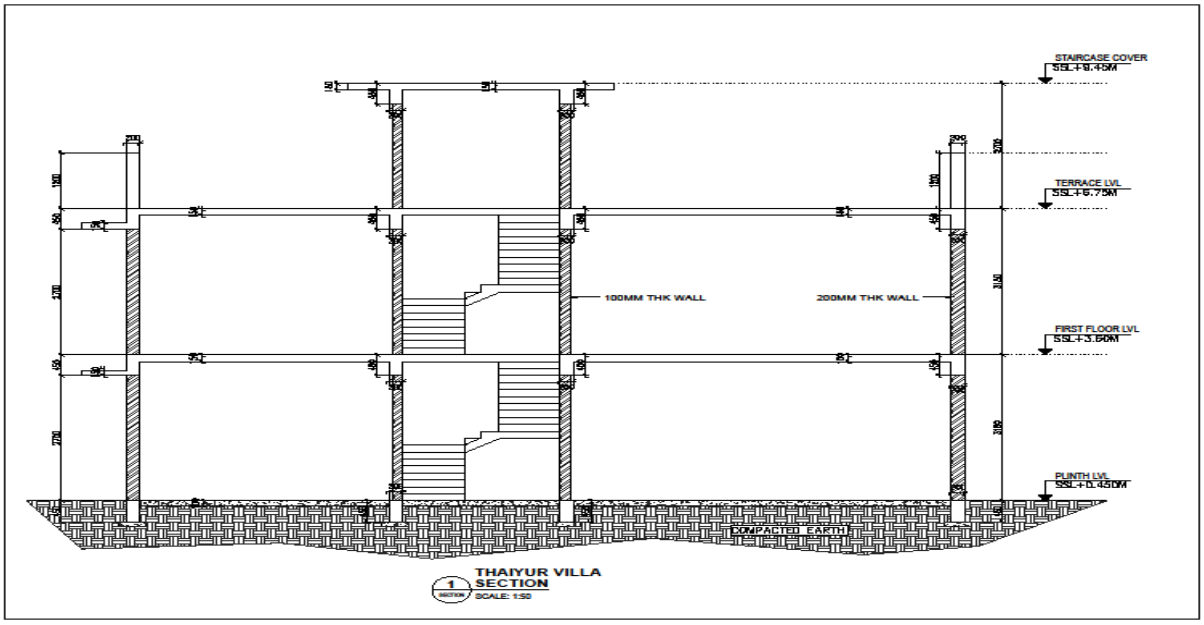
The proposed residential development consists of villa along with one Ground Floor, First floor, & Terrace Floor. This design basis caters for the Structural Design of Villa building.

Villa will have Ground floor, First floor & terrace. Height of the Blocks is approx. 9.0m from ground level.

Dimensions of Villa are approx. 16.6m x 7.72m with following floor heights

Ground Floor	:	3.15 m
First Floor	:	3.15 m
Terrace Floor	:	2.75 m

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SL.NO	VILLA TYPE	NO OF VILLA
1	TYPE-A- 3BHK (TYPICAL)	59
2	TYPE-B - 3BHK (EWS)	29
3	TYPE-C -3BHK (CUSTOMIZED)	9
4	TYPE-D1 -3BHK(CUSTOMIZED)	1
5	TYPE-D2 -3BHK(CUSTOMIZED)	2
6	TYPE-D3 -3BHK(CUSTOMIZED)	0
7	TYPE-E1 -3BHK(CUSTOMIZED)	1
8	TYPE-E2 -3BHK(CUSTOMIZED)	1
9	TYPE-E3 -3BHK(CUSTOMIZED)	1
10	TYPE-E4 -3BHK(CUSTOMIZED)	1
11	TYPE-F -4BHK(CUSTOMIZED)	4
12	TYPE G -3BHK(CUSTOMIZED)	1
13	TYPE G -3BHK(CUSTOMIZED)	1
	TOTAL AREA	**110**

3. CONSTRUCTION TYPE

SUBSTRUCTURE

There will not be any basement. The buildings will be supported on set of Isolated footing for Column.

SUPERSTRUCTURE

The superstructure will be constructed in conventional RCC slab system with beams, & columns. Concrete will be poured in a RCC slab on erection of formwork and fabrication of reinforcement.

4. STRUCTURAL SYSTEM

4.1 FOUNDATION

Based on the proposed structure and sub soil conditions, Geotechnical investigations report recommends Isolated foundation system. As per Soil report the footings will be designed for allowable Bearing Capacity, For Isolated Footing 150 kN/sq.m at depth of 1.5m below natural ground level.

Table-4.1 Recommended Allowable Safe Bearing Pressures

Sl.No.	Depth of Foundation below E.G.L. (m)	Allowable Safe Bearing Pressure (kPa)	Elastic Settlement (mm)
		Size of Foundation (m)	Size of Foundation (m)
		1.0	1.0
1	1.00	100	2.64
2	1.25	125	3.30
3	1.50	150	3.46
4	2.00	200	4.10

4.2 SUPERSTRUCTURE

- The proposed structural system for this project is a RC Beams & Column and RC Slabs.
- RC Columns are spaced according to the framing plans based on the architectural requirement in order to transfer the loads from the Super Structure to the Foundation System.
- The structure with villa is analysed using industry standard software ETABS.
- Beams and columns are assigned as frame elements and Slabs are assigned with shell elements wherever required.
- The slab has been considered as a rigid diaphragm at the respective floor levels to transfer the lateral forces to vertical members.
- Appropriate load and its combinations, as per relevant clauses in the latest IS codes for most unfavourable effects are chosen for design.

5. STRUCTURAL DESIGN STANDARDS AND CODES CONSIDERED

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(Part 1): 1987:	Dead Loads Unit Weight of Building Material and Stored Material
IS 875(Part 2): 1987:	Imposed Loads
IS 875(Part 3): 2015:	Wind Loads
IS 875(Part 4): 1987:	Snow Loads
IS 875(Part 5): 1987:	Special loads and load combinations
IS 1893:2016:	Criteria for earthquake resistance design of structures.
IS: 13920-2016:	Code of practice for ductile detailing of reinforced concrete structures subjected to seismic forces

Foundations:

IS 1080:1985(2016):	Code of Practice for design and construction of shallow foundations on soils (other than raft, ring and shell).

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IS 1904:1986(2015):	Code of Practice for design and construction of foundation in soils general requirements.
IS 2950:1981(2013):	Code of Practice for design and construction of raft foundations
IS 2974:1998(2015/13):	Code of Practice for design and construction of machine foundations (All parts).
IS 8009:1976/1980(2013/15):	Code of Practice for calculations of foundations (All parts).

RCC:

IS 456:2000:	Code of Practice for plain and reinforced concrete
IS 458:1988:	Specification for precast concrete pipes
IS 3370:2009:	Code of Practice for concrete structures for the storage of liquids
IS 4326:2013:	Code of Practice for earthquake resistant design and construction of buildings.
IS 5525:1969(2013):	Recommendation for detailing of reinforced concrete works.
IS 1786:2008:	Specification for high strength deformed steel bars and wires for concrete reinforcement.
IS 10262:2009:	Recommended guidelines for concrete mix design.
IS 1893(Part-1) 2016:	Criteria for earthquake resistant design of structures (General provision and buildings).
IS 13920:2016:	Code of practice for ductile detailing of reinforced concrete structures subjected to seismic forces.
IS 1343:2012:	Prestressed Concrete

Structural steel:

IS 800:2007	Code of Practice for general construction in steel.
IS 806:1968(2013):	Code of Practice for use of steel tubes in general building construction
IS 808:1989:	Dimension for Hot rolled steel beam, column channel and angle section.
IS 816:1998:	Code of Practice for use of metal arc welding for general construction in mild steel.
IS 1161:1998:	Steel tubes for Structural Purpose.
IS 4000:1998:	High strength bolts in Steel Structures- Code of Practice
IS:7215 -1995	Tolerances for fabrication of steel structures.

