Verified RealEstate™

Your trusted partner for buying, selling, and managing property, ensuring hassle-free service with 100% transparency.

3/350/2 Mettukuppam,
OMR Thoraipakkam,
Chennai, India

hello@verified.realestate
+91 9996 12 9996

Official Property Record

Digitally Verified Record - Powered by Verified RealEstate™



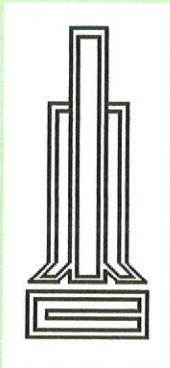
DESIGN BASIS REPORT

PROJECT: PROPOSED RESIDENTIAL PROJECT AT MADHAVARAM, CHENNAI.

CLIENT: M/S. ALLIANCE VILLAS PVT. LTD.

ARCHITECT: M/S. LAVANYA& SHANKAR ARCHITECTS,

GEOTECHNICAL CONSULTANT: M/S. FS ENGINEERS GEOTECHNICAL CONSULTANT.



MAHIMTURA CONSULTANTS PVT.LTD.

CONSULTING ENGINEERS

3rd Floor, Unique House,

25, S.A.Brelvi Road, Fort,

Mumbai - 400 001.

Tel. No. +91-22-4368 5000 - Fax No. +91-22-2266 2227

e-mail: naresh@mahimtura.net



C/2023/9427 **29/01/2025**

STRUCTURAL DESIGN BASIS REPORT

PROPOSED RESIDENTIAL PROJECT AT MADHAVARAM, CHENNAI

1.0 GENERAL INFORMATION

1.1 Introduction

The objective of this report is to lay down the design basis for the structural design of Proposed Residential Buildings for M/s. ALLIANCE VILLAS PVT. LTD.at Madhavaram, Chennai. This report covers the design requirements and overall design philosophy to be adopted in the structural design of the said building.

Client	**: -. M/s. Alliance Villas Pvt. LTD.**
Architects	**: - M/s. Lavanya& Shankar Architects,**
Structural Engineers	**:-M/S Mahimtura Consultants Pvt. Ltd.**
Geotechnical Consultant	**:-M/S. FS Engineers Geotechnical Consultant :-**

2.0 STRUCTURAL ENGINEERINGIN FORMATION

2.1 Structural System

The proposed development consists of total 2 residential towers + Convention center + Club house.

The proposed Residential Building Block- A,B, are to be designed for 2 Basement+ Stilt +18 typical floors + Terrace floor+ LMR and Overhead water tank and the floor to floor height of Basement 2 is 3.3, Basement-1 is 3.8 m, Stilt floor height is 3.80m and typical floor height is 2.95m.

Block-C convention center is to be designed for 2 Basement +Ground + 7floors + Terrace floor.

The Club House consists of 2 Basement + G + 3 floors + Terrace. Ground floor height 4.20 m and Typical floor height is 4.20m.

The buildings are meant for use as residential apartments. The Structural system for the buildings consists of column, shear walls, beams & slabs. Structural framing is of RCC Framed Structure. Basements are used for car parking. The fire tender movement is considered along the periphery of the buildings.

HITEN R. MAHIMTURA
Structural Engineers Grade-1 (SE)
Regn. No: SE/GR-1/19/03/021
Shakti Towers, 3rd Floor, H, Wing-2,
766, Anna Salai, Thousand Lights,
Chennai-600 002, Tel: 044-43156723
E-mail:brchennaimcpl@gmail.com

2.2 Design Loads

2.2.1 Super Imposed Dead Loads

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
Light weight blocks for walls	7.50
Steel	78.50
Plain Concrete	24.00
Reinforced Concrete	25.00
Soil	18.00
Water	10.00

The Super Imposed Loads that are envisaged to act permanently (wherever applicable) are as following.

Item	Intensity in KN/m^2 of plan area
Floor finish– 1. Residential	1.25
Weathering Proof course on Terrace - 150 thk brickbat coba with IPS finish.	3.00
Sunk – Brick bat coba	20 KN/m^3

2.2.2 Live Loads

Block A and B

The superimposed load or otherwise live load is assessed on the basis of occupancy classifications as per IS: 875 (Part –2) – 1987 and are listed as below.

Type of Structure – Residential Building

Occupancy Classification	UDL (KN/m^2)
Living Rooms, Bed rooms	2.0
Baths and toilets	2.0
Corridors, passages, staircases including fire escapes, lobbies – as per the floor serviced excluding stores and the like but not less than.	3.0
Balconies	3.0
Open Terrace	1.5
Parking - For vehicles not exceeding 2.5 tones gross weight.(including access ways & ramps).	3.125
Fire Fighting Truck Movement Load	15
Lift Machine room	400 KN/Lift

CONVENTION CENTER

Parking

Description		KN/m²
Dead Load	Slab & beam	Self-weight
Superimposed Dead Load	Floor Finishes	1.5
	False ceiling & services	0.50
Live Load	(Live 2) Without Stack	3.0
	(Live 2) double Stack if any	5.0

Halls

Description		KN/m²
Dead Load	Slab & beam	Self-weight
Superimposed Dead Load	Floor Finishes	1.5
	False ceiling & services	0.50
	Wall load (Lightweight Partition walls)	1.0
Live Load	(Live 2)	5.0

Staircases

Description		KN/m²
Dead Load	Steps (150mm riser & 300mm tread), Waist Slab	Self-weight
Superimposed Dead Load	Floor Finishes including screed	1.50
Live Load	(Live 2)	4.00

Lobby –passage

Description		KN/m²
Dead Load	Slab & beam	Self-weight
Superimposed Dead Load	Floor Finishes	1.5
	False ceiling & services	0.50
Live Load	(Live 2)	4.0

Mahimtura Consultants (P) Ltd. Chennai.

