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PLAN SHOWING THE PROPOSED CONSTRUCTION OF HIGH RISE BUILDING (HRB) GROUP DEVELOPMENT CONSISTING OF EXTENDED COMBINED BASEMENT FLOOR (BLOCK-1 & BLOCK-2), BLOCK 1: GROUND FLOOR + 12 FLOORS WITH 39.75M HEIGHT (230 DWELLING UNIT) (AMENITIES IN GF-KIDS PLAY AREA, FF-INDOOR GAMES, POOL ROOM & TT ROOM, SF-GYM, AV ROOM & YOGA) , BLOCK 2: GROUND FLOOR + 12 FLOOR WITH 39.75M HEIGHT - - 220 DWELLING UNIT AND OPEN SWIMMING POOL (TOTALLY 450 DWELLING UNITS)AT PALLAVARAM - KUNDRATHUR ROAD (JAWAHARLAL NEHRU ROAD), S.NOS: 7/1, 7/2 & 513/1A1B OF KUNDRATHUR "B" VILLAGE, KUNDRATHUR TALUK, KANCHEEPURAM DISTRICT WITHIN THE LIMITS OF KUNDRATHUR TOWN PANCHAYAT.

06/05/2025

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08th January 2025

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1 INTRODUCTION

The aim of this report is documenting the methodology, design assumptions, procedures and codal compliance for the design of the proposed residential development at Kundrathur -B Village, kundrathur Taluk, Kanchipuram District for Casagrand Fresh Pvt.Ltd.

1.1 PROJECT DETAILS

The site is located in kundrathur Taluk, Kanchipuram District. It consists of 2 Blocks with Combined Basement; Block 1 Consists of Ground Floor + 12 Floors + Terrace+ OHWT (Height - 39.75m) Residential Building with dwelling of 230 units, Block 2 Consists of Ground Floor + 12 Floors Terrace+ OHWT (Height - 39.75m) Residential Building with dwelling of 220 units and Amenities Consist of Ground Floor + 2 Floors (Open Swimming Pool on the Ground Floor Level).

d,f,ds,f

The details of the Towers to be constructed are as follows.

Sr. No	NAME	Description	No of Floors	Design Consideration
1	BLOCK 1	Multiple floors RCC framed structure	B+ G+12+ Terrace+ OHWT	B+ G+12+ Terrace+ OHWT Only.
2	BLOCK 2	Multiple floors RCC framed structure	B+ G+12+ Terrace+ OHWT	B+ G+12+ Terrace+ OHWT Only.

The Separation joint between Blocks and podium and Block to Block are provided.

1.2 STRUCTURAL SYSTEM

For Tower areas All Columns / shear walls designed and Detailed RC Structural Wall system shall be used.

The vertical loads and horizontal loads are transferred through slabs and beams to the columns and walls to the foundations and Floating columns and walls provided wherever required with transfer girder/transfer slabs.

The substructure below the ground level consists of columns, beams, walls and retaining walls. Extended basement floor and podium area are framed with RCC beam column system. The Extended Basement structural system shall be Special moment resisting frame SMRF - Design as Ductile without Beam Column Capacity Ratio for the Podium area columns & for the Podium beams will be designed as ordinary Moment resisting frame but detailed as ductile.

The superstructure (typical floor) consists of monolithic construction of RC wall, beams and slabs.

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1.3 BUILDING DESIGN DATA.

The details of the Towers to be constructed are as follows.

The details of the Towers to be constructed are as follows.

Sr. No	NAME	Description	No of Floors	Design Consideration
1	BLOCK 1	Multiple floors RCC framed structure	B+ G+12+Terrace	B+ G+12+Terrace + OHWT Only.
2	BLOCK 2	Multiple floors RCC framed structure	B+ G+12+Terrace	B+ G+12+Terrace+ OHWT only.

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Note-

- Distances length and breadth are measured at 1st floor level. Ramp and drive way lengths are excluded.
- The Expansion Joints between Tower to Tower are provided as per Cl. 7.11.3 IS 1893(part 1)2016.

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1.4 DESIGN LIFE

The design life of the building is assumed 50 years as per IS code recommendation satisfying for the criteria of environmental conditions. 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.