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6. DESIGN LOADS

6.1 Dead Loads

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

Floor finish of 50 to 75 mm thickness

Self-weight of Plain concrete	:	2400 kg/cu.m (24 kN/cu.m)
Self-weight of RCC	:	2500 kg/cu.m (25 kN/cu.m)
Solid block masonry	:	2000 kg/cu.m (20 kN/cu.m)
Light weight block masonry	:	800 kg/cu.m (8 kN/cu.m)

(with additional 20mm thick plastering on external surface and 14mm plastering on internal) wall surfaces

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)
Masonry with plastering solid block	:	2000 kg/cu.m (22 kN/cu.m)
Masonry with plastering light block	:	1000 kg/cu.m (10 kN/cu.m)
Filling for sunken portion	:	1200 kg/cu.m (12 kN/cu.m) (Wherever filling is required)
Waterproofing	:	As per actuals
Landscape loads	:	300/450/600 soil filling/finishes as per landscape details
OHT loads above the terraces	:	NO OHT
Wall loads	:	As per actuals
Storage rooms	:	750 kg/sq.m (7.5 kN/sq.m)

6.2 Wall Load

- External Walls: 200 mm thick Block Masonry
- Internal Walls: 200/100 mm thick Block Masonry
- Around toilets: 100mm thick Block Masonry

Wall height in m	Wall thickness in mm	kN/m for solid weight cement block
3.15	200	10.2

3.15	100	5.1
Parapet/ Railing ht 1350mm	200	5

For 200 thk wall of height 3.15m Block Masonry,

load calculation = 0.2*3.15*20=12.6 KN/m.

- Toilet Sinking (General) 300 mm = 3.6 KN/m2
- Balcony 300 mm = 3.6 KN/m2
- Filling material for Sunken Slabs Concrete

6.3 Live Loads

Loads for the building shall be taken as follows as per IS: 875 (Part II),

Corridors, passages, lobbies and Staircase	:	3.0 kN/sq.m
Living	:	2.0 kN/sq.m
Bedroom	:	2.0 kN/sq.m
Bath and toilet rooms	:	2.0 kN/sq.m
Terrace/Balcony	:	3.0 kN/sq.m

Wind loads have been derived on basis of IS: 875 (Part 3) 2015

Basic wind speed considered Vb	:	50 m/s (for CHENNAI)
Building classification/ topography data		
Risk coefficient, k1	:	1 Table 1, IS 875 (Part 3)
Topography factor, k3	:	1
Terrain Category	:	2 Cl 6.3.2.1, IS 875 (Part 3)

Terrain and Height Multiplier (k2) will be calculated separately for the building as per Table 2 of IS 875 (Part 3):2015

Importance factor for cyclonic region(k4)	:	1 Cl 6.3.4, IS 875 (Part 3)

6.4 Wind pressure calculation (Cl. 7.2, IS 875 (Part 3) 2015)

Pz	:	0.6Vz2
Vz	:	k1 x k2 x k3 x k4 x Vb
Pd	:	Kd x Ka x Kc x Pz
Where Kd	:	wind directionality factor
Ka	:	area averaging factor

Kc : combination factor

6.5 Seismic Loads

Seismic design and detailing shall be in accordance with IS 1893 (Part 1):2016 and IS 13920:2016 respectively. Thaiyur(Chennai) falls under Zone III as categorized in IS: 1893-2016. All shear walls will be ordinary walls and has to resist 100% of lateral shear.

Seismic Force is considered in all three directions in accordance with IS 1893 (Part 1):2016.

The seismic design parameters are as follows:

Z : 0.16 (as per Table 3 IS 1893:2016)

I : 1.0 (Building as per Table 8 of IS 1893:2016)

Damping : 5% (as per Cl 7.2.4 of IS 1893:2016)

Soil type II : (for Medium or Stiff soils as per Cl 6.4.2 of IS 1893:2016)

R : 5.0 (Refer Table 9; SMRF)

Design Lateral Force: (as per Cl.7.2, IS 1893:2016)

Time Period

$T = : 0.075\ h^{0.75}$

h= Height of the Building.

Minimum design Lateral Force

Building will be designed for minimum lateral force for 0.7 % of total seismic weight as per Cl.7.2.2 of IS 1893:2016 (Table 7 for Seismic Zone III). For isolated and combined footings with tie beams, SBC will be increased by 25% in earthquake condition for Rock or Hard soils, in accordance with Table 1, Sl. No. (i) of IS 1893 Part 1.

6.6 Primary Loads and Load Combination

DL : Dead Load

LL : Live Load

WLX : Wind Load in + ve X-Direction

WLY : Wind Load in + ve Y-Direction

EQx : Seismic Load in X-Direction

EQy : Seismic Load in y-Direction

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Load combinations Used for Strength, Serviceability are tabulated below:

Load Combination	Limit State of Collapse			Limit State of Serviceability		
	DL+SDL	*LL*	*WL/EL/TL*	*DL+SDL*	*LL*	*WL/EL/TL*
DL + LL	1.5	1.5	—	1	1	—
DL + WL	1.5 or 0.9*	—	1.5	1	—	1
DL + EL	1.5 or 0.9*	—	1.5	1	—	1
DL+LL+WL	1.2	1.2	1.2	1	0.8	1
DL+LL+EL	1.2	1.2	1.2	1	0.8	1

DL - Dead Load; LL - Live Load; WL - Wind Load; EL - Earthquake Load

Vertical earthquake effect is not considered for the design of structural elements. 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: 1893-2016 / Clause 7.3.3 of seismic code will be used both for evaluating earthquake effect and for combined load effects used in such combination.

7. FIRE RESISITANCE OF ELEMENTS

All structural members will be designed for two-hour fire rating. The requirements for fire resistance will be met by adopting the minimum structural dimensions and clear cover to reinforcement. Minimum dimension of structural element and Nominal cover to reinforcements will be provided as given IS: 456-2000.

8. ENVIRONMENTAL EXPOSURE

The site is situated in Thaiyur, which receives moderate rainfall. However, “Moderate” exposure is considered for the Substructure in view of the site situated in valley region, there will be seasonal surface run off water. The minimum nominal cover to the reinforcement will be 35 mm & 50mm for the structural elements like Retaining wall and footing respectively which are in contact with soil. Also, for UG tank and STP walls which are in contact with water, minimum cover shall be 35mm. The members in the Superstructure exposed to weather will be designed for “Moderate” exposure condition. All members in the Super structure within the building will be designed for ‘Mild’ exposure condition as defined in IS 456-2000, Table 16.

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9. COVER TO REINFORCEMENT

Minimum clear cover to any reinforcement shall be provided based on the fire requirements and exposure condition whichever is more.

10. MATERIALS

10.1 Concrete

Minimum grade for structural concrete shall be of grade M25. Footings are Designed for M30, Beams & Slabs are Designed for M25 and Columns Are Designed for M30. The minimum cement content in concrete for substructure as well as superstructure shall be 350kg/m3 and the maximum free water-cement ratio shall be 0.50. Reinforcements High strength deformed steel bar, produced by the thermo-mechanical treatment (TMT) process, of grades Fe 550 having elongation more than 14.5 percent as per IS 13920:2016 and conforming to other requirements of IS 1786: 2008 will be used for the reinforcement.