Kitchen –pantry

Description		KN/m²
Dead Load	Slab & beam	Self-weight
Superimposed Dead Load	Floor Finishes with sunk	4.0
	False ceiling & services	0.50
	Wall load (Lightweight Partition walls)	1.0
Live Load	(Live 1)	2.0

Toilet

Description		KN/m²
Dead Load	Slab & beam	Self-weight
Superimposed Dead Load	Floor Finishes	1.5
	250mm sunk	5.0
Live Load	(Live 1)	2.0

6th & 7Th floor (Hotel rooms)

Description		KN/m²
Dead Load	Slab & beam	Self-weight
Superimposed Dead Load	Floor Finishes	1.5
	False ceiling & services	0.50
	Wall load (Lightweight Partition walls)	As per Layout
Live Load	(Live 2)	2.0

Terrace floor

Description		KN/m²
Dead Load	Slab & Beam	Self-weight
Superimposed Dead Load	Water Proofing	3.0
	False ceiling & services	0.50
Live Load	(Live 3) solar panel	5.00

Note: Chiller unit loction and load data is awaited from client

Mahimtura Consultants (P) Ltd. Chennai.

Weight of Wall:

200mm thick brick wall with density 20 kN/m^3

(As per Architectural Drawing)

Note: For localized design of slabs, wall loading shall be applied as per actual layout.

CLUB HOUSE

Gym & play area & Party hall

Description		KN/m²
Dead Load	Slab & beam	Self-weight
Superimposed Dead Load	Floor Finishes	1.5
	False ceiling & services	0.50
	Wall load (Lightweight Partition walls)	1.0
Live Load	(Live 2)	4.0

Shops

Description		KN/m²
Dead Load	Slab & beam	Self-weight
Superimposed Dead Load	Floor Finishes	1.5
	False ceiling & services	0.50
Live Load	(Live 2)	6.0

Car Parking

Description		KN/m²
Dead Load	Slab & beam	Self-weight
Superimposed Dead Load	Floor Finishes	1.5
	False ceiling & services	0.50
Live Load	(Live 1) without stack	3.0

Terrace landscape

Description		KN/m²
Dead Load	Slab & beam	Self-weight
Superimposed Dead Load	Floor Finishes "(200mm water proofing)	4
Live Load	(Live 2) Electrical Solar Panel	3.0

Mahimtura Consultants (PVT) Ltd. Chennai.

Swimming pool

Description		KN/m²
Dead Load	Slab & beam	Self-weight
Superimposed Dead Load	Floor Finishes	1.5
	Water proofing	3
	1.2m water height	12

Kids pool

Description		KN/m²
Dead Load	Slab & beam	Self-weight
Superimposed Dead Load	Floor Finishes	1.5
	Water proofing	3
	0.6m water height	6

Toilet/Deck

Description		KN/m²
Dead Load	Slab & beam	Self-weight
Superimposed Dead Load	Floor Finishes	1.5
Live Load	(Live 2)	4.0

Electric room

Description		KN/m²
Dead Load	Slab & beam	Self-weight
Superimposed Dead Load	Floor Finishes	1.5
Live Load	(Live 2)	5.0

Mahimtura Consultants (P) Ltd. Chennai.

Pump Room

Description		KN/m²
Dead Load	Slab & beam	Self-weight
Superimposed Dead Load	Floor Finishes	1.5
	False ceiling & services	0.50
Live Load	(Live 1)	5.0

Balancing Tank

Description		KN/m²
Dead Load	Slab & beam	Self-weight
Superimposed Dead Load	Floor Finishes	1.5
	False ceiling & services	0.50
Live Load	(Live 2) water Height 2.0m	20

Staircases

Description		KN/m²
Dead Load	Steps (150mm riser & 300mm tread), Waist Slab	Self-weight
Superimposed Dead Load	Floor Finishes including screed	1.50
Live Load	(Live 2)	4.00

Lobby –passage

Description		KN/m²
Dead Load	Slab & beam	Self-weight
Superimposed Dead Load	Floor Finishes	1.5
	False ceiling & services	0.50
Live Load	(Live 2)	4.0

Mahimtura Consultants (P) Ltd. Chennai.

2.2.3 Wind Loads

The wind pressure has been calculated based on the data furnished below and other provisions laid in IS: 875(Part 3)-2015

Basic Wind Speed	V_b	=	50 m/sec
Risk Coefficient	K1	=	1 (Probable Design life = 50 years)
Terrain Category		=	3
Factor	K_2	=	As per IS 875 (Part III)
Topography factor	K_3	=	1
Importance factor	K_4	=	1
Design Wind Speed	V_z	=	$V_b K_1 K_2 K_3 K_4$

Wind Pressure P_z = $0.6\ V_z^2$

Design Wind Pressure P_d = $K_d K_a K_c P_z$

Where,

K_d= Wind directionality factor.

K_a = Area averaging factor.

K_c= Combination factor.

P_z= Wind pressure.



2.2.4 Earthquake Load

The loading due to earthquake is assessed based on the provisions of IS: 1893(Part-1):2016

Seismic Zone= III

Zone factor (Z)	=	0.16 (Table – 3)
Importance Factor (I)	=	1.2 (Table – 8)
Response Reduction Factor (R)	=	4.00 (Table - 9 Building with RC ductile Structural walls)
Soil type	=	I
Height of building (h)	=	56.90m. (For block A, B)
	=	29.10 m (For Convention center)
	=	17.40 m (For Club House)

Fundamental natural time period (Ts) with INFILL WALLS

T_a = 0.09h/√d from CL.7.6.2 (c) – IS1893 (part – I):2016
Considering with In-fill walls.

Fundamental Natural Time Period (Ta)

Ta = $\frac{0.075h^{0.75}}{\sqrt{A_w}} \geq \frac{0.09h}{\sqrt{d}}$ From Cl. 7.6.2.(b) – IS1893 (Part-I):2016

Sa/g from FIG-2 IS 1893 (part I):2016, considering Type I soil.

