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VIJAYA ENGINEERING CONSULTANTS
(*Powered by Civil Engineers*)

31-07-2024

To,
M/s. Mrs.S.Manjula**,**
Villa No. 596 & 597, Mahidhara fortune city,
Chikkanahalli Village, Attibele Hobli,
Anekal taluk. 562107.

STRUCTURAL STABILITY CERTIFICATE

This is to certify that the Structural design for the proposed residential building having Stilt Floor + 5 Typical Upper Floors for "**NAVACHAITANYA NIVAS**" in old Sy.No.540/1B1A, New Sy.No.540/3 at Mathigiri Village, Hosur City Municipal corporation, Hosur Taluk, Krishnagiri District **,** Promoted by Mrs.S.Manjula, villa no 596 & 597, Mahidhara fortune city, Chikkanahalli village, attibele hobli, Anekal taluk. 562107.
The Proposed building have 27 numbers of dwelling units.

The Building in the above site have been designed as per national Buildings Code, IS 456, IS 1893-2016 and other IS Codes. The building is designed for Gravity Loads and Lateral Loads (winds and earthquake forces) refer to Latest seismic code design "criteria for earthquake resistant design of structures IS 1893-2016". I Hereby certify that the proposed building is structurally safe and sound as per National Building Code.

This Certificate is issued for the purpose of RERA Registration

1. Name of the Structural Engineer
2. Signature
3. License No
4. Date : 31.07.2024
5. Place

Er. G. HATHIRAM, BE.,M.E.,Ph.D.
Licenced Structural Engineer
GHMC, HYDERABAD
Licence No.288/Strl.Engr./TP10/GHMC/2021
Mobile : 9490756760

#4-4-130, Gandhi Colony, Bhadradri Kothagudem. T.G (State)-507101
veckgm1@gmail.com, Mobile: 9490756760

MATHIGIRI VILLAGE, HOSUR CITY MUNICIPAL CORPORATION, HOSUR TALUK, KRISHNAGIRI DISTRICT

DESIGN BRIEF REORT FOR STRUCTURAL SERVICES

Client	:	M/s. Mrs.S.Manjula
Project Information	:	Proposed residential building having Stilt Floor + 5 Typical Upper Floors for "**NAVACHAITANYA NIVAS**" in old Sy.No.540/1B1A, New Sy.No.540/3 at Mathigiri Village, Hosur City Municipal corporation, Hosur Taluk, Krishnagiri District
Structural Consultant	:	Vijaya Engineering Consultants, #4-4-130, Gandhi Colony, Kothagudem, Bhadradri Kothagudem DT-507101. Telangana State-Mobile 9490756760

DOCUMENT NO: VEC/STR -DBR/SCT/Rev-R1

DATE	ISSUE	PREPARED	CHECKED	REVISION
31.07.2024	Approval	Er. Upendra	Dr.GHR	R1

1.0 INTRODUCTION

This Design Bried Report (DBR) is for the Proposed residential building having Stilt Floor + 5 Typical Upper Floors for "**NAVACHAITANYA NIVAS**" in old Sy.No.540/1B1A, New Sy.No.540/3 at Mathigiri Village, Hosur City Municipal corporation, Hosur Taluk, Krishnagiri District, represented by M/s. Mrs.S. Manjula**,**
Villa No. 596 & 597, Mahidhara fortune city, Chikkanahalli Village, Attibele Hobli,
Anekal taluk. 562107.

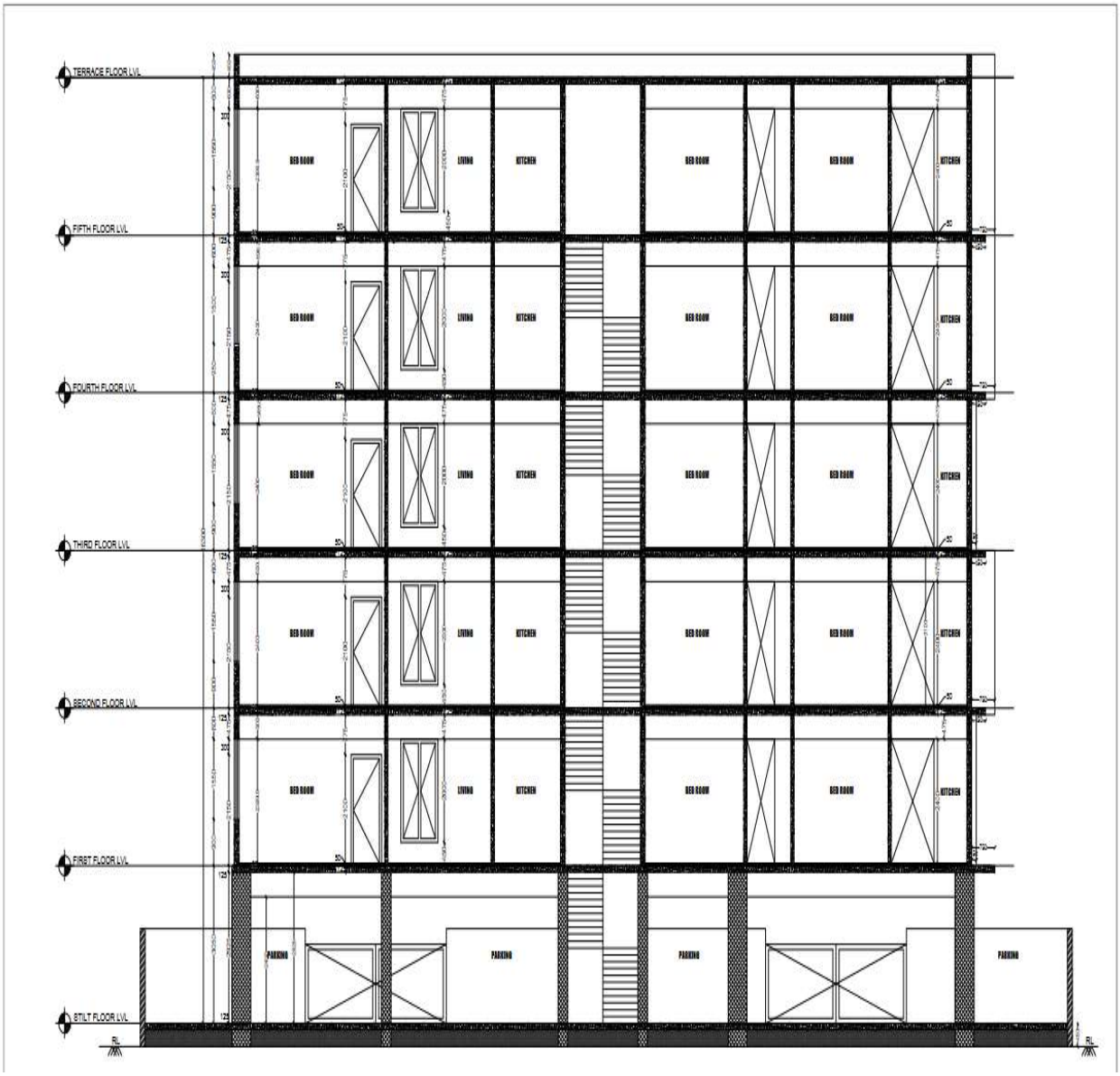
This report provides the information on Codes of practice, design loading's, material strength considered for the Design and Analysis of the building. In addition, this Report includes structural system, foundation System Method Statement of structural analysis which will be adopted for the design and analysis for the building

1.1 Facilities:

Stilt Floor	: Parking Lobby.
1st Floor to 5Th Floor	: Residential units.
Terrace	: Open Terrace, OHT & LMR.

1.2 Floor to Floor Height:

Stilt Floor	: 3.00M (Car Parking)
1st Floor to 5Th Floor	: 3.00M (Residential)
Terrace Floor	: 3.00M



SECTION

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2.0 CODES OF PRACTICE

The relevant Indian Standard Codes mentioned below are followed.

2.1 CODES, STANDARDS & REFERENCES

All the structural designs 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 edition 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 Version, with amendments if any, as on date. In addition, others 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.

CODE	DESCRIPTION
IS 875 (Part 1) 1987	Code of Practice for Design Loads (others than earthquake) for Buildings and Structures – units' 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 building and structures -wind loads
IS 875 (Part 5) 1987	Code of Practice for Design Loads (Other Than earthquake) for building and structures- Special Loads and Loads Combinations

IS 456 -2000	Code of Practice for plains and Reinforced Concrete.
IS 16700 – 2017	Criteria for Structural Safety of Tall Concrete Buildings Code of Practice for prestressed Concrete
IS 1343 – 2012	Code of practice For Prestressed Concrete
IS 1893 -2016	Criteria for earthquake resistant design of structures
IS 4326 - 1993	Code of practice for earthquake Resistant Design and Construction of Buildings
IS 3370 - 2009	Code of Practice for Concrete Structures for The Storage of Liquids.
IS 1904 – 1995	Code of Practice for Design and Construction of Foundation.
IS 1080 – 1997	Code of Practice for design and Construction of Shallow Foundation.
IS 800 – 2007	Code of Practice for General Construction in steel
BS 8110: 1997	Plain and Reinforced Concrete-Code of practice (British Standard)
ACI 318	Plain and reinforced concrete-code of practice (American Standard)
IS 13920:2016	Code of practice for ductile detailing of reinforced concrete structures subjected to seismic forces
SP24	Explanatory Hand Book on Indian Standard code of practice
SP34	Handbook on Concrete reinforcement and detailing

3.0 DESIGN OF LOADINCGS

A) 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 member sizes-shown in the floor plans.

LOADINGS	DEADLOAD (kN/m²)				LIVE LOAD (kN/m²)
	FINISHES	SERVICES	SDL/ Non Reduce LL	PARTITION	
STAIRCASE	I.8O	0.00	1.80/STEP)	0.00	3.00
TOILET	2.40	0.00	0.00	0.00	2.00
BALCONY	I.80	0.00	0.00	0.00	3.00
Utility ROOM	3.60	0.00	0.00	0.00	2.00
LOBBY& CORRIDOR	1.80	0.00	0.00	0.00	3.00
BED, LIVING & DINING	1.20	0.00	0.00	0.00	2.00
KITCHEN	I.80	0.00	0.00	0.00	2.00
TERRACE	3.60	0.00	0.00	0.00	3.00
LMR	3.60	0.00	12.40	0.00	0.00
			10XWATER	0.00	0.00

Permissible reduction in imposed load on each floor is considered for design of columns and footings as per IS 875 part (2)

A) SUPER IMPOSED DEAD LOADS (kN/m²)

For apartment floor Finishes of 50 mm thickness have been Considered on all the typical floors. Filling is considered for toilet 100mm (typical floor), utility=l50mm, balcony=150mm.

TERRACES (Load in kN/m²)

Water proofing + Screed 3.60 (0.15 (average finishes Thick) x 24 = 3.60)

C) SELF-WEIGHT OF SOLID BLOCK WALLS (KN/m)

Infill walls (20mm for External wall & Internal wall 1 5mm plastering on either side)

i. 200mm thick wall = 4.40kN/m

ii. 100mm thick wall = 2.20KN/m

iii. Water tank = Water Height x 10

D) MATERIAL DENSITY

Unit weight of materials are as per IS: 875 (Part-1) 1987.

Unit weight of concrete	-	25 kN / Cum.
Unit Weight of Steel	-	78.5 kN / Cum
Screed Concrete	-	24 kN / Cum.
Unit Weight of Dry Soil	-	18 kN / Cum.
Unit Weight of saturated Soil	-	20 kN / Cum.
Unit Weight of Glass	-	27.2 kN / Cum.
Unit weight of water	-	9.81 kN / Cum.
Unit Weight of Solid Block wall	-	22 kN / Cum.
Light Weight concrete Filling	-	16 kN / Cum.

E) SEISMIC LATERAL FORCE

Seismic loads are considered in accordance with IS: 1893-2016.

