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DESIGN BASIS REPORT

PROJECT:

Proposed Residential & Commercial Building at OMR , Chennai.

CLIENT :
M/S BAASHYAAM REALITY PVT LTD AND BAASHYAAM VENTURES PVT LTD.

ARCHITECT: M/S ED+ ARCHIETECTURE

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C/9783/2023/R1

Date: 23.09.2024

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ARCHITECT : M/S ED+ ARCHITECTURE

STRUCTURAL CONSULTANT: M/s Mahimtura Consultants Pvt. Ltd.

GEO-TECH CONSULTANTS : M/S Geo Marine Consultant Pvt. Ltd.

1. DESIGN ASSUMPTIONS & STRUCTURAL SYSTEM

The structural system for the proposed residential & commercial development at OMR, Chennai consists of R.C.C. framed structure with shear wall, columns, beams, slabs and staircases etc. The floor slabs are mainly R.C.C. slab system. The report outlines the key structural design criteria/assumptions. The design has been done in accordance with the provision given in the architectural/services drawings as well as IS standards.

The Number of floors which has to be Design is given below.

NUMBER OF FLOORS
THE BLDG. IS DESIGNED FOR 2 BASEMENT+ GROUND +Typical Floor (33 FLOOR) + TERRACE. For tower A-B-C_D (1-2-3-4)
THE BLDG. IS DESIGNED FOR 2 BASEMENTS+ GROUND +Typical Floor (32 FLOOR) + TERRACE. For tower E-F (5-6)
(landscape podium is at first floor level)

The floor-to-floor heights at different levels are shown below in the following table:

Floor level	Floor to Floor Ht (m)
Basement 1 floor	3.6
Basement 2 floor	3.6
Ground Floor	4.5
First Floor	3.10 for tower A,B,C,D (1-2-3-4) 3.20 for tower E & F (5-6)
2nd Floor	3.10 for tower A,B,C,D 3.20 for tower E & F
3rd to 32nd/33rd h Typ. floor	3.10 for tower A,B,C,D (33rd floor) 3.20 for tower E & F (32nd floor)

The height of structure from Ground level to terrace level is 106.80 m for Tower A-B-C-D (1-2-3-4) & 106.90 m for tower E-F (5-6).

2. DESIGN LOADS

a) GRAVITY LOADS

The construction load, super imposed dead load that are envisaged to act permanently (wherever applicable) & Live loads for each occupancy category as per IS:875(part-2)–1987 are as follows: -

i) BASEMENT 01 & 02

Name of Structure		kN/m2
Construction Dead Load	Slab & Beam	As per sizes Of members
Superimposed Dead Load	50mm floor Finishes	1.25
	False ceiling & services	0.50

Live Load	Car parking @ drive way/ ramp	3.00
	ELECTRICAL/METER ROOM (NON- REDUCIBLE LIVE)	5
	GARBEGE ROOM (NON- REDUCIBLE LIVE)	5

ii) GROUND Floor

Name of Structure		**kN/m2**
Construction Dead Load	Slab & Beam	As per sizes Of members
Superimposed Dead Load	50mm floor Finishes	1.25
	False ceiling & services	0.50
Live Load	Car parking / drive way	3.00
	ENTRANCE LOBBY	5.0
	RETAIL AREA(NON-REDUCIBLE LIVE)	5.0
	ELECTRICAL/METER ROOM (NON- REDUCIBLE LIVE)	5
	PUMP ROOM (NON-REDUCIBLE LIVE)	5
	DG LOAD(NON-REDUCIBLE LIVE)	15

iii) Parking & Driveway

Name of Structure		kN/m2
Construction Dead Load	Slab & Beam	As per sizes Of members
Superimposed Dead Load	50mm floor Finishes	1.25
	False ceiling & services	0.50
Live Load	Car parking / drive way	3.0

iv) Fire Tender Load & Fire Ramp driveway

Name of Structure		kN/m2
Construction Dead Load	Slab & Beam	As per sizes Of members
Superimposed Dead Load	Finishes	1.50
	False ceiling & services	0.50
Live Load (NON-REDUCIBLE LIVE)		15.0

v) Swimming pool

Name of Structure		kN/m2
Construction Dead Load	Slab & Beam	As per sizes Of members
Superimposed Dead Load	150mm thk water proofing	3
	False ceiling & services	0.50
Live Load (NON-REDUCIBLE LIVE)		6 or 12 as per drawing.

vi) Podium Floor

Name of Structure		kN/m2
Construction Dead Load	Slab & Beam	As per sizes Of members
Superimposed Dead Load	50mm floor Finishes	1.25
	False ceiling & services	0.50
Live Load	GYM	5.0
	Multipurpose hall	4.0
	Dining hall	4.0
	Open to sky	4.0
	Landscaping	As per landscaping drawing.

