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STRUCTURAL DESIGN CALCULATION REPORT

(THE REVISION OF GROUP DEVELOPMENT OF 10 BLOCKS – RESIDENTIAL DEVELOPMENT CONSTRUCTION OF THE BUILDING/BLOCK/TOWER/RESIDENTIAL OF HIGH RISE BUILDING CONSIST OF BLOCK-A3: COMBINED BASEMENT FLOOR+ COMBINED STILT FLOOR+ COMBINED PODIUM FOR BLOCK A3 & A4, BLOCK A3: 1ST FLOOR TO 21ST FLOOR WITH 166 DWELLING UNITS AND BLOCK A4: 1ST FLOOR TO 21ST FLOOR WITH 294 DWELLING UNITS (TOTALLY 460 DWELLING UNITS) WITH 66.0M HEIGHT OF RESIDENTIAL BUILDING IN THE SITE COMPRISING COMPLETION CERTIFICATE ISSUED BLOCKS VIZ: A1, A2, A6; BLOCK A1 & A2 TYPICAL: COMBINED BASEMENT FLOOR+ STILT FLOOR+ PODIUM WITH 1ST TO 13TH FLOOR+ 14TH FLOOR PART WITH EACH BLOCK 110 DWELLING UNITS (TOTALLY- 220 DWELLING UNITS), BLOCK A6 (LIG BLOCK): 1ST TO 13TH FLOOR+ 14TH FLOOR PART WITH EACH BLOCK 192 DWELLING UNITS AND CLUB HOUSE: 1ST TO 3RD FLOORS+ 4TH FLOOR (INDOOR GAMES, BANQUET HALL, GYM & SWIMMING POOL AT 4TH FLOOR), BLOCK B1& B2 TYPICAL : 1ST TO 14TH FLOOR PART WITH 216 DWELLING UNITS(TOTALLY – 628 DWELLING UNITS) WITH 2 COMMERCIAL BLOCKS- TOTALLY 1088 DWELLING UNITS (PROPOSED 460 DWELLING UNITS+ CC OBTAINED 628 DWELLING UNITS) SITUATED AT MEDAVAKKAM - MAMBAKKAM ROAD ON THE LAND BEARING SURVEY NO, 19/61A, 19/6A2, 19/6A3, 19/6B1, 19/6B2, 20/2B, 20/3, 20/4A, 20/4B, 20/4C, 20/5A1, 20/5A2, 20/5B1, 20/5B2, 37/6A, 37/6B, 37/7, 37/8, 37/9, 364/1B2, 365/1B1 OF VENGAIVASAL VILLAGE, CHENNAI – 600126.

CLIENT:

NAVIN HOUSING & PROPERTIES (P) LTD,
CHENNAI, TAMILNADU.

ARCHITECT:

ANAND ARCHITECTS,
CHENNAI, TAMILNADU.

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R0	17.12.2024	Design Basis Report	OK	T.PRAKATHISH	PERAM	PERAM
REV NO.	**DATE**	**DESCRIPTION**	**STATUS**	**PREPARED BY**	**REVIEWED BY**	**APPRVD. BY**

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DESIGN INFORMATION AND CRITERIA

1. INTRODUCTION

M/s. Navin Housing & Properties (P) Ltd., a Chennai based Developer proposed a construction of the building/block/tower/Residential of high rise building consist of block-A3: Combined Basement floor+ Combined Stilt floor+ Combined Podium for Block A3 & Block A4, Block A3: 1st floor to 21st floor with 166 Dwelling units and Block A4: 1st floor to 21st floor with 294 Dwelling units (Totally 460 Dwelling units) with 66.0m height of Residential Building in the site comprising Completion Certificate issued Blocks viz: A1, A2, A6; Block A1 & A2 Typical: Combined Basement Floor+ Combined Stilt Floor+ Combined Podium with 1st floor to 13th floor+ 14th floor part with each block 110 dwelling units (Totally- 220 Dwelling units), Block A6 (LIG block): 1st floor to 13th floor+ 14th floor part with each block 192 Dwelling units and club house: 1st floor to 3rd floors+ 4th floor (Indoor games, Banquet hall, Gym & Swimming pool at 4th floor), Block B1& B2 Typical : 1st floor to 14th floor part with 216 Dwelling units(Totally – 628 Dwelling units) with 2 commercial blocks-Totally 1088 Dwelling units (Proposed 460 Dwelling units+ CC obtained 628 Dwelling units) situated at Medavakkam - Mambakkam Road on the land bearing Survey No, 19/61A, 19/6A2, 19/6A3, 19/6B1, 19/6B2, 20/2B, 20/3, 20/4A, 20/4B, 20/4C, 20/5A1, 20/5A2, 20/5B1, 20/5B2, 37/6A, 37/6B, 37/7, 37/8, 37/9, 364/1B2, 365/1B1 of Vengaivasal Village, Chennai – 600126.

This report covers Tower- A3 of Ph-3 development which includes two towers named A3 & A4, each comprises single Basement+Stilt+1st Floor to 21st Floor+Roof. In which the Basements & Stilt floors are combined one, which accommodates car/two wheeler parking. 1st Floor is combined with Podium floor which is partly covered & partly uncovered over the snorkel movement area. The covered area podium slab has been designed to accommodate landscape with 500mm filling whereas the stilt floor extended basement roof area has been designed for fire tender lorry movement. The tower portion of First floor to 21st floor designed to accommodate residential units. Architecturally, the tower is designed to be a linear & rectangular in shape. Conceptually the building is visualized as shear wall building which shall be constructed using aluminum formwork. Structurally, it has been framed as shear wall buildings with load bearing walls are 170mm thick some of the fin walls and walls having thickness 100 & below are considered as non-load bearing walls. Foundation is designed to be Raft with depth of foundation around 3.5m & below. The raft is connected monolithically with Basement wall forms the water tight basement structure shall be protected by applying the approved water proofing on positive side taking the water table likely to rise up to the ground level during peak monsoon. Superstructure is designed to be a

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shear wall structure with Slab connected directly to the shear walls and Beams are provided in few locations where opening/door is provided. At 1st Floor, the shear walls are supported by wide RC transfer Beams. Soft storey at transfer level has been taken care by providing the wider shear walls in the lower storey and compliance made as per ACI code provisions. This report provides the information on Codes of Practice, Design loadings, Material Strength considered for the Design and Analysis of the building. In addition, this report includes information on Structural system, Foundation system, Parameters & Method statement of structural analysis which will be adopted for design and analysis of the building.

2. CODES OF PRACTICE

In the analysis, design and detailing of the building, the following Indian Standard codes will be used.

2.1 Design Loads (Other Than Earthquake Loads)

IS Code	Description
IS 875 (Part 1): 1987	Dead Loads (Unit Weight of Building Material and Stored Material)
IS 875 (Part 2): 1987	Imposed Load
IS 875 (Part 3): 2015	Wind Load
IS 875 (Part 5): 1987	Special Loads and Combinations

2.2 Design for Earthquake Resistance

IS Code	Description
IS 1893(Part-1) :2016	Criteria for Earthquake Resistance design of structures.
IS 4326: 1993	Earthquake Resistant Design and Construction of Buildings – Code of Practice
IS 13920: 2016	Ductile Detailing of Reinforced Concrete Structures subject to Seismic Forces - Code of Practice.
IS 16700: 2017	Criteria for Structural Safety of Tall Concrete Buildings

2.3 Design of Steel Structural Elements

IS Code	Description
IS 800: 2007	Code of Practice for General Construction in Steel
IS 2062: 1999	Steel for General structural purposes

2.4 Design of Concrete Elements

IS Code	Description
IS 456: 2000	Plain and Reinforced Concrete - Code of practice
IS 6403 -1981	Code of practice for determination of bearing capacities of shallow foundations.
IS 8009 -1976 (Part I):	Code of practice for calculation of settlement of foundations – Shallow foundation
IS 1904	Indian Standard Code of practice for design & construction foundations in Soil: General Rééquipements
IS 2950 (Part 1):1981 (Reaff. Nov 2013)	Code of practice for design and construction of raft foundations : Part 1 Design (second revision).
IS 2974	Code of practice for design & construction of machine foundation
SP 16	Structural use of concrete, Design charts for singly reinforced beams, doubly reinforced beams and columns.
SP 34	Hand book on Concrete Reinforcement & Detailing
SP 7(Part IV)-2015	National Building code of India
IS 1786-2007	Specification for high strength deformed bars and wires for concrete Reinforcement.
IS 432 (Part 2) 1982	Specification for Mild Steel and Medium Tensile Steel Bars and Hard Drawn Steel Wire for concrete reinforcement – Hard Drawn Steel Wire
IS 3370 (part I)	Code of practice for concrete structure for the storage of liquids

3. DESIGN PARAMETERS

3.1 Materials of Construction

The building is predominantly Shear wall connected with slab/beam. The lateral load resisting system of Shear walls/Columns are well connected in orthogonal direction along with the centrally located Lift Core wall which are connected by floor slab is act as diaphragm in distribution of lateral forces.

3.1.1 Concrete Grade

Concrete grade shall be M35 for Basement wall, Basement slab, etc. whereas Shear wall, RC Column, RC beam & RC slab shall be M40 with minimum 28-day strength of 35 & 40 MPa respectively.

Concrete Mix M10 has been used in filling, plum concrete, levelling courses (PCC) and other non-structural items.

Density of reinforced concrete is assumed as 25 kN/cu.m.
Minimum cement content, water cement ratio etc. shall conform to IS 456:2000 code provisions for durability and strength criteria. The approved design mix shall be used for producing concrete.

Grade of Concrete for various structural elements: (PODIUM / EXTENDED BASEMENT)

Footings	M35
Basement Wall	M35
Basement Slab	M35
Columns	M35
Stilt Floor RC Beam	M35
Stilt Floor RC Slab	M35
First Floor (Landscape/Podium)	
RC Beam/Slab	M35

Grade of Concrete for various structural elements: (TOWERS)

Basement Slab	M35
Columns	M40
First Floor Level Transfer Beam	M35
First Floor Level Transfer Slab	M35
Shear Wall (upto 11th Floor)	M40
RC Beam	M40
RC Slab	M40
Shear Wall (Above 11th Floor)	M30
RC Beam	M30
RC Slab	M30

3.1.2 Cement

Ordinary Portland cement of grade 43 or higher confirming to IS 8112 and IS 12269 is specified for concrete M35 for Basement wall & Slab whereas the grade is to be M40 for RC shear wall, column, Beam, RC Slab etc. with cement content appropriate to the desirable compressive strength and slump. The design mix using the intended brand of cement together with material test report including tests on coarse aggregate, fine aggregate etc. shall be submitted to the consultant's review and approval.

3.1.3 Aggregates

The sizes of coarse aggregates confirm to IS 383. Nominal maximum size of coarse aggregate to be 20 mm, suitably graded as per the requirement of mix design. The fine aggregates confirm to the specifications of IS 383.

3.1.4 Water

Water used for construction shall complied with stipulations given in IS 456: 2000.

3.1.5 Reinforcement

High yield strength deformed bars conforming to IS 1786 with f_y = 500 N/ sq.mm has been used with elongation not less than 14.5 %.

3.1.6 Structural Steel

MS steel with yield strength f_y = 250 N/ sq.mm shall be used for Structural steel work wherever necessary which shall conform to IS 226 and IS 2062 for Indian steel sections.

3.1.7 Concrete Cover

Cover to reinforcement considered for various elements with Fire rating considered - 2hrs. are as follows.

a. Raft = 60mm
b. Column = 40mm
c. Shear Wall Load Bearing
   Below 1st Floor = 40mm
   Above 1st Floor = 30mm
d. Shear Wall Non-Load Bearing
   300mm thick. = 40mm
   200mm thick. = 30mm
   170mm thick. = 30mm

e. Beam = 30mm (Bottom and sides)
f. Slab = 25mm (Top and Bottom)
g. Basement wall/Water tanks/Sump tank
   On water face = 40mm (Top and Bottom)
   On other face = 40mm (Top and Bottom)

3.1.8 Development Length

Unless otherwise specified in the good for construction drawing, the Development length of 50 times diameter of bar is to be considered in the BBS & Fabrication.

3.1.9 Soil Parameters

Based on the soil report No. KMFC/NAVIN/VENGAIVASAL/645 dated 18.05.2011, there are 5 nos. of bore holes were done at different locations of the plot spread across the development which includes PH1 to PH3. In which bore holes-2&3 are falls over the PH-3. All the bore holes are terminated at around 5m by reaching the hard layer or hammer rebound whichever reach earlier. The top layer up to 0.75m is sandy silty clay. Below it is a medium fine to coarse sand with "N" value around 14. From 1.5m and up to 2.25m it is a very stiff silty clay with stones with "N" value is in the range of 41. Below 2.25m and up to 3m it is very dense of fine to coarse sand with gravel with "N' value more than 100. Below three meter it is weathered rock encountered with "N" value more than 100. All the two bore holes are terminated at this depth. Ground water table is reported during the investigation period of May-2019 is around 3.4m below NGL. However, it is advisable to design the basement structure for the head of water up to Ground level as the water table likely to raises up to ground during peak monsoon.

3.2 Loading Standards

Table: Structural Configuration and Floor heights:

Building Floor Height Details	**Basement+Stilt +21+Roof**
Basement (Car Park)	3.55m
Stilt floor height (Car Park)	3.50m
1st Floor to 21th Floor height (Residential)	3.00m
Head Room	2.50m
LMR	2.80m
Type of Foundation	**Raft**
Grade of concrete for Raft	M35
Grade of concrete for Columns (Podium)	M35

Grade of concrete for Shear Walls(above 11th floor) (Tower)	M30
Grade of concrete for RC beams (Podium)	M35
Grade of concrete for RC slabs (Podium)	M35
Grade of concrete for RC beams (upto 11th floor) (Tower)	M40
Grade of concrete for RC slabs (upto 11th floor) (Tower)	M40
Grade of concrete for RC beams (above 11th floor) (Tower)	M30
Grade of concrete for RC slabs (above 11th floor) (Tower)	M30
Grade of Steel	Fe 550

Table: Unit Weight of Materials:

Material	Density
Plain Cement Concrete	25.00 kN/Cu.m
Brick Work	20.00 kN/Cu.m
Mortar Finishing	20.00 kN/Cu.m
Dry soil	18.00 kN/Cu.m
Saturated soil	10.00 kN/Cu.m
Glass	28.00 kN/Cu.m
water	09.81 kN/Cu.m

Table: Gravity Load Calculations:

Floor Slab:		
Self weight of 125 mm thick Slab	0.125x25 = 3.125 kN/Sq.mt.	
Self weight of 150 mm thick Slab	0.150x25 = 3.750 kN/Sq.mt.	
Self weight if 175mm thick slab	0.175x25 = 4.375 kN/Sq.mt.	
Self weight if 200mm thick slab	0.200x25 = 5.000 kN/Sq.mt.	
Self weight if 225mm thick slab	0.225x25 = 5.625 kN/Sq.mt.	
Self weight if 250mm thick slab	0.250x25 = 6.250 kN/Sq.mt.	
Residential Building External/Internal Wall Line Load:		
Basement-1	= (0.2x3.55x20)+(0.03x3.55x20)	= 16.33 kN/m
Stilt Floor	= (0.2x3.50x20)+(0.03x3.50x20)	= 16.10 kN/m
First Floor to 21th Floor	= (0.1x3.00x25)	= 7.50 kN/m
First Floor to 21th Floor	= (0.16x3.0x25)	= 12.0 kN/m
First Floor to 21th Floor	= (0.17x2.4x25)	= 10.2 kN/m
Terrace Parapet Wall	= (0.17x1.2x25)	= 5.1 kN/m

3.2.1 Imposed Loads on Slab

The following are the imposed loads in the structural slabs, in addition to the self-weight and the floor finishes. *(Self-weight of slab will be as per the thickness mentioned in the respective drawings Floor finishes of 50mm thickness have been considered on all floors)*

Table: Superimposed Dead Load (SDL) & Live Load (LL)

BASEMENT (Car Parks & Ramp)		
	SDL (kN/Sq.mt.)	**LL (kN/Sq.mt.)**
Finishes	1.8	-
Services	0.6	-
Live Load	-	3.0
Partition Load	-	-
Total	**2.4**	**3.0**
STILT FLOOR (Podium)		
	SDL (kN/Sq.mt.)	**LL (kN/Sq.mt.)**
Finishes	5.6	-
Services	-	-
Live Load	-	20.0
Partition Load	-	-
Total	**5.6**	**20.0**
STILT FLOOR (Lobby)		
	SDL (kN/Sq.mt.)	**LL (kN/Sq.mt.)**
Finishes	1.8	-
Services	0.6	-
Live Load	-	3.0
Partition Load	-	-
Total	**2.4**	**3.0**
STILT FLOOR (Car Parks)		
	SDL (kN/Sq.mt.)	**LL (kN/Sq.mt.)**
Finishes	1.8	-
Services	0.6	-
Live Load	-	3.0
Partition Load	-	-
Total	**2.4**	**3.0**
STILT FLOOR (Electrical Room)		
	SDL (kN/Sq.mt.)	**LL (kN/Sq.mt.)**
Finishes	3.0	-
Services	-	-
Live Load	-	7.5
Partition Load	-	-
Total	**3.0**	**7.5**
First Floor to 21th Floor (Rooms)		
	SDL (kN/Sq.mt.)	**LL (kN/Sq.mt.)**
Finishes	1.2	-
Services	-	-
Live Load	-	2.0
Partition Load	-	-
Total	**1.2**	**2.0**
First Floor to 21th Floor (Toilet)		

	SDL (kN/Sq.mt.)	LL (kN/Sq.mt.)
Finishes	2.7	-
Services	-	-
Live Load	-	2.0
Partition Load	-	-
Total	**2.7**	**2.0**
First Floor to 21th Floor (Balcony)		
	SDL (kN/Sq.mt.)	**LL (kN/Sq.mt.)**
Finishes	2.7	-
Services	-	-
Live Load	-	3.0
Partition Load	-	-
Total	**2.7**	**3.0**
First Floor to 21th Floor (Corridor)		
	SDL (kN/Sq.mt.)	**LL (kN/Sq.mt.)**
Finishes	2.2	-
Services	-	-
Live Load	-	3.0
Partition Load	-	-
Total	**2.2**	**3.0**
First Floor to 21th Floor (Rooms)		
	SDL (kN/Sq.mt.)	**LL (kN/Sq.mt.)**
Finishes	1.2	-
Services	-	-
Live Load	-	2.0
Partition Load	-	-
Total	**1.2**	**2.0**
First Floor to 21th Floor (Living)		
	SDL (kN/Sq.mt.)	**LL (kN/Sq.mt.)**
Finishes	1.2	-
Services	-	-
Live Load	-	2.0
Partition Load	-	-
Total	**1.2**	**2.0**
First Floor to 21th Floor (Staircase)		
	SDL (kN/Sq.mt.)	**LL (kN/Sq.mt.)**
Finishes	3.0	-
Services	-	-
Live Load	-	3.0
Partition Load	-	-
Total	**3.0**	**3.0**

Roof Terraces		
	SDL (kN/Sq.mt.)	LL (kN/Sq.mt.)
Finishes (weathering courses)	3.0	-
Services	-	-
Live Load	-	3.0
Partition Load	-	-
Total	**3.0**	**3.0**
LMR		
	SDL (kN/Sq.mt.)	**LL (kN/Sq.mt.)**
Finishes	3.0	-
Services	-	-
Live Load	-	15.0
Partition Load	-	-
Total	**3.0**	**15.0**

Permissible reduction in imposed load on each floor is considered for design of columns and foundation as per IS 875 Part (2), clause.3.2.

The proposed structure is a RCC framed structure with columns and shear walls predominantly forming vertical components. In which, the vertical structural systems are formed such that the RC wall & columns are transfers its base shear in proportion to its stiffness in their loading direction of wind & seismic.

3.3 Thermal Effects

Temperature variation produces stresses in the structure, as it tends to expand and contract. In the structures, with large geometrical dimensions, the effect of temperature is important in the behaviour and final design. Due to deformation of expansion & contraction - between Day time and nights, and between winter and summer - the effect on the durability of structure and on the supported finishes is significant to produce considerable results.

In this case, the size of the structure below ground level is about 96mx67m, structurally divided from the phase-II by an expansion joint whereas the size of the super structure is 87.5mx16.5m. The temperature effect over the building design has been captured by applying the differential temperature over the exposed area like roof & terraces.

3.3.1 Shrinkage Effects

The Building length is 96m below ground level and it is 87.5m above ground level. The temperature effect in the building has been considered in the design of structural elements as the length of building falls close to the limitation stimulated in IS 456: 2000, clause.27.2. However the shrinkage shall be controlled by introducing pour strip with adopting the sequence of construction appropriately.

3.3.2 Expansion Joints

Expansion joints are normally provided when the structure is more than 45m length as per IS-456-2000, clause 27.2. In this case, the size of the structure below ground level is about 96mx67m whereas the size of the super structure is 87.5mx16.5m. The temperature effect over the building design has been captured by applying the differential temperature over the exposed area like roof & terraces as the length of the building falls close to the limitation stimulated in IS 456: 2000, clause.27.2. The differential temperature of 15° C has been applied over the exposed areas like Roof & Terraces.

4. PROPOSED APPROACH OF STRUCTURAL ANALYSIS

The building is a R.C.C columns connected by beams as framed structure. Slabs acting as rigid in-plane diaphragms have been considered in the model. After preliminary sizing of various structural members, a computer model of the structural frame of the building is generated for carrying out computer analysis for the effects of vertical and lateral loads that are likely to be imposed on the structure.

The building structure has been analysed using the ETABS v2018 software for the following computer models of the building floor analysis of all floors - for vertical loads with the entire building space frame. ETABS v2018 have been thoroughly tested, validated and recognized internationally by several organizations and are well suited for the analysis of building systems.

Geometrical dimensions, member properties and member-node connectivity, including eccentricities will be modeled in the analysis problem. Variation in material grades, if present, will also be considered. The permissible values of the load factors and stresses will be utilized within the purview of the Indian Standards.

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

Design of different structural elements will be carried out using In-house developed spreadsheets and packages.

The following model assumptions used in E-TABS 3D modeling and the load applications are done as listed below,

Column	: Frame Element
RC Wall	: Shell Element
Beam Element	: Frame Element
Slab	: Shell Element

- Modulus of Elasticity of Concrete -5000√fck
- Consideration of Diaphragm - Rigid Diaphragm.
- Slab/Wall element considered as Shell element

The structural model and its behaviour has been checked for the following

a) Storey Drift.

b) Storey Weight/Column Loading.

c) Soft Storey Effect.

d) Deformation.

e) Design Forces.

The following methods of modeling are adopted in creating ETABS 3D model,

- The 3D ETABS model generated based on the shuttering drawing prepared using preliminary sizes.
- Sectional properties are assigned to all the structural elements as per the preliminary shuttering drawing.
- Mesh size assigned in size of 1m x 1m approx.
- External & Internal filler wall loads are assigned as uniformly distributed line load on beams and as area load if the wall is intended to distribute on slab directly. These loads are assigned under SDL type load case.
- Slabs are modelled as shell element in Flat Plate area and the same has been modelled as membrane in Beam-slab system which are assigned with horizontal diaphragms.
- 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.
- Area design load i.e. Live load/SIDL or any other load is applied at floor relevant to its usage.
- All lateral loads & parameters are assigned as per Codes IS 1893-2016 & IS 875-2015.
- Temperature loads are applied on to the terraces which are directly exposed to sun includes podium, Roof etc.
- Beams under Torsion is required to maintain Equilibrium will be designed for Torsion in accordance with IS 456-2000, clause 41.1 to 41.4 and for all other beams torsional stiffness is neglected in the analysis by applying stiffness modifier as 0.01 to torsional constant "J". Hence no specific design for Torsion is required for these beams.

- Chennai is zone-III. Hence ductile detailing is followed in the design and detailing of structural elements.
- Concrete cover to reinforcement complied accordance with IS 456-2000, Tabl.16 & 16A.
- All vertical wall elements are assigned with auto meshing/manual messing appropriately in order to achieve accuracy in results.
- UG Sump is designed for 0.2mm and STP is designed for the crack width of 0.1mm.
- Secondary beams are not designed for ductile detailing.
- Long term deflections are checked by manual calculation using excel spread sheet wherever necessary. Crack width calculation will be done using spread sheet wherever necessary.

Area Load & Application: Applied as uniformly distributed area load with intensity proportionate to its usage as mentioned in the Loading items in the DBR.

Line (Wall) Load & Application: Filler wall loads are calculated appropriately considering light weight Brick Work and Applied as uniformly distributed line load.

Lateral Load Resisting Systems: The Building is primarily shear wall structure with Floor Beams and slabs are connected rigidly. The vertical structural systems are formed such that the RC wall transfers its base shear in proportion to its stiffness in their loading direction for both wind & seismic.