The structure will be designed by dynamic analysis method by response spectrum method. The design seismic base pressure (Vb) =Ah W (as per Is 1893(Part-1) 2016 clause 5.4.6.1)

The design horizontal seismic coefficient $Ah = \frac{ZI\ Sa}{2\ R\ g}$

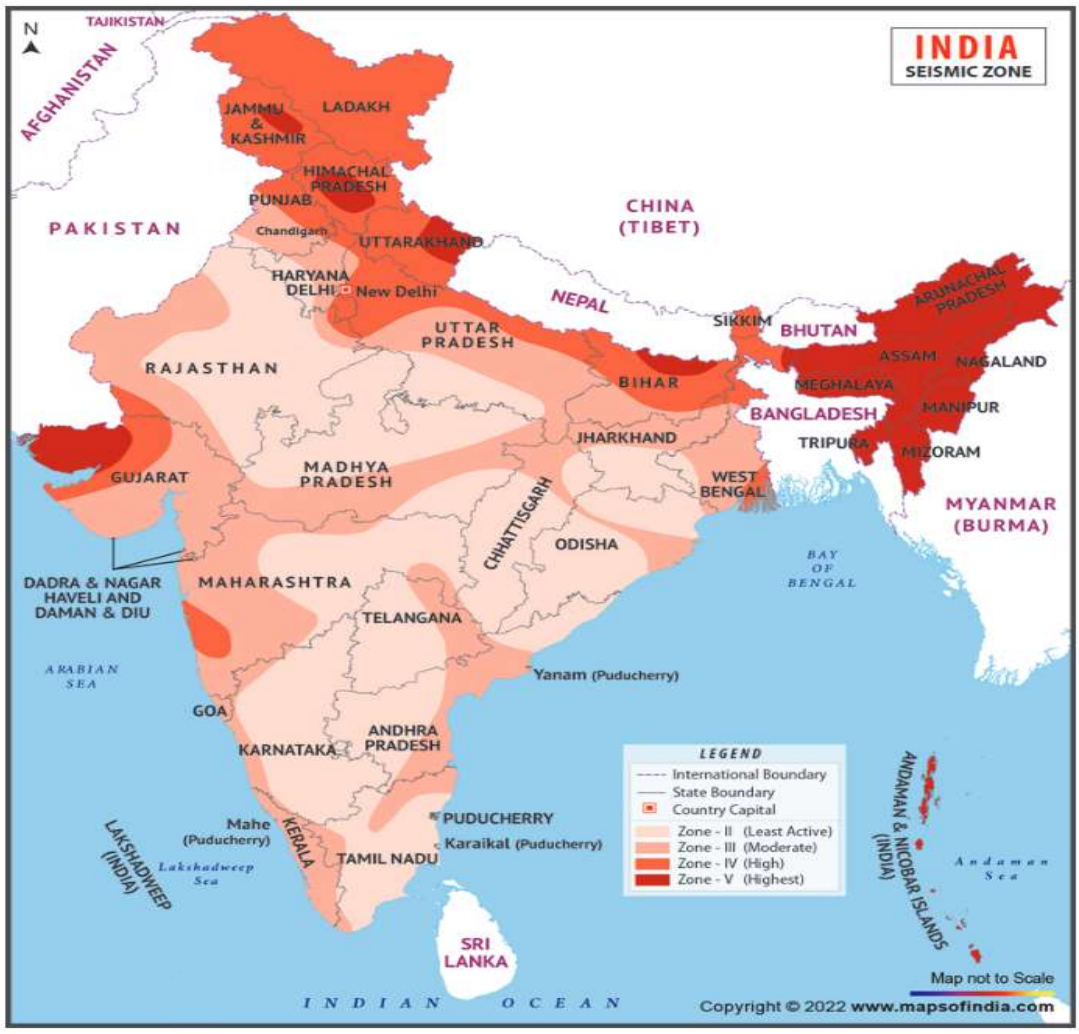
The various factors will be considered as below:

Factor	Description	Clause	Value
Z- II	Zone Factor	1893-2016 (PART-1) Table -3	0.1
I	Importance Factor	1893-2016 (PART-1) Table -8	1.0
R	Response Reduction Factor	1893-2016 (PART-1) Table -9	3.0

The approximate fundamental Time period (Ta) = 0.09h/√d (as per Is 1893(Part-1) 2016 clause 7.6.2) h= height of the building in m (excluding basements)

Sa/g Average response acceleration coefficient = as per Is 1893(Part-1) 2016 clause 7.2.5 Damping Percentage=5%

W (seismic weight)= Full dead load of structure + 50% of imposed loads exceeding 3kN\m^2 Full dead load of structure + 25% of imposed loads less than & up to 3kN\m^2. building is analyzed by the seismic coefficient method.



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F)

DYNAMIC ANALYSIS

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

Number of modes Considered	: 20 numbers (Min)
Modal Combination Method Used	: Complete Quadratic combination (CQC)
Directional Combination Method Used	: Square root of square (SRSS).
Modal case type	: Ritz vector method

Cut off frequency in case response spectrum method of analysis – 33Hz.

Mass participation is 90% as per our analysis

Damping 5% is used for seismic analysis

Dynamic analysis of building is carried out the members are designed accordingly.

F) WIND LOADS

The wind pressure shall be calculated based on the basic wind speed and other provisions laid in IS 875 part (3) – 2015

Design Wind speed $V_Z = V_b \times k_1 \times k_2 \times k_3 \times k_4$,

Where

V_b Basic Wind velocity for Coimbatore = 39m/s

K_1 Risk coefficient for all general buildings = 1.00

K_2 Terrain Category 2 = To suit the height of the structure for terrain

[K_2 (H=31.2m -GF to roof including parapet wall) = 1.10]

K_3 Topography factor = 1.00

K_4 Importance Factor = 1.00

Based on the above,

Max. design Wind speed (V_z) ($V_b \times k_1 \times k_2 \times k_3 \times k_4$) =42.9m/s

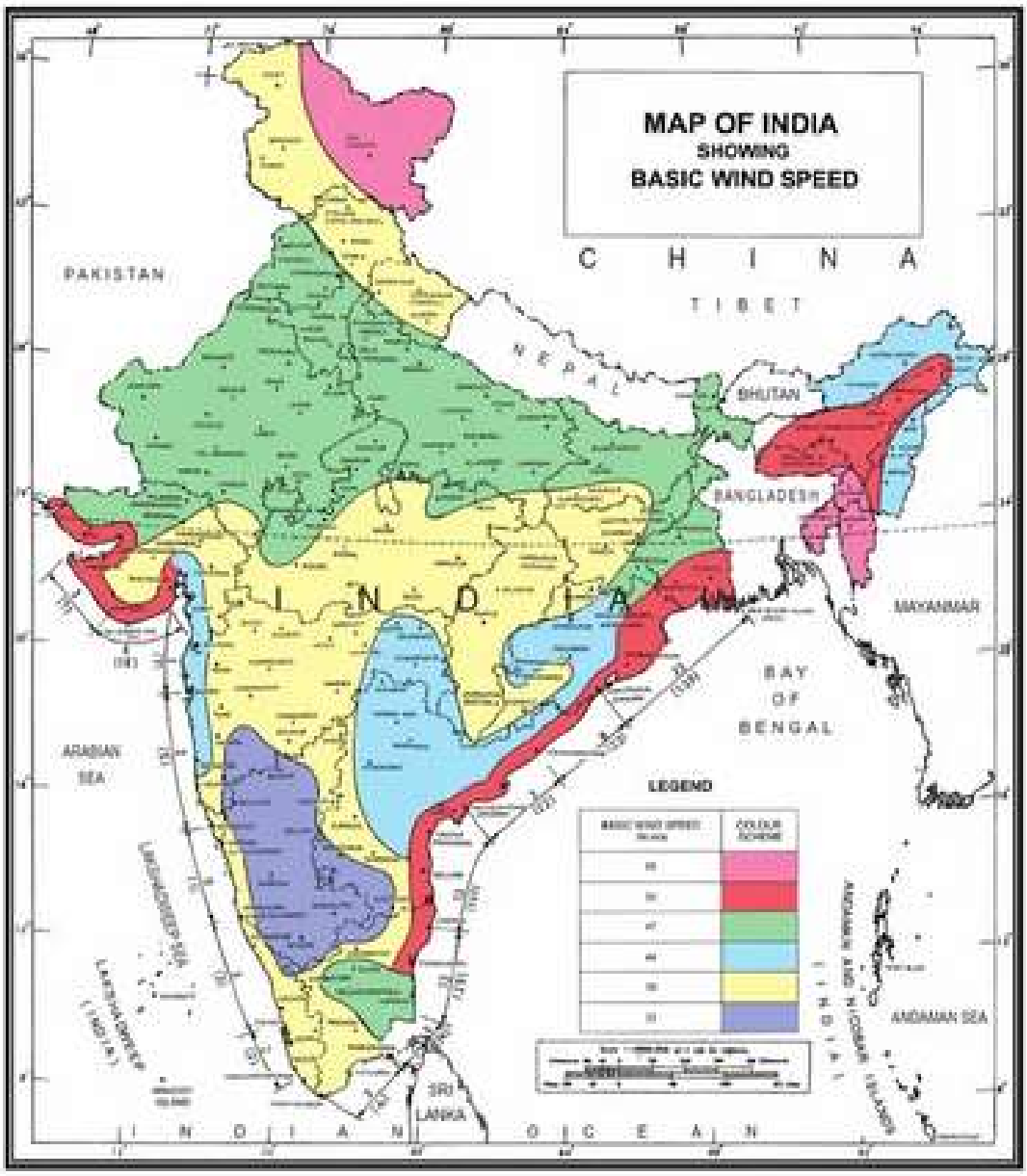
Max design wind pressure (Pz) = $0.6 \times Vz^2$ = 1104.25 N/m^2

Design wind pressure Pd = $Pz \times ka \times kd \times kc$ = 805 N/m^2

K_d wind directionality factor = 0.90

Ka Area averaging factor = 0.90

K_c Combination factor = 0.90



G) TEMPERATURE LOAD

The building is of Shear Wall type and combination of brick work. There will be no appreciable differential temperature during the service life of building. The roof slab and the podium of building is to be analyzed for = 15^0 C difference in temperature is applied to Staad model and necessary load combinations are considered in analysis & Design of the building the roof slab is assign as semi rigid diaphragm for ultimate load combination. The final deflection due to all loads including the effect

of temperature, creep and shrinkage are measured from the as cast level of the supports of floors, roofs and all others horizontal members should not normally exceed to span/250 ratio. The deflection including the effect of temperature, creep and shrinkage occurring after erection of partitions and the application of finishes should not normally exceed to span/350 or 20mm whichever is less.

3.1 LOAD COMBINATIONS

The various loads combinations used for design in accordance with IS 1893-2016 are as follows

1. 1.5 (DL + LL)
2. 1.2 (DL + LL ± SPECX-D) ± 0.36 SPECY-D ± 0.36 SPECZ-D
3. 1.2 (DL + LL ± SPECY-D) ± 0.36 SPECX-D ± 0.36 SPECZ-D
4. 1.2 (DL + LL ± SPECZ-D) ± 0.36 SPECX-D ± 0.36 SPECY-D
5. 1.2 (DL + LL ± WindX)
6. 1.2 (DL + LL ± WindY)
7. 1.5 (DL ± SPECX-D) ± 0.45 SPECY-D ± 0.45 SPECZ-D
8. 1.5 (DL ± SPECY-D) ± 0.45 SPECX-D ± 0.45 SPECZ-D
9. 1.5 (DL ± SPECZ-D) ± 0.45 SPECX-D ± 0.45 SPECY-D
10. 1.5 (DL ± WindX)
11. 1.5 (DL ± WindY)
12. 0.9DL ± 1.5 SPECX-D ± 0.45 SPECY-D ± 0.45 SPECZ-D
13. 0.9DL ± 1.5 SPECY-D ± 0.45 SPECX-D ± 0.45 SPECZ-D
14. 0.9DL ± 1.5 SPECZ-D ± 0.45 SPECX-D ± 0.45 SPECY-D
15. 0.9DL ± 1.5WindX
16. 0.9DL ± 1.5WindY

The various service loads combinations of structure as per IS 456 are as follows

17. 1.0DL +1.0 LL
18. 1.0DL ± 1.0SPECX-D ± 0.3 SPECY-D ± 0.3 SPECZ-D
19. 1.0DL ± 1.0SPECY-D ± 0.3 SPECX-D ± 0.3 SPECZ-D
20. 1.0DL ± 1.0SPECZ-D ± 0.3 SPECX-D ± 0.3 SPECY-D
21. 1.0DL ± 1.0WindX
22. 1.0DL ± 1.0WindY
23. 1.0DL + 0.8LL ± 0.8SPECX-D ± 0.24 SPECY-D ± 0.24 SPECZ-D
24. 1.0DL + 0.8LL ± 0.8SPECY-D ± 0.24 SPECX-D ± 0.24 SPECZ-D
25. 1.0DL + 0.8LL ± 0.8SPECZ-D ± 0.24 SPECX-D ± 0.24 SPECY-D
26. 1.0DL + 0.8LL ± 0.8WindX
27. 1.0DL + 0.8LL ± 0.8WindY

Where,	DL	- Dead load,
	LL	- Live load (Live>3kN/m2, Live1<=3kN/m2)
	WindX	- Wind load in x - direction
	WindY	- Wind load in y-direction
	SPECX	- Earthquake load in x-direction
	SPECY	- Earthquake load in y-direction
	TEMP	- Temperature load

4.0 MATERIAL GRADES

i) **CONCRETE**

Grade M25 (fck = 25 N/mm^2) for Raft Foundation, Overhead water Tank, UG Water Tank Pump Room, Beam & Slab.

ii) **REINFORCEMENT**

Reinforcement bars of grade Fe550D conform to IS 1789 – 2008

5.0 COVER AND FIRE RATING

Fire Rating Considered – 2hrs

Cover to Reinforcement considered for various Elements as as follows

a) Raft Footing :50 mm (Very Severe exposure condition)
b) Columns :40 mm (2 hours fire resistance)
c) Tanks Walls :45 mm (severe Exposure condition)
d) Shear walls :30 mm (2 hours fire resistance)
e) Beams(simply supported) :40 mm(2hours fire Resistance & Moderate)
f) Beams (Continuous) :30mm (2 hours fire Resistance & Moderate)
g) Slabs (Simply Supported) :35 mm (2hours fire resistance & Moderate)
h) Slabs (Continuous) : 25 mm 2 hours fire Resistance & Moderate)

6.0 STRUCTURAL SYSTEM

SUPER STRUCTURE: The Structural system for the super structure is R.C.C Beams with RCC slab the Slab Thickness is 125mm

7.0 DEFLECTION CRITERIA

7.1 Lateral Deflection (Wind)

(i) Over Deflection < Height / 500
(ii) Storey Deflection < Storey height /500

7.2 Lateral Defelction (Seismic)

(i) Overall Drift	<	H / 250
(ii) Storey Drift	<	0.004 times storey height

7.3 Vertical Deflection of Beams and Slab due to Gravity Loads

(i) Total Deflection (DL + LL)	<	Span /250
(ii) Deflection including the effects of Temperature Creep and Shrinkage Occurring after erection of partitions And the application of finishes	<	(Span/ 350) or 20mm whichever is less

8.0 STRUCTURAL ANALYSIS

Computer -adied Analysis using finite elements method (FEM) shall be carried out the design of structural elements For 3D or D structural frame Analysis latest version of software Staad.Pro or ETABS or 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.