Horizontal seismic co-efficient

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

Design Base Shear

V_B = Ah x W

Where, W = Seismic weight of bldg. as per CL.7.4 - IS1893 (Part-I):2016
25 % upto& including live load 3.0kN/sq.m
50 % above 3.0kN/sq.m

Mahimtura Consultants (P) Ltd. Chennai.

3. CHECK FOR LATERAL SWAY AS PER IS - 456-2000

The allowable lateral sway at top due to wind force should not exceed H/500, where H is total height of Building.

4. CHECK FOR LATERAL SWAY (STOREY DRIFT) AS PER IS- 1893-2016

The allowable lateral sway (storey drift) due to earthquake force should not exceed L/250, where L is the storey height.

5. 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.

Primary Loads
DL
SIDL
LL
EQX
EQZ
WLX
WLZ

5.1. Load Factors For Design Of Strengths (Concrete Members)

Description of Load Combination	Load Factor for Primary Load Cases				
	Dead Load	Live Load	Wind Load	Seismic Load	Temp Load
Dead load	1.5	0.0	0.0	0.0	0.0
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	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

5.2 Load Factors For Serviceability

Description of Load Combination	Load Factor for Primary Load Cases			
	Dead Load	Live Load	Wind Load	Seismic Load
Dead load + Live load	1.0	1.0	0.0	0.0
Dead load + / - Wind load	1.0	0.0	1.0	0.0
Dead load + /- Seismic load	1.0	0.0	0.0	1.0
Dead load + Live load + / -Wind load	1.0	0.8	0.8	0.0
Dead load +Live load+/-Seismic load	1.0	0.8	0.0	0.8

6. ANALYSIS METHOD

The modeling has been generated in ETABS for analysis. The structure will be analyzed for Static and Lateral loads due to Earthquake/Wind loads and its combinations ETABS Software used - In house interlinked package with ETABS and SAFE.

7. DESIGN LIFE

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

8. 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. Limit state method is adopted for design of overhead water tanks by using IS-3370(2009).

9. MATERIALS

Concrete

Following grades of concrete are proposed for the construction of the structure.

Foundation	= M25/M30/M40
Columns	= M25/M30/M40/M50
Beams and Slabs	= M25/M30
Retaining walls	= M25/M30
Tanks	= M25/M30

10. REINFORCEMENT

The reinforcements shall be Corrosion Resisting of Grade Fe550.

11. EXPOSURE CONDITION

Structural elements below Plinth level are to be designed for moderate exposure conditions and super-structure is designed for mild exposure conditions as per Table 16 of IS 456-2000.

12. CONCRETE COVERS TO REINFORCEMENT

Concrete Covers to the reinforcements are based on exposure conditions and fire resistance. The clear cover to main reinforcements shall be as follows.

Footing or Raft Foundations	=	50 mm
Columns	=	40 mm
Floor Beam – simply supported	=	40 mm
Floor Beam – continuous	=	30 mm
Slab	=	25 mm
Water Tanks		
= 40 mm		
Retaining walls on earth side	=	40 mm
Retaining walls on non-earth side	=	25 mm

13. FOUNDATION SYSTEM

Isolated/Combined footings are proposed based on the safe bearing capacities as per soil investigation report.

14. FIRE RESISTANCE

The structural elements will be designed for two hours of fire rating.

15. SHRINKAGESTRIP AND EXPANSION JOINTS

Expansion joints and shrinkage strips are provided at suitable spacing with least disturbances between the buildings and podium to take care of differential temperature and shrinkage.

16. CODES & STANDARDS

All the designs shall be 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 (Part-1)-2000	Code of Practice for Plain and Reinforced Concrete
IS:1893 (Part-1)-2016	Indian Standard Criteria for Earthquake Resistant Design of Structures.
IS:3370 - 2009	Code of practice for design & construction of concrete structures for storage of liquids.
IS:432 (Part-1)-1982	Specification of Mild Steel and Medium Tensile Steel bars and Hard drawn Steel Wire for concrete reinforcement – Mild Steel and Medium Tensile Steel Bars.
IS:432 (Part-2)-1982	Specification of Mild Steel and Medium Tensile Steel bars and Hard drawn Steel Wire for concrete reinforcement – Hard drawn Steel Wire
IS:1786-2007	Specification for High Strength Deformed Steel Bars and Wires for Concrete Reinforcement.
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.

HITEN R. MAHIMTURA
Structural Engineers Grade-1 (SE)
Regn. No: SE/GR-1/19/03/021
Shakti Towers, 3rd Floor, H, Wing-2,
766, Anna Salai, Thousand Lights,
Chennai-600 002, Tel: 044-43156723
E-mail:brchennaimcpl@gmail.com

H. R. MAHIMTURA
Consulting Structural Engineer
Registration No. **STR/M/63**.

M/s. Mahimtura Consultants Pvt. Ltd
Consulting Engineers,
Unique House, 3rd Floor,
25, S. A. Brelvi Road,
Fort, Mumbai – 400 001

Mahimtura Consultants Pvt. Ltd.
25, Unique House,S.A.Brelvi Road
Fort, Mumbai- 400001

Name of The Project:	*MADHAVARAM TOWER*	
Date : 14-11-2024	**TYPICAL DESIGN OF BEAM**	DESIGN SHEET No. 1
REVISION : 01		

Data :

Beam Marked: B8 1st floor

D = 600 mm Conc M 40 N/mm2

b = 200 mm Steel Fe 550 N/mm2

d_{eff} = 600 - 35 = 565 mm

Moments :