vii) TYPICAL FLOOR with partition walls

Name of Structure		kN/m2
Construction Dead Load	Slab & Beam	As per sizes Of members
Superimposed Dead Load	50mm floor Finishes	1.25
Live Load		2.00
Partition wall load		As per architectural wall layout.

viii) TYPICAL FLOOR without partition walls

Name of Structure		kN/m2
Construction Dead Load	Slab & Beam	As per sizes Of members
Superimposed Dead Load	50mm floor Finishes	1.25
Live Load		2.00

ix) LIFT LOBBY/CORRIDOR/PASSAGE/STAIRCASE

Name of Structure		kN/m2
Construction Dead Load	Slab & Beam	As per sizes Of members
Superimposed Dead Load	50mm floor Finishes	1.25
Live Load		3.00

x) TOILET / BATHROOM

Name of Structure		kN/m2
Construction Dead Load	Slab & Beam	As per sizes Of members
Superimposed Dead Load	Sunk (75mm)	1.50
Superimposed Dead Load	50mm floor Finishes	1.25
Live Load		2.00

xi) BALCONY & FLOWER BED

Name of Structure		kN/m2
Construction Dead Load	Slab & Beam	As per sizes Of members
Superimposed Dead Load	Sunk & waterproofing (150mm)	3.0
Superimposed Dead Load	50mm floor Finishes	1.25
Live Load		3.00

xii) TERRACE

Name of Structure		kN/m2
Construction Dead Load	Slab & Beam	As per sizes Of members
Superimposed Dead Load	Water proofing (150 mm)	3.00
Live Load		3.00
OHT LOAD (NON-REDUCIBLE LIVE)	AS PER ARCH. WATER HEIGHT DATA (WATER INTENSITY = 10 kN/m^3)	
LIFT MACHINE ROOM (NON-REDUCIBLE LIVE)	In the absence of Lift load data. Assumed load per lift 40 TON /PER LIFT UNIT	

3. MASONARY WALL

Periphery walls

150mm RCC Non-structural walls as per arch layout

Internal walls

100mm Nonstructural walls as per arch layout

4. WIND LOADS

The wind pressure for Initial Estimate of Wind Load has been calculated

based on clause 6.3 of I.S. 875 (Part) – III) 2015.

Basic Wind Speed V_b = 50 m/sec

Table-1 Risk Coefficient k_1 = 1.0
(Based on 50 years return Period)

Terrain Category = 3

Hourly mean wind speed factor $\overline{k_{2,i}}$ = Varies as per height

Topography factor k_3 = 1.0

Important factor for cyclonic region k_4 = 1

Design hourly mean wind Speed V_z = $V_b k_1 \overline{k_{2,i}} k_3 k_4$

Wind Pressure p_z = $0.6\ V_z^{\,2}$

Design Wind Pressure (p_d) calculated as per IS 875 (part 3) clause 7.2. Gust factor has been considered in analysis as per IS 875 (part 3) clause 9.1.

5. EARTHQUAKE LOADS

The loading due to earthquake is assessed based on the provisions of IS: 1893(Part-1):2002.

Seismic Zone		=	III
Table-2	Zone factor (Z)	=	0.16
Table-6	Importance Factor (I)	=	1.2
Table-7	Response Reduction Factor (R)	=	4

The response reduction factor R will be taken as 4 as the structure is ductile shear wall with ordinary moment resisting frame. Hence Ductile detailing is considered as per IS 13920.

Soil type = Hard soil

Fundamental Natural Time Period (Ts) calculation –

As per Clause 7.6.2(b)

$$T_a = \frac{0.075h^{0.75}}{\sqrt{A_w}} \geq \frac{0.09h}{\sqrt{d}}$$

HORIZONTAL SEISMIC CO-EFFICIENT –

As per Clause 6.4.2

$$A_h = \frac{Z \times I \times Sa}{2 \times R \times g}$$

DESIGN BASE SHEAR

$V_b = A_h \times W$

DYNAMIC ANALYSIS-

Response spectrum analysis considered as per clause no. 7.8.4 of IS: 1893-2016.

6. Live load reduction factor.

Live load reduction factor is applied as per IS875-part 2 Caluse 3.2.1

3.2.1 *For Floor Supporting Structural Members* — Except as provided for in 3.2.1.1, the following reductions in assumed total imposed loads on floors may be made in designing columns, load bearing walls, piers, their supports and foundations.

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

7. P-delta Analysis

P-delta analysis shall be carried out for accurate results.