5.0 LATERAL LOADS

5.1 Wind Loads

The wind pressure shall be calculated based on the basic wind speed and other provisions laid in IS 875 (part 3) – 2015. The basis wind speed is considered in the analysis for Chennai, TN is 50 m/sec. The design parameters for wind load calculation are as follows,

Design Wind Pressure $Vz = 0.6\ Vz^2$

But $Vz = Vb*k1*k2*k3*k4$

Where Vz - Design Wind Speed

k1 – 1.0 probability factor or risk coefficient

k2 – 1.193, Terrain height (66.5m), structure size factor

(measured from Ground floor) with terrain Category–2

k3 – 1.0, Topography factor

k4 – 1.0, Importance factor for the cyclonic region, for all other

Structure as per IS 875-Part3, clause 6.3.4.

Hence the Design Wind Pressure $= 0.6x\ (50x1.0*1.193*1.0*1.0)^2$

$= 2135\ N/m^2 \approx 2.135\ kN/m^2$

The design wind load will be calculated based on the surface area with the calculated design wind pressure and it shall be applied on surface area of the building in both the orthogonal direction.

As per IS-875-2015 clause 9.1(a), the building is classified as not a slender structure which doesn't requires wind dynamic analysis. But as per clause 9.1(b), wind dynamic analysis shall be carried out as the frequency is less than 1 Hz works out along the transverse direction. Hence wind dynamic analysis performed in ETABS along transverse direction.

5.2 Earthquake Loads

Chennai is classified under Earthquake Zone III (Moderate) as per the latest classification. The loading due to earthquake shall be assessed based on the provisions of IS 1893 – 2016 The design parameters adopted are as follows:

Seismic Zone III with seismic zone factor Z = 0.16 (Moderate) and Response reduction factor is to be 4.0 considering Building with RC Structural Wall as per IS: 1893-2016, Table-7 and Soil considered as Type-I Hard soil.

Base Shear Calculation for Static Analysis

As per IS 1893:2016, the total design lateral force or design seismic base shear (V_b) is determined by the following expression.

$$V_b = A_h W$$

Where Ah is Design horizontal acceleration spectrum value using fundamental natural period and W is Seismic weight of the building.

The Seismic weight is estimated based on Full dead load + 25 % Live load for Residential building i.e. for Live Load < 3 kN/Sq.mt. the reduction considered is 25%.

The Fundamental natural period of vibration (Ta) in seconds of a RC building is estimated by using the following formula, Ta = 0.09*h/(d)^0.5.

Where h is the height of the building in meters. d is the base dimension of the building at the plinth level, in m along the considered direction of the lateral force.

Height of the building = 66.5m (measured from Stilt floor)
d (along-y, length of the building) = 87.63 m
b (along-x breadth of the building) = 16.81 m
Ta (along x) = 0.09 x 66.5/(87.63)^0.5
= 0.6393 Sec.
Ta (along y) = 0.09 x 66.5/(16.81)^0.5
= 1.4597 Sec.

From IS 1893: 2002, Clause 6.4.2, Design horizontal seismic coefficient

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

Where,
Z for Zone III = 0.16

I for Building has occupants more than 200 = 1.2 (Refer to IS 1893-2016, Table.8)
R for Building with Ductile RC Structural walls i.e. 4.0
as per (Table 9).

Sa/g (Hard soil) X-Dir. = 1.0/0.6345=1.576 (Refer to IS 1893-2016, page 13, Fig 1)
Sa/g (Hard soil) Y-Dir. = 1.0/0.7415=0.69 (Refer to IS 1893-2016, page 13, Fig 1)

Design horizontal seismic coefficient Ah_x = 0.0378
Base Shear Vb_x = 0.0378 W

Design horizontal seismic coefficient Ah_y = 0.016
Base Shear Vb_y = 0.016 W

5. LOAD COMBINATIONS

The various loads shall be combined in accordance with the stipulations in IS 875 (Part 5) 1987 and IS 456: 2000. The structural elements shall be designed for the combination that produces most unfavorable effect out of the following combinations.

The results obtained from the computer analysis in the form of member forces and reactions will be used for design the structural members. Following load combinations of the member forces will be considered for arriving at the design forces. The analysis considered load factor is as follows,

Load Combination	LOAD FACTORS								
	D.L.	I.L.	T.L	EQX	EQY	SPECX	SPECY	WX	WY
Limit State Of Serviceability (LSS) Combinations									
LC1	1.0	-	1.0	-	-	-	-	-	-
LC2	1.0	1.0	1.0	-	-	-	-	-	-
LC3	1.0	-	1.0	1.0	-	-	-	-	-
LC4	1.0	-	1.0	-1.0	-	-	-	-	-
LC5	1.0	-	1.0	-	1.0	-	-	-	-
LC6	1.0	-	1.0	-	-1.0	-	-	-	-
LC7	1.0	-	1.0	-	-	-	-	1.0	-
LC8	1.0	-	1.0	-	-	-	-	-1.0	-
LC9	1.0	-	1.0	-	-	-	-	-	1.0
LC10	1.0	-	1.0	-	-	-	-	-	-1.0
LC11	1.0	-	1.0	-	-	1.0	-	-	-
LC12	1.0	-	1.0	-	-	-1.0	-	-	-
LC13	1.0	-	1.0	-	-	-	1.0	-	-
LC14	1.0	-	1.0	-	-	-	-1.0	-	-
LC15	1.0	0.8	1.0	0.8	-	-	-	-	-
LC16	1.0	0.8	1.0	-0.8	-	-	-	-	-
LC17	1.0	0.8	1.0	-	0.8	-	-	-	-
LC18	1.0	0.8	1.0	-	-0.8	-	-	-	-
LC19	1.0	0.8	1.0	-	-	-	-	0.8	-
LC20	1.0	0.8	1.0	-	-	-	-	-0.8	-
LC21	1.0	0.8	1.0	-	-	-	-	-	0.8
LC22	1.0	0.8	1.0	-	-	-	-	-	-0.8

LC23	1.0	0.8	1.0	-	-	0.8	-	-	-
LC24	1.0	0.8	1.0	-	-	-0.8	-	-	-
LC25	1.0	0.8	1.0	-	-	-	0.8	-	-
LC26	1.0	0.8	1.0	-	-	-	-0.8	-	-
Limit State Of Collapse (LSC) Combinations									
COMB1	1.5	-	1.0	-	-	-	-	-	-
COMB2	1.5	1.5	1.0	-	-	-	-	-	-
COMB3	1.2	1.2	1.0	1.2	-	-	-	-	-
COMB4	1.2	1.2	1.0	-1.2	-	-	-	-	-
COMB5	1.2	1.2	1.0	-	1.2	-	-	-	-
COMB6	1.2	1.2	1.0	-	-1.2	-	-	-	-
COMB7	1.2	1.2	1.0	-	-	-	-	1.2	-
COMB8	1.2	1.2	1.0	-	-	-	-	-1.2	-
COMB9	1.2	1.2	1.0	-	-	-	-	-	1.2
COMB10	1.2	1.2	1.0	-	-	-	-	-	-1.2
COMB11	1.2	1.2	1.0	-	-	1.2	-	-	-
COMB12	1.2	1.2	1.0	-	-	-1.2	-	-	-
COMB13	1.2	1.2	1.0	-	-	-	1.2	-	-
COMB14	1.2	1.2	1.0	-	-	-	-1.2	-	-
COMB15	1.5	-	1.0	1.5	-	-	-	-	-
COMB16	1.5	-	1.0	-1.5	-	-	-	-	-
COMB17	1.5	-	1.0	-	1.5	-	-	-	-
COMB18	1.5	-	1.0	-	-1.5	-	-	-	-
COMB19	1.5	-	1.0	-	-	-	-	1.5	-
COMB20	1.5	-	1.0	-	-	-	-	-1.5	-
COMB21	1.5	-	1.0	-	-	-	-	-	1.5
COMB22	1.5	-	1.0	-	-	-	-	-	-1.5
COMB23	1.5	-	1.0	-	-	1.5	-	-	-
COMB24	1.5	-	1.0	-	-	-1.5	-	-	-
COMB25	1.5	-	1.0	-	-	-	1.5	-	-
COMB26	1.5	-	1.0	-	-	-	-1.5	-	-
COMB27	0.9	-	1.0	1.5	-	-	-	-	-
COMB28	0.9	-	1.0	-1.5	-	-	-	-	-
COMB29	0.9	-	1.0	-	1.5	-	-	-	-
COMB30	0.9	-	1.0	-	-1.5	-	-	-	-
COMB31	0.9	-	1.0	-	-	-	-	1.5	-
COMB32	0.9	-	1.0	-	-	-	-	-1.5	-
COMB33	0.9	-	1.0	-	-	-	-	-	1.5
COMB34	0.9	-	1.0	-	-	-	-	-	-1.5
COMB35	0.9	-	1.0	-	-	1.5	-	-	-
COMB36	0.9	-	1.0	-	-	-1.5	-	-	-
COMB37	0.9	-	1.0	-	-	-	1.5	-	-
COMB38	0.9	-	1.0	-	-	-	-1.5	-	-

DL: Dead Load **EQX** : Earthquake Load in X-dir. **WX**: Wind Load in X-dir.

IL: Imposed Load **EQY** : Earthquake Load in Y-dir. **WY**: Wind Load in Y-dir.

6. COVER AND FIRE RATING

Fire rating considered - 2hrs. Cover to reinforcement considered for various elements are as follows.

Pile/Pile Cap	50/75 mm
Columns	40 mm
Car Pit wall/base slab	40 mm
Shear Wall	40 mm
Beams	30 mm
Slabs	25 mm

7. DEFLECTION CRITERIA

7.1 Lateral Deflection (Wind)

Overall Deflection<	Height/500
Storey Deflection <	Storey height/500

7.2 Lateral Deflection (Seismic)

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

7.3 Vertical Deflection of Beams and Slabs due to Gravity Loads

Total Deflection (DL + LL)	< Span/250 up to 20 maximum
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. CONSTRUCTION JOINT

Construction joints and shrinkage strips will be planned with the contractor and only be used in locations pre-approved by consultants.

1) No construction joint is allowed in the sunken portion
2) Construction joint shall be provided in slab/beam at l/3 from support.
3) Construction joint shall be placed at accessible location for maintenance purpose.
4) Joints are common source of weakness, therefore it is desirable to avoid or at least minimize them.

9. DESIGN OF STRUCTURAL ELEMENTS

For the design of R.C.C. elements, the Limit State Method will be used as per IS 456-2000. Materials of construction will be predominantly concrete with consideration for strength and durability. The grade of concrete adopted in the Analysis and Design is M35 for Raft, Basement slab, Basement wall etc whereas the vertical elements like shear wall/columns are designed using M40 considering the level of stresses to be borne by the members both in compression as well as flexural.

High Yield Strength Deformed bars conforming to IS: 1786 with F_y = 500 MPa will be used as reinforcement. Structural steel, if any with Fy = 250 Grade shall be used.

Covers to reinforcement shall be in accordance with IS: 456:2000 corresponding to **moderate exposure conditions** for the super-structure or severe exposure conditions for the sub-structure and to satisfy a fire rating of 2 hrs as per National building code of India- SP7 (part IV).

10. FOUNDATION

The proposed Residential building comprises single Basement+Stilt Floor+1st Floor to 21st Floor (Residential Use) storey structure located in Vengaivasal, Medavakkam, Chennai. Based on the analysis results, it is noticed that the vertical elements are considerably loaded being a MSB.

As per the column load intensity and the Soil consultant recommendation laid down in the report, the building is designed with Raft Foundation. Raft Foundation has been designed using Safe Bearing Capacity of 150 t/Sq.mt. The Raft is analyzed for the modulus of subgrade reaction of 10,000 kN/m^2.

11. STABILITY OF STRUCTURES

1. For the purpose of stability of the structure as a whole against overturning, the restoring moment shall not be less than 1.2 times the maximum overturning moments due to dead load plus 1.4 times the maximum overturning moments due to imposed loads. In case where dead load provides the restoring moments only 0.9 times in dead load shall be considered. The restoring moments due to imposed loads shall be ignored.

2. The factor of safety against sliding shall not be less than 1.40.

3. Factor of safety against buoyancy shall be not less than 1.20 ignoring the superimposed loading.

12.0 OTHER DATA

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

13.0 R.C Design

The structures are analyzed for the various load combinations as per IS: 456-2000. The design of structural elements are carried out by ETABS/RCDC Ver.6.1 for all structural elements for the worst forces extracted from the ETABS analysis output whereas the slab design is being done using in house spread sheet. For the design of R.C.C structural elements carried out, the recommendations stipulated in IS: 456-2000 is followed. Limit State method of design is adopted with appropriate load factors with the various load combinations for the different structural elements appropriately.

13.1. Foundation

Raft Foundation has been designed using Safe Bearing Capacity of 150 t/Sq.mt and it is analyzed for the modulus of subgrade reaction of 10,000 kN/m^2. The design has been carried out using SAFE for the exported forces/reactions from the ETABS model.

13.2. Column/Wall

Vertical elements carry both gravity and lateral loads like Columns/RC Walls are designed for the worst combination results using ETABS.

13.3. Beam

Beams are designed for the worst combination results using ETABS/RCDC/in house spread sheet.

13.4. Slab

Flat Plate/irregular slab is designed using SAFE and the conventional Slabs are designed using in house spread sheet as per IS-456 Annexe-D, Table-2

14.0 COMPUTER PROGRAMS USED

The following Software / spreadsheet are used to carry out Structural design.

14.1 PROKON Ver 2.3 - Wall & Beam design

14.2 ETABS Ver 2017 -Three Dimensional FEM analysis and Design Programs

14.3 SAFE 2016 Ver 16.1.1 - Used mainly for B Floor Slab Analysis & Design

14.4 In-House Spreadsheet - One way/ Two way slab design

14.5 RCDC V.8.0 - Design Software for all Structural Elements except Raft.

3DMODEL & ANALYSIS SUMMARY REPORT

ETABS®



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1 Structure Data

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

1.1 Story Data

Table 1.1 - Story Definitions

Tower	Name	Height m	Master Story	Similar To	Splice Story	Color
T1	OHT	2.5	No	None	No	Yellow
T1	LMR	2.8	No	None	No	Blue
T1	TEERACE	3	No	2ND FLOOR	No	Cyan
T1	21TH	3	No	2ND FLOOR	No	Magenta
T1	20TH	3	No	2ND FLOOR	No	Gray8Dark
T1	19TH	3	No	2ND FLOOR	No	Green
T1	18TH	3	No	2ND FLOOR	No	Red
T1	17TH	3	No	2ND FLOOR	No	Yellow
T1	16TH	3	No	2ND FLOOR	No	Blue
T1	15TH	3	No	2ND FLOOR	No	Cyan
T1	14TH	3	No	2ND FLOOR	No	Magenta
T1	13TH	3	No	2ND FLOOR	No	Gray8Dark
T1	12TH	3	No	2ND FLOOR	No	Green
T1	11TH	3	No	2ND FLOOR	No	Red
T1	10TH	3	No	2ND FLOOR	No	Yellow
T1	9TH	3	No	2ND FLOOR	No	Blue
T1	8TH	3	No	2ND FLOOR	No	Cyan
T1	7TH	3	No	2ND FLOOR	No	Magenta
T1	6TH	3	No	2ND FLOOR	No	Gray8Dark
T1	5TH	3	No	2ND FLOOR	No	Green
T1	4TH	3	No	2ND FLOOR	No	Red
T1	3RD FLOOR	3	No	2ND FLOOR	No	Yellow
T1	2ND FLOOR	3	Yes	None	No	Blue
T1	1ST FLOOR	3.5	No	None	No	Cyan
T1	STILT FLOOR	3.55	No	None	No	Magenta

2 Loads

This chapter provides loading information as applied to the model.

2.1 Load Patterns

Table 2.1 - Load Pattern Definitions

Name	Is Auto Load	Type	Self Weight Multiplier	Auto Load
~LLRF	Yes	Other	0	
Dead	No	Dead	1	
EQX	No	Seismic	0	IS 1893:2016
EQY	No	Seismic	0	IS 1893:2016
Live<3	No	Reducible Live	0	
Live>3	No	Reducible Live	0	
Roof Live	No	Roof Live	0	
SDL	No	Super Dead	0	
TEMP	No	Other	0	
WALL	No	Super Dead	0	
WIND X	No	Wind	0	Indian IS 875:2015
WIND Y	No	Wind	0	User Loads

2.2 Auto Wind Loading

User Loads Auto Wind Load Calculation

This calculation presents the user defined lateral wind loads for load pattern WIND Y.

Lateral Forces

2.3 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.

Direction and Eccentricity

Direction = X + Eccentricity Y

Eccentricity Ratio = 0% for all diaphragms

Structural Period

Period Calculation Method = User Specified

User Period $T = 0.639\ sec$

Factors and Coefficients

Seismic Zone Factor, Z [IS Table 3] $Z = 0.16$

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

Importance Factor, I [IS Table 8] $I = 1.2$

Site Type [IS Table 1] = I

Seismic Response

Spectral Acceleration Coefficient, S_a/g [IS 6.4.2] $\frac{S_a}{g} = \frac{1}{T}$ $\frac{S_a}{g} = 1.564093$

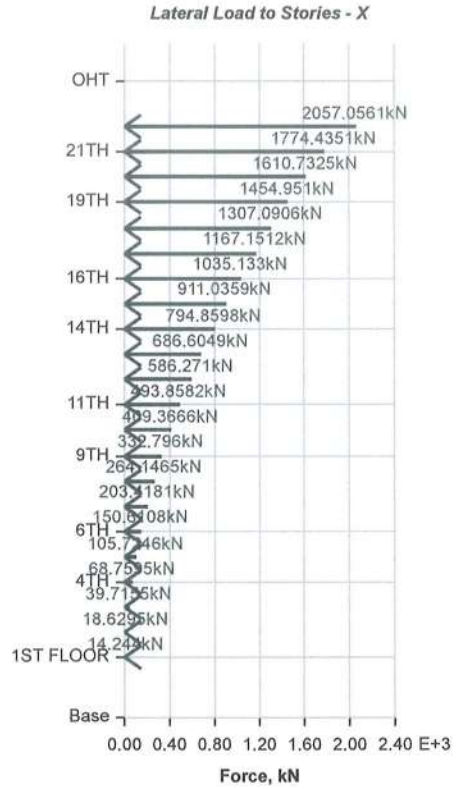
Equivalent Lateral Forces

Seismic Coefficient, A_h [IS 6.4.2] $A_h = \frac{Z I \frac{S_a}{g}}{2R}$

Calculated Base Shear

Direction	Period Used (sec)	W (kN)	V_b (kN)
X + Ecc. Y	0.639	412555.0214	15486.5903

Applied Story Forces


Lateral Load to Stories - X
OHT
21TH
19TH
16TH
14TH
11TH
9TH
6TH
4TH
1ST FLOOR
Base
2057.0561kN
1774.4351kN
1610.7325kN
1454.951kN
1307.0906kN
1167.1512kN
1035.133kN
911.0359kN
794.8598kN
686.6049kN
586.271kN
493.8582kN
409.3666kN
332.796kN
264.1465kN
203.4181kN
150.6108kN
105.7246kN
68.7595kN
39.7156kN
18.6295kN
14.243kN
0.00 0.40 0.80 1.20 1.60 2.00 2.40 E+3
Force, kN

IS 1893:2016 Auto Seismic Load Calculation

This calculation presents the automatically generated lateral seismic loads for load pattern EQY according to IS 1893:2016, as calculated by ETABS.

Direction and Eccentricity

Direction = Y + Eccentricity X

Eccentricity Ratio = 0% for all diaphragms

Structural Period

Period Calculation Method = User Specified

User Period $T = 1.46\ sec$

Factors and Coefficients

Seismic Zone Factor, Z [IS Table 3] $Z = 0.16$

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

Importance Factor, I [IS Table 8] $I = 1.2$

Site Type [IS Table 1] = I

Seismic Response

Spectral Acceleration Coefficient, S_a/g [IS 6.4.2] $\frac{S_a}{g} = \frac{1}{T}$ $\frac{S_a}{g} = 0.685046$

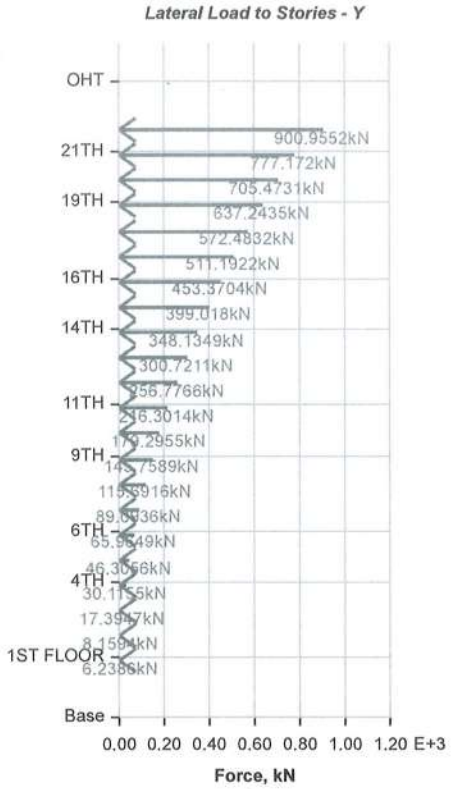
Equivalent Lateral Forces

Seismic Coefficient, A_h [IS 6.4.2] $A_h = \frac{Z\,I\,\frac{S_a}{g}}{2\,R}$

Calculated Base Shear

Direction	Period Used (sec)	W (kN)	V_b (kN)
Y + Ecc. X	1.46	412555.0214	6782.86

Applied Story Forces


Lateral Load to Stories - Y
OHT
21TH
19TH
16TH
14TH
11TH
9TH
6TH
4TH
1ST FLOOR
Base
900.9552kN
777.172kN
705.4731kN
637.2435kN
572.4832kN
511.1922kN
453.3704kN
399.018kN
348.1349kN
300.7211kN
256.7766kN
216.3014kN
179.2955kN
145.7589kN
115.8916kN
89.6936kN
65.9649kN
46.3056kN
30.1155kN
17.3947kN
8.1594kN
6.2386kN
0.00 0.20 0.40 0.60 0.80 1.00 1.20 E+3
Force, kN

2.4 Functions

2.4.1 Response Spectrum Functions

Table 2.5 - Functions - Response Spectrum - IS1893 2016

Name	Period sec	Value	Seismic Zone	I	Soil Type	R	Damping Ratio
Func1	0	0.024	III	1.2	I	4	0.05
Func1	0.1	0.06					
Func1	0.4	0.06					
Func1	0.6	0.04					
Func1	0.8	0.03					
Func1	1	0.024					
Func1	1.2	0.02					
Func1	1.4	0.017143					
Func1	1.6	0.015					
Func1	1.8	0.013333					
Func1	2	0.012					
Func1	2.5	0.0096					
Func1	3	0.008					
Func1	3.5	0.006857					
Func1	4	0.006					
Func1	4.5	0.006					
Func1	5	0.006					
Func1	5.5	0.006					
Func1	6	0.006					
Func1	6.5	0.006					
Func1	7	0.006					
Func1	7.5	0.006					
Func1	8	0.006					
Func1	8.5	0.006					
Func1	9	0.006					
Func1	9.5	0.006					
Func1	10	0.006					

2.5 Load Cases

Table 2.6 - Load Case Definitions - Summary

Name	Type
Modal	Modal - Eigen
Dead	Linear Static
Live	Linear Static
SDL	Linear Static
WALL	Linear Static
Live>3	Linear Static
EQX	Linear Static
EQY	Linear Static
SPECX	Response Spectrum
SPECY	Response Spectrum
TEMP	Linear Static
SPECX-S	Response Spectrum
SPECY-S	Response Spectrum
WIND	Linear Static
WIND X	Linear Static

Table 2.6 - Load Case Definitions - Summary (continued)