1.5 DESIGN INTERFACE

Structural form shall contribute to the building character and identity, while being efficient, cost effective and simple to construct. Since the structure has physical interface with all the disciplines like Architecture, MEP Services, Landscape etc., provision shall be done in design in such a way that all services can be laid without any major obstructions.

2. DESIGN STANDARDS & DESIGN CODES

Specific applicable codes and standards will be identified in the Design Philosophies as appropriate. The latest editions of the Codes and Standards will be used. All design work shall be based on Indian Standards.

2.1 Loadings

IS: 875 -1987 Code of Practice for Design Loads (Other than Earthquake) for Building and Structures-Unit Weights of Buildings Materials and Stored Material.
PART 1 - Dead Loads (IS: 875 -1987)
PART 2 - Live loads or Imposed Loads (IS: 875 -1987)
PART 3 - Wind Loads (IS: 875 -2015)
PART 5 - Special Loads and Load Combinations (IS: 875 -1987)

2.2 Design for Earthquake Resistance

IS 1893 (Part-1)-2016-Indian Standard Criteria for Earthquake Resistant Design of Structures.
IS 4326: 2013 Earthquake resistant design and construction of buildings code of practice.
IS 13920: 2016 Ductile design and detailing of reinforced concrete structures subjected to seismic forces - code of practice.

2.3 Design of Reinforced Concrete Elements

IS: 456 - 2000 Code of Practice for Plain and Reinforced Concrete.
IS: 1786-2008 Specification for High Strength Deformed Steel Bars and Wires for Concrete Reinforcement.
SP: 16 Design aid for reinforced concrete to IS: 456.
SP: 23 Handbook on concrete mixes.
SP: 24 Explanatory hand books on code of practice for PCC.
SP: 34 Handbook on Concrete reinforcement and Detailing.
IS: 1343-2012 Pre-stressed Concrete - Code of Practice

2.4 Earthwork Soil and Foundation

IS 3764 Code of safety for Excavation Works
IS 8009: 1976 Code of practice for calculation of settlements of foundations.
IS: 1904-1986 Indian Standard Code of practice for Design & Construction foundations in Soil: General Requirements.
IS: 3370 (Part-2)-2009 Concrete Structures for Storage of Liquids - Code of Practice.
IS: 2911 (Part-1)-1979 Bored cast in situ piles - Code of Practice.

2.5 FIRE SAFETY OF BUILDING

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IS: 1642-1989 Indian Standard Code of practice for Fire Safety of Buildings (General): Details of Construction.
ANSI/UL263 Fire resistance rating.

3.0 DESIGN LOADS

The RCC/Basic frame structure shall be designed considering the dead loads of the following elements.

WALLS

External walls	200 thk. light weight Block Masonry
Internal walls	200mm/100mm thk. lightweight Block Masonry
Around toilets	200mm/100mm thk. lightweight Block Masonry
Parapet walls	150 thick solid Block Masonry

SUNKEN SLAB

Toilet Sinking (General)	100 mm
Utility	150 mm
Balcony	100 mm
Filling material for Sunken Slabs	Cinder/Broken brick bat.

O.H. WATER TANKS

The R.C.C. overhead water tank shall be considered for Potable /Fire & Raw water storage at locations above the staircase headroom. Capacity of tanks considered based on input from MEP consultants.

3.1 Dead Load

Self-weight of the structural members will be considered on the basis of the following properties:

a.	Unit Weight of Reinforced Concrete	25.0 kN/m3
b.	Unit Weight of Plain Concrete	24.0 kN/m3
c.	Unit Weight of Soil (Unsaturated)	18.0 kN/m3
d.	Unit Weight of Soil (Saturated)	21.0 kN/m3
e.	Unit Weight of Light weight blocks	9.0 kN/m3
f.	Unit Weight of Plaster	20.4 kN/m3
g.	Unit Weight of Light Weight Filling Material (Cinder)	8.0 kN/m3
h.	Unit Weight of Reinforcement	78.5 kN/m3
i.	Unit Weight of Water	10.0 kN/m3
j.	Unit Weight of Glass	27.0 kN/m3
k.	Unit Weight of Brickbat Filling	20.0 kN/m3

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Wall load considered on the beams = [(3.00-0.60) x 0.2 x 9] + [(3.00-0.125) x 0.03 x 20.4] =6.22 KN/ m =6.08 KN/ m (200mm thk wall).