B.M. hogging at column face (right), Mtl = 5 Mutl = 8 KN.m

B.M. sagging at midspan, Mb = 5 Mub = 8 KN.m

B.M. hogging at column face(left), Mtr = 5 Mutr = 8 KN.m

Steel @ right top

$$\frac{Mutl}{b\,d^2} = \frac{7.50E+06}{200 \times 565 \times 565} = 0.12$$

As per SP 16 Table 3

% steel required = p = 0.016 %

Steel at top = 18 mm^2

Provide 2 Nos Of 12 Dia Area of Steel Provided 226 mm^2

Steel @ midspan bottom.

$$\frac{Mub}{b\,d^2} = \frac{7.50E+06}{200 \times 565 \times 565} = 0.12$$

As per SP 16 Table 3

% steel required = p = 0.02 %

As per IS: 456: 2000 CL: 26.5.1.1.

minimum pt required = $\frac{Ast}{fy} = 0.155$ %

% steel provided = pt = 0.15 %

$$Ast = \frac{0.15 \times 200 \times 565}{100} = 175 \text{ mm2}$$

Provide 2 Nos Of 12 Dia Area of Steel Provided 226 mm^2

HITEN R. MAHIMTURA
Structural Engineers Grade-1 (SE)
Regn. No: SE/GR-1/19/03/021
Shakti Towers, 3rd Floor, H, Wing-2,
766, Anna Salai, Thousand Lights,
Chennai-600 002, Tel: 044-43156723
E-mail:brchennaimcpl@gmail.com

Designed By :

Checked By :

Steel @ left top.

$$\frac{Mutr}{b\,d^2} = \frac{7.50E+06}{200 \times 565 \times 565} = 0.12$$

As per SP 16 Table 3

% steel required = p = 0.02 %
Steel at top = 19.494 mm^2
Provide 12 **mm Dia.** 2 nos Area of Steel Provided 226.1 mm^2

Check for Shear.

Shear force at a distance d from face of column V = 11.00 KN
Vu = 11.00 KN (factored shear)

$$Tv = \frac{11.00 \times 1000}{200 \times 565.0} = 0.10 \text{ N/mm2}$$

$$\% \text{ steel provided} = \frac{226.1 \times 100.0}{200 \times 565.0} = 0.20 \%$$

Tc = 0.41 N/mm^2 (Refer Table 19 of IS 456 : 2000)

Tv < Tc

Provide minimum shear reinforcement Provide 8 ϕ @ 100 mm c/c

∴ Shear resisted by concrete = Tc.b.d

= 0.41 x 200 x 565

= 46332 N = 46.3 KN

Shear to be resisted by stirrups = 11 - 46.3 = -35.3 KN

∴ Vu = -35.3 KN

$$\therefore \frac{Vu}{d} = \frac{-35.3}{56.5} = -0.625 \text{ KN/cm}$$

As per IS 456 -2000 cl.26.5.1.6
Min.Shear reinfocrcement Sv = 0.87 fy Asv / 0.4 b
Stirrups = 2 Legged Dia. 8 mm

$$= \frac{0.87 \times 250 \times 100.48}{0.4 \times 200} = 273.18 \text{ c/c}$$

Provide 8 ϕ @ 100 mm c/c

Designed By :

Checked By :

Mahimtura Consultants (P) Ltd. Chennai.

Mahimtura Consultants Pvt. Ltd.	Project	MADHAVARAM TOWER	Job No. 9427
25, Unique House,S.A.Brelvi Road	Floor Level	FOUNDATION	Revision - R0
Fort, Mumbai- 400001	Date	14/November/24	Sheet No. - 1

Design Code	:	IS 456 : 2000 + IS 13920 : 2016	
Footing No	:	F2	
Column No	:	SW2	(300 mm X 8835 mm)
Analysis No	:	SW2	
Concrete Grade	:	M30	N/sqmm
Steel Grade	:	Fe550	N/sqmm
Clear Cover	:	50	mm
Density of Soil	=	18	
Soil Bearing Capacity	=	500	
Permissible SBC Increase for EQ	=	25	kN/cum
Permissible SBC Increase for Wind	=	25	kN/sqm
Live Load Reduction	=	50	%
Permissible area of loss of contact	=	0	%
			%
Cross Section designed by	:	Maximum pressure	%

Footing Type	:	Pad	
Footing Size (L x B x D)	:	12355mm X 2760mm X 800mm	
Without considering Effect of Water Table			
Footing Self Wt., F1	=	682	kN
Soil Weight, S1	=	0.00	kN
Total Weight, W1	=	F1 + S1	
	=	384.8	kN
Offset Along L (Loff)	=	780	mm
Offset Along B (Boff)	=	775	mm

Check For Maximum Soil Pressure:

Critical Load Combination	=	[1] : (Dead) +(FF) +(LMR) +(OHWT) +(PODIUM) +(STAIRCASE) +(SUNK-FILLING) +(WALL) +(WATER-PROOFING) +(LIVE) +(Live1) +(TERRACE LIVE)

HITEN R. MAHIMTURA
Structural Engineers Grade-1 (SE)
Regn. No: SE/GR-1/19/03/021
Shakti Towers, 3rd Floor, H, Wing-2,
766, Anna Salai, Thousand Lights,
Chennai-600 002, Tel: 044-43156723
E-mail:brchennaimcpl@gmail.com

Pcomb	=	8319.69	kN
P	=	Pcomb + W1	
P	=	8704.49	kN
Mx	=	-1273.04	kNm
My	=	10.58	kNm
P/A	=	452.42	kN/sqm
Mx/Zx	=	-38.17	kN/sqm
My/Zy	=	1.78	kN/sqm
Maximum Soil Pressure	=	492.37	kN/sqm
Allowable Soil Pressure	=	1x500	kN/sqm
	=	500	kN/sqm

Check For Minimum Soil Pressure:

Critical Load Combination	=	[1] : (Dead) +(FF) +(LMR) +(OHWT) +(PODIUM) +(STAIRCASE) +(SUNK-FILLING) +(WALL) +(WATER-PROOFING) +(LIVE) +(Live1) +(TERRACE LIVE)	
Pcomb	=	8319.69	kN
P	=	Pcomb + W1	
P	=	8704.49	kN
Mx	=	-1273.04	kNm
My	=	10.58	kNm
P/A	=	452.42	kN/sqm
Mx/Zx	=	-38.17	kN/sqm
My/Zy	=	1.78	kN/sqm
Minimum Soil Pressure	=	412.46	kN/sqm
	>	0	

Design For Bending:

Bottom Reinforcement Along L:

Critical Load Combination	=	[69] : 1.5 (Dead) +1.5 (FF) +1.5 (LMR) +1.5 (OHWT) +1.5 (PODIUM) +1.5 (STAIRCASE) +1.5 (SUNK-FILLING) +1.5 (WALL) +1.5 (WATER-PROOFING) -1.5 (WIND501)	
Pu	=	10388.17	kN
Mux	=	-22333.02	kNm
Muy	=	-19.61	kNm
P/A	=	539.93	kN/sqm
Mx/Zx	=	-669.67	kN/sqm



My/Zy	=	-3.31	kN/sqm
Deff	=	742	mm
Beff	=	1850	mm
SPu	=	1212.9	kN/sqm
Mu	=	SPu X B X Loff X Loff / 2	
	=	682.58	kNm
Pt	=	0.144	%
Ast Rqd (BM)	=	1975	sqmm
Ast Prv (Distributed Across Total Width)	=	T20 @ 100 C/C	

Bottom Reinforcement Along B:

Critical Load Combination	=	[69] : 1.5 (Dead) +1.5 (FF) +1.5 (LMR) +1.5 (OHWT) +1.5 (PODIUM) +1.5 (STAIRCASE) +1.5 (SUNK-FILLING) +1.5 (WALL) +1.5 (WATER-PROOFING) -1.5 (WIND501)	
Pu	=	10388.17	kN
Mux	=	-22333.02	kNm
Muy	=	-19.61	kNm
P/A	=	539.93	kN/sqm
Mx/Zx	=	-669.67	kN/sqm
My/Zy	=	-3.31	kN/sqm
Deff	=	726	mm
Leff	=	10400	mm
SPu	=	1212.9	kN/sqm
Mu	=	SPu X L X Boff X Boff / 2	
	=	3788.19	kNm
Pt	=	0.148	%
Ast Rqd (BM)	=	11211	sqmm
Ast Prv (Distributed Across Total Length)	=	T20 @ 150 C/C	

Design For Shear:

One Way Shear Along L:

Critical Section @ d from Column Face			
	=	742	mm
Critical Load Combination	=	[69] : 1.5 (Dead) +1.5 (FF) +1.5 (LMR) +1.5 (OHWT) +1.5 (PODIUM) +1.5 (STAIRCASE)	



		+1.5 (SUNK-FILLING) +1.5 (WALL) +1.5 (WATER-PROOFING) -1.5 (WIND501)	
Pu	=	10388.17	kN
Mux	=	-22333.02	kNm
Muy	=	-19.61	kNm
P/A	=	539.93	kN/sqm
Mx/Zx	=	-669.67	kN/sqm
My/Zy	=	-3.31	kN/sqm
Deff	=	742	mm
Beff	=	1850	mm
SPu	=	1212.9	kN/sqm
Vu	=	SPu X (Loff - d) X B	
	=	85.27	kN
Tv	=	Vu / (Beff X Deff)	
	=	0.06	N/sqmm
Tc	=	0.29	N/sqmm
Tv	<	Tc	

One Way Shear Along B:

Critical Section @ d from Column Face

	=	726	mm
Critical Load Combination	=	[69] : 1.5 (Dead) +1.5 (FF) +1.5 (LMR) +1.5 (OHWT) +1.5 (PODIUM) +1.5 (STAIRCASE) +1.5 (SUNK-FILLING) +1.5 (WALL) +1.5 (WATER-PROOFING) -1.5 (WIND501)	
Pu	=	10388.17	kN
Mux	=	-22333.02	kNm
Muy	=	-19.61	kNm
P/A	=	539.93	kN/sqm
Mx/Zx	=	-669.67	kN/sqm
My/Zy	=	-3.31	kN/sqm
Deff	=	726	mm
Leff	=	10400	mm
SPu	=	1212.9	kN/sqm
Vu	=	SPu X (Boff - d) X L	
	=	618.09	kN

Tv	=	Vu / (Leff X Deff)	
	=	0.08	N/sqmm
Tc	=	0.29	N/sqmm
Tv	<	Tc	

Design For Punching Shear:

Critical Section @ d/2 from Column Face

	=	367	mm
Critical Load Combination	=	[26] : 1.5 (Dead) +1.5 (FF) +1.5 (LMR) +1.5 (OHWT) +1.5 (PODIUM) +1.5 (STAIRCASE) +1.5 (SUNK-FILLING) +1.5 (WALL) +1.5 (WATER-PROOFING) +1.5 (LIVE) +1.5 (Live1) +1.5 (TERRACE LIVE)	
Pu	=	12479.54	kN
Mux	=	-1909.56	kNm
Muy	=	15.86	kNm
P/A	=	648.62	kN/sqm
Mx/Zx	=	-57.26	kN/sqm
My/Zy	=	2.67	kN/sqm
Deff	=	734	mm
Leff	=	9574	mm
Beff	=	1034	mm
Punching Perimeter	=	21216	mm
Punching Area	=	15572544	sqmm
SPu	=	Max Pressure	
	=	708.56	kN/sqm
Vu	=	SPu X ((L X B)-(Leff X Beff))	
	=	6618.27	kN
Tv	=	Vu / Punching Area	
	=	0.425	N/sqmm
Tc	=	0.731	N/sqmm
Tv	<	Tc	