Assumptions for 3D model analysis Staad/ETABS

Column	:	Frame Elements
RC walls	:	Wall (Shell) Elements
Beams Elements	:	Frame Elements
Slab	:	shell Elements

The following are general paraments adopted in the analysis and Design, Modulus

of Elasticity of concrete -5000 √fck

Consideration of Diaphragm -Rigid Diaphragm

Slab / wall elements considered as shell elements

Stiffness modification factors are adopted in the analysis as per IS -16700-2023, Table 6, Page 7.

Table 5 Cracked Section Properties of RC members

(*Clauses* 5.5.2,7.3.6, 8.1.3.2.1 *and* 7.2)

Sl No.	Structural Element	Serviceability Design		Strength Design	
		Cross-Sectional Area	Moment of Inertia	Cross-Sectional Area	Moment of Inertia
(1)	(2)	(3)	(4)	(5)	(6)
i)	Slabs	$1.0A_g$	$0.35I_g$	$1.00A_g$	$0.25\ I_g$
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 and methods are adopted in creating Staad.Pro 3D model for the building and design of structural elements.,

i. The 3D Staad.Pro model generated based on the preliminary floor plans (shuttering drawings) prepared using preliminary sizes.

ii. Sectional properties are assigned to all the structural elements as per the preliminary floor plans (shuttering drawings).

iii. External & Internal in fill wall loads are assigned as uniformly distributed line load on beams and as area load if the wall is intending to distributed on slab directly.

iv. Slab are modelled as shell elements if floor system and slab are assigned with horizontal diaphragms .

v. 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

vi. Area design load i.e Live Load/SDL or any other Load is appled ar floor relevant to its usage,

vii. All lateral loads & parameters are assigned as per codes IS 1893-2016 & IS 875-part-3, 2015

viii. Temperature loads are applied on to the terraces and to areas directly exposed to atmosphere

ix. Beams under torsion is required to maintain Equilibrium will be designed for torsion in accordance with IS 456-2000, clause 41.1 to 41.1 and for all others beams torsional stiffness is neglected in the analysis by applying stiffness modifier as 0.000001 to torsional constant "J" Hence no specific design for torsion is required for these beam.

x. Concrete cover to reinforcement complied accordance with IS 456-2000, Table 16 & 16A.

xi. All vertical wall elements are assigned with auto meshing/manual messing appropriately in order to achieve accuracy in results.

DESIGN APPROACH OF STRUCTURAL ELEMENTS

SHEAR WALL /COLUMN:

RC structural 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 the structural elements from the load combinations considered in the 3D Staad Model.

BEAMS:

Each Beams Will be Designed for Maximum forces from the 3D analysis using Staad.Pro software.

AREA LOAD & APPLICATION:

Applied as uniformly distributed area load with intensity proportinat eto its usage as mentioned in the Loading items in the DBR.

LINE (WALL) LOAD & APPLICATION:

Non-Load Bearing or infill wall load are calculated appropriately and applied as uniformly distributed line load.

9.0 FOUNDATION

Proposed foundation System is Raft footing and SBC considered for the Design is 35kN/m^2 and the foundation Depth is to be 2.8m from the natural ground level with reference to the soil investigation report No-ATV/GT/2023-11-28 from M/s A.T.V GEOTECHNICAL (INDIA), Civil Engineering Project Consultant, atv.geoindia@gmail.com.

10.0 COMPUTER PROGRAMS

The following Software / Spreadsheet to be used carry out structural analysis and design.

1. STAAD PRO - wall & Beam Design
2. STAAD PRO - Three Dimensional program
3. SAFE Ver 20.2 - Raft Analysis / Strip Analysis
4. In house Spreadsheet – one way / two way slab design
5. RCDC - Beams Design Columns Design and Wall Design
6. STAAD PRO & ETABS – Structural Steel Design

STAAD IMAGES

Fig 1. COLUMN POSITIONS

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veckgm1@gmail.com, Mobile: 9490756760

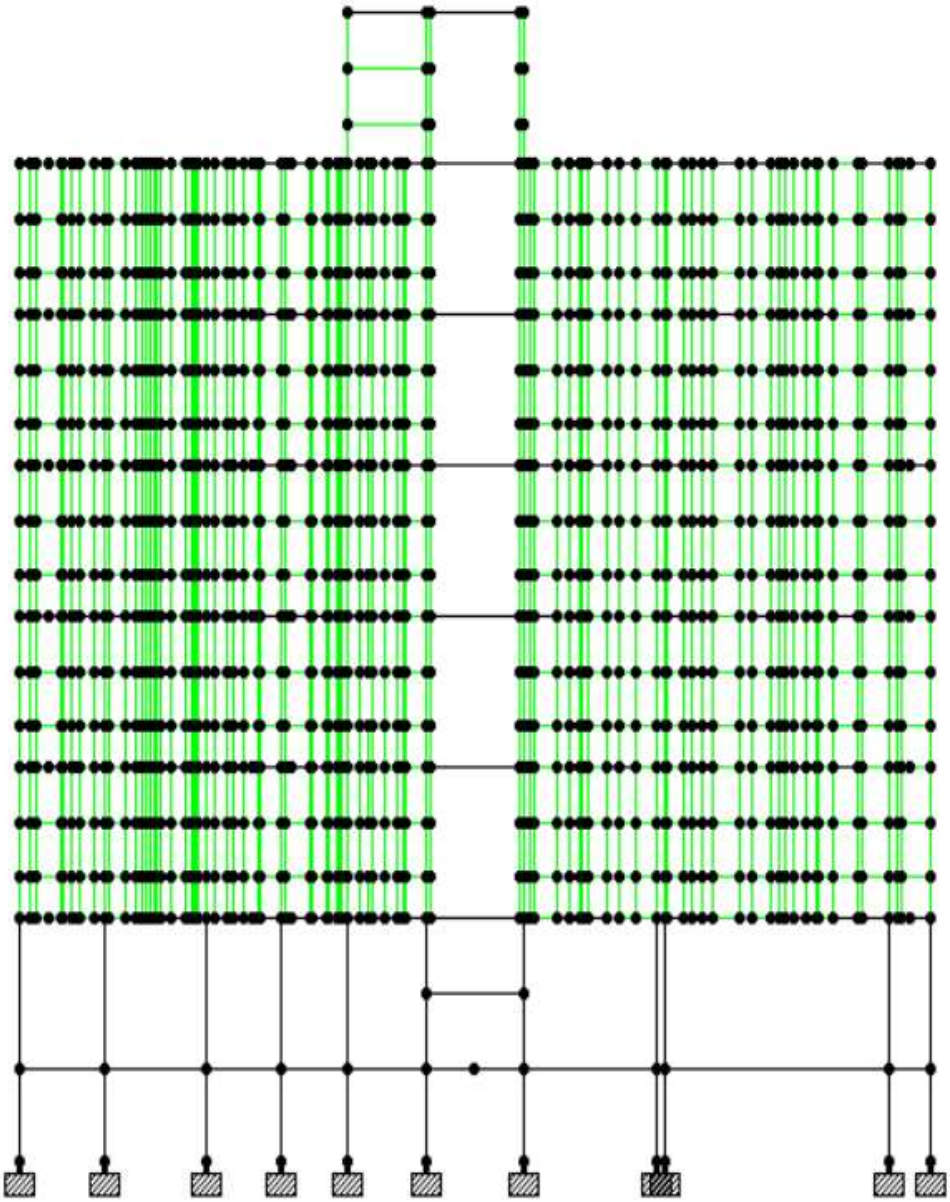

Fig 2 . FRONT VIEW

#4-4-130, Gandhi Colony, Bhadradri Kothagudem. T.G (State)-507101
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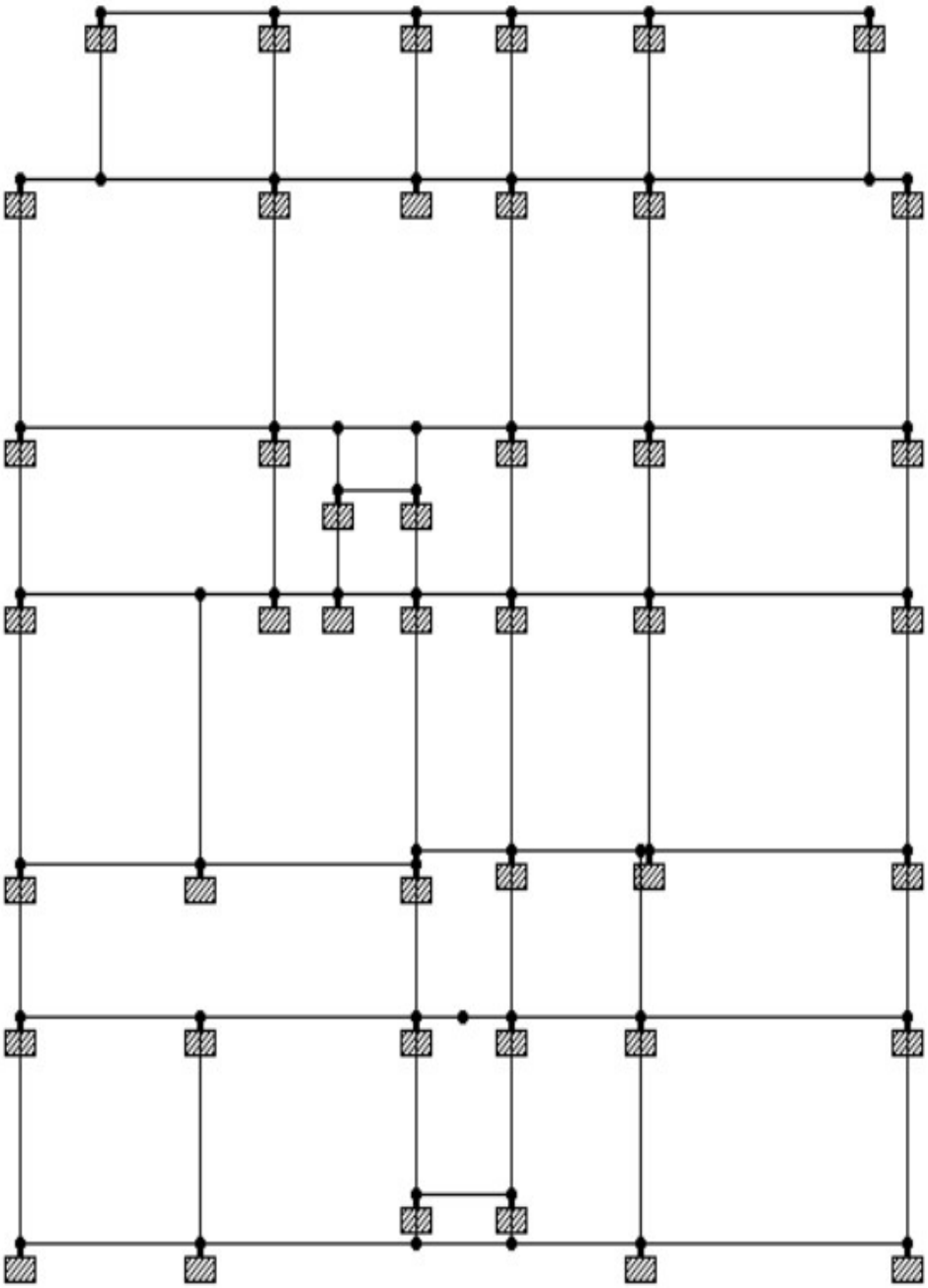

Fig 3. PB FRAMING

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veckgm1@gmail.com, Mobile: 9490756760