Name	Type
WIND Y	Linear Static
Roof Live	Linear Static

2.6 Load Combinations

Table 2.7 - Load Combination Definitions

Name	Type	Is Auto	Load Name	SF	Notes
Comb1	Linear Add	No	Dead	1	
Comb1			Live	1	
Comb1			SDL	1	
Comb1			WALL	1	
Comb1			Live>3	1	
Comb1			Roof Live	1	
Comb2	Linear Add	No	Dead	1.5	
Comb2			Live	1.5	
Comb2			SDL	1.5	
Comb2			WALL	1.5	
Comb2			Live>3	1.5	
Comb2			Roof Live	1.5	
Comb3	Linear Add	No	Dead	1.2	
Comb3			Live	1.2	
Comb3			Live>3	1.2	
Comb3			SDL	1.2	
Comb3			WALL	1.2	
Comb3			EQX	1.2	
Comb3			TEMP	1	
Comb3			Roof Live	1.2	
Comb4	Linear Add	No	Dead	1.2	
Comb4			Live	1.2	
Comb4			Live>3	1.2	
Comb4			SDL	1.2	
Comb4			WALL	1.2	
Comb4			EQX	-1.2	
Comb4			TEMP	1	
Comb4			Roof Live	1.2	
Comb5	Linear Add	No	Dead	1.2	
Comb5			Live	1.2	
Comb5			Live>3	1.2	
Comb5			SDL	1.2	
Comb5			WALL	1.2	
Comb5			EQY	1.2	
Comb5			TEMP	1	
Comb5			Roof Live	1.2	
Comb6	Linear Add	No	Dead	1.2	
Comb6			Live	1.2	
Comb6			Live>3	1.2	
Comb6			SDL	1.2	
Comb6			WALL	1.2	
Comb6			EQY	-1.2	

Table 2.7 - Load Combination Definitions (continued)

Name	Type	Is Auto	Load Name	SF	Notes
Comb6			TEMP	1	
Comb6			Roof Live	1.2	
Comb7	Linear Add	No	Dead	1.5	
Comb7			SDL	1.5	
Comb7			WALL	1.5	
Comb7			EQX	1.5	
Comb7			TEMP	1	
Comb8	Linear Add	No	Dead	1.5	
Comb8			SDL	1.5	
Comb8			WALL	1.5	
Comb8			EQX	-1.5	
Comb8			TEMP	1	
Comb9	Linear Add	No	Dead	1.5	
Comb9			SDL	1.5	
Comb9			WALL	1.5	
Comb9			EQY	1.5	
Comb9			TEMP	1	
Comb10	Linear Add	No	Dead	1.5	
Comb10			SDL	1.5	
Comb10			WALL	1.5	
Comb10			EQY	-1.5	
Comb10			TEMP	1	
Comb11	Linear Add	No	Dead	0.9	
Comb11			SDL	0.9	
Comb11			WALL	0.9	
Comb11			EQX	1.5	
Comb11			TEMP	1	
Comb12	Linear Add	No	Dead	0.9	
Comb12			SDL	0.9	
Comb12			WALL	0.9	
Comb12			EQX	-1.5	
Comb12			TEMP	1	
Comb13	Linear Add	No	Dead	0.9	
Comb13			SDL	0.9	
Comb13			WALL	0.9	
Comb13			EQY	1.5	
Comb13			TEMP	1	
Comb14	Linear Add	No	Dead	0.9	
Comb14			SDL	0.9	
Comb14			WALL	0.9	
Comb14			EQY	-1.5	
Comb14			TEMP	1	
Comb15	Linear Add	No	Dead	1.2	
Comb15			Live	1.2	
Comb15			Live>3	1.2	
Comb15			SDL	1.2	
Comb15			WALL	1.2	
Comb15			TEMP	1	
Comb15			Roof Live	1.2	

Table 2.7 - Load Combination Definitions (continued)

Name	Type	Is Auto	Load Name	SF	Notes
Comb15			WIND X	1.2	
Comb16	Linear Add	No	Dead	1.2	
Comb16			Live	1.2	
Comb16			Live>3	1.2	
Comb16			SDL	1.2	
Comb16			WALL	1.2	
Comb16			TEMP	1	
Comb16			Roof Live	1.2	
Comb16			WIND X	-1.2	
Comb17	Linear Add	No	Dead	1.2	
Comb17			Live	1.2	
Comb17			Live>3	1.2	
Comb17			SDL	1.2	
Comb17			WALL	1.2	
Comb17			TEMP	1	
Comb17			Roof Live	1.2	
Comb17			WIND Y	1.2	
Comb18	Linear Add	No	Dead	1.2	
Comb18			Live	1.2	
Comb18			Live>3	1.2	
Comb18			SDL	1.2	
Comb18			WALL	1.2	
Comb18			TEMP	1	
Comb18			Roof Live	1.2	
Comb18			WIND Y	-1.2	
Comb19	Linear Add	No	Dead	1.5	
Comb19			SDL	1.5	
Comb19			WALL	1.5	
Comb19			TEMP	1	
Comb19			WIND X	1.5	
Comb20	Linear Add	No	Dead	1.5	
Comb20			SDL	1.5	
Comb20			WALL	1.5	
Comb20			TEMP	1	
Comb20			WIND X	-1.5	
Comb21	Linear Add	No	Dead	1.5	
Comb21			SDL	1.5	
Comb21			WALL	1.5	
Comb21			TEMP	1	
Comb21			WIND Y	1.5	
Comb22	Linear Add	No	Dead	1.5	
Comb22			SDL	1.5	
Comb22			WALL	1.5	
Comb22			TEMP	1	
Comb22			WIND Y	-1.5	
Comb23	Linear Add	No	Dead	0.9	
Comb23			SDL	0.9	
Comb23			WALL	0.9	
Comb23			TEMP	1	

Table 2.7 - Load Combination Definitions (continued)

Name	Type	Is Auto	Load Name	SF	Notes
Comb23			WIND X	1.5	
Comb24	Linear Add	No	Dead	0.9	
Comb24			SDL	0.9	
Comb24			WALL	0.9	
Comb24			TEMP	1	
Comb24			WIND X	-1.5	
Comb25	Linear Add	No	Dead	0.9	
Comb25			SDL	0.9	
Comb25			WALL	0.9	
Comb25			TEMP	1	
Comb25			WIND Y	1.5	
Comb26	Linear Add	No	Dead	0.9	
Comb26			SDL	0.9	
Comb26			WALL	0.9	
Comb26			TEMP	1	
Comb26			WIND Y	-1.5	
Comb27	Linear Add	No	Dead	1.2	
Comb27			Live	1.2	
Comb27			Live>3	1.2	
Comb27			SDL	1.2	
Comb27			WALL	1.2	
Comb27			SPECX	1.2	
Comb27			TEMP	1	
Comb27			Roof Live	1.2	
Comb28	Linear Add	No	Dead	1.2	
Comb28			Live	1.2	
Comb28			Live>3	1.2	
Comb28			SDL	1.2	
Comb28			WALL	1.2	
Comb28			SPECX	-1.2	
Comb28			TEMP	1	
Comb28			Roof Live	1.2	
Comb29	Linear Add	No	Dead	1.2	
Comb29			Live	1.2	
Comb29			Live>3	1.2	
Comb29			SDL	1.2	
Comb29			WALL	1.2	
Comb29			SPECY	1.2	
Comb29			TEMP	1	
Comb29			Roof Live	1.2	
Comb30	Linear Add	No	Dead	1.2	
Comb30			Live	1.2	
Comb30			Live>3	1.2	
Comb30			SDL	1.2	
Comb30			WALL	1.2	
Comb30			TEMP	1	
Comb30			Roof Live	1.2	
Comb31	Linear Add	No	Dead	1.5	
Comb31			SDL	1.5	

Table 2.7 - Load Combination Definitions (continued)

Name	Type	Is Auto	Load Name	SF	Notes
Comb31			WALL	1.5	
Comb31			SPECX	1.5	
Comb31			TEMP	1	
Comb32	Linear Add	No	Dead	1.5	
Comb32			SDL	1.5	
Comb32			WALL	1.5	
Comb32			SPECX	-1.5	
Comb32			TEMP	1	
Comb33	Linear Add	No	Dead	1.5	
Comb33			SDL	1.5	
Comb33			WALL	1.5	
Comb33			SPECY	1.5	
Comb33			TEMP	1	
Comb34	Linear Add	No	Dead	1.5	
Comb34			SDL	1.5	
Comb34			WALL	1.5	
Comb34			SPECY	-1.5	
Comb34			TEMP	1	
Comb35	Linear Add	No	Dead	0.9	
Comb35			SDL	0.9	
Comb35			WALL	0.9	
Comb35			SPECX	1.5	
Comb35			TEMP	1	
Comb36	Linear Add	No	Dead	0.9	
Comb36			SDL	0.9	
Comb36			WALL	0.9	
Comb36			SPECX	-1.5	
Comb36			TEMP	1	
Comb37	Linear Add	No	Dead	0.9	
Comb37			SDL	0.9	
Comb37			WALL	0.9	
Comb37			SPECY	1.5	
Comb37			TEMP	1	
Comb38	Linear Add	No	Dead	0.9	
Comb38			SDL	0.9	
Comb38			WALL	0.9	
Comb38			SPECY	-1.5	
Comb38			TEMP	1	
Envelope	Envelope	No	Comb1	1	
Envelope			Comb2	1	
Envelope			Comb15	1	
Envelope			Comb16	1	
Envelope			Comb17	1	
Envelope			Comb18	1	
Envelope			Comb19	1	
Envelope			Comb20	1	
Envelope			Comb21	1	
Envelope			Comb22	1	
Envelope			Comb23	1	

Table 2.7 - Load Combination Definitions (continued)

Name	Type	Is Auto	Load Name	SF	Notes
Envelope			Comb24	1	
Envelope			Comb25	1	
Envelope			Comb26	1	
Envelope			Comb27	1	
Envelope			Comb28	1	
Envelope			Comb29	1	
Envelope			Comb30	1	
Envelope			Comb31	1	
Envelope			Comb32	1	
Envelope			Comb33	1	
Envelope			Comb34	1	
Envelope			Comb35	1	
Envelope			Comb36	1	
Envelope			Comb37	1	
Envelope			Comb38	1	
MASS SOURCE	Linear Add	No	Dead	1	
MASS SOURCE			Live	0.25	
MASS SOURCE			Live>3	0.5	
MASS SOURCE			SDL	1	
MASS SOURCE			WALL	1	

3 Analysis Results

This chapter provides analysis results.

3.1 Modal Results

Table 3.1 - Modal Participating Mass Ratios (Part 1 of 2)

Case	Mode	Period sec	UX	UY	UZ	SumUX	SumUY	SumUZ	RX	RY	RZ
Modal	1	1.732	0	0.5315	0	0	0.5315	0	0.4883	0	0.002
Modal	2	1.397	0.0005	0.0001	0	0.0005	0.5316	0	2.201E-05	0.0003	0.402
Modal	3	0.808	0.5939	1.366E-06	0	0.5944	0.5316	0	2.224E-06	0.4255	0.0198
Modal	4	0.395	6.059E-07	0.1633	0	0.5944	0.6949	0	0.1299	1.421E-06	2.184E-05
Modal	5	0.347	1.236E-05	2.85E-05	0	0.5944	0.695	0	0.0001	0.0004	0.1058
Modal	6	0.255	0.1129	3.684E-05	0	0.7073	0.695	0	0.0001	0.2027	0.0039
Modal	7	0.183	2.799E-06	0.0888	0	0.7073	0.7838	0	0.0911	0	0.0012
Modal	8	0.176	0.0054	1.329E-05	0	0.7127	0.7838	0	1.162E-05	0.0071	5.224E-06
Modal	9	0.16	0.0003	3.018E-05	0	0.713	0.7838	0	0.0001	0.0002	0.0537
Modal	10	0.138	0.0582	0.0002	0	0.7713	0.784	0	0.0003	0.053	0.0022
Modal	11	0.127	0.0002	0.0271	0	0.7715	0.8111	0	0.0342	0.0002	0.0007
Modal	12	0.113	0.0001	0.0451	0	0.7716	0.8562	0	0.0591	0.0001	0.0059
Modal	13	0.102	0.0032	0.0004	0	0.7748	0.8566	0	0.0004	0.0044	0.0407
Modal	14	0.098	0.0343	0	0	0.809	0.8566	0	3.005E-06	0.0503	0.0032
Modal	15	0.094	0.0018	0	0	0.8108	0.8566	0	0	0.0025	0
Modal	16	0.089	0.0052	4.882E-05	0	0.816	0.8567	0	0.0001	0.0076	4.336E-05
Modal	17	0.083	4.357E-05	0.0335	0	0.8161	0.8902	0	0.0458	3.287E-05	0.0053
Modal	18	0.081	0.0108	0.0004	0	0.8269	0.8905	0	0.0005	0.0145	3.178E-05
Modal	19	0.074	0.0012	0.0006	0	0.828	0.8911	0	0.0007	0.0013	0.0268
Modal	20	0.069	0.0199	2.156E-06	0	0.8479	0.8911	0	6.52E-06	0.025	0.0003
Modal	21	0.066	0.0003	0.0139	0	0.8481	0.905	0	0.0195	0.0003	0.0076
Modal	22	0.062	0.0002	0.0084	0	0.8483	0.9135	0	0.0117	0.0002	0.0006
Modal	23	0.06	2.903E-05	7.594E-07	0	0.8483	0.9135	0	1.094E-06	4.834E-05	4.261E-06
Modal	24	0.058	0.0018	0.024	0	0.8502	0.9374	0	0.0337	0.0023	0.018
Modal	25	0.055	0.0101	0.0011	0	0.8603	0.9385	0	0.0015	0.0147	0.0057

Table 3.1 - Modal Participating Mass Ratios (Part 2 of 2)

Case	Mode	SumRX	SumRY	SumRZ
Modal	1	0.4883	0	0.002
Modal	2	0.4883	0.0003	0.404
Modal	3	0.4883	0.4258	0.4238
Modal	4	0.6182	0.4258	0.4238
Modal	5	0.6183	0.4262	0.5297
Modal	6	0.6184	0.6289	0.5336
Modal	7	0.7095	0.6289	0.5348
Modal	8	0.7095	0.636	0.5348
Modal	9	0.7096	0.6362	0.5885
Modal	10	0.7099	0.6892	0.5907
Modal	11	0.7442	0.6894	0.5914
Modal	12	0.8032	0.6895	0.5973
Modal	13	0.8037	0.6939	0.638
Modal	14	0.8037	0.7442	0.6412
Modal	15	0.8037	0.7467	0.6412
Modal	16	0.8037	0.7543	0.6412

Table 3.1 - Modal Participating Mass Ratios (Part 2 of 2, continued)

Case	Mode	SumRX	SumRY	SumRZ
Modal	17	0.8495	0.7543	0.6466
Modal	18	0.85	0.7689	0.6466
Modal	19	0.8507	0.7702	0.6734
Modal	20	0.8507	0.7952	0.6737
Modal	21	0.8703	0.7955	0.6813
Modal	22	0.8819	0.7957	0.6818
Modal	23	0.8819	0.7958	0.6818
Modal	24	0.9156	0.7981	0.6998
Modal	25	0.9171	0.8128	0.7054

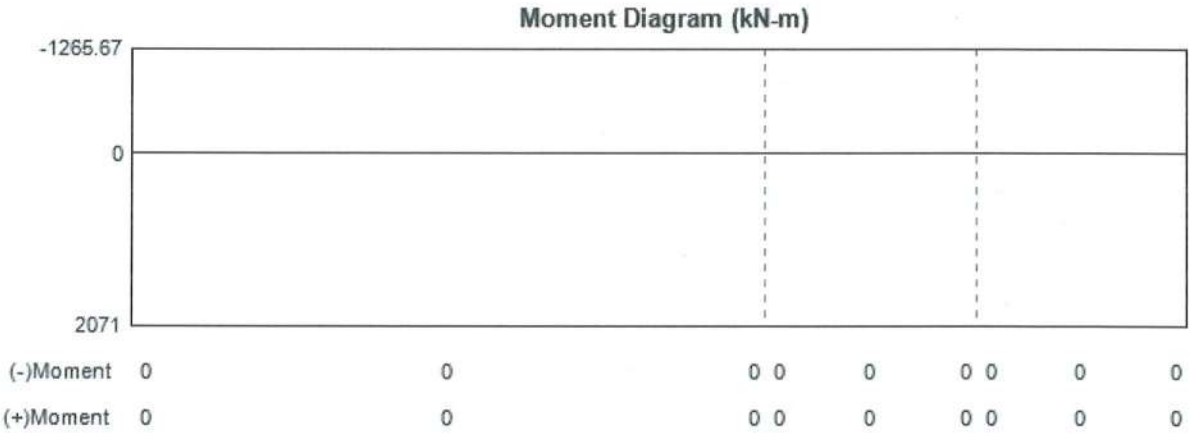
DESIGN OF FOUNDATION

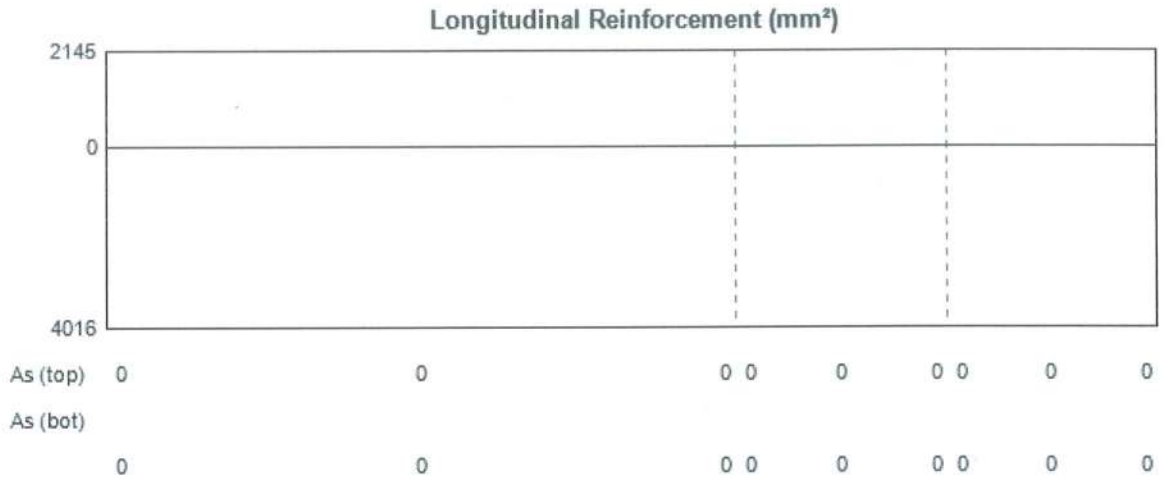
IS 456:2000 Concrete Strip Design

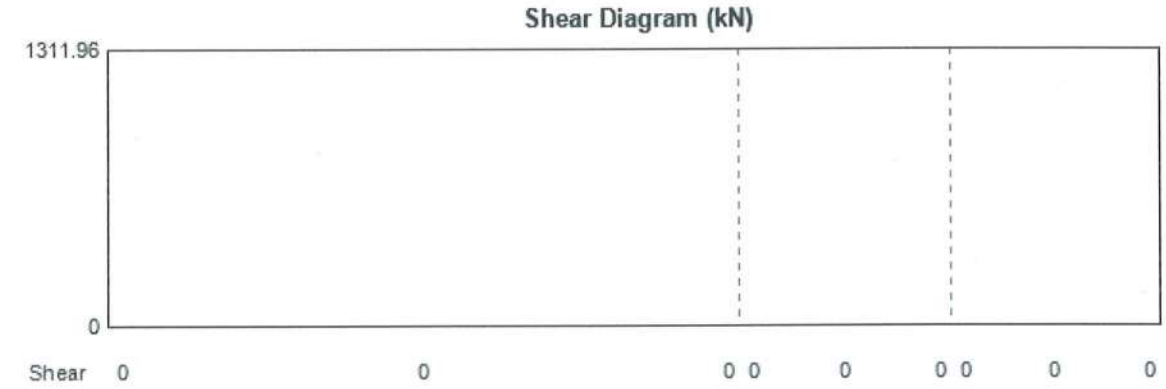
Geometric Properties
Combination = Overall Envelope
Strip Label = SA61
Length = 132 m
Distance to Top Rebar Center = 62.5 mm
Distance to Bot Rebar Center = 87.5 mm

Material Properties
Concrete Comp. Strength = 35 MPa
Concrete Modulus = 29580.4 MPa
Longitudinal Rebar Yield = 500 MPa



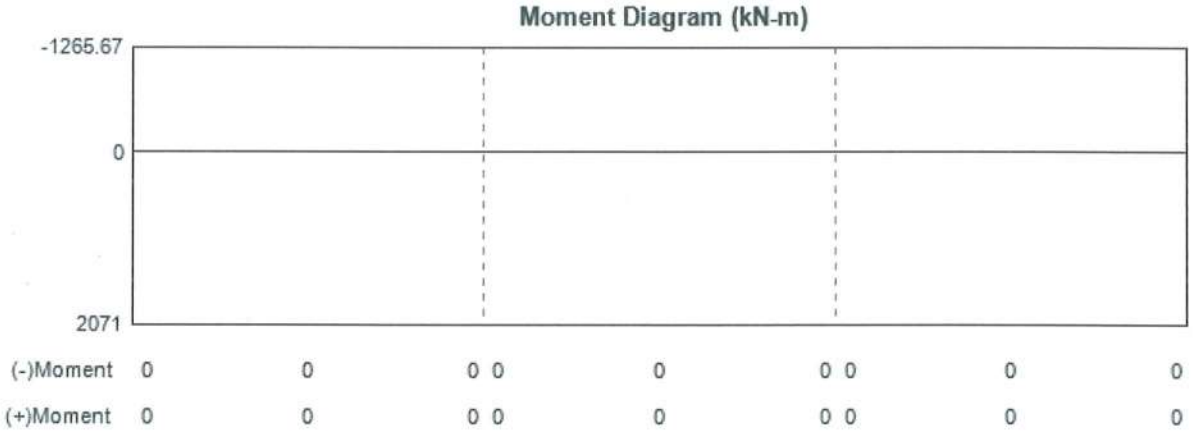


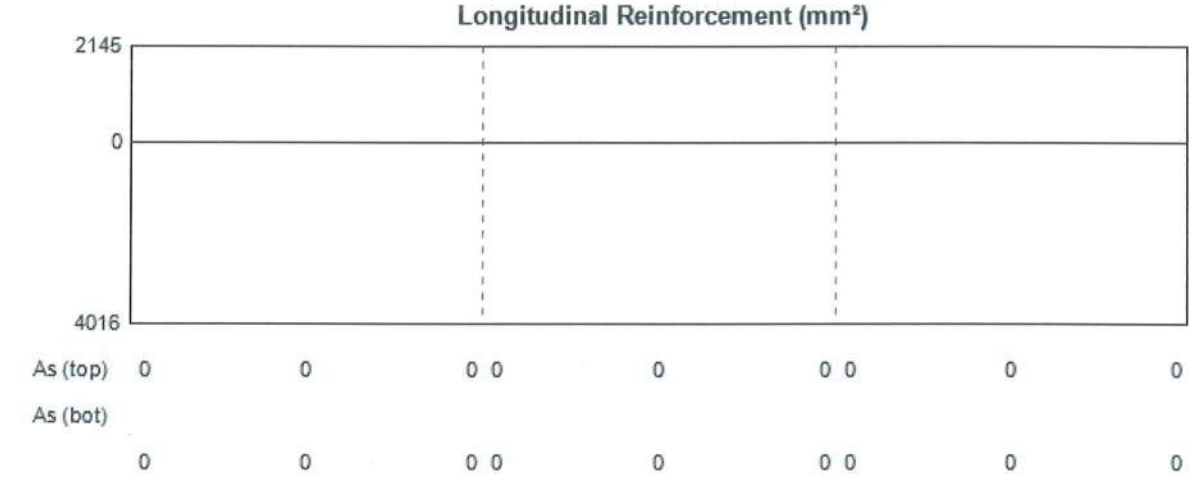

Longitudinal Reinforcement (mm²)
2145
0
4016
As (top) 0 0 0 0 0 0 0 0
As (bot)
0 0 0 0 0 0 0 0