Load Transfer Check For Load Transfer From Column To Footing

Critical Load Combination	=	[26] : 1.5 (Dead) +1.5 (FF) +1.5 (LMR) +1.5 (OHWT) +1.5 (PODIUM) +1.5 (STAIRCASE) +1.5 (SUNK-



		FILLING) +1.5 (WALL) +1.5 (WATER-PROOFING) +1.5 (LIVE) +1.5 (Live1) +1.5 (TERRACE LIVE)	
Pu	=	12479.54	kN
A2	=	2.65	sqm
A1	=	42.14	sqm
Base Area	=	19.24	sqm
A1	>	Base Area	
Thus, A1	=	19.24	
Modification Factor	=	SquareRoot(A1/A2) < = 2	
SquareRoot(A1/A2)	=	2.6945	
Thus, Modification Factor	=	2	
Concrete Bearing Capacity	=	0.45 X Fck X Modification Factor X Column Area	
	=	71604	kN
Concrete Bearing Capacity	>	Pu, Hence Safe.	

HITEN R. MAHIMTURA
Structural Engineers Grade-1 (SE)
Regn. No: SE/GR-1/19/03/021
Shakti Towers, 3rd Floor, H, Wing-2,
766, Anna Salai, Thousand Lights,
Chennai-600 002, Tel: 044-43156723
E-mail:brchennaimcpl@gmail.com

Mahimtura Consultants Pvt. Ltd.	Project	MADHAVARAM TOWER	Job No.	9427
25, Unique House,S.A.Brelvi Road	Floor Level	LOWER BASEMENT	Revision -	R0
Fort, Mumbai- 400001	Date	14/November/24	Sheet No. -	1

General Data

Wall No.	:	SW2	
Frame Type	=	Ductile	
Level	:	Base To Basement-1	
Design Code	=	IS 456 - 2000 + IS 13920 - 2016	
Grade Of Concrete	=	M40	N/sqmm
Grade Of Steel (Main)	=	Fe550	N/sqmm
Grade Of Steel (Shear)	=	Fe415	N/sqmm
Grade Of Steel - Flexural Design	=	Fe550	N/sqmm
Grade Of Steel - Shear Design	=	Fe415	N/sqmm
Wall B	=	300	mm
Wall D	=	8840	mm
Clear Cover	=	40	mm
Clear Floor Height @ B	=	2700	mm
Clear Floor Height @ D	=	2700	mm
No Of Floors	=	1	
No Of Walls In Group	=	1	
Wall Type	:	UnBraced	
Minimum eccentricity check	:	One Axis at a Time	
Code defined D/B ratio	:	4	
D/B Ratio	:	29.47 >= 4 Hence, Design as Wall	

Flexural Design (Analysis Forces)

Analysis Reference No.	=	SW2	
Load Combination	=	[68] : 0.9 (Dead) +0.9 (FF) +0.9 (LMR) +0.9 (OHWT) +0.9 (PODIUM) +0.9 (STAIRCASE) +0.9 (SUNK-FILLING) +0.9 (WALL) +0.9 (WATER-PROOFING) -1.5 (WIND501)	
Critical Location	=	Bottom Joint	
Pu	=	5994.26	kN
Mux	=	-21685.34	kNm
Muy	=	-25.61	kNm
Vux	=	-3.34	kN
Vuy	=	-439.83	kN



Check For Requirement Of Boundary Element

Check For Maximum Compressive Stress

Having maxstress in between level's (Basement-1 - 1ST)

At level (Basement-1)

Load Combination	=	[30] : 1.5 (Dead) +1.5 (FF) +1.5 (LMR) +1.5 (OHWT) +1.5 (PODIUM) +1.5 (STAIRCASE) +1.5 (SUNK-FILLING) +1.5 (WALL) +1.5 (WATER-PROOFING) -1.5 (Spec-X+0.3SPECZMax)
Maximum Stress	=	8.54
0.2 x Fck	=	8

Maximum Stress in Wall > 0.2 x Fck

Hence Boundary Element is applicable

At level (Basement-1)

Load Combination	=	[30] : 1.5 (Dead) +1.5 (FF) +1.5 (LMR) +1.5 (OHWT) +1.5 (PODIUM) +1.5 (STAIRCASE) +1.5 (SUNK-FILLING) +1.5 (WALL) +1.5 (WATER-PROOFING) -1.5 (Spec-X+0.3SPECZMax)
Maximum Stress	=	8.54
0.15 x Fck	=	6

Maximum Stress in Wall > 0.15 x Fck

Hence Boundary Element is applicable

Effective Length Calculation

Calculation Along Major Axis Of Column

Joint	Column Stiffness	Beam Sizes		Beam Stiffness		Beta
		Beam 1 (Length x Width x Depth)	Beam 2 (Length x Width x Depth)	Beam 1	Beam 2	
	N-m x 10^6	mm	mm	N-m x 10^6	N-m x 10^6	
Bottom	661976.931	No Beam	No Beam	-	-	1
Top	661976.931	No Beam	6442.58 x 300 x 600	-	106.021	1

Sway Condition (as per Stability Index)	=	Non Sway
Effective Length Factor along Major Axis	=	1



Calculation Along Minor Axis Of Column

Joint	Column Stiffness	Beam Sizes		Beam Stiffness		Beta
		Beam 1 (Length x Width x Depth)	Beam 2 (Length x Width x Depth)	Beam 1	Beam 2	
	N-m x 10^6	mm	mm	N-m x 10^6	N-m x 10^6	
Bottom	762.396	No Beam	No Beam	-	-	1
Top	762.396	3210 x 300 x 600	No Beam	212.789	-	0.77

Sway Condition (as per Stability Index)	=	Non Sway	
Effective Length Factor along Minor axis	=	1	

Minimum Eccentricity Check

Since Axial Force is compressive, Min. Eccentricity check to be performed

Most critical case is with Min. Eccentricity check in X-direction

Minimum Eccentricity Along D:

Minimum Eccentricity	=	Unsupported Length / 500 + D / 30	
	=	300.07	mm
Minimum Eccentricity	>	20	mm
Mminx	=	Pu x Minimum Eccentricity	
	=	1798.68	kNm

Slenderness Check

Max Slenderness Ratio(L/B)	=	9	
	<	60	(Hence Ok)

Column Is Unbraced Along D

Slenderness Check Along D:

Effective Length Factor	=	1	
Slenderness Ratio	=	Effective Length / D	
	=	0.31, Wall not Slender Along D	

Column Is Unbraced Along B

Slenderness Check Along B:

Effective Length Factor	=	1	
Slenderness Ratio	=	Effective Length / B	
	=	9, Wall Not Slender Along B	

Calculation of Design Moment

Direction	Manalysis	Mmin (Abs)	Mdesign	MsIndx (Abs)	Mdesign-final
	A	B	C	E	F
Major Axis - Mux	-21685.34	1798.68	-21685.34	0	-21685.34
Minor Axis - Muy	-25.61	---	-25.61	0	-25.61



Where

A = Moments directly from analysis

B = Moments due to minimum eccentricity

C = Maximum of analysis moment and min. eccentricity = Max (A,B)

E = Moment due to slenderness effect

F = Final design Moment = Max(C- Top Bottom , D- Top Bottom) + E

Final Critical Design Forces

Pu	=	5994.26	kN
Mux	=	-21685.34	kNm
Muy	=	-25.61	kNm

Minimum % steel

User defined pt min1	=	0.4	
Vertical reinforcement as per type of wall			
hw	=	3300	mm
Lw	=	8840	mm
hw/Lw	=	0.37	
Type of wall	=	0.37 < 1, hence, Squat wall	
tw	=	300	mm
Ptv min2	=	0.3	%
Ptmin	=	Max (0.4 , 0.3)	
	=	0.4	%

Resultant Moment (Combined Action)

Moment Capacity Check

Pt Calculated	=	0.77	
Reinforcement Provided	=	180-T12	
Load Angle	=	Tan^{-1}(Muy/Mux)	
	=	0.32	deg
MRes	=	21685.67	kNm
MCap	=	51396	kNm
Capacity Ratio	=	MRes/ MCap	
	=	0.42 <= 1	

Level	=	Base To Basement-1
Analysis Reference Number	=	C2



Critical Load Combination	[39] : 1.5 (Dead) +1.5 (FF) +1.5 (LMR) +1.5 (OHWT) +1.5 (PODIUM) +1.5 (STAIRCASE) +1.5 (SUNK-FILLING) +1.5 (WALL) +1.5 (WATER-PROOFING) +1.5 (SpecZ+0.3SpecX+0.3SpecYMax)	[57] : 0.9 (Dead) +0.9 (FF) +0.9 (LMR) +0.9 (OHWT) +0.9 (PODIUM) +0.9 (STAIRCASE) +0.9 (SUNK-FILLING) +0.9 (WALL) +0.9 (WATER-PROOFING) +1.5 (Spec-Y+0.3SPECZMax)
Design shear force, Vu (kN)	970.3181	92.3973
Pu (kN)	9866.65	5654.79
Design shear stress, Tv	Vu / (D x 0.8 x B)	Vu / (B x 0.8 x D)
Tv (N/sqmm)	0.4574	0.0436
Pt (20% of vertical reinforcement)	0.154	0.154
Design shear strength, Tc (N/sqmm)	0.3004	0.3004
Shear Strength Enhancement Factor (Compressive Force)	1 + 3 x Pu / (B x D x Fck)	
	1.3488	1.1999
Shear Strength Enhancement Factor (Tensile Force)	-	-
Shear Strength Enhancement Factor (max)	1.5	1.5
Shear Strength Enhancement Factor	1.3488	1.1999
Enhanced shear strength, Tc-e (N/sqmm)	0.4052	0.3604
Design shear check	Tv > Tc x Enhancement factor	Tv < Tc x Enhancement factor
Shear Links Design	**Shear Links Required**	**Shear Links Not Required**
Pt (20% of vertical reinforcement)	0.154	-
Shear resisted by concrete Vc (kN)	(Tc-e) x (B x Deff)	-
	815.14	-
Shear to be resisted by shear reinforcement = Vus (kN)	Vu - Vc	
	155.18	-
Area of shear reinforcement required, Asv (sqmm)	(Vus x 1000) / (Deff x 0.87 x Fy)	(Vus x 1000) / (Beff x 0.87 x Fy)
	750	-
Master Link Rebar (mm)	8	-
Number of legs provided	2	-
Spacing of links reqd (mm)	134	-
Spacing of links prvd, Sv (mm)	125	-
Asv Provided (sqmm)	804.25	-



Design Of Links

Main Links

Links in the zone where special confining links are not required

Normal Links

Horizontal reinforcement as per type of wall		
hw	= 3300	mm
Lw	= 8840	mm
hw/Lw	= 0.37	
Type of wall	= 0.37 < 1, hence, Squat wall	
tw	= 300	mm
Pth min	= 0.3	%
Diameter of main horizontal steel	= 8	mm
Thus, Spacing	= 125	mm
Spacing of horizontal reinforcement is minimum of following		
D / 5	= 1768	mm
3 x B	= 900	mm
Maximum	= 450	mm
Spacing considered	= 125	mm

Special confining reinforcement as per IS 13920 - 2016

Min. Lateral dimension of column, B	= 300	mm
B/3	= 100	mm
6 X Smallest Longitudinal Bar Dia	= 72	mm
Spacing	= 150	mm
Hence Link spacing, Sv	= 100	mm
Hoop dimension, h	118	
Gross area of column, Ag	= B x D	
	= 2652000	sqmm
Core area of column, Ak	= (B- 2 x cover to Link) x (D- 2 x cover to Link)	
	= 2071136	sqmm



Area of special confining link, Ash1	= (0.18 x S x h x (Fck/Fy) x (Ag/Ak-1))	
	= 43.32	sqmm
Area of special confining link, Ash2	= (0.05 x S x h x (Fck/Fy))	
	= 42.91	sqmm
Area of special confining link, Ash	= Maximum (Ash1,Ash2)	
	= 43.32	sqmm
Diameter of special confining link	= 8	mm
	= > Max. longitudinal bar dia / 4	
	= 3	mm
Area of horizontal steel provided	= Area of bar provided x 1000 x 2 / spacing	
	= 1005.4	(sqmm)/ m height
	= 0.3351	%
	= > min. steel required 0.25%	

Special confining links to be provided along full height in BE.