10.3 Structural Steel

All structural steel used for construction shall conform to IS: 2062 with fy= 310 Mpa.

11. ANALYSIS OF STRUCTURE

The analysis will be based on Stiffness matrix method and using the engineering software ETABS 20.3.0 version. This is a tried and time tested 3D Structural analysis tool, which includes analysis of plane frames, space frames using truss, beam and shell elements. Generally, all the structures will be idealized as 3D – frames, using line element for column & beams and Shell elements for slabs, shear walls. The structures shall be analysed for individual load cases as described in 6.6 above. Analysis for governing load combinations shall be performed and the performance of the structures in various states of Collapse and Serviceability will be checked accordingly. Manual analysis shall be done for retaining walls, slabs, staircases, water tank etc.

The raft and combined footings will be modelled and analysed using software SAFE.

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12. DESIGN OF STRUCTURE

The design of the RC and steel structures will be based on the Limit State Method as per IS: 456-2000 and IS: 800-2007 respectively. For liquid retaining concrete structures, the design is based on the Limit State Method, conforming to IS 3370-2009.

The design of RC Columns and beams, footings, slab, staircases and junctions of the structures shall be made using spread sheets developed in-house and/or manual calculations and/or using ETABS software.

13. ACCEPTANCE OF CRITERIA

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 long term deflection is considered as span/250 and for the long-term deflection after erection of partitions & finishes is considered as span/350 or 20mm whichever less as per IS 456 – 2000.

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.

Permissible Drift Limits:

Lateral drift = Height/500(For Wind Loads)

Lateral drift = Height/1000 (at Roof) (For Seismic loads as per Note 4 of Table 9 of IS 1893:2016)

Inter Storey drift = 0.004 x storey height (as per IS 1893:2016)