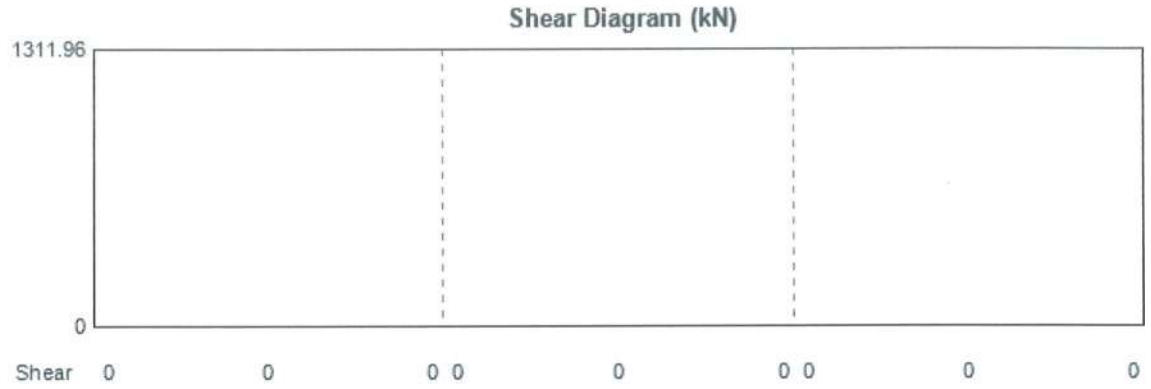

Shear Diagram (kN)
1311.96
0
Shear 0 0 0 0 0 0 0 0


Transverse Reinforcement (mm²/m)
1841.36
0
Asv/s reqd 0 0 0 0 0 0 0 0

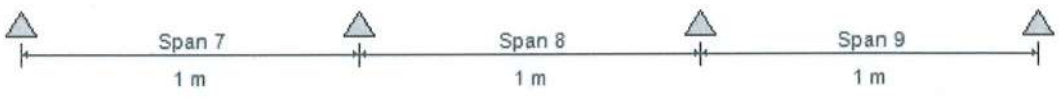

Span 4
1 m
Span 5
1 m
Span 6
1 m

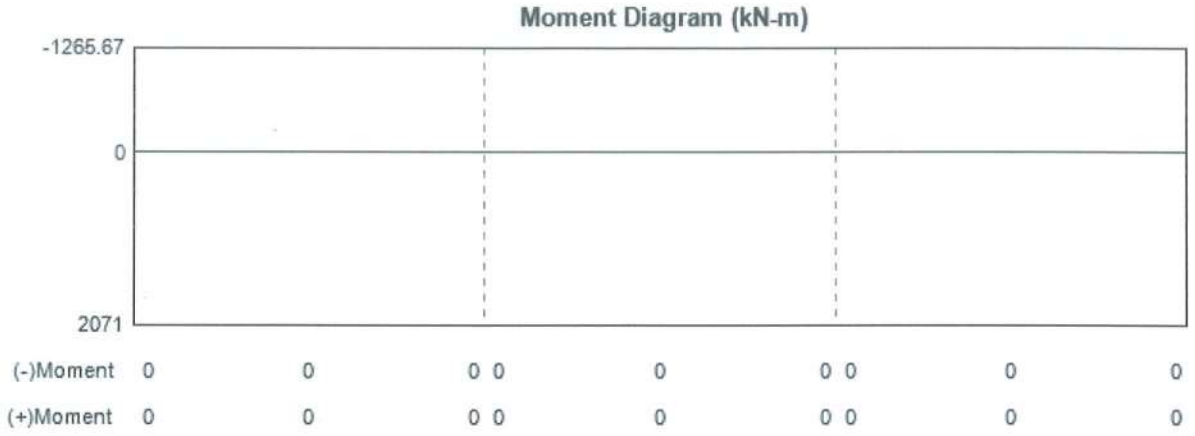

Moment Diagram (kN-m)
-1265.67
0
2071
(-)Moment 0 0 0 0 0 0 0 0
(+)Moment 0 0 0 0 0 0 0 0

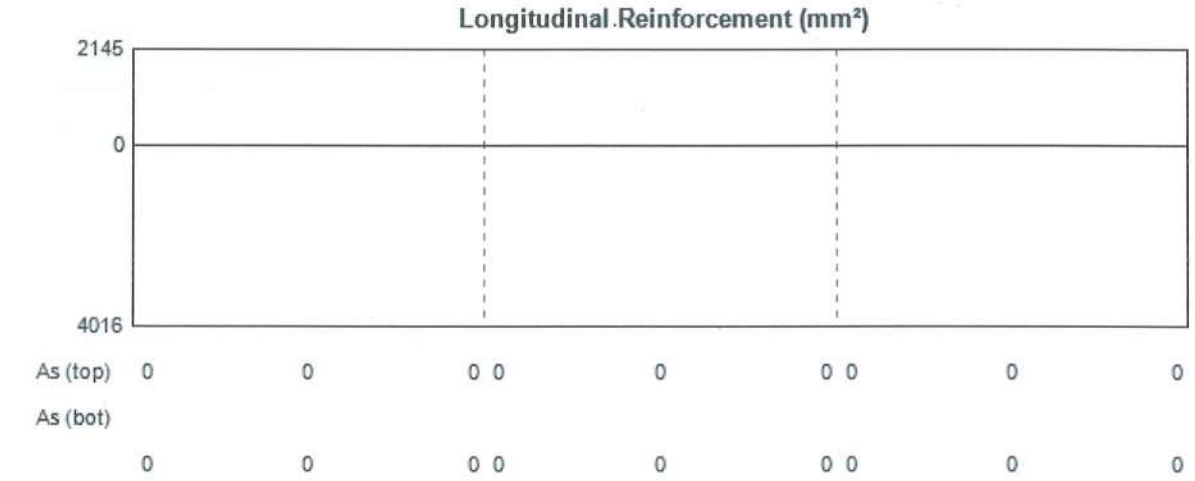

Longitudinal Reinforcement (mm²)
2145
0
4016
As (top) 0 0 0 0 0 0 0 0
As (bot)
0 0 0 0 0 0 0 0

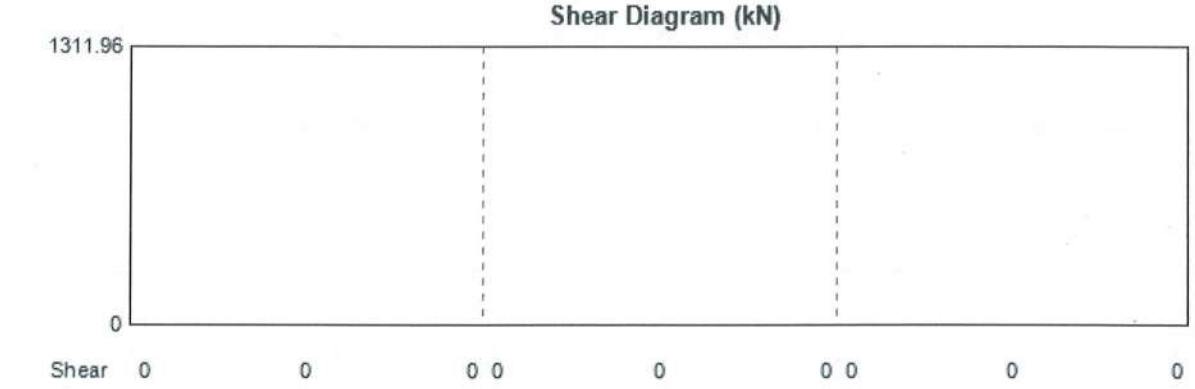

Shear Diagram (kN)
1311.96
0
Shear 0 0 0 0 0 0 0 0


Transverse Reinforcement (mm²/m)
1841.36
0
Asv/s reqd 0 0 0 0 0 0 0 0

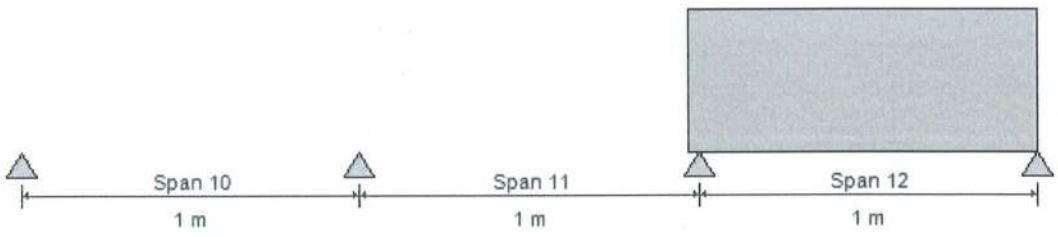

Span 7
1 m
Span 8
1 m
Span 9
1 m

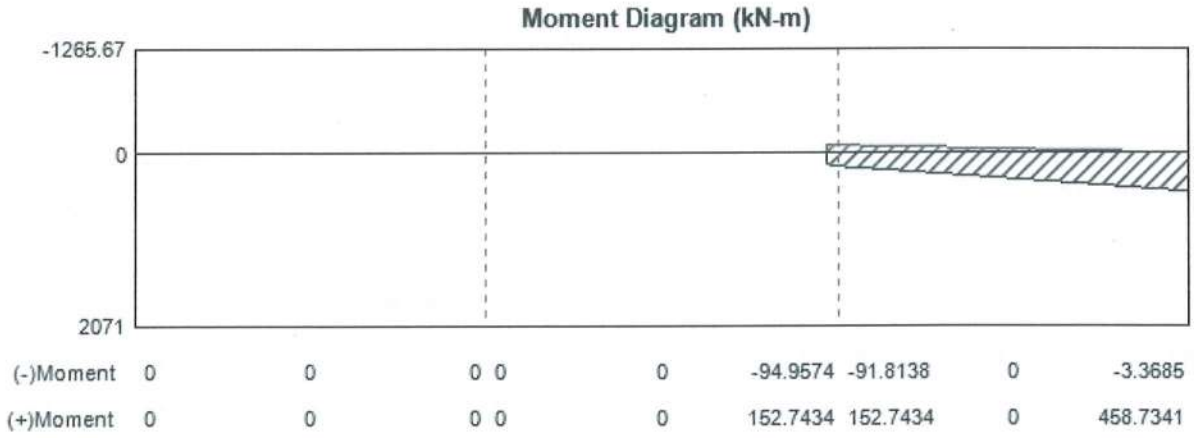

Moment Diagram (kN-m)
-1265.67
0
2071
(-)Moment 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(+)Moment 0 0 0 0 0 0 0 0 0 0 0 0 0 0


Longitudinal Reinforcement (mm²)
2145
0
4016
As (top) 0 0 0 0 0 0 0 0 0 0 0 0 0 0
As (bot) 0 0 0 0 0 0 0 0 0 0 0 0 0 0


Shear Diagram (kN)
1311.96
0
Shear 0 0 0 0 0 0 0 0 0 0 0 0 0 0


Transverse Reinforcement (mm²/m)
1841.36
0
Asv/s reqd 0 0 0 0 0 0 0 0

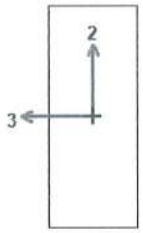

Span 10
1 m
Span 11
1 m
Span 12
1 m


Moment Diagram (kN-m)
-1265.67
0
2071
(-)Moment 0 0 0 0 0 -94.9574 -91.8138 0 -3.3685
(+)Moment 0 0 0 0 0 152.7434 152.7434 0 458.7341

DESIGN OF COLUMN

ETABS Concrete Frame Design

IS 456:2000 Column Section Design (Summary)



Column Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF	Type
STILT FLOOR	C38	5505	C 750 X 300	Comb2	2800	3550	1	Ordinary Frame

Section Properties

b (mm)	h (mm)	dc (mm)	Cover (Torsion) (mm)
300	750	60	30

Material Properties

E_c (MPa)	f_{ck} (MPa)	Lt.Wt Factor (Unitless)	f_y (MPa)	f_{ys} (MPa)
27386.4	35	1	550	550

Design Code Parameters

γ_c	γ_s
1.5	1.15

Axial Force and Biaxial Moment Design For P_u , M_{u2} , M_{u3}

Design P_u kN	Design M_{u2} kN-m	Design M_{u3} kN-m	Minimum M_2 kN-m	Minimum M_3 kN-m	Rebar Area mm²	Rebar % %
2124.5659	-42.4913	599.8876	42.4913	65.0117	4498	2

Axial Force and Biaxial Moment Factors

	K Factor Unitless	Length mm	Initial Moment kN-m	Additional Moment kN-m	Minimum Moment kN-m
Major Bend(M3)	0.695225	2800	239.955	0	65.0117
Minor Bend(M2)	0.541858	2800	-12.2757	0	42.4913

Shear Design for V_{u2} , V_{u3}

	Shear V_u kN	Shear V_c kN	Shear V_s kN	Shear V_p kN	Rebar A_{sv} /s mm²/m
Major, V_{u2}	358.7244	214.4874	144.237	0	579.26
Minor, V_{u3}	18.8065	197.0729	72.0006	0	831.33

Joint Shear Check/Design

	Joint Shear Force kN	Shear V_{Top} kN	Shear $V_{u,Tot}$ kN	Shear V_c kN	Joint Area cm²	Shear Ratio Unitless
Major Shear, V_{u2}	N/N	N/N	N/N	N/N	N/N	N/N
Minor Shear, V_{u3}	N/N	N/N	N/N	N/N	N/N	N/N

(1.4) Beam/Column Capacity Ratio

Major Ratio	Minor Ratio
N/N	N/N

Additional Moment Reduction Factor k (IS 39.7.1.1)

A_g cm²	A_{sc} cm²	P_{uz} kN	P_b kN	P_u kN	k Unitless
2250	45	5399.359	1462.605	2124.5659	0.831851

Additional Moment (IS 39.7.1)

	Consider M_a	Length Factor	Section Depth (mm)	KL/Depth Ratio	KL/Depth Limit	KL/Depth Exceeded	M_a Moment (kN-m)
Major Bending (M_3)	Yes	0.789	750	2.596	12	No	0
Minor Bending (M_2)	Yes	0.789	300	5.057	12	No	0

Notes:

N/A: Not Applicable

N/C: Not Calculated

N/N: Not Needed

DESIGN OF WALL

ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (mm)	Centroid Y (mm)	Length (mm)	Thickness (mm)	LLRF
1ST FLOOR	PW4	0	-16540	4910	300	1

Material Properties

E_c (MPa)	f_{ck} (MPa)	Lt.Wt Factor (Unitless)	f_y (MPa)	f_{ys} (MPa)
31622.7	40	1	550	550

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 mm	Left Y_1 mm	Right X_2 mm	Right Y_2 mm	Length mm	Thickness mm
Top	Leg 1	0	-18995	0	-14085	4910	300
Bottom	Leg 1	0	-18995	0	-14085	4910	300

Flexural Design for P_u, M_{u2} and M_{u3}

Station Location	Required Rebar Area (mm^2)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u kN	M_{u2} kN-m	M_{u3} kN-m	Pier A_g mm^2
Top	14220	0.0097	0.0054	Comb2	14976.5011	-1178.1065	-3568.9277	1473000
Bottom	13394	0.0091	0.0054	Comb2	15169.7753	1194.1169	-2696.6804	1473000

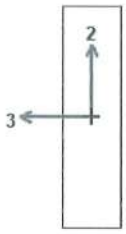
Shear Design

Station Location	ID	Rebar mm^2/m	Shear Combo	P_u kN	M_u kN-m	V_u kN	V_c kN	$V_c + V_s$ kN
Top	Leg 1	600	Comb2	14976.5011	-3568.9277	701.0853	3409.1883	4259.6857
Bottom	Leg 1	600	Comb2	15169.7753	-1115.1292	701.0853	3409.1883	4259.6857

DESIGN OF BEAM

ETABS Concrete Frame Design

IS 456:2000 + IS 13920:2016 Beam Section Design (Summary)



Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF	Type
10TH	B1711	11119	B 160X600	Comb2	0	5000	1	Ductile Frame

Section Properties

b (mm)	h (mm)	b_f (mm)	d_s (mm)	d_{ct} (mm)	d_{cb} (mm)
160	600	160	0	40	40

Material Properties

E_c (MPa)	f_{ck} (MPa)	Lt.Wt Factor (Unitless)	f_y (MPa)	f_{ys} (MPa)
27386.13	30	1	500	415

Design Code Parameters

γ_c	γ_s
1.5	1.15

Factored Forces and Moments

Factored M_{u3} kN-m	Factored T_u kN-m	Factored V_{u2} kN	Factored P_u kN
-68.2004	0.0005	83.7861	0

Design Moments, M_{u3} & M_t

Factored Moment kN-m	Factored M_t kN-m	Positive Moment kN-m	Negative Moment kN-m
-68.2004	0.0014	0	-68.2018

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment kN-m	Design +Moment kN-m	-Moment Rebar mm²	+Moment Rebar mm²	Minimum Rebar mm²	Required Rebar mm²
Top (+2 Axis)	-68.2018		297	0	297	236
Bottom (-2 Axis)		0	148	0	0	148

Shear Force and Reinforcement for Shear, V_{u2} & T_u

Shear V_e kN	Shear V_c kN	Shear V_s kN	Shear V_p kN	Rebar A_{sv} /s mm²/m
83.7861	36.934	46.8571	28.7709	231.87

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u kN-m	V_u kN	Core b_1 mm	Core d_1 mm	Rebar A_{svt} /s mm²/m
0.0005	83.7861	100	540	0

DESIGN OF SLAB

PROJECT

DESIGN OF SLAB No:

1.00	Grade of concrete	=	*40.00*	N/mm^2	Case No: *5*
2.00	Grade of steel	=	*500.00*	N/mm^2	D+(C-D)*(E-A)/(B-A)
3.00	Cover to reinforcement	=	*25.00*	mm	
	Diameter of bar	=	*8.00*	mm	
4.00	Aspect ratio $\frac{l_y}{l_x}$ = *4.00* / *3.00*	4.10 / 3.10	1.323	< 2	
5.00	Edge condition: Two Short Edge Discontinuous		Two way slab		
6.00	Modification factor assumed		*1.60*		
		84.13			
7.00	Depth required for deflection:	D =	*125.00*	mm	
			125.00	mm	
		d =	96.00	mm	ok
8.00	Dead Load	=	3.00	kN/m^2	qa
9.00	Live load	=	*2.00*	kN/m^2	
10.00	Partitions & FF	=	*1.20*	kN/m^2	
11.00	Total load	=	6.20	kN/m^2	
12.00	Factored load	=	9.30	kN/m^2	

		Negative	Positive
A		*1.30000*	*1.30000*
B		*1.40000*	*1.40000*
C		*0.05600*	*0.04300*
D		*0.05900*	*0.04400*
E		***1.32300***	***1.32300***
Value		**0.05669**	**0.04323**

STEP 1	Details	tx S- SPAN (-ve) support(α_x)	b1 (+ve) span(α_x)	ty L-SPAN (-ve) support(α_y)	b2 (+ve) span (α_y)
	Co-efficent (IS:456, Table :26	0.057	0.043	0.000	0.035
	M_u=Co-efficient*w* l_x^2	5.05	3.85	0.00	3.12
	K= Mu/bd2	0.55	0.42	0.00	0.34
	Percentage of steel required	0.13	0.10	0.00	0.08
	Ast required(in mm^2)	*122.99*	*93.42*	*0.00*	*75.46*
	Ast min (in mm^2)	150.00	150.00	150.00	150.00
	Ast to be provided (in mm2)	150.00	150.00	150.00	150.00
	Provided bars spacing (c/c)	335.24	335.24	335.24	335.24
	max spacing	250.00	250.00	250.00	250.00
	spacing	250.00	250.00	250.00	250.00
	Reqd bars spacing (c/c)	**250.00**	**250.00**	**250.00**	**250.00**
	Pvd bars spacing (c/c)	***200.00***	***200.00***	***200.00***	***200.00***
	Ast Provided(in mm^2)	**251.43**	**251.43**	**251.43**	**251.43**
	Percentage of steel provided	**0.26**	**0.26**	**0.26**	**0.26**

STEPII	F_s=0.58 *f_y * (Ast required/ Ast provided)		
	F_s	107.75	
	M.F	***2.00***	
	if assumed modification factor is less than or equal to calculated the section is safe for deflection	safe	
	OVERALL DEPTH D	**125.00 mm**	
	EFFECTIVE DEPT d	**96.00 mm**	

STEPIII	Crack width calculation			
	m	=	6.3	
	E_s	=	200000.0	
	Ec	=	31622.8	
	Pt	=	0.3	
	k	=	0.2	
	x	=	16.0	
	A_{st}	=	251.4	
	I_{cr}	=	11542411.19	
	M	=	3.9	
	f_{st}	=	169.0	
	ε_m	=	0.0	
	Spacing		200.0	
	a_{cr}	=	103.1	
	ω_{cr}	=	0.02	
			<	
			0.20	mm (safe)

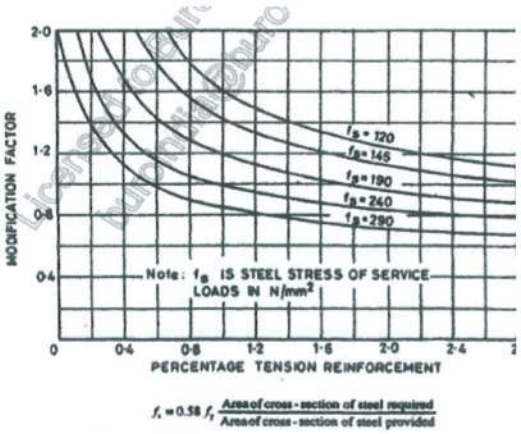
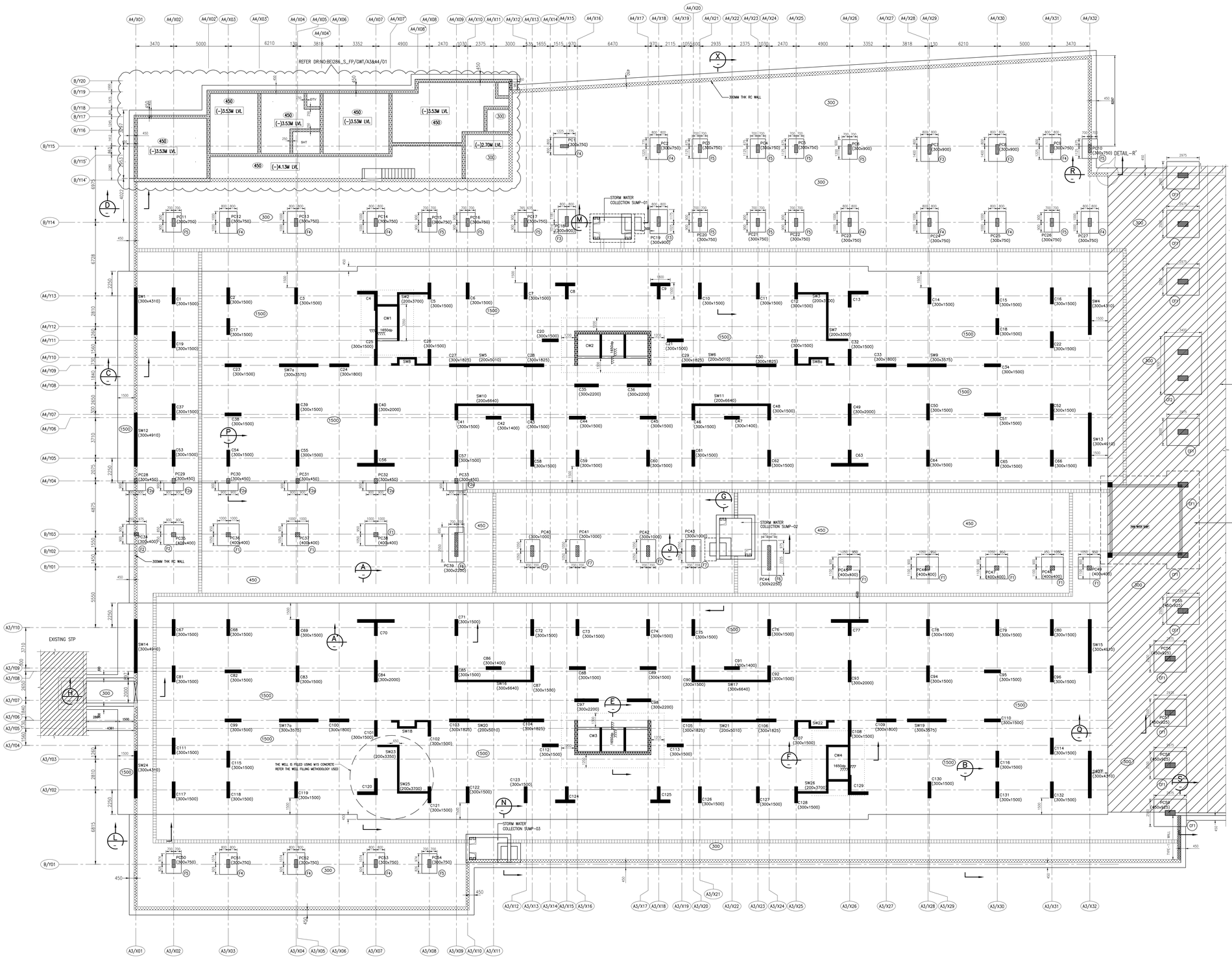


FIG. 4 MODIFICATION FACTOR FOR TENSION REINFORCEMENT

A. PERAMAIYAN, M.E., (Struct.), M.I.E.
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CHENNAI METROPOLITAN DEVELOPMENT AUTHORITY
REGISTRATION No. SE/GR-I/19/03/026
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BASEMENT FRAMING PLAN

SCALE - 1:125

LEGEND

- 300mm THICK BASEMENT WALL
- 300mm THICK RC WALL
- 200mm THICK RC WALL
- PODIUM COLUMN TERMINATED @ STILT FLOOR ROOF CARRIES UPTO PODIUM LOADS
- EXTENDED BASEMENT COLUMN TERMINATED @ BASEMENT ROOF
- TOWER COLUMN TERMINATED @ STILT FLOOR ROOF CARRIES 21 STOREY STRUCTURE LOADS