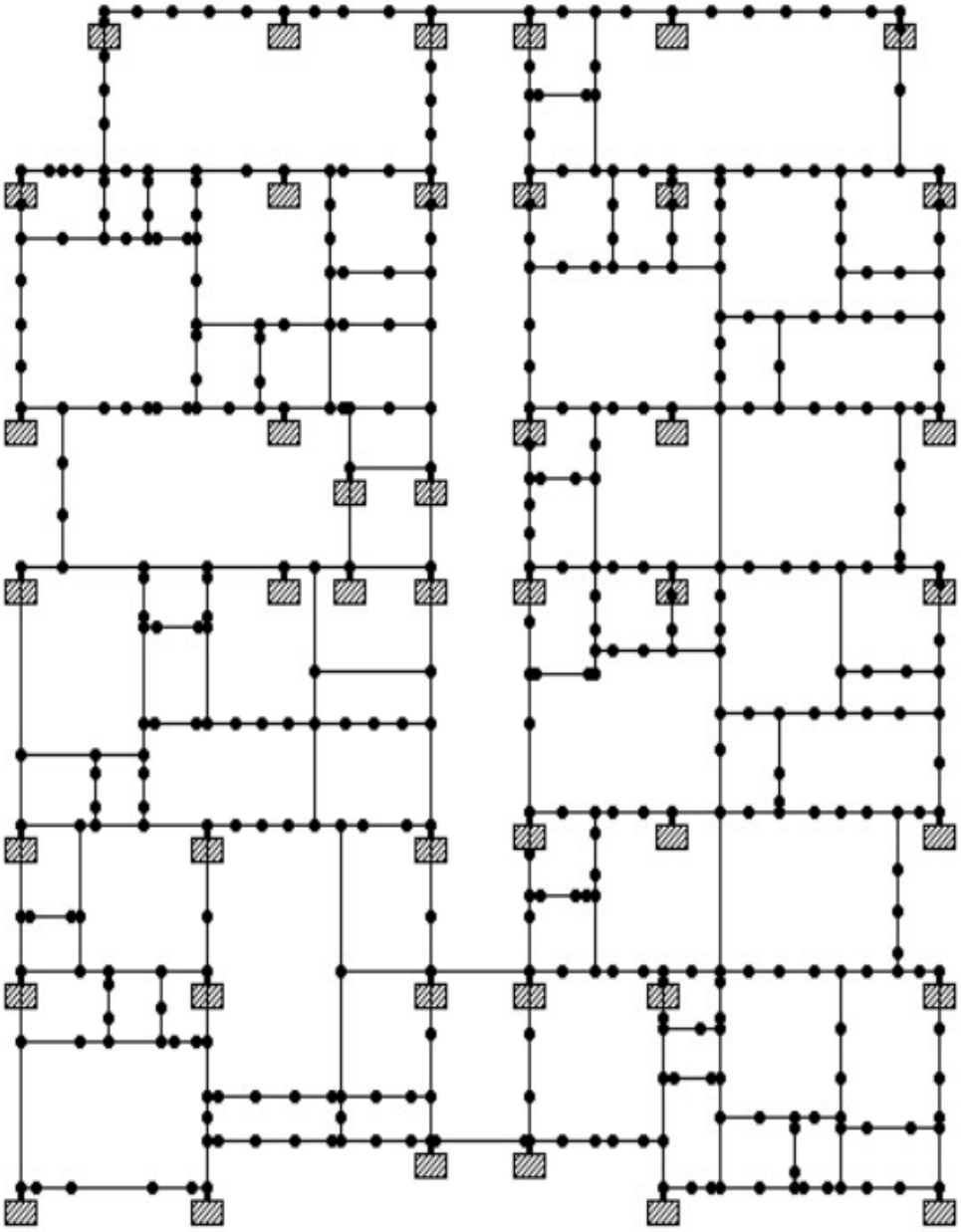

Fig 4. SLAB BEAM FRAMING

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veckgm1@gmail.com, Mobile: 9490756760

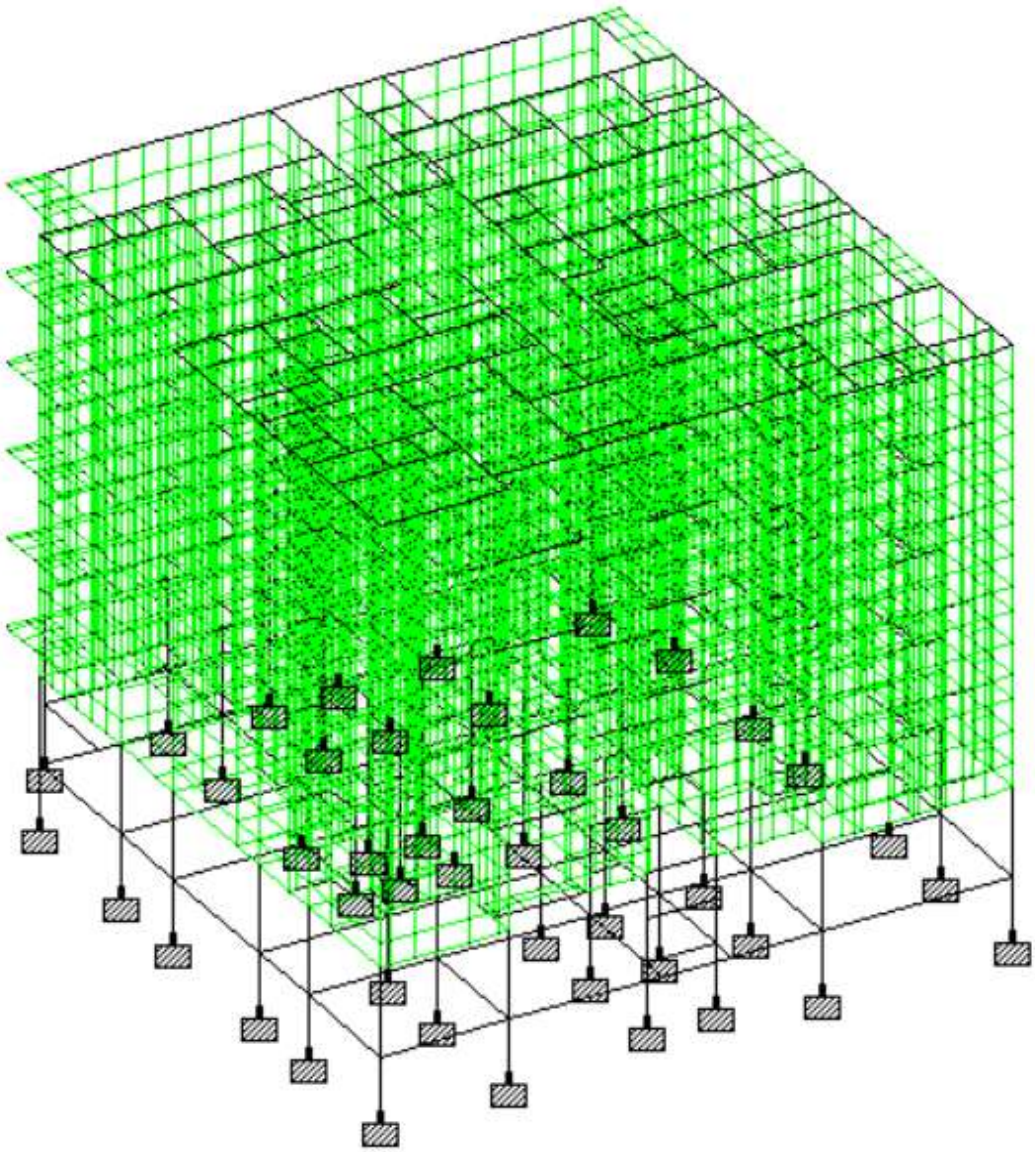

Fig 5. ISOMETRIC VIEW

STAAD LOADS FLOOR WISE

SELFWEIGHT Y -1
FLOOR LOAD
YRANGE 3.3 3.3 FLOAD -4.75 XRANGE 0 8.244 ZRANGE 0 3.405 .
YRANGE 3.3 3.3 FLOAD -4.75 XRANGE -2.156 8.244 ZRANGE 3.405 8.498 .
YRANGE 3.3 3.3 FLOAD -4.75 XRANGE -1.106 6.221 ZRANGE 8.498 11.895 .
YRANGE 3.3 3.3 FLOAD -4.75 XRANGE 6.221 8.245 ZRANGE 8.498 9.775 .
YRANGE 3.3 3.3 FLOAD -4.75 XRANGE -2.155 8.245 ZRANGE 11.895 17.408 .
YRANGE 3.3 3.3 FLOAD -4.75 XRANGE -2.155 2.614 ZRANGE 17.408 25.104 .
YRANGE 3.3 3.3 FLOAD -4.75 XRANGE 2.614 8.245 ZRANGE 17.408 23.183 .
YRANGE 3.3 3.3 FLOAD -4.75 XRANGE 8.244 10.792 ZRANGE 0 20.531 .
YRANGE 3.3 3.3 FLOAD -4.75 XRANGE 10.792 20.155 ZRANGE 0 3.405 .
YRANGE 3.3 3.3 FLOAD -4.75 XRANGE 10.792 21.2 ZRANGE 3.405 8.498 .
YRANGE 3.3 3.3 FLOAD -4.75 XRANGE 10.792 20.163 ZRANGE 8.498 11.895 .
YRANGE 3.3 3.3 FLOAD -4.75 XRANGE 10.792 21.2 ZRANGE 11.895 17.116 .
YRANGE 3.3 3.3 FLOAD -4.75 XRANGE 10.792 20.15 ZRANGE 17.116 20.531 .
YRANGE 3.3 3.3 FLOAD -4.75 XRANGE 10.792 14.161 ZRANGE 20.531 24.116 .
YRANGE 3.3 3.3 FLOAD -4.75 XRANGE 14.161 21.2 ZRANGE 20.531 25.104 .
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YRANGE 6.6 6.6 FLOAD -4.75 XRANGE 0 8.244 ZRANGE 0 3.405 .
YRANGE 6.6 6.6 FLOAD -4.75 XRANGE -2.156 8.244 ZRANGE 3.405 8.498 .
YRANGE 6.6 6.6 FLOAD -4.75 XRANGE -1.106 6.221 ZRANGE 8.498 11.895 .
YRANGE 6.6 6.6 FLOAD -4.75 XRANGE 6.221 8.245 ZRANGE 8.498 9.775 .
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YRANGE 6.6 6.6 FLOAD -4.75 XRANGE 8.244 10.792 ZRANGE 0 20.531 .
YRANGE 6.6 6.6 FLOAD -4.75 XRANGE 10.792 20.155 ZRANGE 0 3.405 .
YRANGE 6.6 6.6 FLOAD -4.75 XRANGE 10.792 21.2 ZRANGE 3.405 8.498 .
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ELEMENT LOAD
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3358 3398 TO 3403 3410 3412 3413 3415 TO 3417 3424 3426 3427 3435 3453 3459 -
3460 TO 3462 3465 TO 3478 3992 TO 4000 4002 4004 TO 4028 4031 4032 -
5790 TO 5795 5801 TO 5837 7595 TO 7600 7606 TO 7642 9400 TO 9405 -
9411 TO 9447 11205 TO 11210 11216 TO 11252 PR GY -4.75
MEMBER LOAD
309 3590 4139 5944 7749 9554 11305 11324 UNI GY -13.08
LOAD 2 LOADTYPE Live TITLE LL
FLOOR LOAD
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MEMBER LOAD
309 3590 4139 5944 7749 9554 11305 11324 UNI GY -7.9

#4-4-130, Gandhi Colony, Bhadradri Kothagudem. T.G (State)-507101
veckgm1@gmail.com, Mobile: 9490756760

F-1FOOTING DESIGN FOR COLUMN C-1

f_{ck} (N/mm^2)	25		
f_y (N/mm^2)	500		
Uplift load	0		
Depth of Foundation	2.5		
Load (P) (in tons)	152		
Moment (M in ton-met)	0.09	0.42	
Safe Bearing Capacity(SBC) (in ton/m^2)	35		
Area reqiured (A_{req}) (in m^2)	5.08		
Provide area (in mts) (A x B)	2.10	2.55	
Pedestal size (in mm) (p x q)	450	750	
Over burden on footing due to soil	2.10	2.55	1.75
Deduction for area of pedestal	0.45	0.75	1.75
Self weight of footing	2.10	2.55	0.75
Over burden + Self weight			
extra 15 degrees wt for uplift (for conidering enter" 1 "(or) enter " 0"		0	
	2.10	0.47	1.75
	2.55	0.47	1.75
Total load on footing	177.85	152	
Eccentricity in case of uplift (e)	0.00		
length of contact Le = 3((L/2)-e)	3.82	100	%
p_g (in ton/m^2) (p_g = load/area of footing)	33.25	33.4352	
Cantilever projection of the footing from face of the pedestal ©	825	900	
Moment (M in ton-met)	9.67	11.59	
Depth required (d_{req}) (d_{req}= sqrt((M*1.5*10^7)/(0.138*f_{ck}*b)))	205.08	224.45	
Provide total depth(D in mm)	600	600	
Effective depth (d in mm)	550	550	
(M_u/(b*d^2))	0.48	0.575	
Refer table -2 of SP-16			
p_t in %	0.113	0.136	
A_t in cm^2	6.221	7.47393	