Iterative – Based on load cases: The load is computed from a specified nonlinear analysis load cases created by combining load patterns as required for initial P-Delta analysis. This is an iterative method which considers P-delta on an elements basis. Local buckling is captured more effectively.
Sale factors of 1.2 for D.L and 0.5 for L.L is used for gravity load analysis case which is used for P-delta analysis.
As per clause 7.2 (d) of IS 16700, scale factor of 1.5 for earthquake/wind shall be used and another load cases shall be created as specified in the clause for initial P-delta analysis.

8. Crack width limits

- Limiting values of crack width as per clause 35.3 of IS:456-2000 is followed in the design.
- In general, for slab and beam, the crack width is limited to 0.3mm.
- For water retaining structures and element in contact with soil/water, crack width is limited to 0.2mm.

9. DEFLECTION :

Beam Slab deflection: -Span /Depth ratio as per IS:456-2000

10. BUILDING SWAY AND INTER-STOREY DRIFT.

It is generally recognized that absolute sway is not a perceivable parameter, however limiting sway is used to provide a reasonable level of stiffness and in order to limit damage to non-structural elements as well as limit size of curtain wall joints, etc. Generally tall building lateral load resisting systems are sized on the basis of limiting overall lateral sways to limits of approximately Overall Height/500 under the 20-year return period wind loads.

11. 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:1893-2002 is adopted both for evaluating earthquake effect and for combined load effects, used in such combination.

11.1. TEMPERATURE LOAD

The available guidelines in IS-875-1987-part 5 do not suffice for completeness. However, SP:24 Explanatory Handbook for IS:456-1978 mentions additional information with regards to load combination to be used when temperature loads are associated with dead and live load. However load combination mentioned in IS-875 suggests that temperature load cases shall be combined with gravity and lateral loads. IS-875 also suggests referring to specialized literature for accounting effect of temperature changes on building.

Following methodology is suggested to account for temperature effect on building.

i) Healing of structure element is evaluated with principles of thermodynamic and its effect in terms of rise/fall in temperature is quantified for total incident sun energy on hottest/coolest day at the geographical location of building.

Uniform rise/fall in temperature for terrace slab and side of wall/column is considered as10°C

Type	LOAD COMBINATIONS
Primary	DEAD LOAD (DL)
Primary	WALL LOAD (WL)
Primary	SLAB DEAD LOAD (SDL)
Primary	LIVE LOAD (LL)
Primary	WIND LOAD X (+) WLX
Primary	WIND LOAD Z (+) WLZ
Primary	SIESMIC LOAD ALONG-X SLX
Primary	SIESMIC LOAD ALONG-Z SLZ

Primary	UNIFORM RISE / WALL IN 10°C AT ROOF SLAB LVL.
Combination	DL + WL + SDL + LL
Combination	DL + WL + SDL + LL + WLX
Combination	DL + WL + SDL + LL + WLZ
Combination	DL + WL + SDL + LL - WLX
Combination	DL + WL + SDL + LL - WLZ
Combination	DL + WL + SDL + LL + SLX
Combination	DL + WL + SDL + LL + SLZ
Combination	DL + WL + SDL + LL - SLX
Combination	DL + WL + SDL + LL - SLZ
Combination	DL + WL + SDL + WLX
Combination	DL + WL + SDL + WLZ
Combination	DL + WL + SDL - WLX
Combination	DL + WL + SDL - WLZ
Combination	DL + WL + SDL + SLX
Combination	DL + WL + SDL + SLZ
Combination	DL + WL + SDL - SLX
Combination	DL + WL + SDL - SLZ

12. LOAD FACTORS FOR DESIGN

Description of Load Combination	**Load Factor for Primary Load Cases**				
	Dead Load	**Live Load**	**Wind Load**	**Seismic Load**	**Tempreture Load**
Dead load + Live load	1.5	1.5	0.0	0.0	0.0
Dead load ± Wind load	1.5	0.0	±1.5	0.0	0.0
Dead load ± Seismic load	1.5	0.0	0.0	±1.5	0.0
Dead load + Live load ± Wind load	1.2	1.2	±1.2	0.0	0.0
Dead load + Live load ± Seismic load	1.2	1.2	0	±1.2	0.0
Dead Load ± Wind Load	0.9	0.0	±1.5	0.0	0.0
Dead Load ± Seismic Load	0.9	0.0	0.0	±1.5	0.0
Dead load ± Temp.	1.5	0.0	0.0	0.0	±1.5
Dead load + Live load ± Temp.	1.125	1.125	0.0	0.0	±1.125

13. STIFFERENERS MODIFIERS

Since the total height is more than 49.1m, following stiffness modifiers to be used: -

SI No.	Structural Elements	Un-Factored Loads		Factored Loads	
		Area	Moment of Inertia	Area	Moment of Inertia
i.)	Slabs	1.0Ag	0.35Ig	1.00Ag	0.25Ig
ii.)	Beams	$1.0A_g$	$0.7I_g$	$1.00A_g$	$0.35I_g$
iii.)	Columns	$1.0A_g$	$0.9I_g$	$1.00A_g$	$0.70I_g$
iv.)	Walls	$1.0A_g$	$0.9I_g$	$1.00A_g$	$0.70I_g$

14. ANALYSIS METHOD

The structure is analyzed for Static loads (both dead and live loads) and Lateral loads due to Earthquake/Wind loads and its combinations.