NOTES

UNLESS OTHERWISE SPECIFIED

1. CONCRETE GRADE
   BASEMENT WALL - M35
   RAFT - M35
2. THE SBC IS TO BE CONSIDERED 800 KN/M²
   SFL - STRUCTURAL FLOOR LEVEL
   REFER ARCH.DRAWING FOR FINISHED FLOOR LEVEL

METHODOLOGY USED FOR THE DISMANTLING AND BACK FILLING OF EXISTING WELL IN THE PROPOSED STARWOOD TOWERS (BLOCK-A3)

1. REMOVAL OF WATER & SLUDGE : Water in the well shall be pumped out till the bottom and the base shall be exposed. The sludge till its bottom layer shall be removed.
2. DISMANDLING: The brick work of the body wall shall be dismandled at least up to a depth of 300mm below natural ground level and the top surface to be leveled.
3. THE ENTIRE WELL IS FILLED USING M15 GRADE OF CONCRETE TILL THE BOTTOM OF RAFT

TABLE-1 (FLAT FOOTING)

SL NO	FOOTING MARK	NO.OF FOOTING	FOOTING SIZE Lr	FOOTING SIZE Br	FOOTING SIZE D	SIDE BAR (SB)	COLUMN MARK	COLUMN SIZE Lc	COLUMN SIZE Bc	REINFORCEMENT B1	REINFORCEMENT B2	REMARKS
1	F1	8	2000	2000	600	-	AS SHOWN	AS SHOWN		T20-150	T20-150	
2	F2	2	1800	1800	600	-				T16-150	T16-150	
2a	F2a	6	REFER PLAN		600	-				T12-150	T12-150	
3	F3	4	1600	2200	650	-				T16-150	T16-150	
4	F4	13	1600	2000	600	-				T16-150	T16-150	
5	F5	15	1400	1800	600	-				T16-150	T16-150	
6	F6	2	1400	3200	600	-				T16-150	T16-150	
7	F7	4	1400	2100	650	-				T16-150	T16-150	

NOTES:

1. ALL DIMENSIONS ARE IN MM
2. FOR GENERAL NOTES REFER TO DWG. NO. BE0286_S-/NT/--/01.
3. FOR STANDARD DETAILS REFER TO DWG. NO. BE0286_S-/SD/--/01.
4. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE KEY PLAN, ARCHITECTURAL AND ALL OTHER RELEVANT SERVICES DRAWINGS.
5. CONCRETE GRADE:
   RAFT : M35
   BASEMENT WALL : M35
   COLUMN : M50
   PODIUM COLUMN : M35
   SHEAR WALL : M50 (UPTO 11TH FLOOR)
   SHEAR WALL : M35 (ABOVE 11TH FLOOR)
   BEAM : M35
   SLAB : M35
   APPROVED DESIGN MIX SHALL BE ADOPTED IN CONSTRUCTION

   FOR ALUMINIUM FORM WORK (FOR BLOCKS A3 & A4 SUPER STRUCTURE) SELF COMPACTING CONCRETE SHALL BE USED. DESIGN MIX WITH WORKABILITY AND STRENGTH REPORT SHALL BE SUBMITTED FOR REVIEW & APPROVAL.
6. STEEL GRADE: Fe550 CONFORMING TO IS:1786-2008.
7. CLEAR COVER FOR COLUMN-40mm, SLAB-25mm, BEAM-30mm, RAFT-60mm. 300MM THICK RC WALL -40mm 200MM THICK RC WALL -30mm
8. UNLESS OTHERWISE SPECIFIED, LAP/DEVEPMENT LENGTH SHALL NOT BE LESS THAN 50 X DIA OF BAR
9. SEISMIC LOAD HAS BEEN CONSIDERED AS PER IS:16700-2017 & 1893-2016 WITH THE SEISMIC ZONE III. DUCTILE DESIGN & DETAILING CARRIED OUT AS PER THE STIPULATIONS MADE IN IS:13920-2016.
10. STRUCTURE TO BE CONSTRUCTED IN ACCORDANCE WITH I.S.456-2000, NBC (SP7-1983) AND RELAVANT INDIAN CODE STIPULATIONS
11. ONUS OF CONSTRUCTION LIES WITH CONTRACTOR/ PROMOTER / BUILDER / OWNER.

REV. NO.	AMENDMENTS	BY	DATE
-	CONSTRUCTION DRAWING	DP	04/12/2021

Client :
NAVIN HOUSING & PROPERTIES (P)LTD.
NAVIN'S Triumph
(Opposite to Cosmopolitan Golf Ground Annex, Near GR Complex) No. 802 & 804, Anna Salai, Nandanam, Chennai - 600 035 INDIA.
web site: www.navinhousing.com

LANDSCAPE CONSULTANTS

Resident Architect :
W.ANAND
27/4, EAST CHETTY ROAD, RUNNIMEDE(MCCHENNAI) - 600 041. TEL: 65480003 FAX : 4211 4661
E-mail : anandarchitects@gmail.com

PLUMBING CONSULTANTS
* PRISM *
No.13/22, 11th CROSS, 1st FLOOR, OPPOSITE TO MAHAVEER MEDICAL MALLESWARAM, BANGALORE-560003.

ELECTRICAL CONSULTANTS
MADRAS ELECTRICAL CONSULTANTS
23, PARK AVENUE, 2ND CROSS STREET, BABY NAGAR, VELACHERRY, CHENNAI - 42
PH: 9444023054 E-Mail: anbu_mani@vsnl.net

Civil & Structural Engineer :
BURO ENGINEERS (I) PRIVATE LTD.
Civil & Structural Consultants
New No. 31, Old No. 14, Besant Avenue, Adyar, Chennai - 600 020. ₹044-2491 2754/55/56,
e-Mail ID: burovindia@buroengineers.in

CONSTRUCTION DRAWING

STRUCTURAL

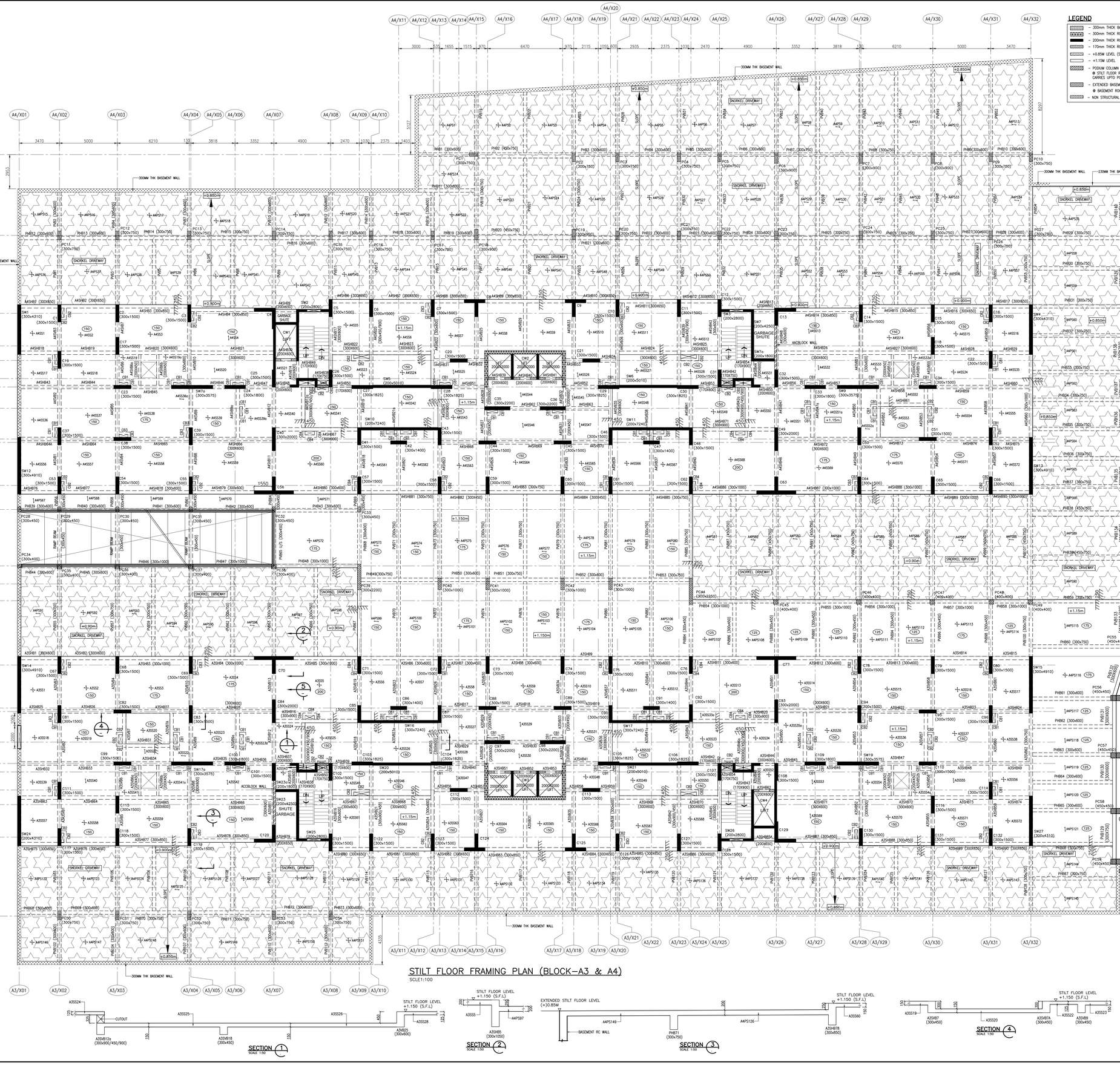
project title
STARWOOD TOWERS PHASE-III

drawing title
BASEMENT FLOOR FRAMING PLAN (BLOCK-A3 & A4) (SHEET 1 OF 3)

scale	AS SHOWN	design by	SIVA
drawn by	D.P	checked by	MP
date	APR 2013	approved by	AP
drawing no.	BE1286_S-/FP/B-/A3&A4/01	revision	-

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CAD FILE NAME: BE1286_S-FPB-A3A401_.dwg



LEGEND

- 300mm THICK BASEMENT WALL
- 300mm THICK RC WALL
- 200mm THICK RC WALL
- 170mm THICK RC WALL
- +0.85M LEVEL (SNORKEL DRIVE WAY)
- +1.15M LEVEL
- PODIUM COLUMN TERMINATED @ STILT FLOOR ROOF CARRIES UPTO PODIUM LOADS
- EXTENDED BASEMENT COLUMN TERMINATED @ BASEMENT ROOF
- NON STRUCTURAL WALL 200MM THICK

NOTES

UNLESS OTHERWISE SPECIFIED

1. CONCRETE GRADE:
   TOWER COLUMN – M40,
   BASEMENT RC WALL ,SHEAR WALL – M40
   PODIUM COLUMN – M35,
   SLAB – M35,
   BEAM – M35.
2. GRADE OF STEEL Fe550
3. ALL THE TOWER SLABS SHALL BE 125mm THICK.
4. ALL THE TOWER BEAMS ARE TO BE 300X450mm.
5. ALL THE TOWER COLUMNS ARE TO BE 300X1500mm.
6. ALL THE PODIUM BEAMS ARE TO BE 300X600mm.
7. ALL THE PODIUM SLAB ARE TO BE 200mm.
8. ALL SUNKEN AREA SHALL BE FILLED USING CINDER.
9. REMOVE BEAM NO: A3HB61,A3VB20,A3VB39,A3VB49
10. CB1 – 200X125
11. CB2 – 200X150
12. CB3 – 200X175
13. CB4 – 200X200

NOTES:

1. ALL DIMENSIONS ARE IN MM
2. FOR GENERAL NOTES REFER TO DWG. NO. BE0286_S–/NT/–/–/01.
3. FOR STANDARD DETAILS REFER TO DWG. NO. BE0286_S–/SD/–/–/01.
4. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE KEY PLAN, ARCHITECTURAL AND ALL OTHER RELEVANT SERVICES DRAWINGS.
5. CONCRETE GRADE:

PODIUM / EXTENDED BASEMENT	
FOOTINGS	: M35
BASEMENT WALL	: M35
BASEMENT SLAB	: M35
COLUMNS	: M35
STILT FLOOR RC BEAMS/SLABS	: M35
FIRST FLOOR (LANDSCAPE PODIUM) RC BEAMS/SLABS	: M35
TOWERS	
RAFT SLAB	: M35
COLUMN	: M40
FIRST FLOOR LEVEL TRANSFER BEAM/SLAB	: M35
SHEAR WALL (UPTO 11TH FLOOR) : RC BEAMS/SLABS	: M40 / : M30
SHEAR WALL (ABOVE 11TH FLOOR) : RC BEAMS/SLABS	: M30 / : M30

   APPROVED DESIGN MIX SHALL BE ADOPTED IN CONSTRUCTION
   FOR ALUMINUM FORM WORK (FOR BLOCKS A3 & A4 SUPER STRUCTURE) SELF COMPACTING CONCRETE (SCC) SHALL BE USED. DESIGN MIX WITH WORKABILITY AND STRENGTH REPORT SHALL BE SUBMITTED FOR REVIEW & APPROVAL.
6. STEEL GRADE: Fe550 CONFORMING TO IS:1786–2008.
7. CLEAR COVER FOR FOOTINGS–60MM, COLUMN–40mm, SLAB–25mm, BEAM–30mm, RAFT–60mm, 300MM THICK RC WALL – 40mm 200MM THICK RC WALL – 30mm
8. SEISMIC LOAD HAS BEEN CONSIDERED AS PER IS:16700–2017 & 1893–2016 WITH THE SEISMIC ZONE III, DUCTILE DESIGN & DETAILING CARRIED OUT AS PER THE STIPULATIONS MADE IN IS:13920–2016.
9. STRUCTURE TO BE CONSTRUCTED IN ACCORDANCE WITH I.S.456–2000, NBC (SP7–1983) AND RELAVANT INDIAN CODE STIPULATIONS
10. ONUS OF CONSTRUCTION LIES WITH CONTRACTOR/ PROMOTER / BUILDER / OWNER.

LOAD TABLE

LOCATION	L.L kN/m2	S.D.L kN/m2
AHU&ELEC. ROOM	7.5	2.4
TOILET	2.0	6.0
STAIRCASE	3.0	3.0
PARKING	3.0	2.4
DRIVEWAY	3.0	2.4
SNORKEL DRIVEWAY	12.0	4.7

STILT FLOOR FRAMING PLAN (BLOCK–A3 & A4)

SCLE1:100

SECTION 1 — STILT FLOOR LEVEL +1.150 (S.F.L) — A3SB24, A3SB12a (300x900/450/900), A3SB18 (300x450), A3SB25 (300x600), A3SB28, A3SB26, A3SB27, CUTOUT

SECTION 2 — STILT FLOOR LEVEL +1.150 (S.F.L) — A3SB5 (300x1050), A3SS5, A4PS97

SECTION 3 — EXTENDED STILT FLOOR LEVEL (+)0.85M — BASEMENT RC WALL, A4PS149, PHB71 (300x750), A4PS126, A3SB78 (300x850), A3SS60, STILT FLOOR LEVEL +1.150 (S.F.L)

SECTION 4 — STILT FLOOR LEVEL +1.150 (S.F.L) — A3SV87 (300x450), A3SS19, A3SV87A (300x450), A3SS22, A3SV89 (300x450), A3SS23

SECTION 5 — CUTOUT, STILT FLOOR LEVEL +1.150 (S.F.L) — A3SB38 (170x900), A3SV812a (300x900/450/900), A3SB16 (300x900), A3SS55

–	CONSTRUCTION DRAWING	DP	12/03/2022
REV. NO.	AMENDMENTS	BY	DATE

Client :

NAVIN'S Triumph
[Opposite to Cosmopolitan Golf Ground Annex, Near GR Complex] No. 802 & 804, Anna Salai, Nandanam, Chennai - 600 035 INDIA.
web site: www.navinhousing.com

LANDSCAPE CONSULTANTS

Resident Architect :

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E-mail : anandarchitects@gmail.com

PLUMBING CONSULTANTS

" PRISM "
No.1502, 11th CROSS, 1st FLOOR, OPPOSITE TO MAHAVEER MEDICAL MALLESWARAM, BANGALORE-560003.

ELECTRICAL CONSULTANTS

MADRAS ELECTRICAL CONSULTANTS
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BABY NAGAR, VELACHERRY, CHENNAI – 42
PH: 9444223054 E-Mail: anbu_mani@rediffmail.com

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BURO ENGINEERS (I) PRIVATE LTD.
Civil & Structural Consultants
New No. 21, Old No. 16, Besant Avenue, Adyar, Chennai - 600 020. ₰044-2491 2754/55/56,
e-Mail ID: burovindu@buroengineers.in

CONSTRUCTION DRAWING

STRUCTURAL

project title

STARWOOD TOWERS PHASE-III

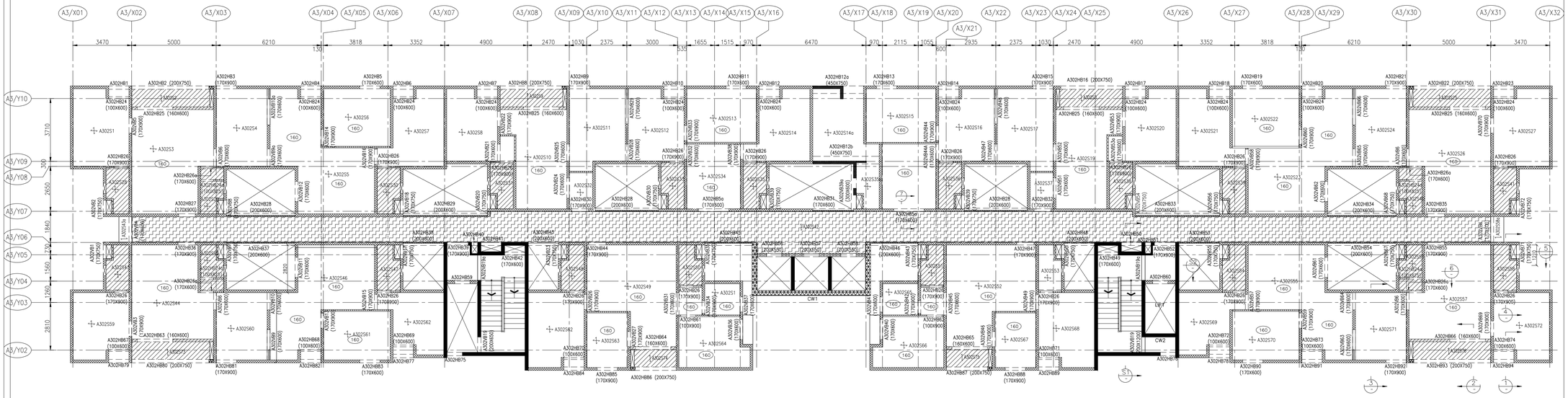
drawing title

STILT FLOOR FRAMING PLAN (BLOCK–A3 & A4)

scale	AS SHOWN	design by	SNA
drawn by	D.P	checked by	MP
date	APR 2013	approved by	AP
drawing no.	BE0286_S–/FP/S–/A3&A4/01		revision 0

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CAD FILE NAME: BE0286_S–FP/S–A3A401_.dwg



2ND FLOOR FRAMING PLAN (BLOCK-A3)

SCLE1:125

NOTES

UNLESS OTHERWISE SPECIFIED
CONCRETE GRADE:
SHEAR WALL : M40 (UPTO 11TH FLOOR)
SHEAR WALL : M30 (ABOVE 11TH FLOOR)
BEAM : M30
SLAB : M30

2. GRADE OF STEEL Fe550
3. ALL THE TOWER SLABS SHALL BE 125mm THICK.
4. ALL THE TOWER BEAMS ARE TO BE 200X600mm.
5. ALL THE TOWER COLUMNS ARE TO BE 300X1500mm.
6. ALL SUNKEN AREA SHALL BE FILLED USING CINDER.

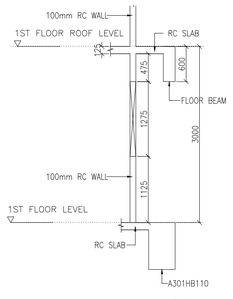
- 300mm THICK RC WALL
- 200mm THICK RC WALL
- 200mm THICK LOAD BEARING WALL
- 170mm THICK LOAD BEARING WALL
- 100mm THICK NON LOAD BEARING WALL
- 160mm THICK NON LOAD BEARING WALL
- 75THK RCC WALL
- SUNK BY 75mm.
- SUNK BY 50mm.
- NON STRUCTURAL WALL 200MM THICK
- 100mm THICK NON LOAD BEARING WALL LOW WALL UPTO 1450mm HT.

LEGEND:

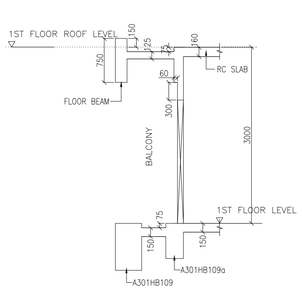
- THIS PORTION OF WALL WILL BE START FROM 1ST FLOOR ROOF

LOAD TABLE

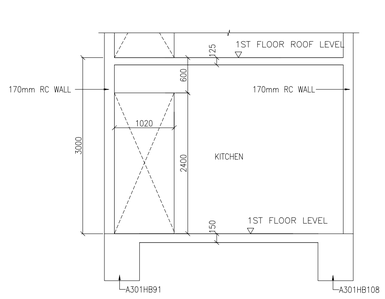
LOCATION	L.L kN/m2	S.D.L kN/m2
ROOM	2.0	1.2
TOILET	2.0	2.7
STAIRCASE	3.0	3.0
BALCONY	3.0	2.7
CORRIDOR	3.0	2.2



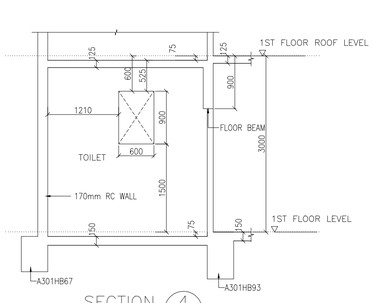
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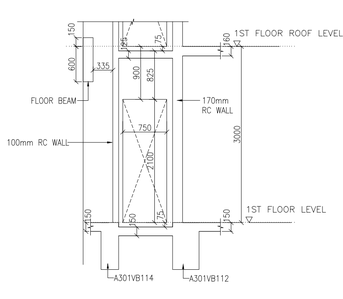
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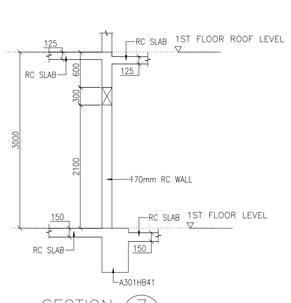
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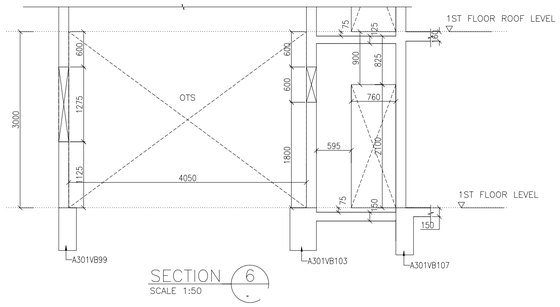
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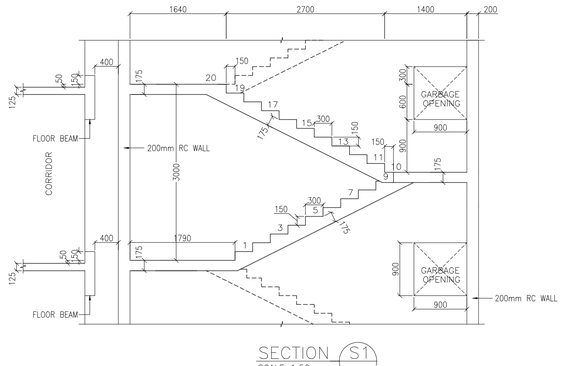
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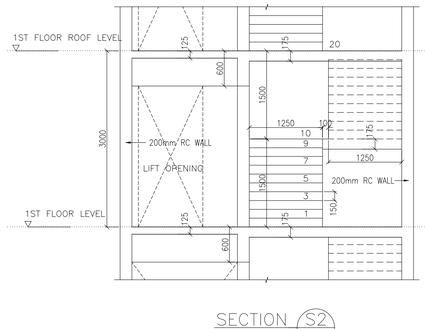
SECTION 7 SCALE 1:50



SECTION 6 SCALE 1:50



SECTION S1 SCALE 1:50



SECTION S2 SCALE 1:50

NOTES:

1. ALL DIMENSIONS ARE IN MM
2. FOR GENERAL NOTES REFER TO DWG. NO. BEI286_S-/NT/--/01.
3. FOR STANDARD DETAILS REFER TO DWG. NO. BEI286_S-/SD/--/01.
4. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE KEY PLAN, ARCHITECTURAL AND ALL OTHER RELEVANT SERVICES DRAWINGS.
5. CONCRETE GRADE:

PODIUM / EXTENDED BASEMENT	
FOOTINGS	: M35
BASEMENT WALL	: M35
BASEMENT SLAB	: M35
COLUMNS	: M35
STILT FLOOR RC BEAMS/SLABS	: M35
FIRST FLOOR (LANDSCAPE PODIUM) RC BEAMS/SLABS	: M35
TOWERS	
BASEMENT SLAB	: M35
COLUMN	: M40
FIRST FLOOR LEVEL TRANSFER BEAM/SLAB	: M35
SHEAR WALL (UPTO 11TH FLOOR)	: M40
RC BEAMS/SLABS	: M40
SHEAR WALL (ABOVE 11TH FLOOR)	: M30
RC BEAMS/SLABS	: M30

HFC

APPROVED DESIGN MIX SHALL BE ADOPTED IN CONSTRUCTION FOR ALUMINUM FORM WORK (FOR BLOCKS A3 & A4 SUPER STRUCTURE) HIGH FLOW CONCRETE (HFC) SHALL BE USED. DESIGN MIX WITH WORKABILITY AND STRENGTH REPORT SHALL BE SUBMITTED FOR REVIEW & APPROVAL.