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Similarly, for 100mm thk wall =3.04 KN/ m =3.05 KN/ m

Similarly, Parapet wall of 150thk =2.37 KN/ m =2.4 KN/ m.

3.2 SUPER IMPOSED DEAD LOADS

In addition to self-weight of structural members, following super imposed dead loads will be considered.

All Floors		in kN/m2
a.	Floor Finishes for Typical floor	1.2 kN/m2
b.	Floor Finishes for Ground floor	1.5 kN/m2
c.	Terrace Level Floor finish	2.4 kN/m2
d.	Car Parking Level Floor Finish	2.4 kN/m2
e.	Staircase Finishes	3.5 kN/m2

Typical Floors		in kN/m2
a.	Floor finish (General -0.050x20)	1.00
b.	Floor finish (Staircase-Including step load)	4.75
c.	Services + False ceiling	NA
d.	100mm Sunk Load (Toilet)	2.40
e.	150mm Sunk Load (Utility cinder filling)	1.50
f.	100mm Sunk Load (Balcony)	2.40
g.	150mm fill for refuge balcony	1.50

Terrace		in KN/m2
a.	Floor finish (Including water proofing 150mm thk)	3.60

Ground Floor Level		in KN/m2
a.	Services + False Ceiling	0.50

3.3 IMPOSED LOADS

Basement Floor		in KN/m2
a.	Lift lobby and Staircase	3.00
b.	Pump Room (Non reducible)	5.00
c.	Ramp	3.00
d.	Driveway/Parking	3.00
e.	Electrical room (Non reducible)	5.00

Ground Floor		in KN/m2
a.	Lift lobby, Corridors and Staircase	3.00
b.	Fire driveway (Non reducible)	20.00
c.	Indoor games. TT, Billiards	3.00
d.	Toilet	2.00
e.	Ramp	3.00
f.	Parking	3.00
g.	Electrical room (Non reducible)	5.00
h.	Landscape max. depth of 900mm filling for planters on the podium slab including water proofing and finishes (if any)	As/arch

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i.	Swimming pool (Non reducible)	As/arch
j.	Podium Slabs	3.00
k.	DG Room	10.00
l.	Indoor Kids Play area /Party Hall	5.00
m.	AV Room	5.00
n.	GYM Room	5.00
o.	Meter Room	4.00

First Floor to 12th Floor		in kN/m2
a.	Lift lobby, Corridors and Staircase	3.00
b.	All rooms and kitchens	2.00
c.	Toilet and bath room	2.00
d.	Balconies	3.00
e.	Electrical room (Non Reducible)	5.00
f.	Refuge Balcony	5.00
g.	Meter Room	4.00
h.	Communication Room	2.00
i.	Lift Lobby	3.00

Terrace and Above		in kN/m2
a.	Open Terrace	3.00
b.	Lift lobby and Stairs	3.00
c.	OHWT top slab	2.00
d.	OHT bottom slab (2m depth of water) over the head room (Non reducible)	20.00
e.	Staircase head room	2.00
f.	LMR top slab	10.00

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3.4 SEISMIC LOAD

1	Town	CHENNAI
2	Zone - Annex - E	III
3	Zone co-efficient(Z) Table -03	0.16
4	Importance factor(I) Table - 08	1.2
5	Response reduction factor(R) Table-09	5 (SMRF)
6	Fundamental Natural period in sec - as per IS1893(I):2016, Clause 7.6.2 (b)	Ta = 0.075h ^0.75/√Aw ≥ 0.09h/√d
7	Ductile detailing as per IS-13920-2016	Followed
9	Soil Type- Table -01 of IS-1893:2016	Hard (Type-I)
10	Damping ratio	5%