#4-4-130, Gandhi Colony, Bhadradri Kothagudem. T.G (State)-507101
veckgm1@gmail.com, Mobile: 9490756760

Provided 12 tor @150 mm c/c main reinforcement in bottom bothways
and 10 tor @ 125 mm c/c top reinforcement in both ways

ONE WAY SHEAR

$V = p_g(C-d)*B$ (in tons)		19.93	21.03	
$t_v = V_u/Bd$ (in N/mm^2)		0.21	0.27	OK
	$< t_c=$	0.26	0.28	

TWO WAY SHEAR

$V = p_g((A*B)-((p+d)*(q+d)))$ (in tons)		115.26		
$t_v = V_u/b_od$ (in N/mm^2)		0.68	$< t_c=$	1.25
			OK	

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veckgm1@gmail.com, Mobile: 9490756760

	5.355	OK
18	16.87	T
-18	-1.063	T
25	10.041	T
	25.85	T
18	3.10	T
18	3.77	T
	0.00	

28.42	28.6088	33.2	0.22409
			33.4352

12	150
10	125

OK

F-2FOOTING DESIGN FOR COLUMN C-2

f_{ck} (N/mm^2)	25			
f_y (N/mm^2)	500			
Uplift load	0			
Depth of Foundation	2.5			
Load (P) (in tons)	128			
Moment (M in ton-met)	0.56	0.28		
Safe Bearing Capacity(SBC) (in ton/m^2)	35			
Area reqiured (A_{req}) (in m^2)	4.25			
Provide area (in mts) (A x B)	1.95	2.25		
Pedestal size (in mm) (p x q)	450	750		
Over burden on footing due to soil	1.95	2.25	1.825	
Deduction for area of pedestal	0.45	0.75	1.825	
Self weight of footing	1.95	2.25	0.675	
Over burden + Self weight				
extra 15 degrees wt for uplift (for conidering enter" 1 "(or) enter " 0"		0		
	1.95	0.49	1.825	
	2.25	0.49	1.825	
Total load on footing	148.71	128		
Eccentricity in case of uplift (e)	0.00			
length of contact Le = 3((L/2)-e)	3.36	100	%	
p_g (in ton/m^2) (p_g = load/area of footing)	34.23	34.09		
Cantilever projection of the footing from face of the pedestal ©	750	750		
Moment (M in ton-met)	8.30	8.26		
Depth required (d_{req}) (d_{req}= sqrt((M*1.5*10^7)/(0.138*f_{ck}*b)))	189.98	189.51		
Provide total depth(D in mm)	525	525		
Effective depth (d in mm)	475	475		
(M_u/(b*d^2))	0.55	0.549		
Refer table -2 of SP-16				
p_t in %	0.130	0.130		
A_t in cm^2	6.196	6.16548		

Provided 12 tor @150 mm c/c main reinforcement in bottom bothways
and 10 tor @ 150 mm c/c top reinforcement in both ways

ONE WAY SHEAR

V = p_g(C-d)*B (in tons)		18.26	15.75	
t_v = V_u/Bd (in N/mm^2)		0.26	0.26	OK
	< t_c=	0.27	0.27	

TWO WAY SHEAR

V = p_g((A*B)-((p+d)*(q+d))) (in tons)		96.05		
t_v = V_u/b_od (in N/mm^2)	0.71	< t_c=	1.25	
		OK		

	4.3875
18	14.41
-18	-1.109
25	7.404
	20.71
18	3.13
18	3.61
	0.00
29.51	29.3702

OK

F-3FOOTING DESIGN FOR COLUMN C-3

f_{ck} (N/mm^2)	25			
f_y (N/mm^2)	500			
Uplift load	0			
Depth of Foundation	2.5			
Load (P) (in tons)	112			
Moment (M in ton-met)	0.12	0.31		
Safe Bearing Capacity(SBC) (in ton/m^2)	35			
Area reqiured (A_{req}) (in m^2)	3.70			
Provide area (in mts) (A x B)	1.80	2.10		
Pedestal size (in mm) (p x q)	450	750		
Over burden on footing due to soil	1.80	2.10	1.875	
Deduction for area of pedestal	0.45	0.75	1.875	
Self weight of footing	1.80	2.10	0.625	
Over burden + Self weight				
extra 15 degrees wt for uplift (for conidering enter" 1 "(or) enter " 0"		0		
	1.80	0.50	1.875	
	2.10	0.50	1.875	
Total load on footing	129.52	112		
Eccentricity in case of uplift (e)	0.00			
length of contact Le = 3((L/2)-e)	3.14	100	%	
p_g (in ton/m^2) (p_g = load/area of footing)	34.36	34.5392		
Cantilever projection of the footing from face of the pedestal ©	675	675		
Moment (M in ton-met)	6.77	6.81		
Depth required (d_{req}) (d_{req}= sqrt((M*1.5*10^7)/(0.138*f_{ck}*b)))	171.57	172.10		
Provide total depth(D in mm)	475	475		
Effective depth (d in mm)	425	425		
(M_u/(b*d^2))	0.56	0.566		
Refer table -2 of SP-16				
p_t in %	0.133	0.134		
A_t in cm^2	5.650	5.6854		

Provided 12 tor @150 mm c/c main reinforcement in bottom bothways
and 12 tor @ 200 mm c/c top reinforcement in both ways

ONE WAY SHEAR

V = p_g(C-d)*B (in tons)		15.60	13.46	
t_v = V_u/Bd (in N/mm^2)		0.26	0.26	OK
	< t_c=	0.28	0.28	

TWO WAY SHEAR

V = p_g((A*B)-((p+d)*(q+d))) (in tons)		81.79		
t_v = V_u/b_od (in N/mm^2)		0.70	< t_c=	1.25
			OK	

	3.78
18	12.76
-18	-1.139
25	5.906
	17.52
18	3.05
18	3.56
	0.00
29.72	29.903

OK

F-4FOOTING DESIGN FOR COLUMN C-4

f_{ck} (N/mm^2)	25			
f_y (N/mm^2)	500			
Uplift load	0			
Depth of Foundation	2.5			
Load (P) (in tons)	86			
Moment (M in ton-met)	0.27	0.26		
Safe Bearing Capacity(SBC) (in ton/m^2)	35			
Area reqiured (A_{req}) (in m^2)	2.87			
Provide area (in mts) (A x B)	1.65	1.95		
Pedestal size (in mm) (p x q)	450	750		
Over burden on footing due to soil	1.65	1.95	1.925	
Deduction for area of pedestal	0.45	0.75	1.925	
Self weight of footing	1.65	1.95	0.575	
Over burden + Self weight				
extra 15 degrees wt for uplift (for conidering enter" 1 "(or) enter " 0"		0		
	1.65	0.52	1.925	
	1.95	0.52	1.925	
Total load on footing	100.60	86		
Eccentricity in case of uplift (e)	0.00			
length of contact Le = 3((L/2)-e)	2.92	100	%	
p_g (in ton/m^2) (p_g = load/area of footing)	31.53	31.5617		
Cantilever projection of the footing from face of the pedestal ©	600	600		
Moment (M in ton-met)	4.86	4.86		
Depth required (d_{req}) (d_{req}= sqrt((M*1.5*10^7)/(0.138*f_{ck}*b)))	145.33	145.42		
Provide total depth(D in mm)	425	425		
Effective depth (d in mm)	375	375		
(M_u/(b*d^2))	0.52	0.519		
Refer table -2 of SP-16				
p_t in %	0.122	0.123		
A_t in cm^2	4.588	4.59452		

Provided 12 tor @150 mm c/c main reinforcement in bottom bothways
and 100 tor @ 200 mm c/c top reinforcement in both ways

ONE WAY SHEAR

V = p_g(C-d)*B (in tons)		11.84	10.03	
t_v = V_u/Bd (in N/mm^2)		0.24	0.24	OK
	< t_c=	0.27	0.27	

TWO WAY SHEAR

V = p_g((A*B)-((p+d)*(q+d))) (in tons)		61.78		
t_v = V_u/b_od (in N/mm^2)		0.63	< t_c=	1.25
			OK	

	3.2175
18	11.15
-18	-1.169
25	4.625
	14.60
18	2.95
18	3.49
	0.00

26.99	27.0227

OK

CF-5FOOTING DESIGN FOR COLUMN C5

f_{ck} (N/mm^2)	25			
f_y (N/mm^2)	500			
Uplift load	0			
Depth of Foundation	2.5			
Load (P) (in tons)	68			
Moment (M in ton-met)	0.46	0.42		
Safe Bearing Capacity(SBC) (in ton/m^2)	35			
Area reqiured (A_{req}) (in m^2)	2.24			
Provide area (in mts) (A x B)	1.35	1.80		
Pedestal size (in mm) (p x q)	450	750		
Over burden on footing due to soil	1.35	1.80	2.025	
Deduction for area of pedestal	0.45	0.75	2.025	
Self weight of footing	1.35	1.80	0.475	
Over burden + Self weight				
extra 15 degrees wt for uplift (for conidering enter" 1 "(or) enter " 0"		0		
	1.35	0.54	2.025	
	1.80	0.54	2.025	
Total load on footing	78.51	68		
Eccentricity in case of uplift (e)	0.01			
length of contact Le = 3((L/2)-e)	2.68	100	%	
p_g (in ton/m^2) (p_g = load/area of footing)	32.94	33.078		
Cantilever projection of the footing from face of the pedestal ©	450	525		
Moment (M in ton-met)	2.90	3.96		
Depth required (d_{req}) (d_{req}= sqrt((M*1.5*10^7)/(0.138*f_{ck}*b)))	112.23	131.25		
Provide total depth(D in mm)	325	325		
Effective depth (d in mm)	275	325		
(M_u/(b*d^2))	0.57	0.563		
Refer table -2 of SP-16				
p_t in %	0.136	0.133		
A_t in cm^2	3.738	4.32406		

Provided 10 tor @125 mm c/c main reinforcement in bottom bothways
and 10 tor @ 200 mm c/c top reinforcement in both ways

ONE WAY SHEAR

V = p_g(C-d)*B (in tons)		9.01	7.76	
t_v = V_u/Bd (in N/mm^2)		0.27	0.27	OK
	< t_c=	0.28	0.28	

TWO WAY SHEAR

V = p_g((A*B)-((p+d)*(q+d))) (in tons)		48.27		
t_v = V_u/b_od (in N/mm^2)	0.75	< t_c=	1.25	
		OK		

	2.43
18	8.86
-18	-1.230
25	2.886
	10.51
18	2.67
18	3.56
	0.00

28.61 28.7517

OK

(Two way slab)-S1

	lg. Span (l_y)	sh. Span(l_x)
Panal size =	4.80	3
f_{ck} =	25	
f_y =	500	

Interior panel

Ly/Lx = 1.60

LOAD in KN/sqm

Dead load of the slab	= D*25 =	3.13		tor =
(Assume D= 125				spacing =
Floor finishes	=	1.0		
Live load	=	2.0		
Any other load	=			
Total load (w)	=	6.13		
				OK

Ref to table 26 of IS 456

a_x(-ve) =	0.0558
a_x(+ve) =	0.0426
a_y(-ve) =	0.032
a_y(+ve) =	0.024

		Moment in KNm	At in sqmm	8 tor mm c/c	10 tor mm c/c	12 tor mm c/c
Mx(-ve) =	a_x(-ve) *w*l_x^2*1.5 =	4.61	103	488	762	1097
Mx(+ve) =	a_x(+ve) *w*l_x^2*1.5 =	3.52	78	642	1003	1444
My(-ve) =	a_y(-ve) *w*l_x^2*1.5 =	2.65	59	858	1340	1930
My(+ve) =	a_y(+ve) *w*l_x^2*1.5 =	1.98	44	1147	1792	2580

d_{req} = SQRT((M_u*10^6)/(0.138*f_{ck}*b)) = 37

D_{prov} = 125

d_{prov} = 105

Provide 8 in R44thick slab with 8 tor @200 mm c/c main reinforcement and 8 tor @ 200 mm c/c distribution reinforcement

Check for deflection :

Ref chart 22 of SP-16

Percentage of reinforcement @ mid span	=	0.2394		
Coefficient for max ratio of span/eff depth	=	24.85		
Effective Depth required	=	92.87	<	105
		OK		

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veckgm1@gmail.com, Mobile: 9490756760

VIJAYA ENGINEERING CONSULTANTS
(*Powered by Civil Engineers*)

19th Aug 2024

To,
M/S. MAYFLOWER ENTERPRISES Pvt Ltd
No.72, Dr Balasundaram Road,
Coimbatore-641018.