Table For Links

Note: Ductile Design Of Links Is Applicable Only For Boundary Elements

	Required			Provided	
	Normal Design	Shear Design	Ductile Design	Normal Zone	Ductile Zone
Link Dia.	8	---	8	8	8
Spacing	130	---	130	130	130



Mahimtura Consultants Pvt. Ltd. 25, Unique House,S.A.Brelvi Road Fort, Mumbai- 400001	Project	MADHAVARAM TOWER	Job No.	9427
	Floor Level	First Floor	Revision -	R0
	Date	14/November/24	Sheet No. -	1

Design Of Two Way Slab

Slab Marked : S1

Span = 3.15 m

Thickness of Slab D = 125 mm

d_{eff} = 125 - 29 = 96 mm

Loading :

Self weight Of Slab	=	0.125	x	25	=	3.125 kN/m²
Live Load	=					2 kN/m²
Floor Finish	=					1.5 kN/m²
Total Load	=					6.625 kN/m²

Bending Moment :

$$M = \frac{6.625 \times 3.15^{2}}{8} = \mathbf{0.00} \text{ kN-m}$$

$$k = \frac{Mu}{b \times d^{2}} = \frac{1.500 \times 0.0 \times 10^{6}}{1000 \times 96 \times 96} = 0 \text{ N/mm}^2$$

fck = 40 N/mm² & fy = 550 N/mm²

Main Reinforcement.

$$pt = \frac{50 x fck}{fy}\left[1 - \sqrt{1 - ((4.6 x k)/(fck))}\right]$$

pt = 0.000 % (Refer SP-16)

Ast = pt x 1000 x $d_{eff.}$ = 0 mm²

Min Steel Reqd = 0.12 % of c/s. area

$$\text{Min Ast Reqd} = \frac{0.12 \times 1000 \times 96}{100} = 115 \text{ mm}^2$$

Main steel Reqd. 8 Dia @ 275 mm c/c.

Main steel Provd 8 Dia @ 150 mm c/c.

Ast provided is 183 mm² > 115 mm²

Hence OK



Distribution Reinforcement.

pt = 0.12 % of c/s. area

Ast = 143 mm^2

Dist steel Reqd. 8 Dia @ 275 mm c/c.

Dist steel Provd 8 Dia @ 200 mm c/c.

Check for Shear.

$$Vu = \frac{6.625 \times 1.5 \times 3.15}{2} = 15.652 \text{ kN}$$

$$Tv = \frac{Vu}{b \times d}$$

$$= \frac{15.652 \times 10^3}{1000 \times 96} = 0.163 \text{ N/mm}^2$$

$$\% \text{ steel provided} = \frac{183 \times 100}{1000 \times 96} = 0.190 \% \quad \beta = 24.4$$

Tc = 0.331 N/mm^2 (Refer Table 19 of IS 456 : 2000)

For D = 174

K = 1.35 (Refer Cl : 40.2.1.1 of IS 456 : 2000)

$\therefore$ K Tc = 1.35 x 0.331 = 0.447 N/mm^2

Tv < K Tc **Hence OK**

Check for Deflection.

Refer fig.4 page. 38 of IS 456 : 2000

$$fs = 0.58 \times fy \times \frac{\text{Area of cross-section of steel required}}{\text{Area of cross-section of steel provided}}$$

$$= 0.58 \times 550 \times \frac{178}{335} = 169.57 \text{ N/mm}^2$$

% steel provided = 0.190 %

MF for Tension Steel = 2.06 (Refer Fig. 4 of IS 456 : 2000)

MF for Compression Steel = 1.00 (Refer Fig. 5 of IS 456 : 2000)

$$\frac{\text{Span}}{d} < 20 \times \text{M.F}$$

$$\text{Reqd. depth, D} = \frac{3150}{2.06 \times 1.0 \times 20} + 29 = 105 \text{ mm}$$

Provided Depth, D = 125 mm **Hence OK**

HITEN R. MAHIMTURA
Structural Engineers Grade-1 (SE)
Regn. No: SE/GR-1/19/03/021
Shakti Towers, 3rd Floor, H, Wing-2,
766, Anna Salai, Thousand Lights,
Chennai-600 002, Tel: 044-43156723
E-mail:brchennaimcpl@gmail.com



our services doesn't just end there

Buying & Selling Services

Property Buying Assistance, Property Selling Support, Market Price Analysis, Owner Outreach and Negotiation.

Legal & Documentation Services

Certified EC, Patta, legal opinions, property verification, due diligence, litigation solutions, and legal heir certificates.

Property Development & Approvals

Building plan approvals, construction, layout and sub-division approvals, zone conversion, and occupancy certification.

NRI & Investment Services

Escrow Services, Rentals, Litigation Solutions, Property Valuation and Property Management

Compliance & Special Services

Demolition, Vaasthu checks, regularization of unauthorized buildings, and office space solutions.



empowering your real estate decisions with smart tools

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

Verified RealEstate™

We're honored to be part of your real estate journey

3/350/2 Mettukuppam,
OMR Thoraipakkam,
Chennai, India

hello@verified.realestate
+91 9996 12 9996
www.verified.realestate