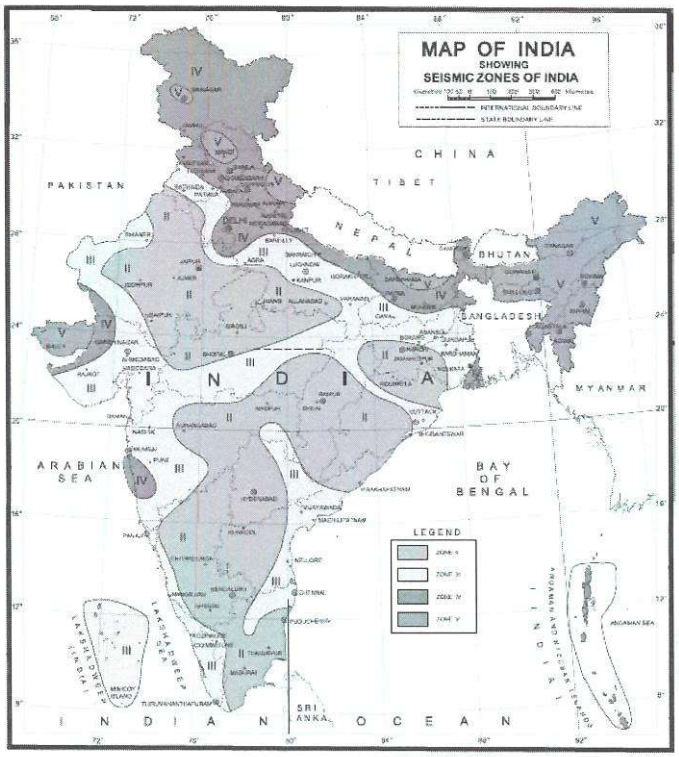
Percentage of imposed load to be considered in seismic weight calculation as per IS-1893-2016 (cl. 7.3.1)

Impose uniformity distributed floor loads (kN /m2)	Percentage of imposed loads
Up to and including 3.0	25
Above 3.0	50

i. For calculating the earthquake force on roofs, the live load shall not be considered.
ii. The horizontal earthquake force shall be calculated for the full dead load and 25% of live loads.

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3.4.1 DESIGN LATERAL FORCE (IS-1893:2016)

The inertia forces are to be distributed along the height of the building as per Clause 7.7.1. The base shear shall be applied from ground of the building, which corresponds to the level of building where the forces are transferred to the foundation. In the case of non-uniform connections of retaining wall at ground floor, the height of the building for seismic loads shall be taken from the basement level. Fundamental natural time period (Ta) with RC walls: As per IS 1893:2016; Clause No. 7.6.2 Page no :21, With infill Wall time period, without infill wall time period and Buildings with RC Structural Walls shall be used whichever is applicable.

The lateral forces shall be applied above the foundation level. Hence base dimensions of the tower along the considered direction of lateral force Vb = Ah * W Where; W= Seismic weight of the structure Ah = Horizontal seismic coefficient Ta = Ta = As per IS 1893:2016 Clause No. 7.6.2, Page No. 21 shall be used.

3.4.2 SEISMIC ANALYSIS

The building is analyzed by Equivalent static method (ESM) and Response spectrum method (RSM). The spectra considered for the building is as per IS 1893 (part1):2002 (Also Ref. #4.5). The base shears due to response spectrum (RSM) in each direction are compared with the respective direction base shear due to equivalent static method (ESM). If the base shear due to ESM is found to be more than the base shear due to RSM then the equivalent scale factor is applied in RSM and the analysis is redone.

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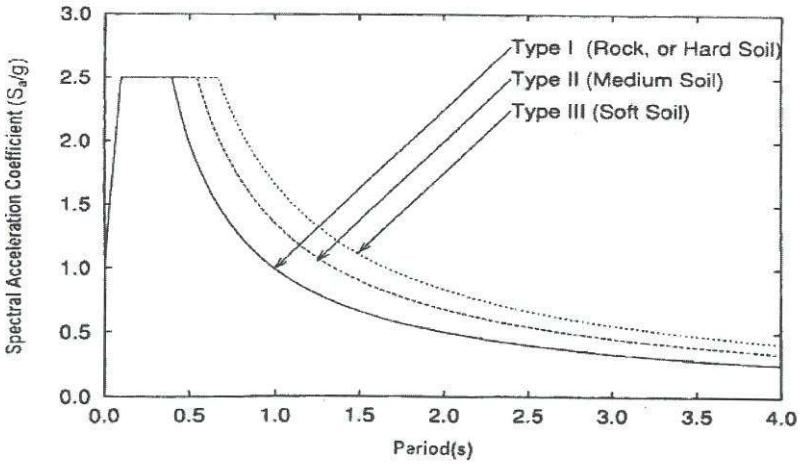