6. STEEL GRADE: Fe550 CONFORMING TO IS:1786-2008.
7. CLEAR COVER FOR FOOTINGS-60MM, COLUMN-40mm, SLAB-25mm, BEAM-30mm, RAFT-60mm.
   300MM THICK RC WALL -40mm
   200MM THICK RC WALL -30mm
   170MM THICK RC WALL -30mm
8. SEISMIC LOAD HAS BEEN CONSIDERED AS PER IS:16700-2017 & 1893-2016 WITH THE SEISMIC ZONE III, DUCTILE DESIGN & DETAILING CARRIED OUT AS PER THE STIPULATIONS MADE IN IS:13920-2016.
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10. ONUS OF CONSTRUCTION LIES WITH CONTRACTOR/ PROMOTER / BUILDER / OWNER.

REV. NO.	AMENDMENTS	BY	DATE
–	CONSTRUCTION DRAWING	RLM	25/05/2024

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23, PARK AVANUE, 2ND CROSS STREET,
BABY NAGAR, VELACHERRY, CHENNAI – 42
PH: 9444023054 E-Mail: anbu_mani@vsnl.net

Civil & Structural Engineer :

BURO ENGINEERS (I) PRIVATE LTD.
Civil & Structural Consultants
New No. 31, Old No. 14, Besant Avenue, Adyar,
Chennai - 600 020. #044-2491 2754/55/56,
e-Mail ID: buroindia@buroengineers.in

CONSTRUCTION DRAWING
STRUCTURAL

project title

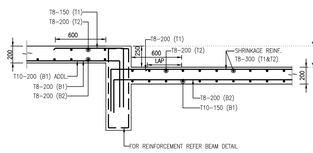
STARWOOD TOWERS PHASE-III

drawing title
2ND FLOOR FRAMING PLAN (BLOCK-A3)

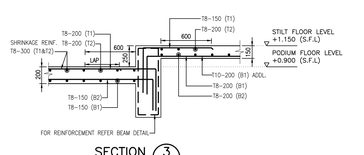
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drawn by	D.P	checked by	AP
date	APR 2013	approved by	AP
drawing no.	BEI286_S-/FP/02/A3/01	revision	–

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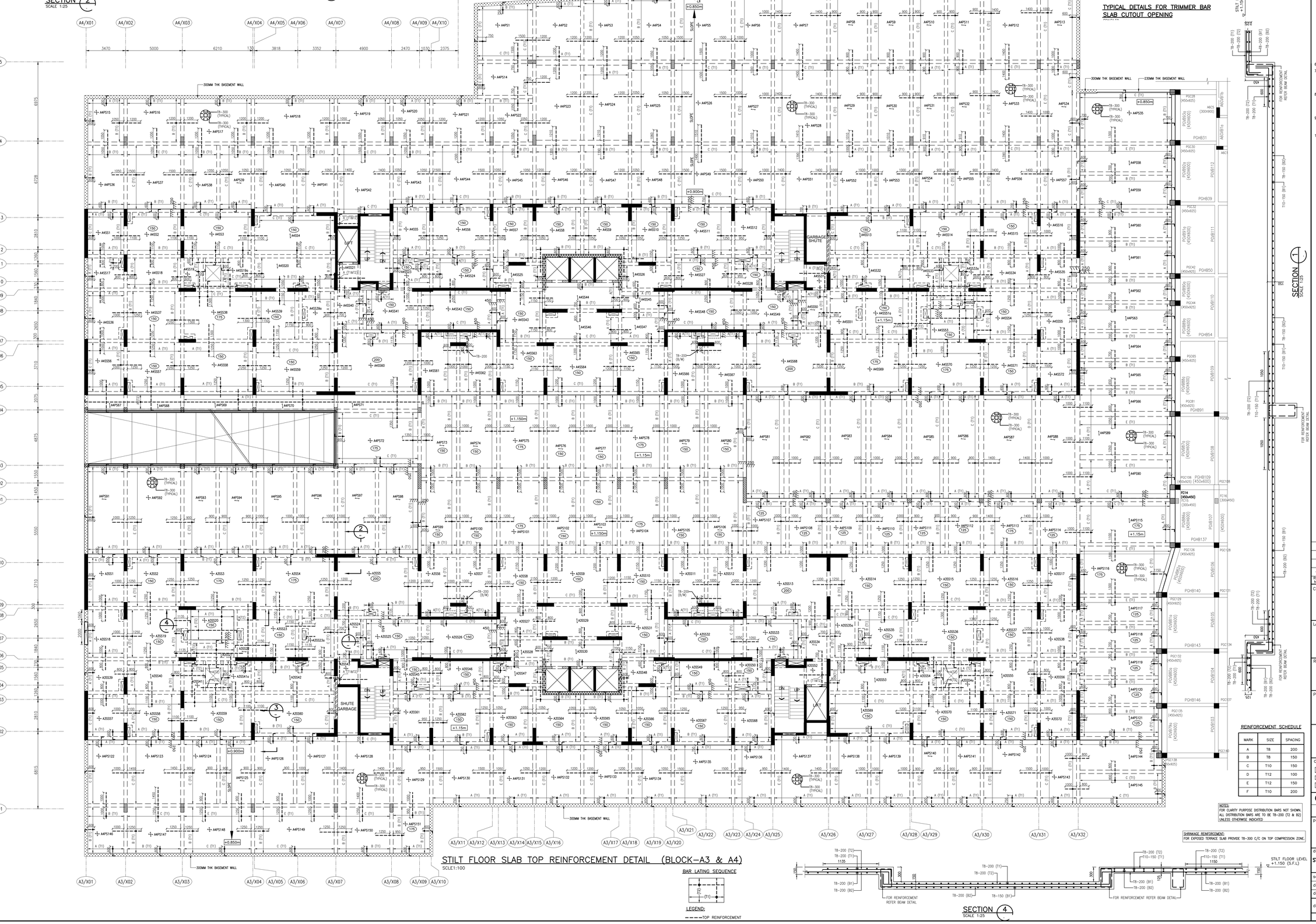
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SECTION 2
SCALE 1:25



SECTION 3
SCALE 1:25

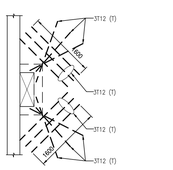


STILT FLOOR SLAB TOP REINFORCEMENT DETAIL (BLOCK-A3 & A4)
SCLE1:100

BAR LATING SEQUENCE

LEGEND:
- - - - TOP REINFORCEMENT

SECTION 4
SCALE 1:25



TYPICAL DETAILS FOR TRIMMER BAR SLAB CUTOUT OPENING

NOTES

UNLESS OTHERWISE SPECIFIED

1. CONCRETE GRADE:
   SLAB = M35.
   BEAM = M35.
2. GRADE OF STEEL Fe500
3. ALL THE TOWER SLABS SHALL BE 125mm THICK.
4. ALL THE TOWER BEAMS ARE TO BE 300X450mm.
5. ALL THE TOWER COLUMNS ARE TO BE 300X1500mm.
6. ALL THE PODIUM BEAMS ARE TO BE 300X600mm.
7. ALL THE PODIUM SLAB ARE TO BE 200mm.
8. ALL SUNKEN AREA SHALL BE FILLED USING CINDER.

NOTES:

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FOOTINGS	: M35
BASEMENT WALL	: M35
BASEMENT SLAB	: M35
COLUMNS	: M35
STILT FLOOR RC BEAMS/SLABS	: M35
FIRST FLOOR (LANDSCAPE PODIUM) RC BEAMS/SLABS	: M35
TOWERS	
RAFT SLAB	: M35
COLUMN	: M40
FIRST FLOOR LEVEL TRANSFER BEAM/SLAB	: M35
SHEAR WALL (UPTO 11TH FLOOR)	: M40
RC BEAMS/SLABS	: M30
SHEAR WALL (ABOVE 11TH FLOOR)	: M30
RC BEAMS/SLABS	: M30

APPROVED DESIGN MIX SHALL BE ADOPTED IN CONSTRUCTION

FOR ALUMINIUM FORM WORK (FOR BLOCKS A3 & A4 SUPER STRUCTURE) SELF COMPACTING CONCRETE (SCC) SHALL BE USED. DESIGN MIX WITH WORKABILITY AND STRENGTH REPORT SHALL BE SUBMITTED FOR REVIEW & APPROVAL.

6. STEEL GRADE: Fe550 CONFORMING TO IS:1786-2008.
7. CLEAR COVER FOR FOOTINGS-60MM, COLUMN-40mm, SLAB-25mm, BEAM-30mm, RAFT-60mm.
   300MM THICK RC WALL - 40mm
   200MM THICK RC WALL - 30mm
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10. ONUS OF CONSTRUCTION LIES WITH CONTRACTOR/ PROMOTER / BUILDER / OWNER.

REINFORCEMENT SCHEDULE

MARK	SIZE	SPACING
A	T8	200
B	T8	150
C	T10	150
D	T12	100
E	T12	150
F	T10	200

NOTES:
FOR CLARITY PURPOSE DISTRIBUTION BARS NOT SHOWN. ALL DISTRIBUTION BARS ARE TO BE T8-200 (T2 & B2) UNLESS OTHERWISE INDICATED.

SHRINKAGE REINFORCEMENT:
FOR EXPOSED TERRACE SLAB PROVIDE T8-300 C/C ON TOP COMPRESSION ZONE

REV. NO.		BY	DATE
-	CONSTRUCTION DRAWING	D.P	12/3/2022
	AMENDMENTS	BY	DATE

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web site: www.navinhousing.com

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PH: 9444023504 E-Mail: anbu_mani@vsnl.net

Civil & Structural Engineer :
BURO ENGINEERS (I) PRIVATE LTD.
Civil & Structural Consultants
New No. 31, Old No. 14, Besant Avenue, Adyar, Chennai - 600 020. 4044-2497 2754/5556, e-Mail ID: buroindia@burroengineers.in

CONSTRUCTION DRAWING

STRUCTURAL

project title

STARWOOD TOWERS PHASE-III

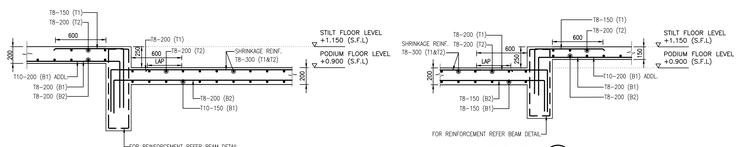
drawing title

STILT FLOOR SLAB REINFORCEMENT DETAILS (TOP) (BLOCK-A3 & A4) (SHEET 2 OF 2)

scale	AS SHOWN	design by	SIVA
drawn by	D.P	checked by	MP
date	APR 2013	approved by	AP
drawing no.	BE1286_S-/SB/S/A3&A4/02	revision	-

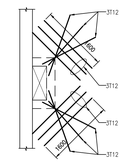
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SECTION 2
SCALE 1:25

SECTION 3
SCALE 1:25

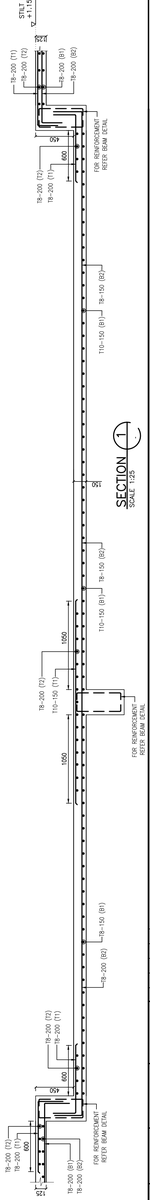


TYPICAL DETAILS FOR TRIMMER BAR SLAB CUTOUT OPENING
SCALE1:50

NOTES

UNLESS OTHERWISE SPECIFIED

1. CONCRETE GRADE:
   SLAB = M35,
   BEAM = M35.
2. GRADE OF STEEL Fe500
3. ALL THE TOWER SLABS SHALL BE 125mm THICK.
4. ALL THE TOWER BEAMS ARE TO BE 300X450mm.
5. ALL THE TOWER COLUMNS ARE TO BE 300X1500mm.
6. ALL THE PODIUM BEAMS ARE TO BE 300X600mm.
7. ALL THE PODIUM SLAB ARE TO BE 200mm.
8. ALL SUMKEN AREA SHALL BE FILLED USING CINDER.



SECTION 1
SCALE 1:25

NOTES:

1. ALL DIMENSIONS ARE IN MM
2. FOR GENERAL NOTES REFER TO DWG. NO. BE0286_S-/NT/---/01.
3. FOR STANDARD DETAILS REFER TO DWG. NO. BE0286_S-/SD/---/01.
4. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE KEY PLAN, ARCHITECTURAL AND ALL OTHER RELEVANT SERVICES DRAWINGS.
5. CONCRETE GRADE:

PODIUM / EXTENDED BASEMENT	
FOOTINGS	: M35
BASEMENT WALL	: M35
BASEMENT SLAB	: M35
COLUMNS	: M35
STILT FLOOR RC BEAMS/SLABS	: M35
FIRST FLOOR (LANDSCAPE PODIUM) RC BEAMS/SLABS	: M35
TOWERS	
RAFT SLAB	: M35
COLUMN	: M40
FIRST FLOOR LEVEL TRANSFER BEAM/SLAB	: M35
SHEAR WALL (UPTO 11TH FLOOR) : RC BEAMS/SLABS	M40 / M30
SHEAR WALL (ABOVE 11TH FLOOR) : RC BEAMS/SLABS	M30 / M30

APPROVED DESIGN MIX SHALL BE ADOPTED IN CONSTRUCTION

FOR ALUMINIUM FORM WORK (FOR BLOCKS A3 & A4 SUPER STRUCTURE) SELF COMPACTING CONCRETE (SCC) SHALL BE USED. DESIGN MIX WITH WORKABILITY AND STRENGTH REPORT SHALL BE SUBMITTED FOR REVIEW & APPROVAL.

6. STEEL GRADE: Fe550 CONFORMING TO IS:1786–2008.
7. CLEAR COVER FOR FOOTINGS–60MM, COLUMN–40mm, SLAB–25mm, BEAM–30mm, RAFT–60mm.
   300MM THICK RC WALL – 40mm
   200MM THICK RC WALL – 30mm
8. SEISMIC LOAD HAS BEEN CONSIDERED AS PER IS:16700–2017 & 1893–2016 WITH THE SEISMIC ZONE III, DUCTILE DESIGN & DETAILING CARRIED OUT AS PER THE STIPULATIONS MADE IN IS:13920–2016.
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STILT FLOOR SLAB BOTTOM REINFORCEMENT DETAIL (BLOCK–A3 & A4)
SCLE1:100

A (B1) – T8–200 (B1 & B2) IN ALL TOWER SLAB THROUGHOUT
A (B2)

LEGEND:
——— BOTTOM REINFORCEMENT

BAR LATING SEQUENCE

SECTION 4
SCALE 1:25

REINFORCEMENT SCHEDULE

MARK	SIZE	SPACING
A	T8	200
B	T8	150
C	T10	150
D	T12	100
E	T12	150
F	T10	200

–	CONSTRUCTION DRAWING	D.P	12/3/2022
REV. NO.	AMENDMENTS	BY	DATE

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CONSTRUCTION DRAWING
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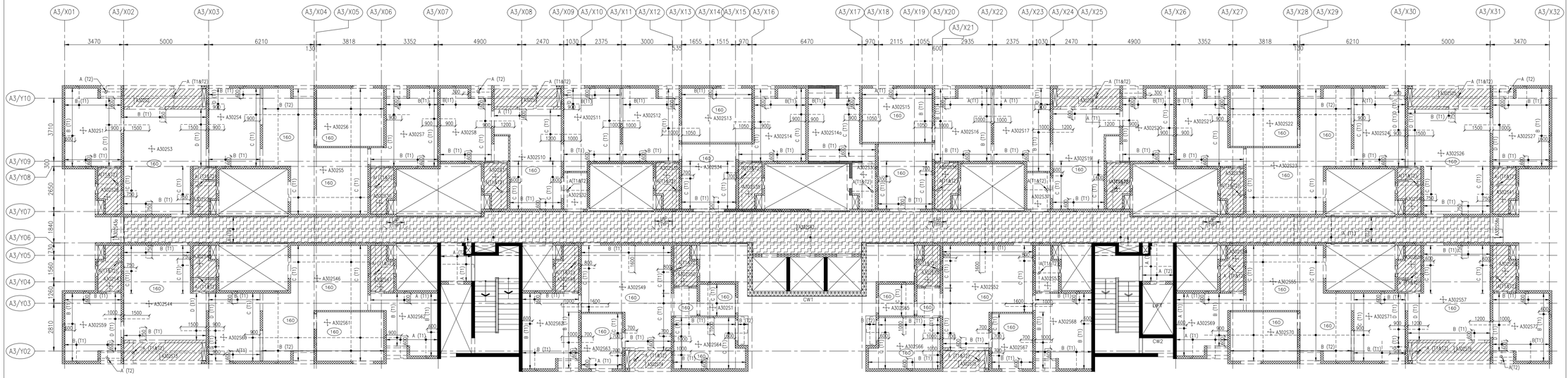
project title
STARWOOD TOWERS PHASE-III

drawing title
STILT FLOOR SLAB REINFORCEMENT DETAILS (BOTTOM) (BLOCK–A3 & A4) (SHEET 1 OF 2)

scale	AS SHOWN	design by	SVA
drawn by	D.P	checked by	MP
date	APR 2013	approved by	AP
drawing no.	BE1286_S-/SB/S/A3&A4/01	revision	–

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CAD FILE NAME: BE0286_S-SBSA3A01_.dwg



2ND FLOOR SLAB REINFT.DETAILS (TOP) (BLOCK-A3)

SCLE1:125

NOTES

UNLESS OTHERWISE SPECIFIED
CONCRETE GRADE:
SHEAR WALL : M40 (UPTO 11TH FLOOR)
SHEAR WALL : M30 (ABOVE 11TH FLOOR)
BEAM : M30
SLAB : M30

2. GRADE OF STEEL Fe550
3. ALL THE TOWER SLABS SHALL BE 125mm THICK.
4. ALL THE TOWER BEAMS ARE TO BE 200X600mm.
5. ALL SUNKEN AREA SHALL BE FILLED USING CINDER.

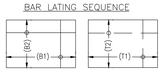
- 300mm THICK RC WALL
- 200mm THICK RC WALL
- 200mm THICK LOAD BEARING WALL
- 170mm THICK LOAD BEARING WALL
- 100mm THICK NON LOAD BEARING WALL
- 160mm THICK NON LOAD BEARING WALL
- 75THK RCC WALL
- SUNK BY 75mm.
- SUNK BY 50mm.
- NON STRUCTURAL WALL 200MM THICK
- 100mm THICK NON LOAD BEARING WALL LOW WALL UPTO 1450mm HT.

REINFORCEMENT SCHEDULE

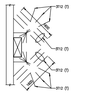
MARK	SIZE	SPACING
A	T8	200
B	T10	200
C	T10	150
D	T10	100

NOTES:
FOR CLARITY PURPOSE DISTRIBUTION BARS NOT SHOWN, ALL DISTRIBUTION BARS ARE TO BE T8-200 (T2 & B2) UNLESS OTHERWISE INDICATED

BAR LATING SEQUENCE



LEGEND:
——— BOTTOM REINFORCEMENT
— — TOP REINFORCEMENT



TYPICAL DETAILS FOR TRIMMER BAR SLAB CUTOUT OPENING

NOTES:

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5. CONCRETE GRADE:

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FOOTINGS	: M35
BASEMENT WALL	: M35
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COLUMNS	: M35
STILT FLOOR RC BEAMS/SLABS	: M35
FIRST FLOOR (LANDSCAPE PODIUM) RC BEAMS/SLABS	: M35

TOWERS		
BASEMENT SLAB	: M35	
COLUMN	: M40	
FIRST FLOOR LEVEL TRANSFER BEAM/SLAB	: M35	
SHEAR WALL (UPTO 11TH FLOOR) RC BEAMS/SLABS	: M40	HPC
SHEAR WALL (ABOVE 11TH FLOOR) RC BEAMS/SLABS	: M30	HPC

APPROVED DESIGN MIX SHALL BE ADOPTED IN CONSTRUCTION FOR ALUMINUM FORM WORK (FOR BLOCKS A3 & A4 SUPER STRUCTURE) HIGH FLOW CONCRETE (HFC) SHALL BE USED. DESIGN MIX WITH WORKABILITY AND STRENGTH REPORT SHALL BE SUBMITTED FOR REVIEW & APPROVAL.

6. STEEL GRADE: Fe550 CONFORMING TO IS:1786-2008.
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E-mail : anandarchitects@gmail.com

PLUMBING CONSULTANTS

" PRISM "
No.135/2, 11th CROSS, 1st FLOOR, OPPOSITE TO MAHAVEER MEDICAL MALLESWARAM, BANGALORE-560003.

ELECTRICAL CONSULTANTS

MADRAS ELECTRICAL CONSULTANTS
23, PARK AVANUE, 2ND CROSS STREET,
BABY NAGAR, VELACHERRY, CHENNAI – 42
PH: 9444023054 E-Mail: anbu_mani@vsnl.net

Civil & Structural Engineer :

BURO ENGINEERS (I) PRIVATE LTD.
Civil & Structural Consultants
New No. 31, Old No. 14, Besant Avenue, Adyar, Chennai - 600 020. 8044-2491 2754/55/56,
e-Mail ID: buroindia@buroengineers.in

CONSTRUCTION DRAWING

STRUCTURAL

project title

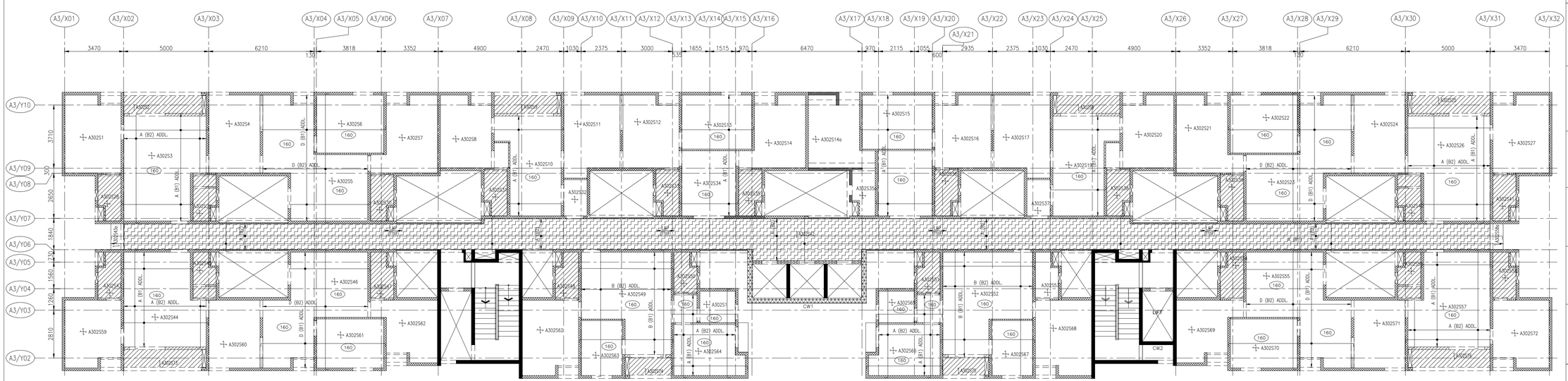
STARWOOD TOWERS PHASE-III

drawing title
2ND FLOOR SLAB REINFT.DETAILS (TOP&BOTTOM) (BLOCK-A3)

scale	AS SHOWN	design by	MSK
drawn by	RLM	checked by	AP
date	APR 2013	approved by	AP
drawn no.	BEI286_S-/SB/02/A3/01	revision	–

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CAD FILE NAME: BEI286_S-SB02-A3-01.dwg



2ND FLOOR SLAB REINFT.DETAILS (BOTTOM) (BLOCK-A3)

SCLE1:125



– T8-200 (B1 & B2) IN ALL TOWER SLAB THROUGHOUT

NOTES

UNLESS OTHERWISE SPECIFIED
CONCRETE GRADE:
SHEAR WALL : M40 (UPTO 11TH FLOOR)
SHEAR WALL : M30 (ABOVE 11TH FLOOR)
BEAM : M30
SLAB : M30

2. GRADE OF STEEL Fe550
3. ALL THE TOWER SLABS SHALL BE 125mm THICK.
4. ALL THE TOWER BEAMS ARE TO BE 200X600mm.
5. ALL SUNKEN AREA SHALL BE FILLED USING CINDER.