STRUCTURAL STABILITY CERTIFICATE

This is to certify that the Structural design fpr the proposed residential building Having 1 Basement + Stilt Floor + 9 Typical Floor and Roof of **HMVC Housing For M/S MAYFLOWER ENTERPRISES P Ltd**, Old S.F. No:4182/2 PT, New T.S .No:5/1, Block No.7, Ward No.Z(26), Gurusamy Nagr, Viliankurinchi Village, Coimbatore North Taluk, Coimbatore Corparation, Coimbatore District, Promoted by **M/S. MAYFLOWER ENTERPRISES Pvt Ltd** No.72, Dr. Balasundaram Road, Coimbatore-641018.

The Proposed builidong have 42 numbers of dwelling units.

The Building on th above site have been designed as per national Buildings Code, IS 456, IS 1893-2016 and other IS Codes. The Building is designed for Gravity Loads and Lateral Loads (winds and earthquake forces) refer to Latest seismic code design "criteria for earthquake resistant design of structures IS 1893-2016". I Hereby certify that the proposed building is structurally safe and sound as per National Building code.

This Certificate is issued for the purpose of RERA Registration

#4-4-130, Gandhi Colony, Bhadradri Kothagudem. T.G (State)-507101
veckgm1@gmail.com, Mobile: 9490756760

Name Of the Structural Engineer

Signature

License No

Date

Place

PROPOSED RESIDENTIAL APARTMENT-CODISSIA AT VILANKURICHI VILLAGE, COIMBATORE

DESIGN BRIEF REORT FOR STRUCTURAL SERVICES

Client: Project Information:		**M/S. MAYFLOWER ENTERPRISES Pvt Ltd** T.S.No.5/1, BLOCK No.7, WARD NoZ(26), VILANKAURICHI VILLAGE, COIMBATORE COREPORATION, COIMBATORE DISTRICT.
Structural Consultant :		BURO ENGINNERS (I) PVT LTD Civil & Structural Consultants New No.31, (Old No.14), Beasent Avenue, Adyar, Chennai 600 020.

DOCUMENT NO : STR -DBR/Rev-R0

DATE	ISSUE	PREPARED	CHECKED	REVISION
06/11/2023	Approval	SJ	PJ	R0

#4-4-130, Gandhi Colony, Bhadradri Kothagudem. T.G (State)-507101
veckgm1@gmail.com, Mobile: 9490756760

2.0 INTRODUCTION

This Design Bried Report (DBR) is for the Proposed Residential Apartment – Codissia at Vilankurichi Village, Coimbatore, for M/S MayFlower Enterprises Pvt Ltd.

The proposed residential building having I basement + Ground + 9 Storey + Roof .

This Report Provides Building the information on codes of practice, Design Loading's , Material Strength Considered For the Analysis of the Building . in addition this Report includes structural system , foundation System Method Statmenet of structural analysis which will be adopted for the design and analysis for the building

1.1 Facilities:

Basement and Ground Floor : Parking Lobby,
1st Floor to 8Th Floor : Residential units.
9Th Floor : Residential units and Club house.
Terrace : Open Terrace, OHT & LMR.

1.2 Floor to Floor Height:

Basement Floor	-3.00m
Ground Floor	-3.00m
1st to 9th Floor Each Floor Height	-3.00m

2.0 CODES OF PRACTICE

The Relevant Indian Standard Codew Below are Followed

2.1 CODES STANDARDS & REFERENCES

All Designs of structures shall comply with the requriments specified in the following.

e) Relevant Indian Standard Codes of Practice
f) National Bulding code.
g) Local Building Regulations.
h) Other Relevant Inernational codes where required .

All applicable latest Edition 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 Version, with amendements if any, as on date. In Additon, others international codes and standards shall also be referred when required and relevant.

In the analysis, design and detailing of thr building, the following Indian standaed codes of Latest amendment will be used.

CODE	DESCRIPTION
IS 875(Part 1) 1987	Code of Practice for Design Loads (others than earthquake)for Buildings and Structures – units 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 building and structures -wind loads
IS 875 (Part 5) 1987	Code of Practice for Design Loads (Other Than earthquake) for building and structures- Special Loads and Loads Combinations
IS 456 -2000	Code of Pratice for plains and Reinforced Concrete.

IS 16700 – 2017	Criteria for Structural Safety of Tall Concrete Buildings Code Of Practice for prestressed Concrete
IS 1343 – 2012	Code of Pratice For Prestressed Concrete
IS 1893 -2016	Criteria for earthquake resistant design of structures
IS 4326 - 1993	Code Of practice for earthquake Resistant Design and Construction Of Buildings
IS 3370 - 2009	Code Of Practice For Concrete Structures for The Storage of Liquids.
IS 1904 – 1995	Code Of Practice for Design and Construction of Foundation.
IS 1080 – 1997	Code of Practice for design and Construction of Shallow Foundation.
IS 800 – 2007	Code of Practice for General Construction in steel
BS 8110 : 1997	Plain and Reinforced Concrete-Code of practice (British Standard)
ACI 318	Plain and reinforced concrete-code of practice (American Standard)
IS 13920:2016	Code of practice for ductile detailing of reinforced concrete structures subjected to seismic forces
SP24	Explanatory Hand Book on Indian Standard code of practice
SP34	Handbook on Concrete reinforcement and detailing

3.0 DESIGN OF LOADINCGS

•/ SUPERIMPOSED D£AD 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 clements will be considered depending member sizes-shown

in the floor plans.

LOADINGS	DEADLOAD (l(N/m2				LIVE LOAD (KN/m2
	FINISHES	SERVICES	SDL/ Non Reduce LL	PA.RTITION	
STAJRCASE	I.SO	0.00	1.80 /STEP)	0.00	3.00
TOILET	2.40	0.00	0.00	0.00	2.00
BALCONY	I.SO	0.00	0.00	0.00	3.00
UTILITY ROOM	3.60	0.00	0.00	0.00	2.00
LOBBY& CORRIDOR	1.80	0.00	0.00	0.00	3.00
8£D.L[VJNG & Dl.NN].1'<G	1.20	0.00	0.00	0.00	2.00
I<JTCHEN	I.SO	0.00	0.00	0.00	2.00
TERRACE	3.60	0.00	0.00	0.00	3.00
LMll.	3.60	0.00	12.40	0.00	0.00
OHT	1.80	0.00	10 X WATER HEIGHT	0.00	0.00

Permissible reduction in imposed load on each floor is considered for design of columns and footings as per IS 875 part (2)

b) **SUPER IMPOSED DEAD LOADS (kJ'l/m')**

For apartment floor Finishei of 50 mm lhickness have been Considered on all the l"ypical floors. Filling ii. considered for toilet 100mm (typical floor), utility=l50mm, balcony=150mm.

TERRACES (Load In kN/m2)

Waterproofing+ Screed 3.60(O.IS(average finishes Thk.) x 24=3.60)

c) **SELF-WEIGHT OF SOLID BLOCK WALLS (KN/m)**

Infill walls (20mm for Extern-al wall & internal wall [5mm plastering on Either side)

(i) 200mm thick wall 4.40kN/m

(ii) 100mm thick wall 2.20KN/m

Water tank water Height x 10

d) Material Density

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Unit weight of materials are as per IS : 875 (part-1) 1987.

Unit weight of concrete	-	25 KN / Cum.
Unit Weight of Steel	-	78.5 KN / Cum
Screed Concrete	-	24 KN / Cum.
Unit Weight of Dry Soil	-	18 KN / Cum.
Unit Weight of saturated Soil	-	20 KN/ Cum.
Unit Weight of Glass	-	27.2 KN / Cum.
Unit weight of water	-	9.81 KN / Cum.
Unit Weight of Soild Block wall	-	22 KN / Cum.
Light Weight concrete Filling	-	16 KN / Cum.

e) SEISMIC LATERAL FORCE

Design of Lateral Froce under seismic condition shall be as per IS 1893 – 2016. Total Lateral Force (base shear) of the vuilding shall e estimated at ground floor lrvrl as per clasuse 7.2.1 of 1893 -2016 which provides by

Base Shear $Vb = Ah\ W$

Ah 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 accerleration 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 is equal and less than 3 KN/ Sq.m.

1) The Lateral load Resisting system of the building is ordinary shear wall with Ordinary moment resisting frames.
2) As per IS 1893-2016 code, Coimbatore lies in Zone III with Zone Factor Z = 0.16
3) The design base shear is given by $V_b = Ah \times W$, where

$Ah = Z / 2 \times I / R \times S_a / g$

I = Importance Factor =1.2

Soil Type 1 (weathered Rock)

R (Response reduction factor) = 4.0 building with Ductile RC structural wall with refence to IS : 1893-2016, table -9 and the frames are designed to carry the design lateral load.

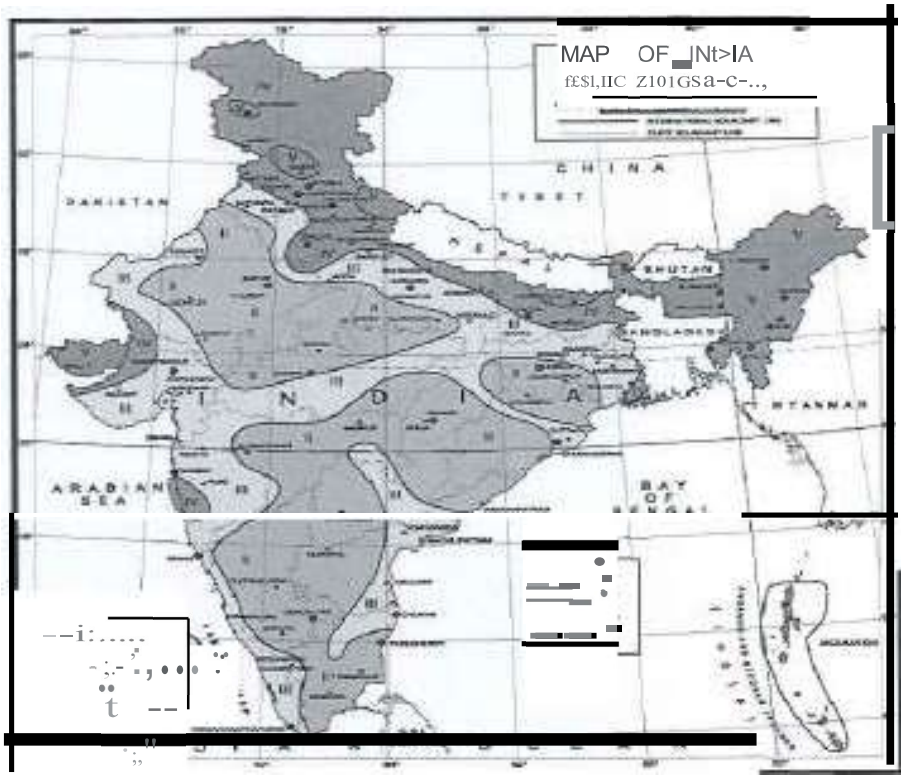
Sa/g = Average Response Acceleration coefficient

With Reference to IS 1893 -2016 clause 7.6.2 © the time period for building each direction are as follows,

The Fundamental natural period (Ta) for Building,

For X and Y Direction the time Period is calculated

7.6.2 the approximate fundamental translational natural period T of osellation, in second shall be estimated by the following expression :



Dynamic Analysis

Respone Spectrum method of Dynamic Analysis carried out with Following parameters pertaining to dynamic analysis

Number of modes Considered : 20 numbers (Min)

Modal Combination Method Used : Complete Quadratic combination (CQC)

Directional Combination Method Used : Square root of square (SRSS).

Modal case type : Ritz vector method

Cut off frequency in case response spectrum method of analysis – 33Hz.

Mass participation is 90% as per our analysis

Damping 5% is used for seismic analysis

Dynamic analysis of building is carried out the members are designed accordingly.