15. DESIGN LIFE

The design life of the structure is assumed as 50 years. This requirement is not applicable to replaceable materials.

16. DESIGN METHODOLOGY

All structures have been designed according to the Limit State Method as specified in IS:456-2000. Appropriate loads and its combinations, as per relevant clauses in IS 456:2000 code, for the most unfavorable effects are chosen for design.

17. EXPANSION STRIP

Expansion Strip of 1m width is provided in podium area only. Typical detail and construction method mentioned in our structural general drawing. Similarly, expansion joint proposed to separate wings of the tower as marked in structural drawing.

18. MATERIALS

The self-weight of the various elements are computed based on the built weight of materials as given below:-

Materials	Unit Weight in KN/m^3
Steel/Reinforcement	78.50
Plain Concrete	24.00
Reinforced Concrete	25.00
Saturated (Moist) Soil	20.00
Dry Soil	18.00
Water	10.00
Light Weight Block	8.00
Toilet Sunk Filling Load	20.0

19. CONCRETE

All the concrete items for the construction have the following characteristics and to be mix designed as per IS: 456-2000

Concrete Grade =M60,M50,M40 for Shear walls/ Columns.

=M40,M30 for beams and slabs

M15 - For P.C.C. / Plum concrete.

Aggregate = 20mm and down size, mechanically crushed aggregate.
(Mix design to be submit by contractor for our approval)

20. STRUCTURAL STEEL

Structural steel girder beams are considered in the service floor. Grade of structural steel E-250/350 as per IS:2062-2011

21. REINFORCEMENT

Reinforcement shall be of Grade Fe550 conforming to IS:1786-1985, With 14.5% elongation as per cl. 5.3 of 13920:1993.

22. EXPOSURE CONDITION

Structural elements below Plinth level and Exterior External faces of walls are designed for Moderate exposure condition and internal faces of walls, floor beams and slabs are designed for mild exposure condition as per Table 16 of IS 456-2000.

23. NOMINAL COVER TO REINFORCEMENT & FIRE RATING

The nominal cover to main reinforcement shall be as follows.
according IS 456:2000 Table 16A

		Cover	Fire resistance(Hours)
Staircase waist slab	=	35mm	2
Slab	=	25mm	1.5
Shear Walls & Columns	=	40mm	2
Floor Beams	=	40mm	2
Raft & Isolated Footing	=	50mm	-
Retaining Walls	=	50mm	-

24. FOUNDATION SYSTEM

Pile Foundation have been considered as per recommendation of soil investigation report.

25 . CODES & STANDARDS –

All the designs are conforming to the relevant Indian Standards. Some of the relevant Indian Standard Codes, which have been followed for the structural design, are given below.

CODE	DESCRIPTION
IS:875(Part-1)-1987	Code of Practice for Design Loads (Other than Earthquake) for Building and Structures-Unit Weights of Buildings Materials and Stored Material.
IS:875 (Part-2)-1987	Code of Practice for Design Loads (Other than Earthquake) for Building and Structures-Imposed loads
IS:875 (Part-3)-2015	Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures –Wind Load.
IS:875 (Part-5)-1987	Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures - Special Loads and Load Combinations
IS:456 -2000	Code of Practice for Plain and Reinforced Concrete

IS:1893(Part-1)-2016	Indian Standard Criteria for Earthquake Resistant Design of Structures
IS:1786-1985	Specification for High Strength Deformed Steel Bars and Wires for Concrete Reinforcement
IS:13920-2016	Ductile Detailing of reinforced concrete structures subjected to seismic forces – code of practice.
IS:1904	Indian Standard Code of practice for Design & Construction foundations in Soil: General Requirements.
IS:1642-1989	Indian Standard Code of practice for Fire Safety Of Buildings (General): Details of Construction.
IS:3370-2009	Indian Standard Code of practice for Concrete structures for storage of liquids.
SP 16-1980	Design Aids for Reinforced Concrete to IS 456-1978.
SP 34-1987	Handbook on Concrete Reinforcement and Detailing.
IS 2062-2011	Indian standard code of practice for hot rolled medium and high tensile structural steel - specification
IS:16700:2023	Criteria for Structural Safety of Tall Concrete Buildings

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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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