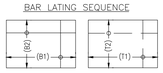
- 300mm THICK RC WALL
- 200mm THICK RC WALL
- 200mm THICK LOAD BEARING WALL
- 170mm THICK LOAD BEARING WALL
- 100mm THICK NON LOAD BEARING WALL
- 160mm THICK NON LOAD BEARING WALL
- 75THK RCC WALL
- SUNK BY 75mm.
- SUNK BY 50mm.
- NON STRUCTURAL WALL 200MM THICK
- 100mm THICK NON LOAD BEARING WALL LOW WALL UPTO 1450mm HT.

REINFORCEMENT SCHEDULE

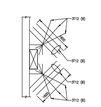
MARK	SIZE	SPACING
A	T8	200
B	T10	200
C	T10	150
D	T10	100

NOTES:
FOR CLARITY PURPOSE DISTRIBUTION BARS NOT SHOWN, ALL DISTRIBUTION BARS ARE TO BE T8-200 (T2 & B2) UNLESS OTHERWISE INDICATED

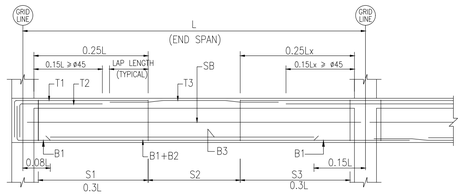
BAR LATING SEQUENCE



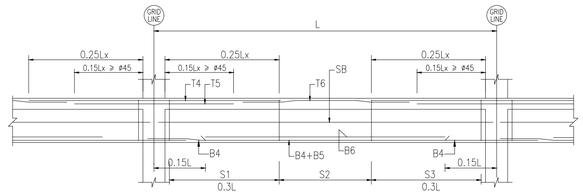
LEGEND:
——— BOTTOM REINFORCEMENT
— — TOP REINFORCEMENT



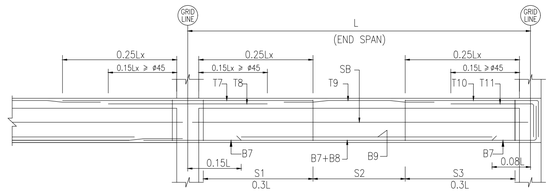
TYPICAL DETAILS FOR TRIMMER BAR SLAB CUTOUT OPENING



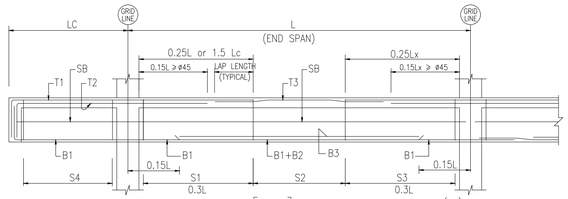
END SPAN BEAM [LHS] (1)



INTERMEDIATE SPAN BEAM (2)



END SPAN BEAM [RHS] (3)

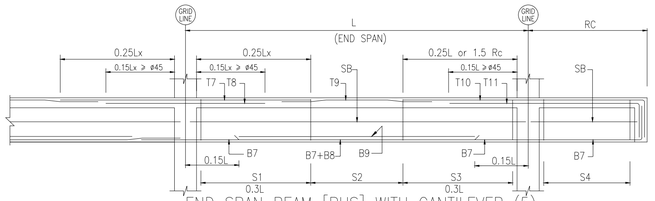


END SPAN BEAM [LHS] WITH CANTILEVER (4)

LEGEND

L —— LENGTH OF SPAN UNDER CONSIDERATION
La —— LENGTH OF ADJACENT SPAN TO THE SPAN UNDER CONSIDERATION
Lc —— LENGTH OF LEFT END CANTILEVER
Rc —— LENGTH OF RIGHT END CANTILEVER
(1) —— CATEGORY

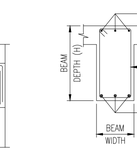
Lx = Length of span under consideration or Length of adjacent span whichever is greater



END SPAN BEAM [RHS] WITH CANTILEVER (5)

SHEET-1

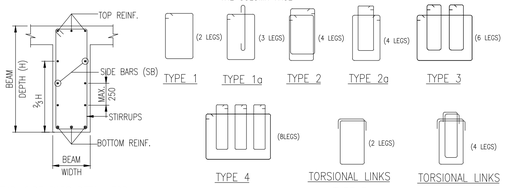
LOCATION			SIZE		SPAN			REINFORCEMENT																			SIDE BAR (EACH FACE)	STIRRUPS					REMARKS
BEAM MARKING	CATEGORY	GRID LINE OR BEAM MARK	WIDTH (mm)	DEPTH (mm)	LEFT END CANTILEVER Lc	SPAN (APPROX) L	RIGHT END CANTILEVER Rc	LEFT END SPAN						INTERMEDIATE SPAN						RIGHT END SPAN														
								T1	T2	T3	B1	B2	B3	T4	T5	T6	B4	B5	B6	T7	T8	T9	T10	T11	B7	B8	B9	SB	S1	S2	S3	S4	TYPE	
A302HB1	1	–	200	600	–	1500	–	2T16+2T16⊛	–	2T16+2T16⊛	2T16+2T16⊛	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	T10–100	T10–100	T10–100	–	1	SIMILAR BEAMS A302HB7,79
A302HB2	2	–	200	750	–	5050	–	–	–	–	–	–	–	2T16+2T16⊛	–	2T16+2T16⊛	2T16+2T16⊛	–	–	–	–	–	–	–	–	–	–	2T10	T8–100	T8–100	T8–100	–	1	SIMILAR BEAMS A302HB8,80
A302HB3	3	–	170	900	–	1400	–	–	–	–	–	–	–	–	–	–	–	–	–	2T16+2T16⊛	–	2T16+2T16⊛	2T16+2T16⊛	–	2T16+2T16⊛	–	–	2T10	T12–100	T12–100	T12–100	–	1	SIMILAR BEAMS A302HB9,81
A302HB5	1	–	170	600	–	1100	–	2T16+2T16⊛	–	2T16+2T16⊛	2T16+2T16⊛	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	T10–100	T10–100	T10–100	–	1	SIMILAR BEAMS A302HB11
A302HB6	3	–	200	600	–	1400	–	–	–	–	–	–	–	–	–	–	–	–	–	2T16+2T16⊛	–	2T16+2T16⊛	2T16+2T16⊛		2T16+2T16⊛	–	–	–	T12–125	T12–125	T12–125	–	1	SIMILAR BEAMS A302HB12
A302HB18	1	–	200	600	–	1400	–	2T16+2T16⊛	–	2T16+2T16⊛	2T16+2T16⊛	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	T12–100	T12–100	T12–100	–	1	
A302HB19	3	–	170	600	–	1500	–	–	–	–	–	–	–	–	–	–	–	–	–	2T16+2T16⊛	–	2T16+2T16⊛	2T16+2T16⊛	–	2T16+2T16⊛	–	–	–	T10–100	T10–100	T10–100	–	1	
A302HB15	1	–	170	900	–	1400	–	2T16+2T16⊛	–	2T16+2T16⊛	2T16+2T16⊛	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2T10	T10–100	T10–100	T10–100	–	1	SIMILAR BEAMS A302HB21,92
A302HB16	2	–	200	750	–	4200	–	–	–	–	–	–	–	2T16+2T16⊛	–	2T16+2T16⊛	2T16+2T16⊛	–	–	–	–	–	–	–	–	–	–	2T10	T10–100	T10–150	T10–100	–	1	SIMILAR BEAMS A302HB22,93
A302HB17	3	–	200	600	–	1400	–	–	–	–	–	–	–	–	–	–	–	–	–	2T16+2T16⊛	–	2T16+2T16⊛	2T16+2T16⊛	–	2T16+2T16⊛	–	–	–	T10–100	T10–100	T10–100	–	1	SIMILAR BEAMS A302HB23,94
A302HB38	1	–	200	600	–	2600	–	2T16	–	2T16	2T16	–	2T16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	T8–100	T8–200	T8–100	–	1	
A302HB39	2	–	170	900	–	1550	–	–	–	–	–	–	–	2T16	–	2T16	2T16	–	–	–	–	–	–	–	–	–	–	2T10	T8–100	T8–100	T8–100	–	1	
A302HB40	2	–	200	600	–	450	–	–	–	–	–	–	–	2T16	–	2T16	2T16	–	–	–	–	–	–	–	–	–	–	–	T8–100	T8–100	T8–100	–	1	
A302HB41	3	–	200	600	–	1600	–	–	–	–	–	–	–	–	–	–	–	–	–	2T16	–	2T16	2T16	–	2T16	–	–	–	T8–100	T8–100	T8–100	–	1	
A302HB43	1	–	200	600	–	2000	–	2T16	–	2T16	2T16	–	2T16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	T8–100	T8–100	T8–100	–	1	
A302HB44	3	–	170	900	–	1200	–	–	–	–	–	–	–	–	–	–	–	–	–	2T16	–	2T16	2T16	–	2T16	–	–	2T10	T12–125	T12–125	T12–125	–	1	
A302HB56	1	–	200	550	–	2200	–	2T16	–	2T16	2T16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	T8–100	T8–150	T8–100	–	1	
A302HB57	2	–	200	550	–	2200	–	–	–	–	–	–	–	2T16	–	2T16	2T16	–	–	–	–	–	–	–	–	–	–	–	T8–100	T8–150	T8–100	–	1	
A302HB58	3	–	200	550	–	2200	–	–	–	–	–	–	–	–	–	–	–	–	–	2T16	–	2T16	2T16	–	2T16	–	–	–	T8–100	T8–150	T8–100	–	1	
A302HB50	1	–	200	600	–	1600	–	2T16	–	2T16	2T16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	T8–100	T8–100	T8–100	–	1	
A302HB51	2	–	200	600	–	450	–	–	–	–	–	–	–	2T16	–	2T16	2T16	–	–	–	–	–	–	–	–	–	–	–	T8–100	T8–100	T8–100	–	1	
A302HB52	2	–	170	900	–	1550	–	–	–	–	–	–	–	2T16	–	2T16	2T16	–	–	–	–	–	–	–	–	–	–	2T10	T8–100	T8–100	T8–100	–	1	
A302HB53	3	–	200	600	–	2600	–	–	–	–	–	–	–	–	–	–	–	–	–	2T16	–	2T16	2T16	–	2T16	–	2T16	–	T8–100	T8–200	T8–100	–	1	
A302HB84	1	–	200	600	–	1200	–	2T16	–	2T16	2T16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	T8–100	T8–100	T8–100	–	1	
A302HB85	2	–	170	900	–	1800	–	–	–	–	–	–	–	2T16	2T16	2T16	2T16	–	–	–	–	–	–	–	–	–	–	2T10	T10–100	T10–100	T10–100	–	1	
A302HB86	3	–	200	750	–	2800	–	–	–	–	–	–	–	–	–	–	–	–	–	2T16	–	2T16	2T16	2T16	2T16	–	2T16	2T10	T10–100	T10–100	T10–100	–	1	
A302HB87	1	–	200	750	–	2800	–	2T16	2T16	2T16	2T16	–	2T16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2T10	T10–100	T10–100	T10–100	–	1	
A302HB88	2	–	170	900	–	1800	–	–	–	–	–	–	–	2T16	–	2T16	2T16	–	–	–	–	–	–	–	–	–	–	2T10	T10–100	T10–100	T10–100	–	1	
A302HB89	3	–	200	600	–	1200	–	–	–	–	–	–	–	–	–	–	–	–	–	2T16	–	2T16	2T16	2T16	2T16	–	–	–	T10–100	T10–100	T10–100	–	1	
A302VB9	1	–	170	600	–	2000	–	2T16	–	2T16	2T16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	T10–100	T10–100	T10–100	–	1	SIMILAR BEAMS A302VB63
A302VB10	3	–	170	600	–	1200	–	–	–	–	–	–	–	–	–	–	–	–	–	2T16	–	2T16	2T16	–	2T16	–	–	–	T10–100	T10–100	T10–100	–	1	SIMILAR BEAMS A302VB64
MARKING BEAM	CATEGORY	BEAM MARK OR GRID LINE	(mm) WIDTH	(mm) DEPTH	Lc CANTILEVER LEFT END	L (APPROX) SPAN	Rc CANTILEVER RIGHT END	T1	T2	T3	B1	B2	B3	T4	T5	T6	B4	B5	B6	T7	T8	T9	T10	T11	B7	B8	B9	SB	S1	S2	S3	S4	TYPE	REMARKS
LOCATION			SIZE		SPAN			LEFT END SPAN						INTERMEDIATE SPAN						RIGHT END SPAN								BAR SIDE	STIRRUPS					
								REINFORCEMENT																										



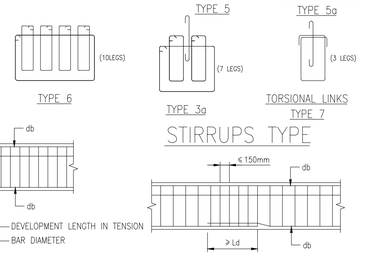
TYP. BEAM SECTION

NOTES :

1. FOR GENERAL NOTES REFER TO DWG. NO. BEI286_S–/NT/–-/01
2. FOR STANDARD DETAILS REFER TO DWG. NO. BEI286_S–/SD/–-/01
3. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE KEY PLAN AND ALL OTHER RELEVANT DRAWINGS.
4. IF THE REINFORCEMENT IS PROVIDED IN TWO LAYERS OR MORE, THEN SPACER BARS BETWEEN THE LAYERS NEED TO BE PROVIDED
5. SPACER BARS TO BE Y25 OR MAIN BAR SIZE (WHICHEVER IS GREATER) AT 900c/c BETWEEN EACH LAYER OF MAIN STEEL.
6. THE SPAN LENGTH INDICATED ARE NOT TO BE USED FOR SETTING OUT OR MEASUREMENT.
7. IF SAME SIZE OF THE REINFORCEMENT BARS IS INDICATED THROUGHOUT FOR BOTTOM OR TOP REINFORCEMENT, THE LAP PROVIDED FOR THE REINFORCEMENT CAN BE OMITTED BY PROVIDING STRAIGHT BARS FOR THE WHOLE LENGTH OF THE BEAM
8. LAP LENGTH FOR BARS SHOULD BE SAME AS TENSION ANCHORAGE LENGTH BASED UPON THE LARGER BAR DIAMETER FOR UNEQUAL SIZE OF BARS
9. FIRST STIRRUP OF BEAM SHOULD BE 50mm (MAXIMUM) FROM THE COLUMN FACE



TYP. SIDE BARS DETAIL FOR BEAM DEPTH > 750



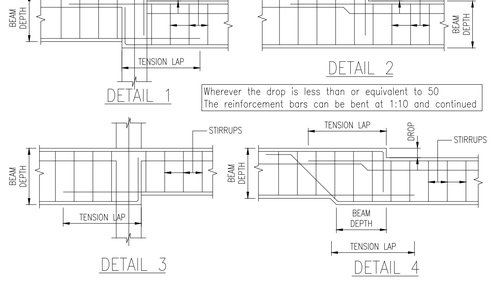
ANCHORAGE OF BEAM BARS AT BEAM AND COLUMN JUNCTION (EXTERNAL JOINT)

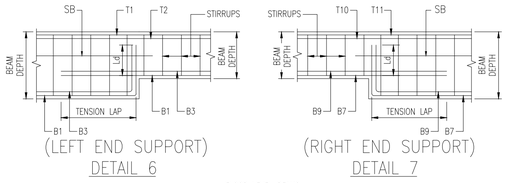
NOTE:
IN AN INTERNAL JOINT, BOTH TOP & BOTTOM BARS OF THE BEAM SHALL BE TAKEN CONTINUOUSLY THROUGH THE COLUMN

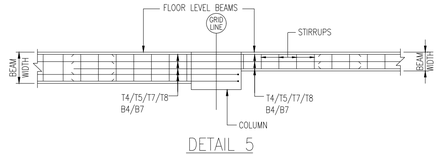
STIRRUPS TYPE

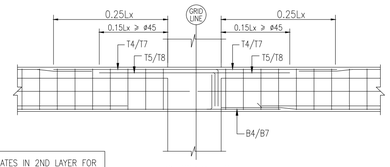
LAP/SPLICE IN BEAM

NOTE:
NOT MORE THAN 50 PERCENT OF THE BARS SHALL BE SPLICED AT ONE SECTION









⊛ INDICATES IN 2ND LAYER FOR FULL LENGTH OF BEAM

NOTES:

1. ALL DIMENSIONS ARE IN MM
2. FOR GENERAL NOTES REFER TO DWG. NO. BEI286_S–/NT/–-/01.
3. FOR STANDARD DETAILS REFER TO DWG. NO. BEI286_S–/SD/–-/01.
4. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE KEY PLAN, ARCHITECTURAL AND ALL OTHER RELEVANT SERVICES DRAWINGS.
5. CONCRETE GRADE:

PODIUM / EXTENDED BASEMENT	
FOOTINGS	: M35
BASEMENT WALL	: M35
BASEMENT SLAB	: M35
COLUMNS	: M35
STILT FLOOR RC BEAMS/SLABS	: M35
FIRST FLOOR (LANDSCAPE PODIUM) RC BEAMS/SLABS	: M35
TOWERS	
BASEMENT SLAB	: M35
COLUMN	: M40
FIRST FLOOR LEVEL TRANSFER BEAM/SLAB	: M35
SHEAR WALL (UPTO 11TH FLOOR)	: M40
RC BEAMS/SLABS	: M40
SHEAR WALL (ABOVE 11TH FLOOR)	: M30
RC BEAMS/SLABS	: M30

HPC

APPROVED DESIGN MIX SHALL BE ADOPTED IN CONSTRUCTION

FOR ALUMINUM FORM WORK (FOR BLOCKS A3 & A4 SUPER STRUCTURE) HIGH FLOW CONCRETE (HFC) SHALL BE USED. DESIGN MIX WITH WORKABILITY AND STRENGTH REPORT SHALL BE SUBMITTED FOR REVIEW & APPROVAL.

6. STEEL GRADE: Fe550 CONFORMING TO IS:1786–2008.
7. CLEAR COVER FOR FOOTINGS–60MM, COLUMN–40mm, SLAB–25mm, BEAM–30mm, RAFT–60mm.
   300MM THICK RC WALL –40mm
   200MM THICK RC WALL –30mm
   170MM THICK RC WALL –30mm
8. SEISMIC LOAD HAS BEEN CONSIDERED AS PER IS:16700–2017 & 1893–2016 WITH THE SEISMIC ZONE III. DUCTILE DESIGN & DETAILING CARRIED OUT AS PER THE STIPULATIONS MADE IN IS:13920–2016.
9. STRUCTURE TO BE CONSTRUCTED IN ACCORDANCE WITH I.S.456–2000, NBC (SP7–1983) AND RELAVANT INDIAN CODE STIPULATIONS
10. ONUS OF CONSTRUCTION LIES WITH CONTRACTOR/ PROMOTER / BUILDER / OWNER.

REV. NO.	AMENDMENTS	BY	DATE
–	CONSTRUCTION DRAWING	RLM	25/05/2024

Client :

NAVIN'S

NAVIN HOUSING & PROPERTIES (P)LTD.
NAVIN'S Triumph
[Opposite to Cosmopolitan Golf Ground Annex, Near GR Complex] No. 802 & 804, Anna Salai, Nandanam, Chennai - 600 035 INDIA.
web site: www.navinhousing.com

LANDSCAPE CONSULTANTS

Resident Architect :

W.ANAND
2/154, EAST COAST ROAD, INJAMBAKKAM,CHENNAI - 600 041.
TEL : 65485655 FAX : 4211 4661
E-mail : anandarchitects@gmail.com

PLUMBING CONSULTANTS

" PRISM "
No.135/2, 11th CROSS, 1st FLOOR, OPPOSITE TO MAHAVEER MEDICAL MALLESWARAM, BANGALORE-560003.

ELECTRICAL CONSULTANTS

MADRAS ELECTRICAL CONSULTANTS
23, PARK AVANUE, 2ND CROSS STREET,
BABY NAGAR, VELACHERRY, CHENNAI – 42
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Civil & Structural Engineer :

BURO ENGINEERS (I) PRIVATE LTD.
Civil & Structural Consultants
New No. 31, Old No. 14, Besant Avenue, Adyar, Chennai - 600 020. ø044-2491 2754/55/56,
e-Mail ID: buroindia@buroengineers.in

CONSTRUCTION DRAWING

STRUCTURAL

project title

STARWOOD TOWERS PHASE-III

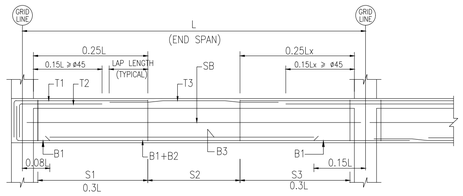
drawing title

2ND FLOOR BEAM SCHEDULE
(BLOCK–A3) (SHEET 01 OF 04)

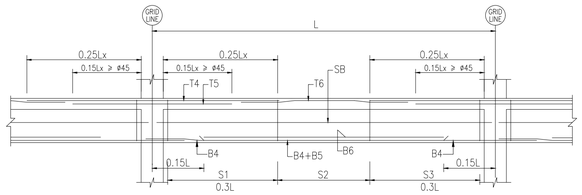
scale	AS SHOWN	design by	MSK
drawn by	RLM	checked by	AP
date	APR 2013	approved by	AP
drawing no.	BEI286_S–/BM/02/A3/01	revision	–

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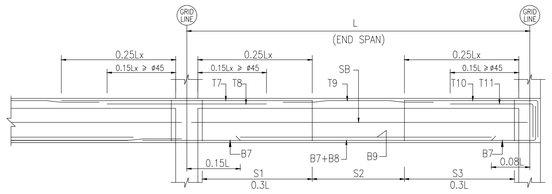
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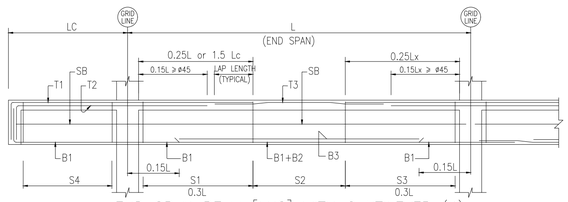
END SPAN BEAM [LHS] (1)



INTERMEDIATE SPAN BEAM (2)



END SPAN BEAM [RHS] (3)

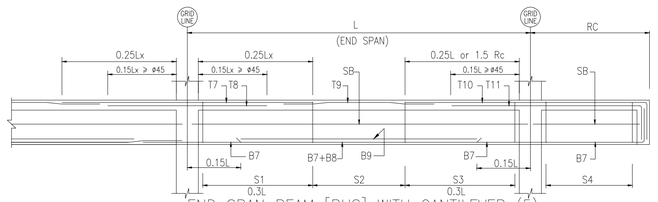


END SPAN BEAM [LHS] WITH CANTILEVER (4)

LEGEND

L —— LENGTH OF SPAN UNDER CONSIDERATION
La —— LENGTH OF ADJACENT SPAN TO THE SPAN UNDER CONSIDERATION
Lc —— LENGTH OF LEFT END CANTILEVER
Rc —— LENGTH OF RIGHT END CANTILEVER
(1) —— CATEGORY

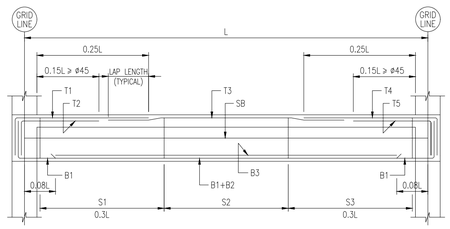
Lx = Length of span under consideration or Length of adjacent span whichever is greater