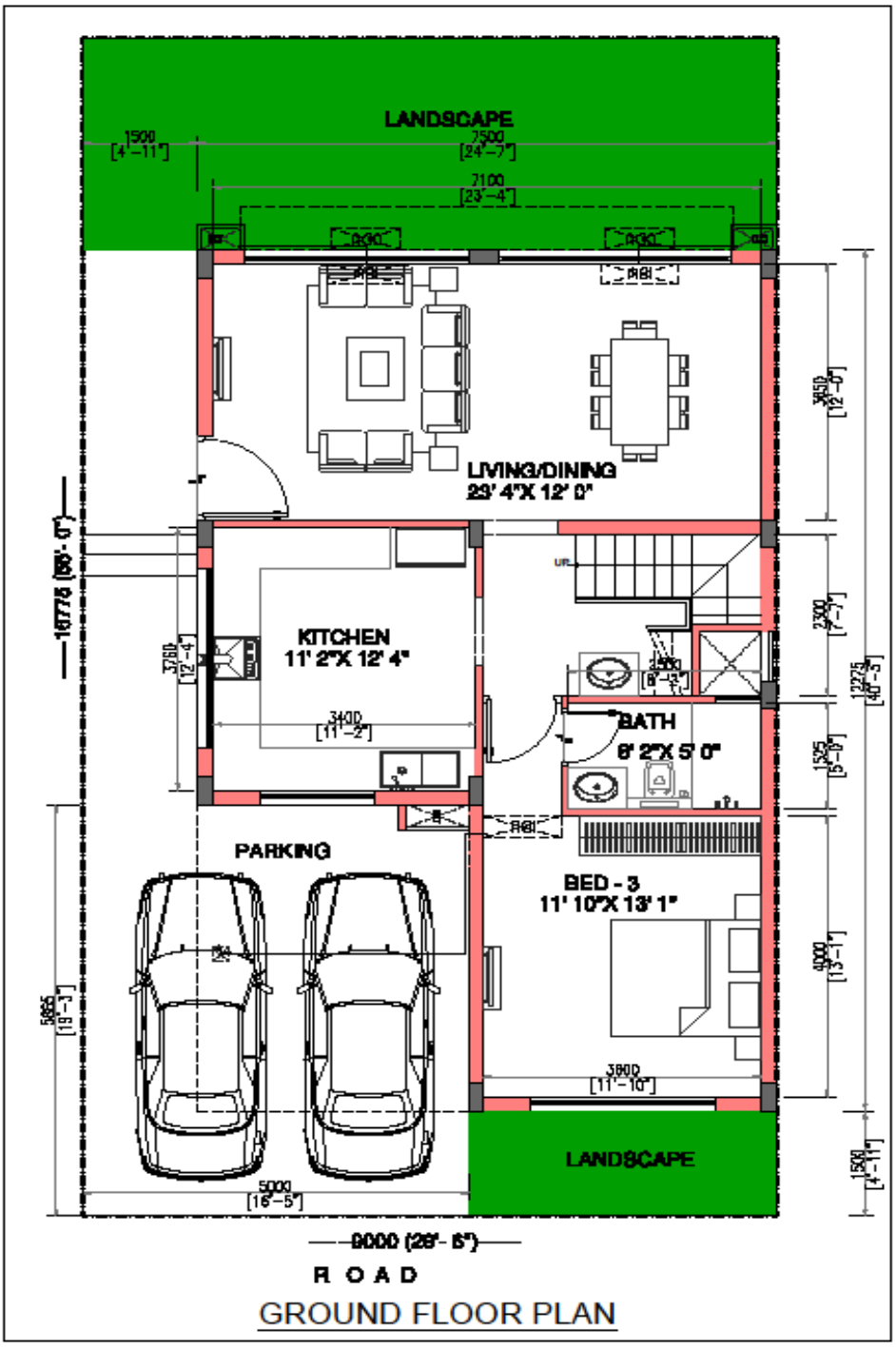
14. WATERPROOFING

The following Water-Proofing methodology is adopted for various members,

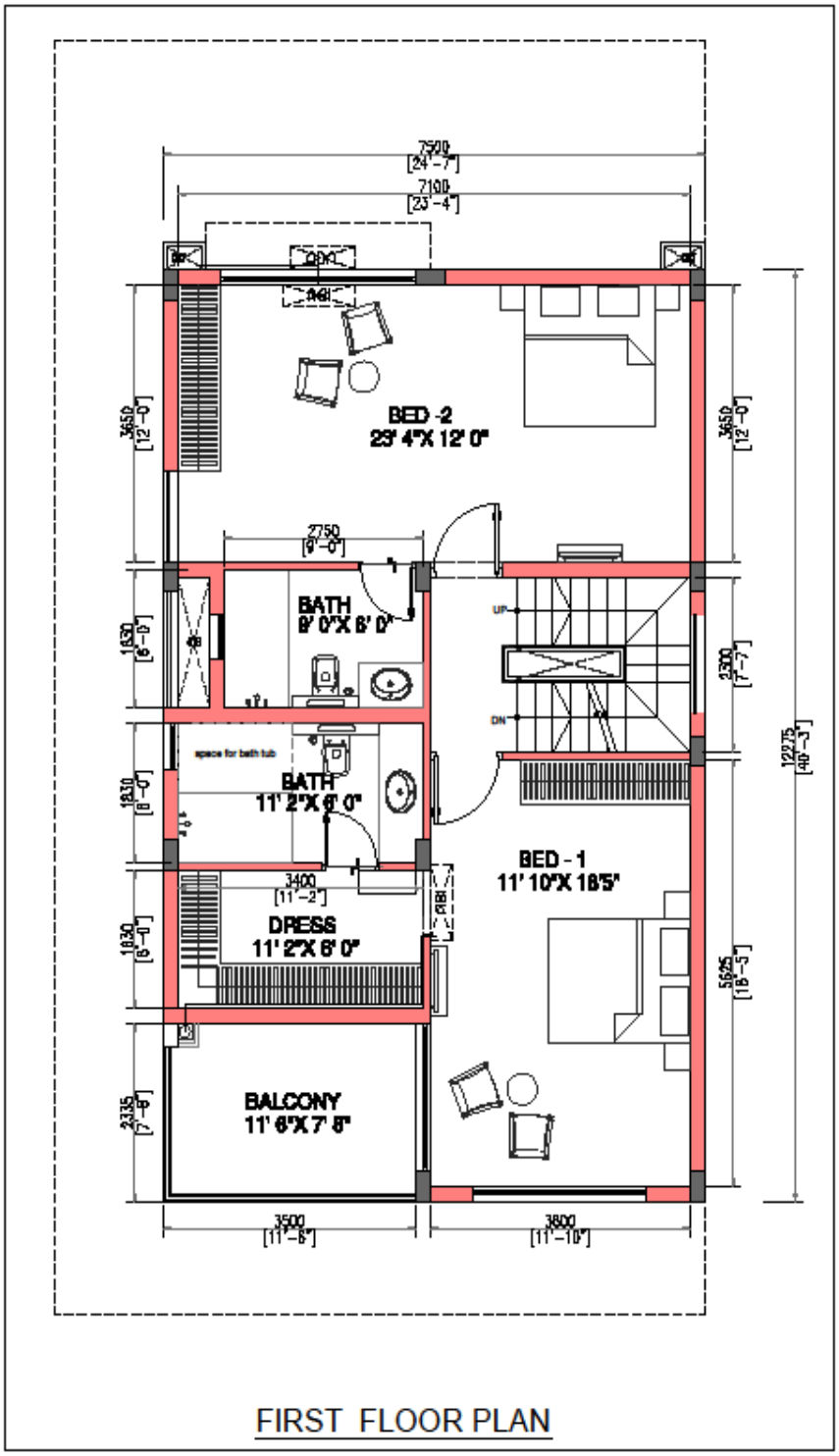
1. Bottom of Foundation: Self Adhesive HDPE membrane or equivalent.
2. Planters (Internal): Brush bond/Spray apply Polyurea.
3. Toilets/Balconies: Dr. fixit - fast flex.
4. Terrace: Brickbat Coba with crystalline mortar or Polyurethane.

ANNEXURE FRAMING PLANS

FLOOR FRAMING LAYOUT

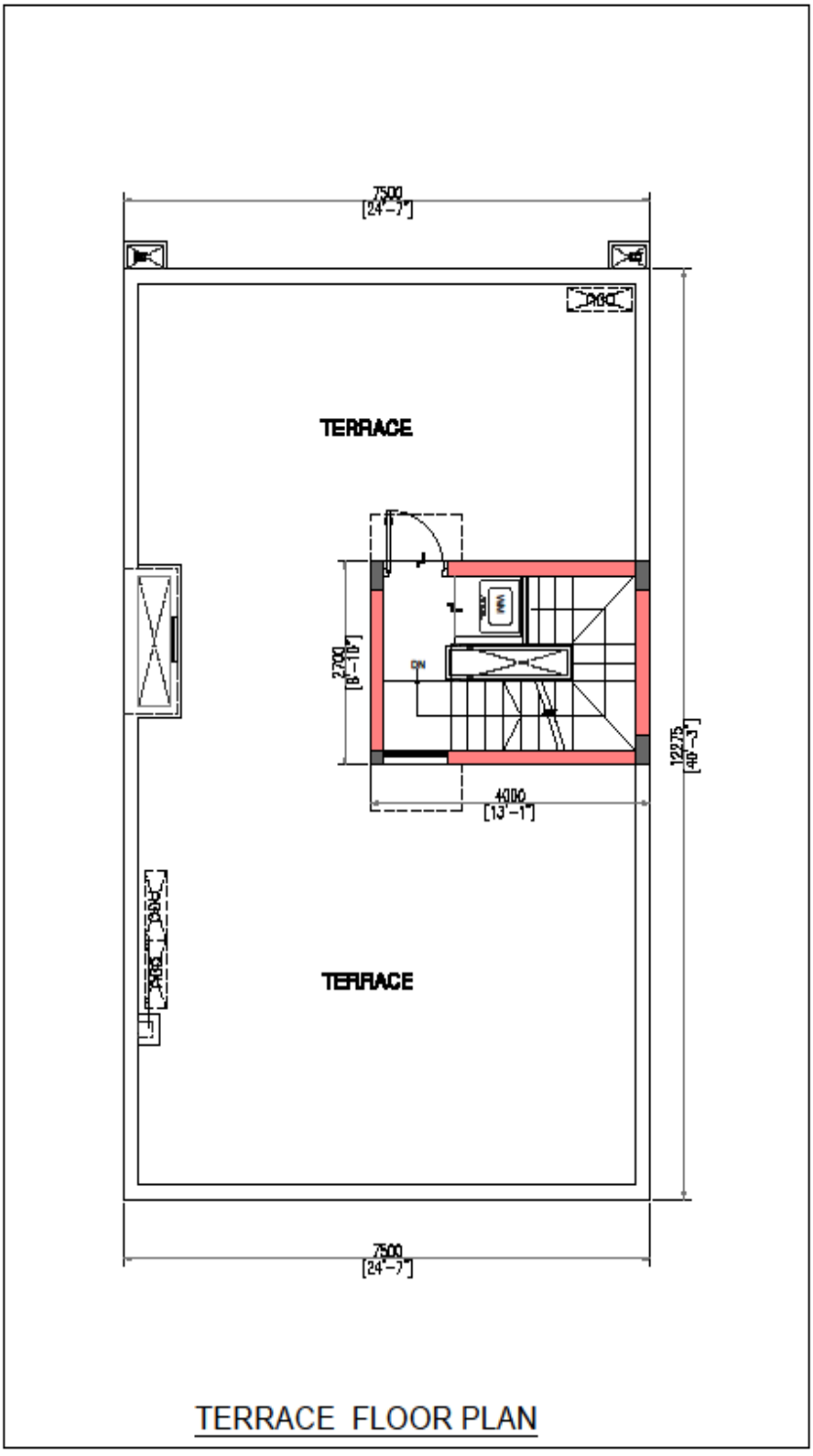


GROUND FLOOR PLAN



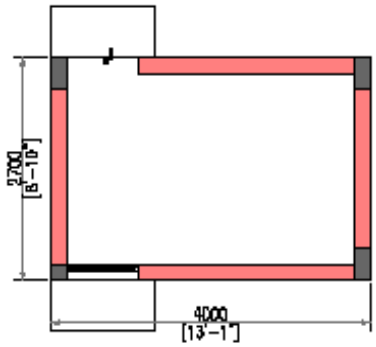
FIRST FLOOR PLAN

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TERRACE FLOOR PLAN

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STAIRCASE COVER PLAN

STRUCTURAL DESIGN BRIEF REPORT



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6	DESIGN LOADS	04
6.1	DEAD LOADS	04
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6.4	WIND LOADS	06
6.5	SEISMIC LOADS	07
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6.7	PRIMARY LOADS AND LOAD COMBINATIONS	09
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1. INTRODUCTION

Quadometry Engineering Pvt. Ltd. has been appointed as Structural Consultants by **M/s CASAGRAND CHENNAI** to develop structural schemes and design for Amenity Block to Residential Building Consists of Ground Floor with Swimming Pool on the First Floor Level Comprised in Survey Nos. 1009/12A, 1009/12B, 1009/12C, 1009/12D, 1009/12E, 1009/12F, & 1009/13A, 1009/13B, 1009/13C, 1009/14, 1009/17A, 1009/17B, 1010/1, 1010/2, 1010/3, 1011/1, 1011/2, 1011/3. 1439/2C, 1439/2C, 1439/2D, 1439/3A1 & 1439/3B of Thaiyur B Village, Thiruporur Taluk, Chengalpattu District. Totally 110 D/U, with Amenity Block to Residential Building Consist of Ground Floor with Swimming Pool on the first Floor Level comprised in Survey No.1009/12A, 1009/12B, 1009/12C1 & 1009/13A3, in DTCP Approved Layout No: L.P/MLPA No. 289/2025 Dated:05.11.2025, of Thaiyur B Village, Thiruporur Taluk, Chengalpattu District.