FIG. 2 RESPONSE SPECTRA FOR ROCK AND SOIL SITES FOR 5 PERCENT DAMPING

3.4.2 STIFFNESS PROPERTY MODIFIERS

Property modifiers are assigned considered for beam, column and walls as per clause 6.4.3.1 of IS1893:2016.

Element	Property Modifier	NOTE
Column (h/b<2.5)	0.7	M22,M33
Wall(h/b>2.5)	0.7 / 0.1	f11, f22, f12- 0.7 m11,m22,m12 -0.1
Beams	0.35	M22, M33 - 0.35 Torsional Modifiers - 0.001 for all internal Beams Torsional Modifiers - 0.25 for all External/ peripheral Beams
Slabs	0.25	f11,f22,f12,m11,m22,m12

3.5 WIND LOADS

The Wind load calculations will be carried out in accordance with IS 875 (Part 3): 2015.
Design wind speed
Vz = Vb x k1 x k2 x k3, where
Vb Basic wind velocity for Chennai = 50 m/s
k1= Risk coefficient for all general buildings = 1
(For a design life of 50 years)
k2 Terrain category, = to suit height of the structure.
k3 Topography factor = 1.0
k4 Importance factor cyclonic region = 1.0
Vz= Vb × k1 × k2 × k3× k4
Design Wind Pressure =0.6Vz2

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3.6 IMPOSED LOAD REDUCTION

As per 3.2.1 of IS 875 (Part-II):1987, the following reductions in total Imposed (Live) loads on floors will be applied, for designing Columns, Walls and Foundations.

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Number of Floors (Including the Roof) to be Carried by Member under Consideration	Reduction in Total Distributed Imposed Load on all Floors to be Carried by the Member under Consideration (Percent)
1	0
2	10
3	20
4	30
5 to 10	40
Over 10	50

3.7 FIRE RATING

All vertical and horizontal elements shall have minimum 2-hour fire rating.

- As per IS:456-2000 21.3 & IS 13920: 2016 the reinforcement detailing should reflect the changing pattern of structural sections & ensure that both individual elements & structure as a whole contain adequate support, bonds & anchorages for the required resistance.
- Thickness of the structural elements as per table 15, 16 & 16A clause 26.4 of IS 456-2000.
- For all RCC walls of varies thickness (Min. 200mm) . For 2hr fire rating the minimum percentage of vertical reinforcement for RC walls is 0.4%. However, considering 500 Degree C isothermal. The minimum percentage of 0.25% shall be adopted as per Euro code for Typical floor. Min. 0.40% will be followed from foundation to ground floor.

3.8 SOIL PRESSURE ON RETAINING WALL

Assumed Soil Properties:

Load on Wall

Density of Soil (Saturated) = 21 kN/cu.m

General Surcharge on the soil retained structure = 10 kN/cu.m

Retaining walls are designed as propped cantilever for soil pressure. No water pressure is considered. All retaining walls are designed for active earth pressure and φ value shall be used for design. Since this retaining wall is considered as Propped cantilever than Earth Pressure at rest shall be used into the design. Retaining walls are modelled in STAAD-Pro/ETABS. and designed using excel calculation sheets confirming to IS: 456- 2000

4.0 SERVICEABILITY

The basic aim of structural design of the buildings is to ensure the achievement of satisfactory behavior during the intended design life. With appropriate degree of safety, they should sustain all the loads coming during construction and use. Adequate durability and fire resistance are other major factors governing the design.

4.1 ROBUSTNESS

Structures are planned and designed so that they are not unreasonably susceptible to effects of accident wherein damage to small area of failure of single element may lead to collapse of major portions of the structure. This is catered to by taking the following precautions:

Designing buildings to withstand horizontal loads,

Providing effective horizontal ties, around the periphery, internally and to the structural members.