F) WIND LOADS

The wind pressure shall be calculated based on the basic wind speed and other provisions laid in IS 875 part (3) – 2015

Design Wind speed $V_Z = V_b \times K_1 \times K_2 \times K_3 \times K_4$,

Where

V_b Basic Wind velocity for Coimbatore = 39m/s

K_1 Risk coefficient for all general buildings = 1.00

K_2 Terrain Category 2 = To suit the height of the structure for terrain

[K_2 (H=31.2m -GF to roof including parapet wall) = 1.10]

K_3 Topography factor = 1.00

K_4 Importance Factor = 1.00

Based on the above,

Max. design Wind speed (V_z) (V_b x K_1 x K_2 x K_3 x K_4) =42.9m/s

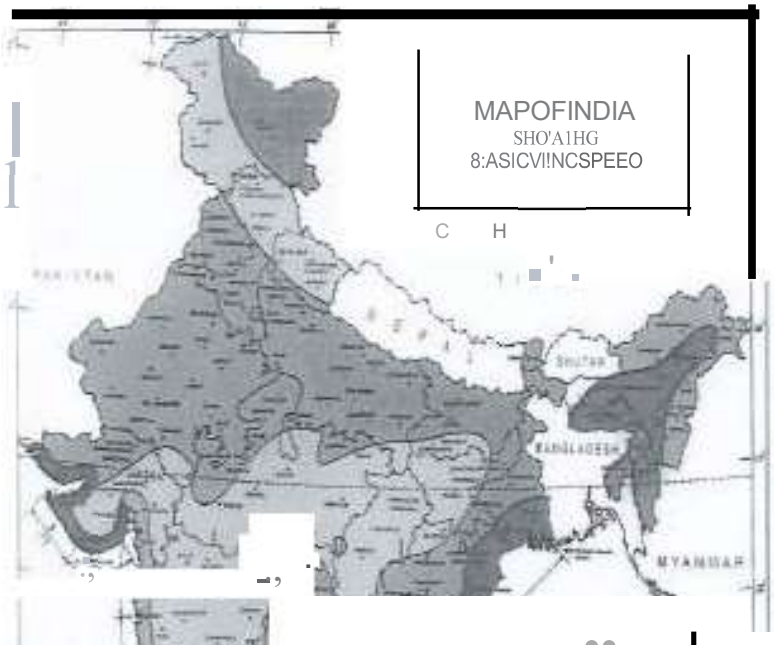
Max design wind pressure (Pz) = 0.6 x Vz^2 = 1104.25 N/m^2

Design wind pressure Pd = Pz x ka x kd x Kc = 805 N/m2

K_d wind directionality factor = 0.90

Ka Area averaging factor = 0.90

K_c Combination factor = 0.90



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g) **TEMPERATURE LOAD**

The Building is completely covered with brick work on the sides. So there will be no appreciable differential temperature during the service life of building. The roof slab and the podium of building is to be analysed for = 15^0 C difference in temperature is applied to Etabs model and necessary load combinations are considered in analysis & Design of thr building the roof slab is assign as semi rigid diaphragm for ultimate load combination.

4.0 MATERIAL GRADES

iii) CONCRETE

Grade M30 (fck = 30 N/mm^2) for Raft Foundation, Overhead water Tank, UG Water Tank Pump Room, Beam & Slab

iv) **REINFORCEMENT**

Reinforcement bars of grade Fe550D conform to IS 1789 – 2008

5.0 COVER AND FIRE RATING

Fire Rating Considered – 2hrs

Cover to Reinforcement considered for various Element

Raft Footing	50 mm (Very Severe exposure condition)
Columns	40 mm (2 hours fire resistance)
Tanks Walls	45 mm (severe Exposure condition)
Shear walls	30 mm (2 hours fire resistance)
Beams (simply supported)	40 mm (2hours fire Resistance & Moderate)
Beams (Continuous)	30mm (2 hours fire Resistance & Moderate)
Slabs (Simply Supported)	35 mm (2hours fire resistance & Moderate)
Slabs (Continuous)	25 mm 2 hours fire Resistance & Moderate)

6.0 STRUCTURAL SYSTEM

SUPER STRUCTURE

The Structural system for the super structure is R.C.C Beams with RCC slab the Slab Thickness is 125mm

7.0 DEFLECTION CRITERIA

7.1 Lateral Deflection (Wind)

Over Deflection	<	Height / 500
Storey Deflection	<	Storey height /500

7.2 Lateral Defelction (Seismic)

Overall Drift	<	H / 250
Storey Drift	<	0.004 times storey height

7.3 Vertical Deflection of Beams and Slab due to Gravity Loads

Total Deflection (DL + LL) < Span /250
Deflection including the effects of
Temperature Creep and Shrinkage
Occurring after erection of partitions
And the application of finishes < Span / 350 or 20mm whichever is less

8.0 STRUCTURAL ANALYSIS

Computer -adied Analysis using finite elements method (FEM) shall be carried out the design of structural elements For 3D or D structural frame Analysis latest version of software ETABS
Or SAFE Shall be used Prokon RCDC and verified in house spreadsheets will be used for the design of reinforced concrete (RC) and steel elements in consideration of flexure, shear and axial forces

Assumptions for 3D model analysis ETABS

Column : Frame Elements
RC walls : Wall (Shell) Elements
Beams Elements : Frame Elements
Slab : shell Elements

The Following are general paraments adopted in the analysis and Design, Modulus of Elasticity of concrete -5000fck
Consideration of Diaphragm -Rigid Diaphragm
Slab / wall elements considered as shell elements

Stiffness modification factors are adopted in the analysis as per IS -16700-2017, Table 6

The Following parameters and methods and methods are adopeted in creating ETABS 3D model for the building and design of structural elements.,

xii. The 3D ETABS model generated based on the preliminary floor plans (shuttering drawings) prepared using preliminary sizes.

xiii. Sectional properties are assigned to all the structural elements as per the preliminary floor plans (shuttering drawings).

xiv. External & Internal in fill wall loads are assigned as uniformly distributed line load on beams and as area load if the wall is intending to distributed on slab directly.

xv. Slab are modelled as shell elements if floor system and slab are assigned with horizontal diaphragms .

xvi. 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

xvii. Area design load i.e Live Load/SDL or any other Load is appled ar floor relevant to its usage,

xviii. All lateral loads & parameters are assigned as per codes IS 1893-2016 & IS 875-part-3, 2015

xix. Temperature loads are applied on to the terraces and to areas directly exposed to atmosphere

xx. Beams under torsion is required to maintain Equilibrium will be designed for torsion in accordance with IS 456-2000, clause 41.1 to 41.1 and for all others beams torsional stiffness is neglected in the analysis by applying stiffness modifier as 0.000001 to torsional constant "J" Hence no specific design for torsion is required for these beam.

xxi. Concrete cover to reinforcement complied accordance with IS 456-2000, Table 16 & 16A.

xxii. All vertical wall elements are assigned with auto meshing/manual messing appropriately in order to achieve accuracy in results.

Design approach of Structural Elements

Shear wall /Column:

RC structural 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 the structural elements from the load combinations considered in the D Etabs Model. RCDC adesign software will be used to design the elements for the maximum forces obtained from the Etabs model analysis Results.

Beams:

Each Beams Will be Designed for Maximum forces from the 3D analysis using Etabs and RCDC software.

Area Load & Application:

Applied as uniformly distributed area load with intensity proportinat eto its usage as mentioned in the Loading items in the DBR.

Line (Wall) Load & Application:

Non Load Bearing or infill wall load are calculated appropriately and applied as uniformly distributed line load.

9.0 FOUNDATION

Proposed foundation System is Raft footing and SBC considered for the Design is 300kN/m^2

And the foundation Depth is to be 3.0m from the natural ground level with reference to the soil investigation report No-SSTS/GT/200223/16 from M/s Sastha soil Testing Services.

10.0 COMPUTER PROGRAMS

The following Software / Spreadsheet to be used carry out structural analysis and design.

7. PROKON Ver 2.3 - wall & Beam Design
8. ETABS Ver 21.0.1 - Three Dimensional program
9. SAFE Ver 20.2 - Raft Analysis / Strip Analysis
10. In house Spreadsheet – one way / two way slab design
11. Rapt – 6 - Post Tensioning Analysis & Design
12. RCDC - Beams Design Columns Design and Wall Design
13. STAAD PRO & ETABS – Structural Steel Design

Summary Report

1. Structure Data

   This chapter provides Model geometry information, including items such as story levels, point coordinates and Elements connectivity.

1.1 Story Data

Table 1.1 - Story Definitions

Tower	Name	Height m	Master Story	Similar to	Splice Story	Color
T1	LMR	3	NO	None	NO	Yellow
T1	TERRACE	3	NO	None	NO	Blue
T1	9TH FLOOR	3	NO	2Nd FLOOR	NO	Cyan
T1	8TH FLOOR	3	NO	2Nd FLOOR	NO	Magenta
T1	7TH FLOOR	3	NO	2Nd FLOOR	NO	Gray& Dark
T1	6TH FLOOR	3	NO	2Nd FLOOR	NO	Green
T1	5TH FLOOR	3	NO	2Nd FLOOR	NO	Red
T1	4TH FLOOR	3	NO	2Nd FLOOR	NO	Yellow
T1	3RD FLOOR	3	NO	2Nd FLOOR	NO	Blue
T1	2ND FLOOR	3	NO	None	NO	Cyan
T1	1ST FLOOR	3	NO	None	NO	Magenta
T1	STILT	3	NO	None	NO	Gray & Dark

2 LOADS

This Chapter provides loading information as applied to the model

2.1 Auto Seismic Loading

IS 1893:2016 Auto Seismic Load Calculation

This Calculation Presents the Automatically generated lateral seismic loads for load pattern EQX according to IS 1893:2016, as calculated by ETABS

Directions and Eccentricity

Direction = X

Structural Period

Period Calculated Method = user Specified

User Period T=0.705sec

Factors and coefficients

Seismic zone factors, Z[IS Table 3] z=0.16

Response Reduction Factors, R [IS Table 9] R=4

Importance factors , I[IS Table 8] I = 1.2

Site Type [IS Table 1] = I

Seismic Response

Spectral Acceleration Coefficient S_a / g [IS S_2/r = t/6.4.2] S_2/r = 1.41844

Equivalent Lateral Forces

Seismic Coefficient, A_h [IS 6.4.2] A_h = ZI S_2/g/2R

Calculated Base Shear

Direction	Period Used (Sec)	W (KN)	V_b (KN)
X	0.705	110558.6195	3763.6977

IS 1893:2016 Auto Seismic Load Calculated

This Calculated Present the Automatically generated lateral seismic loads for load pattern EQy according to IS 1893:2016 as Calculated By ETABS.

Direction and Eccentricity

Direction =Y

Structural Period

Period Calculation Method = Users Specified

User Period T = 0.961 sec

Factors and coefficients

Seismic Zone Factors, Z [IS Table 3] Z= 0.16

Response Reduction Factor, R [IS Table 9] R=4

Importance factors , I [IS Table 8] I = 1.2

Site Type [IS Table 1] = I

Seismic Response

Spectral Acceleration Coefficient S_a /g [IS S_2/g = 1/T 6.4.2] S_2/r = 1.040583

Equivalent Lateral Forces

Seismic Coefficient A_h [IS 6.4.2] A_h = ZI S_2/g/2R

Calculated Base Shear

Direction	Period Used (Sec)	W (KN)	V_b (KN)
Y	0.961	110558.6195	2761.0894

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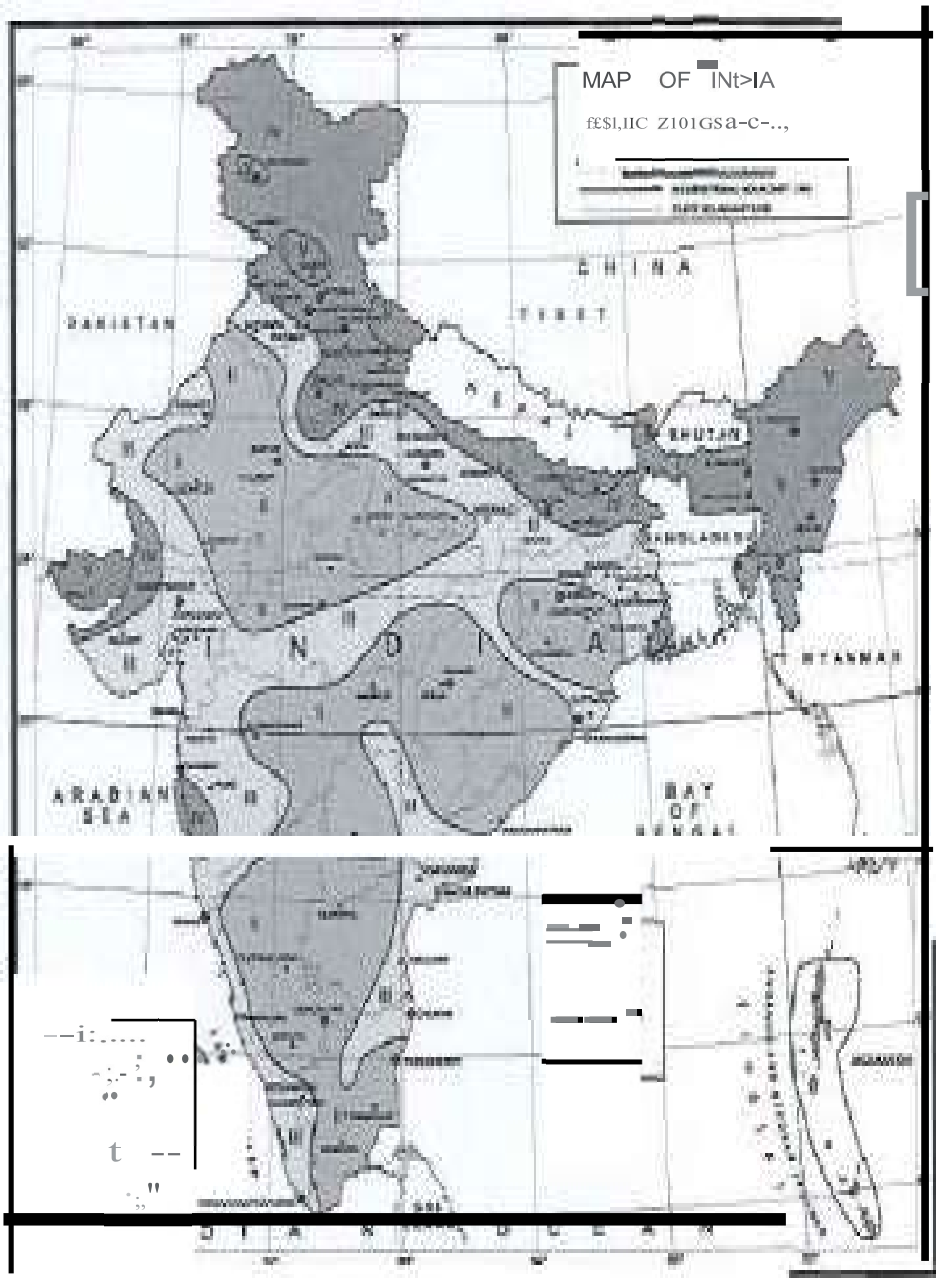