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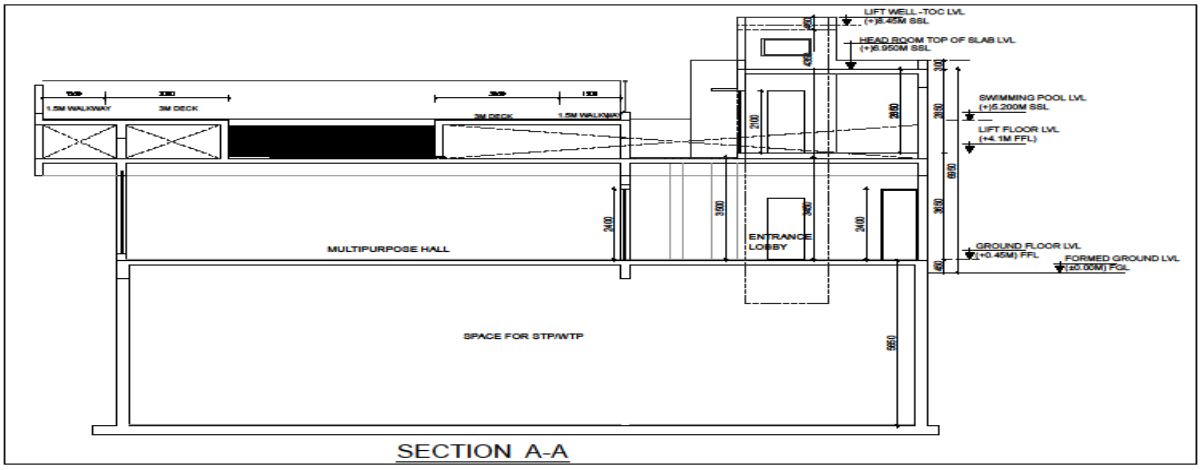
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- Develop structural scheme compatible with Architectural vision, services requirements and client's needs.
- Prepare structural design that will aim to actual structural durability and integrity.
- Desirable structural performance under characteristic services load.
- Fast-track construction and cost effectiveness

2. PROJECT DESCRIPTION

The proposed residential development consists of Amenity Block along with one Ground Floor, First floor, & Terrace Floor. This design basis caters for the Structural Design of Amenity building. Building will have Ground floor, First floor & terrace. Height of the Blocks is approx. 12.2m from ground level.

Dimensions of Building are approx. 19.6m x 17.8m with following floor heights

Ground Floor	:	5.65 m
First Floor	:	3.5 m
Terrace Floor	:	3.05m



3. CONSTRUCTION TYPE

SUBSTRUCTURE

There will not be any basement. The buildings will be supported on set of Isolated footing for Column.

SUPERSTRUCTURE

The superstructure will be constructed in conventional RCC slab system with beams, columns and RC Walls. Concrete will be poured in a RCC Columns, Beams and Slabs on erection of formwork and fabrication of reinforcement.

4. STRUCTURAL SYSTEM

4.1 FOUNDATION

Based on the proposed structure and sub soil conditions, Geotechnical investigations report recommends Isolated foundation system. As per Soil report the footings will be designed for allowable Bearing Capacity, For Isolated Footing 150 kN/sq.m at depth of 1.5m below natural ground level.

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Sl.No.	Depth of Foundation below E.G.L. (m)	Allowable Safe Bearing Pressure (kPa)	Elastic Settlement (mm)
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		1.0	1.0
1	1.00	100	2.64
2	1.25	125	3.30
3	1.50	150	3.46
4	2.00	200	4.10

4.2 SUPERSTRUCTURE

- The proposed structural system for this project is a RC Beams & Column/Walls and RC Slabs.
- RC Walls/Columns are spaced according to the framing plans based on the architectural requirement in order to transfer the loads from the Super Structure to the Foundation System.
- The structure with Club House is analysed using industry standard software ETABS.
- Beams and columns are assigned as frame elements and Slabs &walls are assigned with shell elements wherever required.
- The slab has been considered as a rigid diaphragm at the respective floor levels to transfer the lateral forces to vertical members.
- Appropriate load and its combinations, as per relevant clauses in the latest IS codes for most unfavourable effects are chosen for design.

5. STRUCTURAL DESIGN STANDARDS AND CODES CONSIDERED

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(Part 1): 1987:	Dead Loads Unit Weight of Building Material and Stored Material
IS 875(Part 2): 1987:	Imposed Loads
IS 875(Part 3): 2015:	Wind Loads
IS 875(Part 4): 1987:	Snow Loads
IS 875(Part 5): 1987:	Special loads and load combinations
IS 1893:2016:	Criteria for earthquake resistance design of structures.
IS: 13920-2016:	Code of practice for ductile detailing of reinforced concrete structures subjected to seismic forces

Foundations:

IS 1080:1985(2016):	Code of Practice for design and construction of shallow foundations on soils (other than raft, ring and shell).
IS 1904:1986(2015):	Code of Practice for design and construction of foundation in soils general requirements.
IS 2950:1981(2013):	Code of Practice for design and construction of raft foundations
IS 2974:1998(2015/13):	Code of Practice for design and construction of machine foundations (All parts).

IS 8009:1976/1980(2013/15): Code of Practice for calculations of foundations (All parts).

RCC:

IS 456:2000:	Code of Practice for plain and reinforced concrete
IS 458:1988:	Specification for precast concrete pipes
IS 3370:2009:	Code of Practice for concrete structures for the storage of liquids
IS 4326:2013:	Code of Practice for earthquake resistant design and construction of buildings.
IS 5525:1969(2013):	Recommendation for detailing of reinforced concrete works.

IS 1786:2008:	Specification for high strength deformed steel bars and wires for concrete reinforcement.
IS 10262:2009:	Recommended guidelines for concrete mix design.
IS 1893(Part-1) 2016:	Criteria for earthquake resistant design of structures (General provision and buildings).
IS 13920:2016:	Code of practice for ductile detailing of reinforced concrete structures subjected to seismic forces.
IS 1343:2012:	Prestressed Concrete

Structural steel:

IS 800:2007	Code of Practice for general construction in steel.
IS 806:1968(2013):	Code of Practice for use of steel tubes in general building construction
IS 808:1989:	Dimension for Hot rolled steel beam, column channel and angle section.
IS 816:1998:	Code of Practice for use of metal arc welding for general construction in mild steel.
IS 1161:1998:	Steel tubes for Structural Purpose.
IS 4000:1998:	High strength bolts in Steel Structures- Code of Practice
IS:7215 -1995	Tolerances for fabrication of steel structures.