Sagar

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4.2 SERVICEABILITY

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The design properties of materials and the design loads comply with design codes specified in later part of this report and would typically include:

4.3 Deflection Criteria:

4.3.1 Deflection due to vertical loading

The vertical deflection under imposed load should be limited as follows:
L/250 taking into accounts all imposed loading, including temperature and creep/shrinkage.
L/350 taking into accounts all imposed loading, including temperature and creep/shrinkage after erecting the finishes. Or 20mm whichever is less.

4.3.2 DEFLECTION DUE TO LATERAL LOADING

Permissible Sway/Drift: As per IS 456, the lateral sway due to wind at the top of the structure shall not exceed 0.002 H where H is the height of the building.
As per IS 1893: 2016(part-1) the story drift due to minimum specified lateral force with partial load factor of 1.0 shall not exceed 0.004 hs where hs is the story height under consideration.

4.4 CRACKING OF CONCRETE

Liquid retaining structures will be designed in accordance with relevant codes with a limiting value of 0.1 mm allowable crack width. All other parameters with respect to durability and exposure will also be considered in the design.

4.5 VIBRATIONS

By avoidance of discomfort or alarm to occupants, structural damaged or interference with proper functioning.

4.6 FATIGUE

Cyclical or repetitive loadings such as crane movement etc. will be catered for in the design of the relevant elements of the structure.

4.7 ENVIRONMENTAL CONDITION, CORROSION AND FIRE PROTECTION:

iii. Exposure conditions - Mild/Moderate.
iv. Fire protection --Thickness of the structural elements proportioned to suit Fire Rating (2hrs Fire rating considered in the Design)
v. Nominal covers for 2 hr. fire resistance (As per IS 456-2000).

Cover to reinforcement for various structural members shall be as follows.

MEMBER	CLEAR COVER (MM)
ISOLATED	50 mm
RAFT	75 mm
COLUMN/WALLS	40 mm
TYPICAL FLOOR 160mm THK WALLS	30mm
BEAMS- (Continuous)	30 mm
BEAMS- (Simply Supported)	40mm
SLABS	25 mm
UNDER GROUND TANK	50 mm
VDF OR GRADE SLAB	100 mm
RETAINING WALL ON EARTH FACING SIDE	40 mm

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RETAINING WALL ON NON-EARTH FACING SIDE 25 mm

5.0 GEOTECHNICAL AND FOUNDATION CONSIDERATION.

It is proposed to provide raft footing for the tower areas and isolated footings in the podium areas.

As per the soil report for Isolated footing the allowable bearing capacity of 165kN/m2 at a depth of 2.80 m from the natural ground level (+11.70 m) for the Minimum width of the Footing 1.5 meter.

Podium area Isolated footing will be designed considering 165kN/m2 SBC and raft/Combined footing for tower columns/walls will be designed considering SBC 200kN/m2 with the settlement of 41.85mm for the minimum width of 10meter at the depth of 3.80 m from the NGL.

Sub grade modulus for the RAFT will be = 200/0.04185 which is 4778.973 kN/m2/m will be considered as per the soil report. Footing Bottom will be Placed at the height of 3.80m from the NGL.

6 MATERIALS

6.1 Concrete

Concrete mix/Grade	Type of structure- Residential Building
M7.5	Fill concrete
M10	Blinding layer below foundations and trenches.
M30 M30 M30 M25 M30	Isolated footing and Raft Ramp Retaining wall Grade Slab Staircase.
M45 M40 M35 M30 M35	Columns/ Walls Foundation to First Floor First Floor to 5th floor 5th Floor to 10th floor 10th Floor Above Podium columns
M30 M30	Slab/Beams For All floors For Podium
External / Internal Walls	200thk. RC walls as per architectural layout for residential unit. 200/250 mm thk RC walls for Lift and Staircase core walls & Non-structural RC walls as per architectural layout for residential unit.

Minimum cement content, water cement ratio etc. will conform to IS 456:2000 provisions for durability and strength criteria.

• Ordinary Portland Cement of grade 43 or higher confirming to IS 8112 and IS 12269 is specified for concrete grades ranging from M:10 to M:45.

- Cement and GGBS - 70:30 ratio recommended.