Map of India showing the Seismic Zones

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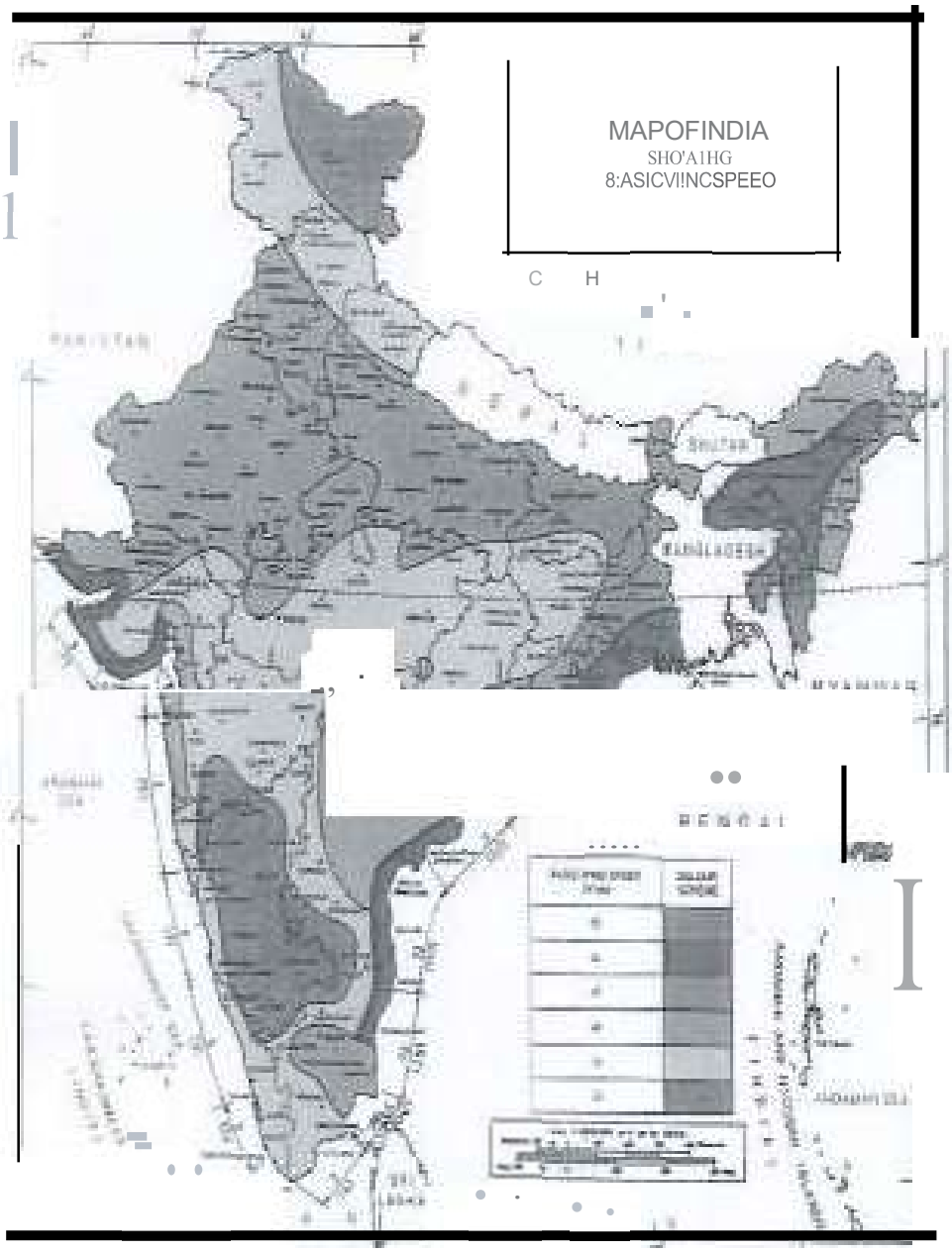

Map of India showing the wind speed zones

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3.0 DESIGN OF LOADINCGS

Design Philosophy

The buildings are proposed to be constructed of RCC structure with isolated (or) combined footings, slabs and beams in the building units.

The structure will be modeled as a space frame and structural packages such as STAAD .Pro CONNECT Edition V22 Update 2 will be used for the design and analysis of the structure.

All reinforced concrete structures will be designed in accordance with IS: 456-2000: - Codes of Practice for Plain and Reinforced Structures adopting limit state method.

The structures will be designed for limit state of collapse and will be check for all limit states of serviceability.

All water retaining structures will be designed in accordance with IS: 3370

Method of Design

1. RCC footings : Limit State
2. RCC columns : Limit State
3. RCC Floor Beams, Tie Beams and Slab : Limit State

4. **Material & Material Stresses**
5. **The grade of concrete and cover to concrete will be as follows:**
6. **Clear cover to main reinforcement:**
7. From durability point of view and as per clause 26.4.2 of IS 456-2000 (Table-16 and Table 16A) all reinforcement shall have concrete cover and minimum thickness of such cover (exclusive of plaster or other decorative finishes). Shall be as follows:
8.

Sl. No.	Structural Element	Concrete Grade	Clear cover to top, bottom and sides in mm
1	Footings	M25	50
2	Shear walls	M25	25
3	columns	M25	40
4	RCC slabs, staircase slab	M25	25
5	Beams	M25	30

The reinforcement used will be high yield strength deformed bars conforming to IS 1786 of grade Fe 500 The permissible stresses and design concept will be as per IS: 456-2000

Grade of Cement - 53
P.C.C (1:4:8) Nominal mix
Thickness of wall 200mm, Internal partition wall 100mm and slabs thickness as per drawing

a. Modulus of elasticity of Concrete - 5000X sqrt fck
b. Poisson's ratio of Concrete - 0.17
c. Modulus of elasticity Steel - $2x10^5$ N/mm^2

Soil Parameters

The net safe bearing capacity of soil will be taken as per soil report.

Analysis of structure

Loads

200 thk external wall and 100thk internal walls

Dead Load (DL)

For dead load calculations the unit weight of different materials considered as below:

1. Reinforced cement concrete = 25 KN/m3
2. PCC = 24 KN/m3
3. Structural steel = 78.5 KN/m3
4. water = 9.81 KN/m^3
5. Soil = 18 KN /m^3
6. Terrace treatment with brickbat coba (assuming) 125mm thk - 12KN/M^3 (Light Weight brick).
7. Ref IS 875 (Part 1 – 1987), for remaining materials whichever is used for buildings.

Brick work = 20 KN/m3.

Description	Load KN/m^2
Floor finishes (50mm)	**1.0**

Super imposed loads on structure.

Superimposed loads will be considered as per occupancy requirements specified in IS 875 Part II for all floors, corridors, balconies and staircases.

Location	Occupancy classification	UDL KN/m2
Residence	All rooms and kitchens	2.0
Lobby area	Corridors, passages and staircases including fire escapes and store rooms	3
Floor area	Toilets	2.0
Basements	Parking	3.5
Podium	Fire tender loada	20
Terrace area	Live load	1.5
Terrace area	Water tanks	As per drg.

soil filling load = As per architectural drawing.
No Soil filling at terrace floor level

WIND LOADS: The wind pressure shall be calculated based on the data furnished below and other provisions laid in

IS: 875 (Part 3) – 2015.Basic Wind Speed = 44m/sec (for hyderabad)
Risk coefficient (k1) = 1.0
Terrain category(k2) = Varies with height (Category 3)

Topography factor (k3) = 1.0

Importance factor for cyclonic zone (k4)=1.0

Wind loads on cladding / glazing:

For designing the cladding / glazing supports, the wind load will govern the design, for which the above design wind pressure will be considered with appropriate local pressure coefficient

Seismic Load (SL)

Seismic loads are considered in accordance with IS: 1893-2016.

The structure will be designed by dynamic analysis method by response spectrum

method. The design seismic base pressure (Vb) =Ah W (as per Is 1893(Part-1) 2016

clause 5.4.6.1)

The design horizontal seismic coefficient Ah = $\frac{ZI\,Sa}{2\,R\,g}$

The various factors will be considered as below:

Factor	Description	Clause	Value
Z- II	Zone Factor	1893-2016 (PART-1) Table -3	0.1
I	Importance Factor	1893-2016 (PART-1) Table -8	1.0
R	Response Reduction Factor	1893-2016 (PART-1) Table -9	3.0

The approximate fundamental Time period (Ta) = 0.09h/√d (as per Is 1893(Part-1) 2016 clause 7.6.2) h= height of the building in m (excluding basements)

Sa/g Average response acceleration coefficient = as per Is 1893(Part-1) 2016
clause 7.2.5 Damping Percentage = 5%

W (seismic weight) = Full dead load of structure + 50% of imposed loads exceeding 3kn\m2 Full dead load of structure + 25% of imposed loads less than & Up to 3kn\m2

The building is analyzed by the seismic coefficient method.

Other equipment load: As per system drawings if any. LOAD COMBINATIONS FACTORED)
The load combinations are as follows:

S/n	Load Combination
1	1.0 DL+1.0 LL
2	1.5 DL+1.5 LL

Limit state of collapse.
The limit state of collapse of the structure or part of the structure could be assessed from rupture of one or more critical sections from buckling due to elastic instability or overturning. The resistance to bending, shear, torsion and axial loads at every section shall not be less than the appropriate values at that section produce by the probable most unfavorable combination of loads on the structure using the appropriate partial safety factor.

Limit state of serviceability. Deflection (Clause 23.2 of IS 456 2000)

The deflection of a structure or part there of shall not adversely affect the appearance or efficiency of the structure or finishes or partitions. The deflection shall generally be limited to the following.

a) The final deflection due to all loads including the effect of temperature, creep and shrinkage are measured from the as cast level of the supports of floors, roofs and all others horizontal members should not normally exceeds to span/250 ratio.
b) The deflection including the effect of temperature, creep and shrinkage occurring after erection of partitions and the application of finishes should not normally exceed to span/350 or 20mm whichever is less
c) **Lateral Sway:** Under transient wind load the lateral sway at the top should not exceed H/500, where H is the total height, of the building.

For seismic loading, As per IS 1893-2002, the Storey drift in any storey due to the minimum specified design lateral force, with partial load factor of 1.0, shall not exceed 0.004 times the storey height.

Cracking (Clause 35.3.2 of IS 456-2000)
Cracking of concrete should not adversely affect the appearance and durability of the structure. The acceptable limit of cracking would vary with the type of structure and environment .The surface width of the cracks should not in general exceeds to 0.3mm in members where cracking is not harmful and does not have any serious adverse effect upon the preservation of

reinforcing steel not upon the durability of the structure

For water retaining structures, the crack width is restricted to 0.2mm as per IS 3370 (part 2)-2009.

Detailing of reinforcement in concrete structures:
General

Detailing is an important aspect of design of concrete and steel structure. Detailing shall be done to ensure ductile behavior of the structure. To ensure the strength and serviceability of the concrete structure reinforcement should be placed along the tensile stress trajectory. This section deals with the reinforcement detailing in concrete members such as slabs, beams, columns and walls.

Requirements of good detailing:

The reinforcement layout will take into account the strength requirements as well as economy of construction. Following are the requirements of good detailing

a) Detailing should be simple for fabrication and placing.
b) Cracking of concrete should be within the permissible limit.
c) There should not be any free paths for propagation of cracks without being traverse by reinforcements.
d) Joint and discontinuities should be capable of withstanding the same forces as the adjoining sections.
e) Reinforcement should not deviate excessively from the direction of the tensile stresses.
f) Reinforcement steel of same type and same grade shall be used as main reinforcement in a structural member.
g) Provision of IS 456-2000, IS 5525 will be followed for the purpose of detailing of reinforcement.

Water Proofing:

The load due to terrace water proofing has been considered as per point no 7 under DL head. The client may obtain the Specifications from the vendors of water proofing, we shall finalize the methodology of water proofing after getting the specifications from the various vendors.
However the related load has been taken into account while designing the structure.

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