6. DESIGN LOADS

6.1 Dead Loads

Dead load shall include weight of all structural and Architectural components. Self-weight of the materials shall be calculated based on unit weights given in IS: 875.
Floor finish of 50 to 75 mm thickness

Self-weight of Plain concrete	:	2400 kg/cu.m (24 kN/cu.m)
Self-weight of RCC	:	2500 kg/cu.m (25 kN/cu.m)
Solid block masonry	:	2000 kg/cu.m (20 kN/cu.m)
Light weight block masonry	:	800 kg/cu.m (8 kN/cu.m)

(with additional 20mm thick plastering on external surface and 14mm plastering on internal) wall surfaces

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)
Masonry with plastering solid block	:	2000 kg/cu.m (22 kN/cu.m)
Masonry with plastering light block	:	1000 kg/cu.m (10 kN/cu.m)
Filling for sunken portion	:	1200 kg/cu.m (12 kN/cu.m) (Wherever filling is required)
Waterproofing	:	As per actuals
Landscape loads	:	300/450/600 soil filling/finishes as per landscape details
OHT loads above the terraces	:	As per actuals (Shall be referred from MEP dwgs).
Wall loads	:	As per actuals
Storage rooms	:	750 kg/sq.m (7.5 kN/sq.m)

6.2 Wall Load

• External Walls: 200 mm thick Block Masonry

• Internal Walls: 200/100 mm thick Block Masonry

• Around toilets: 100mm thick Block Masonry

Wall height in m	Wall thickness in mm	kN/m for solid weight cement block
3.15	200	10.2
3.15	100	5.1
Parapet/ Railing ht 1200mm	200	4.8

For 200 thk wall of height 3.15m Block Masonry,

load calculation = 0.2*(3.15-0.6)*20=10.2 KN/m.

- Toilet Sinking (General) 300 mm = 3.3 KN/m2
- Balcony 300 mm = 3.3KN/m2
- Filling material for Sunken Slabs Concrete

6.3 Live Loads

Loads for the building shall be taken as follows as per IS: 875 (Part II),

Corridors, passages, lobbies and Staircase	:	3.0 kN/sq.m
Multipurpose Hall	:	4.0 kN/sq.m

Bedroom	:	2.0 kN/sq.m
Bath and toilet rooms	:	2.0 kN/sq.m
Terrace / Balcony	:	3.0 kN/sq.m
Gym	:	4.0 kN/sq.m
Indore Games	:	3.0 kN/sq.m

Wind loads have been derived on basis of IS: 875 (Part 3) 2015

Basic wind speed considered Vb : 50 m/s (for CHENNAI)

Building classification/ topography data

Risk coefficient, k1 : 1 Table 1, IS 875 (Part 3)

Topography factor, k3 : 1

Terrain Category : 2 Cl 6.3.2.1, IS 875 (Part 3)

Terrain and Height Multiplier (k2) will be calculated separately for the building as per Table 2 of IS 875 (Part 3):2015

Importance factor for cyclonic region(k4) : 1 Cl 6.3.4, IS 875 (Part 3)

6.4 Wind pressure calculation (Cl. 7.2, IS 875 (Part 3) 2015)

Pz : 0.6Vz2

Vz : k1 x k2 x k3 x k4 x Vb

Pd : Kd x Ka x Kc x Pz

Where Kd : wind directionality factor

Ka : area averaging factor

Kc : combination factor

6.5 Seismic Loads

Seismic design and detailing shall be in accordance with IS 1893 (Part 1):2016 and IS 13920:2016 respectively. Thaiyur(Chennai) falls under Zone III as categorized in IS: 1893-2016. All shear walls will be ordinary walls and has to resist 100% of lateral shear.

Seismic Force is considered in all three directions in accordance with IS 1893 (Part 1):2016.

The seismic design parameters are as follows:

Z : 0.16 (as per Table 3 IS 1893:2016)

I : 1.0 (Building as per Table 8 of IS 1893:2016)

Damping : 5% (as per Cl 7.2.4 of IS 1893:2016)

Soil type II : (for Medium or Stiff soils as per Cl 6.4.2 of IS 1893:2016)

R : 5.0 (Refer Table 9; SMRF)

Design Lateral Force: (as per Cl.7.2, IS 1893:2016)

Time Period

$T = : 0.075\ h^{0.75}$

Where h:Height of building above footing level

Minimum design Lateral Force

Building will be designed for minimum lateral force for 0.7 % of total seismic weight as per Cl.7.2.2 of IS 1893:2016 (Table 7 for Seismic Zone III). For isolated and combined footings with tie beams, SBC will be increased by 25% in earthquake condition for Rock or Hard soils, in accordance with Table 1, Sl. No. (i) of IS 1893 Part 1.

6.6 Primary Loads and Load Combination

DL : Dead Load

LL : Live Load

WLX : Wind Load in + ve X-Direction

WLY : Wind Load in + ve Y-Direction

EQx : Seismic Load in X-Direction

EQy : Seismic Load in y-Direction

TL max : Maximum Temperature load

TL min : Minimum Temperature load

Load combinations Used for Strength, Serviceability are tabulated below:

Load Combination	Limit State of Collapse			Limit State of Serviceability		
	DL+SDL	*LL*	*WL/EL/TL*	*DL+SDL*	*LL*	*WL/EL/TL*
DL + LL	1.5	1.5	—	1	1	—
DL + WL	1.5 or 0.9*	—	1.5	1	—	1
DL + EL	1.5 or 0.9*	—	1.5	1	—	1
DL + TL	1.5	—	1.5	1	—	1
DL+LL+WL	1.2	1.2	1.2	1	0.8	1
DL+LL+EL	1.2	1.2	1.2	1	0.8	1
DL+LL+TL	1.2	1.2	1.2	1	0.8	1
DL+WL+TL	1.2	—	1.2	1	—	1
DL+EL+TL	1.2	—	1.2	1	—	1
DL+LL+EL+TL	1.2	1.2	1.2	1	1	1

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

Vertical earthquake effect is not considered for the design of structural elements. 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: 18932016 / Clause 7.3.3 of seismic code will be used both for evaluating earthquake effect and for combined load effects used in such combination.

7. FIRE RESISITANCE OF ELEMENTS

All structural members will be designed for two-hour fire rating. The requirements for fire resistance will be met by adopting the minimum structural dimensions and clear cover to reinforcement. Minimum dimension of structural element and Nominal cover to reinforcements will be provided as given IS: 456-2000.

8. ENVIRONMENTAL EXPOSURE

The site is situated in Thaiyur, which receives moderate rainfall. However, “Moderate” exposure is considered for the Substructure in view of the site situated in valley region, there will be seasonal surface run off water. The minimum nominal cover to the reinforcement will be 35 mm & 50mm for the structural elements like Retaining wall and footing respectively which are in contact with soil. Also, for UG tank and STP walls which are in contact with water, minimum cover shall be 35mm. The members in the Superstructure exposed to weather will be designed for “Moderate” exposure condition. All members in the Super structure within the building will be designed for ‘Mild’ exposure condition as defined in IS 456-2000, Table 16.

9. COVER TO REINFORCEMENT

Minimum clear cover to any reinforcement shall be provided based on the fire requirements and exposure condition whichever is more.