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• Sizes of aggregates conform to IS 383. Nominal maximum size of coarse aggregate is 20 mm, suitably graded as per the requirement of mix design.
• Mixing Water shall conform to IS 456: 2000.
• Mix design for all concrete grades shall be approved by consultant prior to execution of work.
• 6 cubes shall be taken from every batch of concrete and report of the same at 7 days and 28 days must be submitted to consultant.

6.2 REINFORCEMENT STEEL

• All reinforcement shall confirm to IS: 1786 - 2008 having minimum yield strength of 550 N/Sq. mm (Fe-550). Percentage of elongation shall be more than 14.5%.
• For reinforcement, test reports shall be carried out at every 30 tons for each category.
• No lapping of bars shall be allowed in RC Columns and Shear walls when diameter of bar is 16mm or higher. Mechanical couplers conforming to IS 16172 shall be used to extend bars.

7.0 STRUCTURAL ANALYSIS

7.1 Basic Loads and Load Combinations

The various loads are combined in accordance with the stipulations in IS: 875 (Part 5)-1987. Wherever imposed load is combined with earthquake load the appropriate part of the imposed load as specified in IS: 1893-2016 is adopted both for evaluating earthquake effect and for combined load effects, used in such combination.

DL+LL
DL+EQX
DL-EQX
DL+EQY
DL-EQY
DL+WLX
DL-WLX
DL+WLZ
DL-WLZ
DL+LL+EQX/EQZ
DL+LL-EQX/EQZ
DL+LL +WLX/ WLZ
DL+LL -WLX/ WLZ

FACTORED LOAD CASES

1.5[DL+LL] +TL
1.5[DL+EQX] +TL
1.5[DL-EQX] +TL
1.5[DL+EQZ] +TL
1.5[DL-EQZ] +TL
1.2[DL+LL+EQX] +TL
1.2[DL+LL-EQX] +TL
1.2[DL+LL+EQZ] +TL
1.2[DL+LL-EQZ] +TL
STRESS REVERSAL
[0.9DL+1.5EQX] +TL
[0.9DL-1.5EQX] +TL
[0.9DL+1.5EQZ] +TL
[0.9DL-1.5EQZ] +TL

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WIND

1.5[DL+WLX] +TL
1.5[DL-WLX] +TL
1.5[DL+WLZ] +TL
1.5[DL-WLZ] +TL
1.2[DL+LL+WLX] +TL
1.2[DL+LL-WLX] +TL
1.2[DL+LL+WLZ] +TL
1.2[DL+LL-WLZ] +TL

STRESS REVERSAL
[0.9DL+1.5WLX] +TL
[0.9DL-1.5WLX] +TL
[0.9DL+1.5WLZ] +TL
[0.9DL-1.5WLZ] +TL

SPECTRUM LOAD CASE

1.2[DL+LL+SPECX] +TL
1.2[DL+LL+SPECY] +TL
1.5[DL+SPECX] +TL
1.5[DL+SPECY] +TL
0.9DL-1.5SPEC X+TL
0.9DL-1.5SPEC Y+TL

TEMPERATURE as per SP24 35.4.1

[1.4DL+1.4TL]
[1.05DL+1.275LL+1.05TL]

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7.2 ANALYSIS METHOD

The structure is analyzed for Gravity Load and Lateral loads due to Earthquake/Wind loads and its combinations by using ETABS 18. Response spectrum method is adopted for the dynamic analysis.

7.2.1 DESIGN METHODOLOGY

All structural members will be designed according to the Limit State Method as specified in IS: 456-2000 and IS 13920:2016. Columns, Shear wall and beams from ETABS, raft and Floor slab are designed using SAFE.

After preliminary sizing of various structural members, a computer model of the structural frame of the building will be generated for carrying out computer analysis for the effects of vertical and lateral load that are likely to be imposed on the structure.

The building structure will be analyzed using the ETABS.version.2018 software for the following computer models of the building.

- Floor analysis of all floors - for vertical loads for entire building space frame.
- Space frame analysis (Static) of the entire structure - for wind loads.
- Space frame analysis (Dynamic) of the entire structure - for seismic loads.