10. MATERIALS

10.1 Concrete

Minimum grade for structural concrete shall be of grade M25. The minimum cement content in concrete for substructure as well as superstructure shall be 350kg/m3 and the maximum free

water-cement ratio shall be 0.50. Reinforcements High strength deformed steel bar, produced by the thermo-mechanical treatment (TMT) process, of grades Fe 550 having elongation more than 14.5 percent as per IS 13920:2016 and conforming to other requirements of IS 1786: 2008 will be used for the reinforcement.

10.3 Structural Steel

All structural steel used for construction shall conform to IS: 2062 with fy= 310 Mpa.

11. ANALYSIS OF STRUCTURE

The analysis will be based on Stiffness matrix method and using the engineering software ETABS 19 version. This is a tried and time tested 3D Structural analysis tool, which includes analysis of plane frames, space frames using truss, beam and shell elements. Generally, all the structures will be idealized as 3D – frames, using line element for column & beams and Shell elements for slabs, shear walls. The structures shall be analysed for individual load cases as described in 6.6 above. Analysis for governing load combinations shall be performed and the performance of the structures in various states of Collapse and Serviceability will be checked accordingly. Manual analysis shall be done for retaining walls, slabs, staircases, water tank etc. The raft and combined footings will be modelled and analysed using software SAFE.

12. DESIGN OF STRUCTURE

The design of the RC and steel structures will be based on the Limit State Method as per IS: 456-2000 and IS: 800-2007 respectively. For liquid retaining concrete structures, the design is based on the Limit State Method, conforming to IS 3370-2009.

The design of RC Columns and beams, footings, slab, staircases and junctions of the structures shall be made using spread sheets developed in-house and/or manual calculations and/or using ETABS software.

13. ACCEPTANCE OF CRITERIA

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 long term deflection is considered as span/250 and for the long-term deflection after erection of partitions & finishes is considered as span/350 or 20mm whichever less as per IS 456 – 2000.

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.

Permissible Drift Limits:

Lateral drift = Height/500(For Wind Loads)

Lateral drift = Height/1000 (at Roof) (For Seismic loads as per Note 4 of Table 9 of IS 1893:2016)

Inter Storey drift = 0.004 x storey height (as per IS 1893:2016)

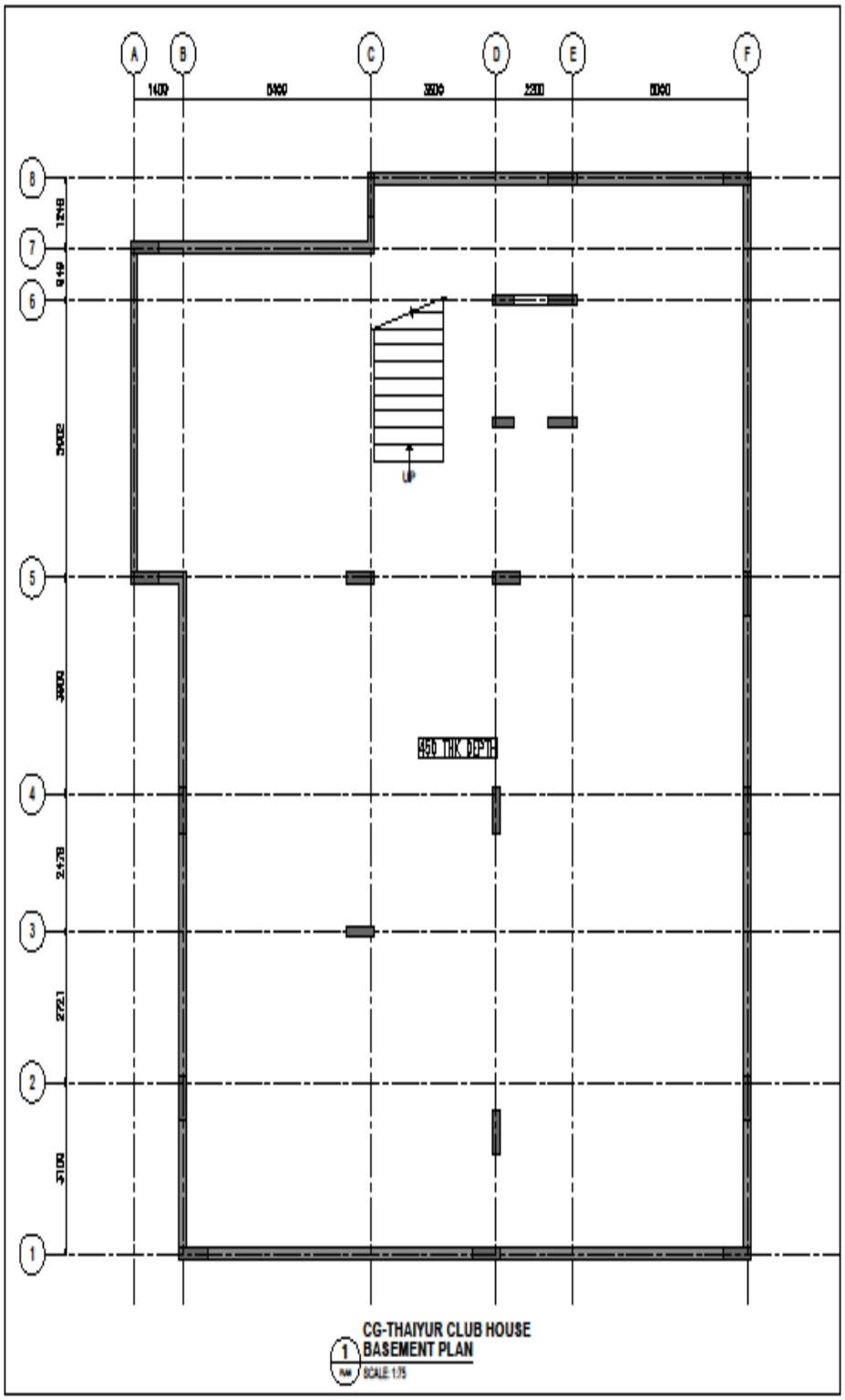
14. WATERPROOFING

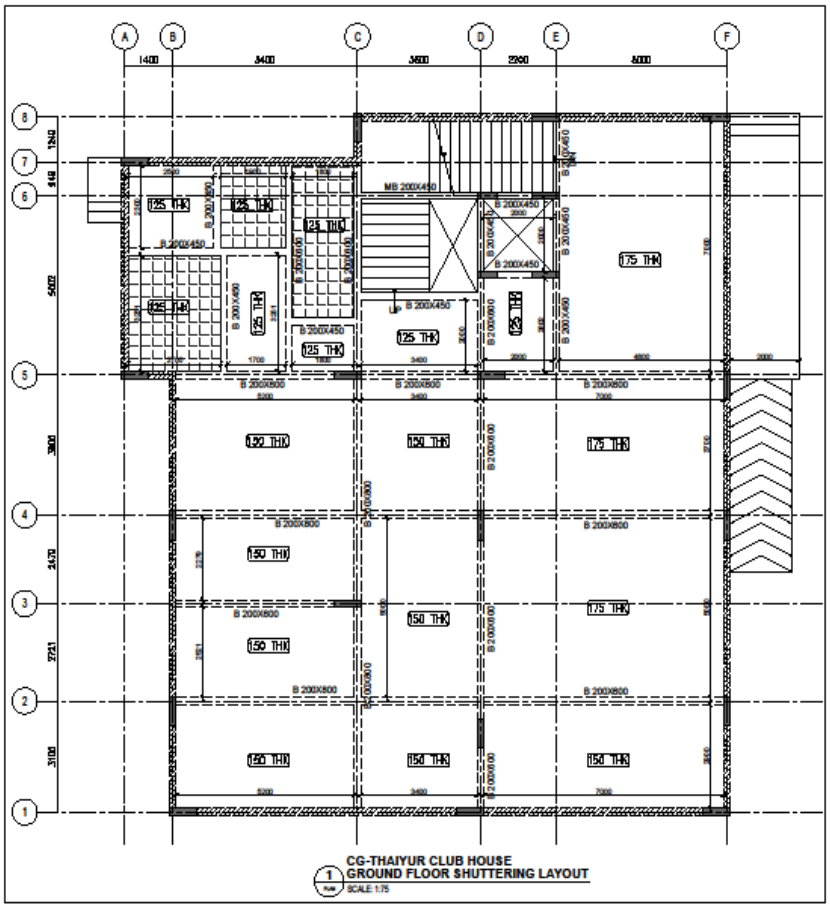
The following Water-Proofing methodology is adopted for various members,

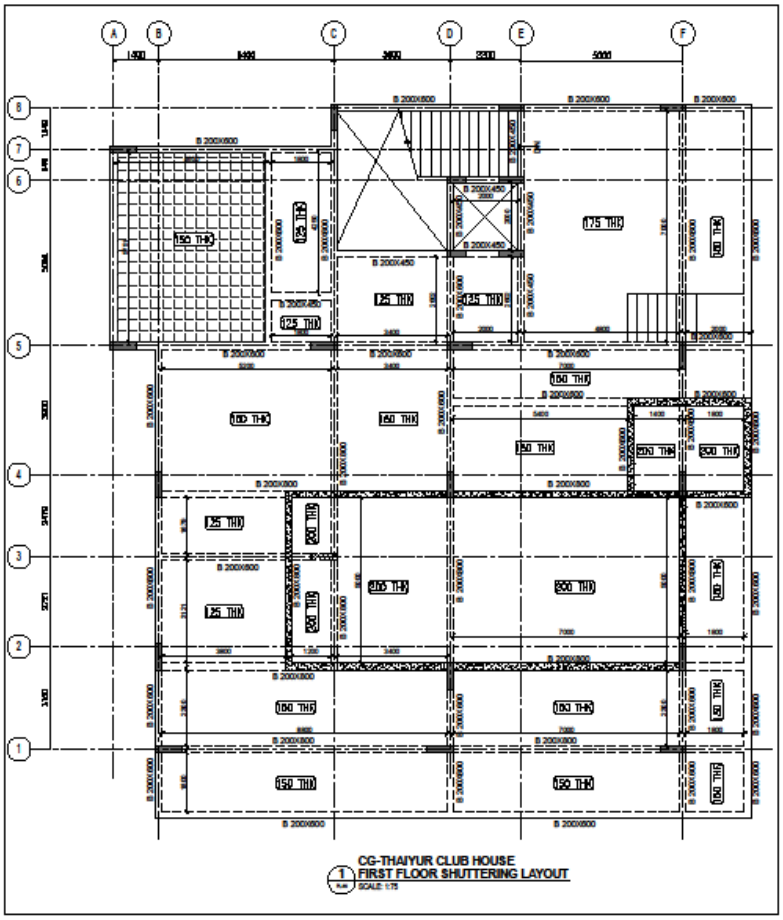
1. Bottom of Foundation, Rafts, Lift pits and Tanks: Self Adhesive HDPE membrane or equivalent.
2. Retaining walls: Sam-Shield XL with protection boards.
3. Podium w/o landscape: Brush bond/Spray apply Polyurethane.
4. Planters/STP/UG (Internal): Brush bond/Spray apply Polyurea.
5. Toilets/Balconies: Dr. fixit - fast flex.
6. Terrace: Brickbat Coba with crystalline mortar or Polyurethane.

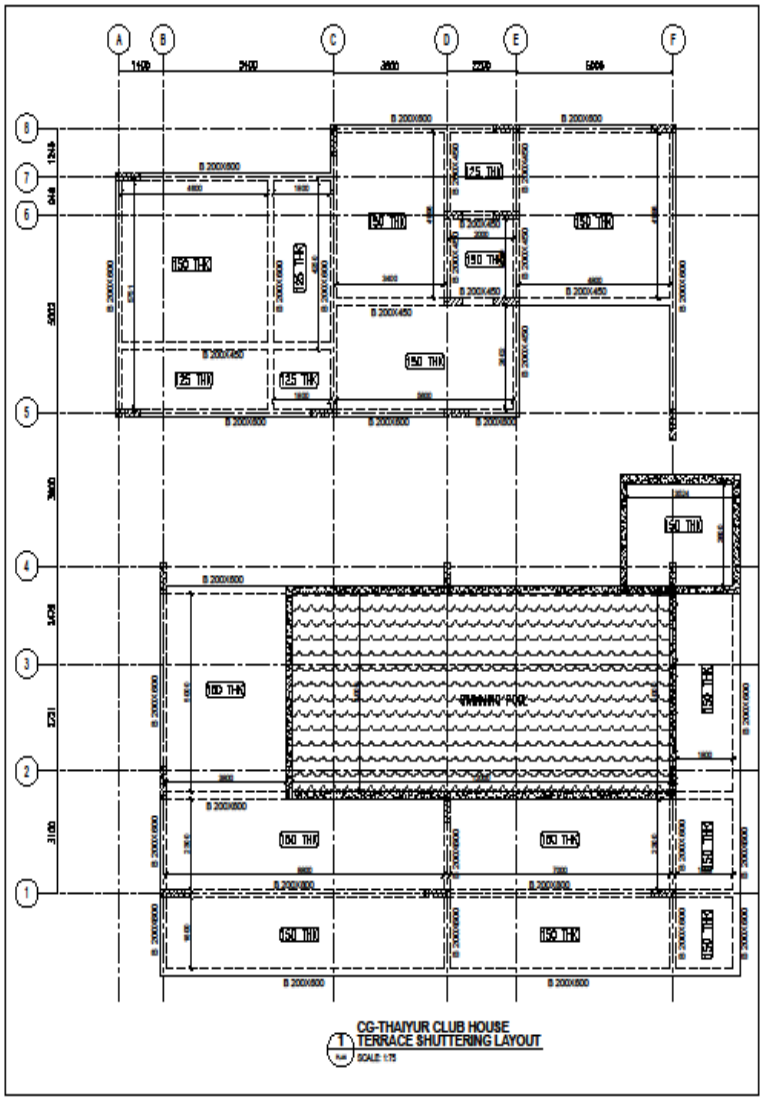
ANNEXURE FRAMING PLANS

FLOOR FRAMING LAYOUT


A
B
C
D
E
F
1409
8400
3809
2300
8090
8
7
6
5
4
3
2
1
1248
949
5002
3800
2478
2721
3108
UP
450 THK DEPTH
CG-THAIYUR CLUB HOUSE
1
BASEMENT PLAN
SCALE 1:75


CG-THAIYUR CLUB HOUSE
GROUND FLOOR SHUTTERING LAYOUT
SCALE 1:75


CG-THAIYUR CLUB HOUSE
FIRST FLOOR SHUTTERING LAYOUT
SCALE 1:75


A
B
C
D
E
F
8
7
6
5
4
3
2
1
125 THK
150 THK
100 THK
CG-THAIYUR CLUB HOUSE
TERRACE SHUTTERING LAYOUT
SCALE: 1:75

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

Verified RealEstate™

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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+91 9996 12 9996

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.