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Geometrical dimensions, member properties and member-node connectivity, including eccentricities will be modeled in the analysis problem. Variation in material grades, if present, will be considered.
Wind load derivations will be carried out using coefficients / factors in accordance with the relevant Indian codes.
Appropriate loads and its combinations, as per relevant clauses in Code IS 456:2000 Code IS 875 (Part-5) 1987.

The seismic loads will be derived from the results of dynamic analysis of the structure in accordance with the relevant code of practice.

The permissible values of the load factors and stresses will be utilized within the purview of the Indian Standards.

7.2.2 COMPUTER ANALYSIS

The computer analysis will produce accurate individual member forces, reactions at foundation level and deflection pattern of the entire structure as well as individual members. This data will then be used to confirm / review the member sizes and arrive at the most appropriate design of the structural members. Some re-runs of the analysis program might be required for arriving at the optimum structural space frame characteristics that satisfy the strength and stability criteria in all respects.

Design of different structural elements will be carried out using In-house developed spreadsheets and packages, software's like STAAD-pro-V8i, ETABS.version.2018, SAFE.v, RCDC,

7.3 OTHER LOADS

Specific requirements of floor and wall cutouts for services, sinking (extent & depth) of floors in services, kitchen, utility and toilet areas, external architectural features, and entrance canopies are provided as required by Architects and Service Consultants. The relevant information is obtained from them in the form of drawings.
Escalators, Lift loads and lift machine room equipment and cutout layouts will be obtained from the lift manufacturers. An impact factor of 100% will be considered in the lift supporting structures.

7.4 LOAD FACTORS FOR DESIGN

Description of load combination	Load factor for primary load cases				
	Dead load	Live load	Wind load	Seismic load	Temperature Load
Dead load + live load	1.5	1.5	0	0	0
Dead load + / - wind load	1.5 / 0.9	0	1.5	0	0
Dead load + /- seismic load	1.5 / 0.9	0	0	1.5	0
Dead load + live load + / -wind load	1.2	1.2	1.2	0	0
Dead load +live load + / - seismic load	1.2	1.2	0	1.2	0
Dead load + temp load	1.4	0	0	0	1.4
Dead load +live load + / - temp load	1.05	1.275	0	0	1.05

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8.0 OTHER IMPORTANT ASPECTS

8.1 WATERPROOFING

Detailed specifications and approved brands will be discussed, agreed and included in the tender documents as the design development progresses.

8.2 EXPANSION JOINTS

Expansion joints are recommended when structure exceeds 45m length. The width of the joints is being calculated as per IS-1893-2016, clause 7.11.3.

- Expansion joint has been considered between the towers and detailed in the current design.
- Expansion strip may be provided wherever required.
- Construction joints will be planned with the coordination of construction team.
- Shrinkage strips of 1m wide will be provided at every 10mt of retaining wall.

9.0 VALUE ENGINEERING EXCERCISES.

In order to optimize the material consumption, sample analysis and design exercises will be undertaken with different combinations of member sizes and the required reinforcement and formwork will be estimated. Results of these exercises will be considered in arriving at the structural scheme of the building.

10 GENERAL NOTES

i. Structural drawings shall be read and used in conjunction with Architectural, Mechanical, Plumbing, Electrical drawings and project specifications.

ii. Unless otherwise noted, details shown on any structural drawings are to be considered typical for all similar conditions.

iii. All levels to be read from Architectural drawings & corresponding services drawings.

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Property Valuation & Cost Estimation

Guideline Value, Apartment Composite Value, Stamp Duty & Registration Fees Calculator, Building Value Calculator, Capital Gains Calculator, Area Unit Converter, Length Unit Converter

Ownership, Compliance & Legal Verification

Encumbrance Certificate (EC) Search, Find Your SRO, Temple Property Check, WAQF Property Check, View Patta/Chitta, View FMB, Patta Analyzer, EC Analyzer

Zoning & Land Use Analysis

Land Use Zone Finder, CRZ Zone Check, Aquifer Zone Check, CBA Check, EWS Check, Road Width Check, Proposed Road Widening Check, FSI Calculator

Property Documentation & Workflow Tools

Forms & Templates, Document Generator, Document Translation, Dictionary

Vastu & Property Management Tools

Home Vastu Shastra, Plot Vastu Shastra, Property Management

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