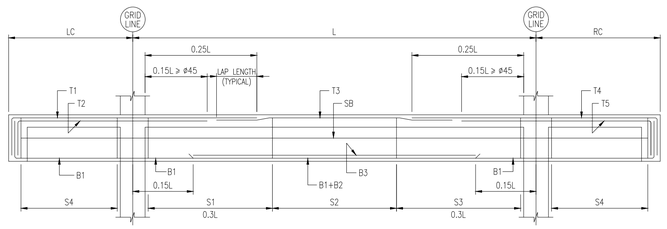
END SPAN BEAM [RHS] WITH CANTILEVER (5)

SHEET-1

LOCATION			SIZE		SPAN			REINFORCEMENT																				SIDE BAR (EACH FACE)	STIRRUPS					REMARKS
BEAM MARKING	CATEGORY	GRID LINE OR BEAM MARK	WIDTH (mm)	DEPTH (mm)	LEFT END CANTILEVER Lc	SPAN (APPROX) L	RIGHT END CANTILEVER Rc	LEFT END SPAN						INTERMEDIATE SPAN						RIGHT END SPAN																S1	S2	S3	S4	TYPE	
								T1	T2	T3	B1	B2	B3	T4	T5	T6	B4	B5	B6	T7	T8	T9	T10	T11	B7	B8	B9	SB						
A302VB9a	1	–	170	600	–	1200	–	2T16	–	2T16	2T16	–	2T12	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	T10–100	T10–100	T10–100	–	1	SIMILAR BEAMS A302VB28,47,65
A302VB10a	3	–	170	600	–	2000	–	–	–	–	–	–	–	–	–	–	–	–	–	2T16	–	2T16	2T16	–	2T16	–	–	–	T10–100	T10–100	T10–100	–	1	SIMILAR BEAMS A302VB29,48,66
A302VB21	1	–	170	600	–	1100	–	2T16	2T12	2T16	2T16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	T10–100	T10–100	T10–100	–	1	SIMILAR BEAMS A302VB32,53a,44a
A302VB22	3	–	170	900	–	1100	–	–	–	–	–	–	–	–	–	–	–	–	–	2T16	2T12	2T16	2T16	–	2T16	–	–	2T10	T10–100	T10–100	T10–100	–	1	SIMILAR BEAMS A302VB33,53,44
A302VB24	1	–	170	600	–	1600	–	2T16+ 2T16⊛	–	2T16+ 2T16⊛	2T16+ 2T16⊛	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	T8–100	T8–100	T8–100	–	1	SIMILAR BEAMS A302VB36,40,51
A302VB25	3	–	170	600	–	1400	–	–	–	–	–	–	–	–	–	–	–	–	–	2T16+ 2T16⊛	–	2T16+ 2T16⊛	2T16+ 2T16⊛	–	2T16+ 2T16⊛	–	–	–	T8–100	T8–100	T8–100	–	1	SIMILAR BEAMS A302VB37,41,52



TYPICAL DETAIL OF SINGLE SPAN BEAM (1)

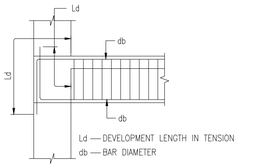


TYPICAL DETAIL OF SINGLE SPAN BEAM WITH CANTILEVERS (2)

L —— LENGTH OF SPAN UNDER CONSIDERATION
RC —— LENGTH OF RIGHT END CANTILEVER
LC —— LENGTH OF LEFT END CANTILEVER
(1) —— CATEGORY

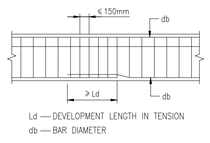
SHEET-3

LOCATION			SIZE		SPAN			REINFORCEMENT								SIDE BAR	STIRRUPS					REMARKS
								SPAN								(EACH FACE)						
BEAM MARKING	CATEGORY	GRID LINE OR BEAM MARK	WIDTH (mm)	DEPTH (mm)	LEFT END CANTILEVER Lc	SPAN (APPROX) L	RIGHT END CANTILEVER Rc	T1	T2	T3	T4	T5	B1	B2	B3	SB	S1	S2	S3	S4	TYPE	
A302HB4	1	–	200	600	–	1600	–	2T16+ 2T16⊛	–	2T16+ 2T16⊛	2T16+ 2T16⊛	–	2T16+ 2T16⊛	–	–	–	T12–100	T12–100	T12–100	–	1	SIMILAR BEAMS A302HB10,14,20,82,91
A302HB5a	1	–	170	600	–	1800	–	2T16+ 2T16⊛	–	2T16+ 2T16⊛	2T16+ 2T16⊛	–	2T16+ 2T16⊛	–	–	–	T8–100	T8–100	T8–100	–	1	
A302HB12a	1	–	450	750	–	3000	–	4T16+ 4T12⊛		4T16+ 4T12⊛	4T16+ 4T12⊛		4T16+ 4T16⊛			2T12	4T10–100	4T10–125	4T10–100	–	2a	
A302HB12b	1	–	450	750	–	3950	–	4T16+ 4T12⊛		4T16+ 4T12⊛	4T16+ 4T12⊛		4T16+ 4T16⊛			2T12	4T10–100	4T10–125	4T10–100	–	2a	
A302HB13	1	–	170	600	–	1200	–	2T16+ 2T12⊛	–	2T16+ 2T12⊛	2T16+ 2T12⊛	–	2T16+ 2T12⊛	–	–	–	T10–100	T10–100	T10–100	–	1	
A302HB24	1	–	100	600	–	1600	–	2T16	–	2T16	2T16	–	2T16	–	–	–	T8–100	T8–100	T8–100	–	1	SIMILAR BEAMS A302HB67,68,69,70,71, 72,73,74
A302HB24a	1	–	100	825	–	1525	–	2T16	–	2T16	2T16	–	2T16	–	–	2T10	T8–100	T8–100	T8–100	–	1	
A302HB25	1	–	160	600	–	5000	–	2T16	2T16	2T16	2T16	–	2T16	–	2T16	–	T8–100	T8–125	T8–100	–	1	SIMILAR BEAMS A302HB63,66
A302HB26	1	–	170	900	–	1700	–	2T16	–	2T16	2T16	–	2T16	–	–	2T10	T8–100	T8–100	T8–100	–	1	
A302HB26a	1	–	170	600	–	1525	–	2T16	–	2T16	2T16	–	2T16	–	–	–	T8–100	T8–100	T8–100	–	1	
A302HB27	1	–	170	900	–	1400	–	2T16+ 2T16⊛	–	2T16+ 2T16⊛	2T16+ 2T16⊛	–	2T16+ 2T16⊛	–	–	2T10	T10–100	T10–100	T10–100	–	1	SIMILAR BEAMS A302HB30,35,36,47,55
A302HB28	1	–	200	600	–	4400	–	2T16+ 2T16⊛	–	2T16+ 2T16⊛	2T16+ 2T16⊛	–	2T16+ 2T16⊛	–	–	–	T8–100	T8–150	T8–100	–	1	SIMILAR BEAMS A302HB34,37,54
A302HB29	1	–	200	600	–	5400	–	2T16+ 2T16⊛	–	2T16+ 2T16⊛	2T16+ 2T16⊛	–	2T16+ 2T16⊛	–	–	–	T8–100	T8–150	T8–100	–	1	SIMILAR BEAMS A302HB33
A302HB31	1	–	170	600	–	2400	–	2T16+ 2T16⊛	–	2T16+ 2T16⊛	2T16+ 2T16⊛	–	2T16+ 2T16⊛	–	–	–	T12–100	T12–100	T12–100	–	1	
A302HB32	1	–	170	900	–	1400	–	2T16+ 2T16⊛	–	2T16+ 2T16⊛	2T16+ 2T16⊛	–	2T16+ 2T16⊛	–	–	2T10	T12–100	T12–100	T12–100	–	1	
A302HB45	1	–	200	600	–	2800	–	2T16	–	2T16	2T16	–	2T16	–	–	–	T8–100	T8–150	T8–100	–	1	SIMILAR BEAMS A302HB46,48
A302HB42	1	–	170	600	–	1400	–	2T16	–	2T16	2T16	–	2T16	–	–	–	T8–100	T8–100	T8–100	–	1	SIMILAR BEAMS A302HB49
A302HB59	1	–	200	600	–	1800	–	2T16	–	2T16	2T16	–	2T16	–	–	–	T8–100	T8–100	T8–100	–	1	SIMILAR BEAMS A302HB60
A302HB61	1	–	100	900	–	1000	–	2T16	–	2T16	2T16	–	2T16	–	–	2T10	T8–100	T8–100	T8–100	–	1	SIMILAR BEAMS A302HB62
A302HB64	1	–	160	600	–	2900	–	2T16	–	2T16	2T16	–	2T16	–	–	–	T8–100	T8–150	T8–100	–	1	SIMILAR BEAMS A302HB65
A302HB75	1	–	200	600	–	1100	–	2T16	–	2T16	2T16	–	2T16	–	–	–	T8–100	T8–100	T8–100	–	1	SIMILAR BEAMS A302HB76
A302HB77	1	–	200	600	–	1400	–	2T16+ 2T16⊛	–	2T16+ 2T16⊛	2T16+ 2T16⊛	–	2T16+ 2T16⊛	–	–	–	T8–100	T8–100	T8–100	–	1	SIMILAR BEAMS A302HB78
A302HB83	1	–	170	600	–	1200	–	2T16	–	2T16	2T16	–	2T16	–	–	–	T10–100	T10–100	T10–100	–	1	SIMILAR BEAMS A302HB90
MARKING BEAM	CATEGORY	BEAM MARK OR GRID LINE	(mm) WIDTH	(mm) DEPTH	Lc CANTILEVER LEFT END	L (APPROX) SPAN	Rc CANTILEVER RIGHT END	T1	T2	T3	T4	T5	B1	B2	B3	SB	S1	S2	S3	S4	TYPE	REMARKS
LOCATION			SIZE		SPAN			REINFORCEMENT								BAR SIDE	STIRRUPS					



ANCHORAGE OF BEAM BARS AT BEAM AND COLUMN JUNCTION (EXTERNAL JOINT)

NOTE:
IN AN INTERNAL JOINT, BOTH TOP & BOTTOM BARS OF THE BEAM SHALL BE TAKEN CONTINUOUSLY THROUGH THE COLUMN

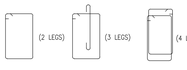


LAP/SPLICE IN BEAM

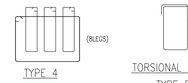
NOTE:
NOT MORE THAN 50 PERCENT OF THE BARS SHALL BE SPLICED AT ONE SECTION

NOTES :

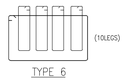
1. FOR GENERAL NOTES REFER TO DWG. NO. BEI286_S-/NT/--/01
2. FOR STANDARD DETAILS REFER TO DWG. NO. BEI286_S-/SD/--/01
3. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE KEY PLAN AND ALL OTHER RELEVANT DRAWINGS.
4. IF THE REINFORCEMENT IS PROVIDED IN TWO LAYERS OR MORE, THEN SPACER BARS BETWEEN THE LAYERS NEED TO BE PROVIDED
5. SPACER BARS TO BE Y25 OR MAIN BAR SIZE (WHICHEVER IS GREATER) AT 900c/c BETWEEN EACH LAYER OF MAIN STEEL.
6. THE SPAN LENGTH INDICATED ARE NOT TO BE USED FOR SETTING OUT OR MEASUREMENT.
7. IF SAME SIZE OF THE REINFORCEMENT BARS IS INDICATED THROUGHOUT FOR BOTTOM OR TOP REINFORCEMENT, THE LAP PROVIDED FOR THE REINFORCEMENT CAN BE OMITTED BY PROVIDING STRAIGHT BARS FOR THE WHOLE LENGTH OF THE BEAM
8. LAP LENGTH FOR BARS SHOULD BE SAME AS TENSION ANCHORAGE LENGTH BASED UPON THE LARGER BAR DIAMETER FOR UNEQUAL SIZE OF BARS
9. FIRST STIRRUP OF BEAM SHOULD BE 50mm (MAXIMUM) FROM THE COLUMN FACE



TYPE 1 TYPE 1a TYPE 2 TYPE 2a TYPE 3

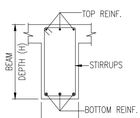


TYPE 4 TORSIONAL LINKS TYPE 5 TORSIONAL LINKS TYPE 5a

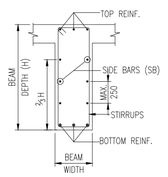


TYPE 6

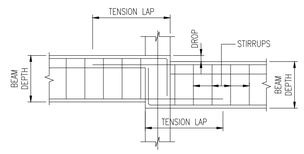
STIRRUPS TYPE



TYP. BEAM SECTION

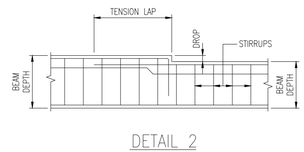


TYP. SIDE BARS DETAIL FOR BEAM DEPTH > 750

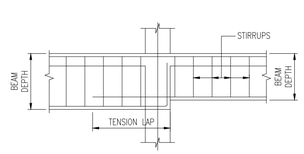


DETAIL 1

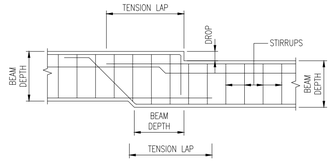
Wherever the drop is less than or equivalent to 50
The reinforcement bars can be bent at 1:10 and continued



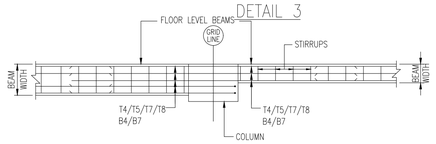
DETAIL 2



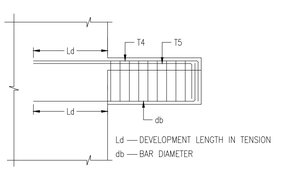
DETAIL 3



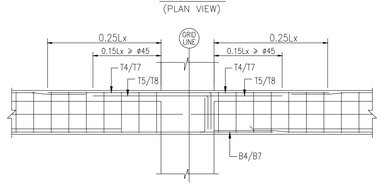
DETAIL 4



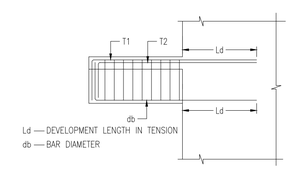
DETAIL 5
(PLAN VIEW)



DETAIL 7

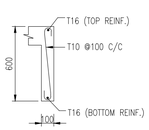


DETAIL 5
(SECTIONAL VIEW)



DETAIL 8

⊛ INDICATES IN 2ND LAYER FOR FULL LENGTH OF BEAM



TYP. BEAM SECTION (A302HB34)
(100X600)

NOTES:

1. ALL DIMENSIONS ARE IN MM
2. FOR GENERAL NOTES REFER TO DWG. NO. BEI286_S-/NT/--/01.
3. FOR STANDARD DETAILS REFER TO DWG. NO. BEI286_S-/SD/--/01.
4. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE KEY PLAN, ARCHITECTURAL AND ALL OTHER RELEVANT SERVICES DRAWINGS.
5. CONCRETE GRADE:

PODIUM / EXTENDED BASEMENT	
FOOTINGS	: M35
BASEMENT WALL	: M35
BASEMENT SLAB	: M35
COLUMNS	: M35
STILT FLOOR RC BEAMS/SLABS	: M35
FIRST FLOOR (LANDSCAPE PODIUM) RC BEAMS/SLABS	: M35
TOWERS	
BASEMENT SLAB	: M35
COLUMN	: M40
FIRST FLOOR LEVEL TRANSFER BEAM/SLAB	: M35
SHEAR WALL (UPTO 11TH FLOOR)	: M40
RC BEAMS/SLABS	: M40
SHEAR WALL (ABOVE 11TH FLOOR)	: M30
RC BEAMS/SLABS	: M30

HFC

APPROVED DESIGN MIX SHALL BE ADOPTED IN CONSTRUCTION FOR ALUMINUM FORM WORK (FOR BLOCKS A3 & A4 SUPER STRUCTURE) HIGH FLOW CONCRETE (HFC) SHALL BE USED. DESIGN MIX WITH WORKABILITY AND STRENGTH REPORT SHALL BE SUBMITTED FOR REVIEW & APPROVAL.

6. STEEL GRADE: Fe550 CONFORMING TO IS:1786–2008.
7. CLEAR COVER FOR FOOTINGS–60MM, COLUMN–40mm, SLAB–25mm, BEAM–30mm, RAFT–60mm.
   300MM THICK RC WALL –40mm
   200MM THICK RC WALL –30mm
   170MM THICK RC WALL –30mm
8. SEISMIC LOAD HAS BEEN CONSIDERED AS PER IS:16700–2017 & 1893–2016 WITH THE SEISMIC ZONE III. DUCTILE DESIGN & DETAILING CARRIED OUT AS PER THE STIPULATIONS MADE IN IS:13920–2016.
9. STRUCTURE TO BE CONSTRUCTED IN ACCORDANCE WITH I.S.456–2000, NBC (SP7–1983) AND RELAVANT INDIAN CODE STIPULATIONS
10. ONUS OF CONSTRUCTION LIES WITH CONTRACTOR/ PROMOTER / BUILDER / OWNER.

REV. NO.	AMENDMENTS	BY	DATE
–	CONSTRUCTION DRAWING	RLM	25/05/2024

Client :

NAVIN HOUSING & PROPERTIES (P)LTD.
NAVIN'S Triumph
[Opposite to Cosmopolitan Golf Ground Annex, Near GR Complex] No. 802 & 804, Anna Salai, Nandanam, Chennai - 600 035 INDIA.
web site: www.navinhousing.com

LANDSCAPE CONSULTANTS

Resident Architect :

W.ANAND
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PLUMBING CONSULTANTS

" PRISM "
No.135/2, 11th CROSS, 1st FLOOR, OPPOSITE TO MAHAVEER MEDICAL MALLESWARAM, BANGALORE-560003.

ELECTRICAL CONSULTANTS

MADRAS ELECTRICAL CONSULTANTS
23, PARK AVANUE, 2ND CROSS STREET, BABY NAGAR, VELACHERRY, CHENNAI – 42
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Civil & Structural Engineer :

BURO ENGINEERS (I) PRIVATE LTD.
Civil & Structural Consultants
New No. 31, Old No. 14, Besant Avenue, Adyar, Chennai - 600 020. ☎044-2491 2754/55/56,
e-Mail ID: buroindia@buroengineers.in

CONSTRUCTION DRAWING

STRUCTURAL

project title

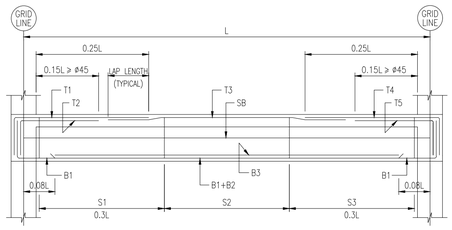
STARWOOD TOWERS PHASE-III

drawing title
2ND FLOOR BEAM SCHEDULE
(BLOCK–A3) (SHEET 03 OF 04)

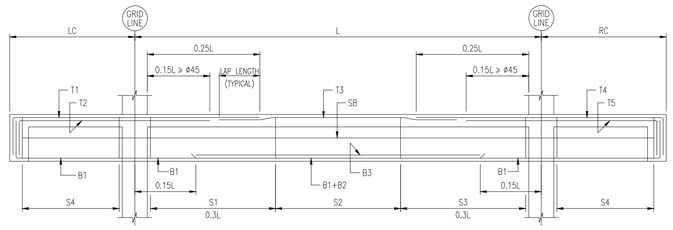
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drawn by	RLM	checked by	AP
date	APR 2013	approved by	AP
drawing no.	BEI286_S-/BM/02/A3/03	revision	–

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TYPICAL DETAIL OF SINGLE SPAN BEAM (1)

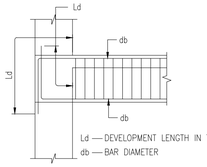


TYPICAL DETAIL OF SINGLE SPAN BEAM WITH CANTILEVERS (2)

L —— LENGTH OF SPAN UNDER CONSIDERATION
RC —— LENGTH OF RIGHT END CANTILEVER
LC —— LENGTH OF LEFT END CANTILEVER
(1) —— CATEGORY

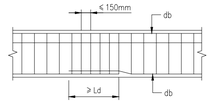
SHEET-3

LOCATION			SIZE		SPAN			REINFORCEMENT								SIDE BAR	STIRRUPS					REMARKS
BEAM MARKING	CATEGORY	GRID LINE OR BEAM MARK	WIDTH (mm)	DEPTH (mm)	LEFT END CANTILEVER Lc	SPAN (APPROX) L	RIGHT END CANTILEVER Rc	SPAN T1	T2	T3	T4	T5	B1	B2	B3	(EACH FACE) SB	S1	S2	S3	S4	TYPE	
A302VB1	1	–	170	750	–	1000	–	2T16+2T16⊛	–	2T16+2T16⊛	2T16+2T16⊛	–	2T16+2T16⊛	–	–	2T10	T10–100	T10–100	T10–100	–	1	SIMILAR BEAMS A302VB2,7,8,17,18,20, 23,30,35,39,43,50,55,56,67,68,71,72
A302VB3	1	–	170	900	–	1200	–	2T16+2T16⊛	–	2T16+2T16⊛	2T16+2T16⊛	–	2T16+2T16⊛	–	–	2T10	T10–100	T10–100	T10–100	–	1	SIMILAR BEAMS A302VB5,13,14, 26,27,34,38,42,46,49,59,60,69,70
A302VB6	1	–	170	600	–	1150	–	2T16	–	2T16	2T16	–	2T16	–	–	–	T10–100	T10–100	T10–100	–	1	
A302VB19	1	–	200	650	–	1200	–	2T16	–	2T16	2T16	–	2T16	–	–	–	T10–100	T10–100	T10–100	–	1	
A302VB19a	1	–	200	600	–	1600	–	2T16	–	2T16	2T16	–	2T16	–	–	–	T8–100	T8–100	T8–100	–	1	
A302VB4	1	–	170	600	–	1900	–	2T16+2T16⊛	–	2T16+2T16⊛	2T16+2T16⊛	–	2T16+2T16⊛	–	–	–	T10–100	T10–100	T10–100	–	1	SIMILAR BEAMS A302VB11,12,31,61,62, 45
A302VB39a	1	–	300	600	–	2800	–	3T16	–	3T16	3T16	–	3T25	–			3T12–100	3T12–125	3T12–100	–	1a	
A302VB16	2	–	170	900	–	–	1200	2T16+2T16⊛	–	2T16+2T16⊛	2T16+2T16⊛	–	2T16+2T16⊛	–	–	2T10	T10–100	T10–100	T10–100	–	1	SIMILAR BEAMS A302VB58
A302VB15	2	–	170	900	1200	–	–	2T16+2T16⊛	–	2T16+2T16⊛	2T16+2T16⊛	–	2T16+2T16⊛	–	–	2T10	T10–100	T10–100	T10–100	–	1	SIMILAR BEAMS A302VB57
MARKING BEAM	CATEGORY	BEAM MARK OR GRID LINE	(mm) WIDTH	(mm) DEPTH	Lc CANTILEVER LEFT END	L (APPROX) SPAN	RC CANTILEVER RIGHT END	SPAN T1	T2	T3	T4	T5	B1	B2	B3	BAR SIDE SB	STIRRUPS S1	S2	S3	S4	TYPE	REMARKS
LOCATION			SIZE		SPAN			REINFORCEMENT														



ANCHORAGE OF BEAM BARS AT BEAM AND COLUMN JUNCTION (EXTERNAL JOINT)

NOTE:
IN AN INTERNAL JOINT, BOTH TOP & BOTTOM BARS OF THE BEAM SHALL BE TAKEN CONTINUOUSLY THROUGH THE COLUMN

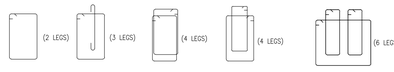


LAP/SPLICE IN BEAM

NOTE:
NOT MORE THAN 50 PERCENT OF THE BARS SHALL BE SPLICED AT ONE SECTION

NOTES :

1. FOR GENERAL NOTES REFER TO DWG. NO. BEI286_S-/NT/--/01
2. FOR STANDARD DETAILS REFER TO DWG. NO. BEI286_S-/SD/--/01
3. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE KEY PLAN AND ALL OTHER RELEVANT DRAWINGS.
4. IF THE REINFORCEMENT IS PROVIDED IN TWO LAYERS OR MORE, THEN SPACER BARS BETWEEN THE LAYERS NEED TO BE PROVIDED
5. SPACER BARS TO BE Y25 OR MAIN BAR SIZE (WHICHEVER IS GREATER) AT 900c/c BETWEEN EACH LAYER OF MAIN STEEL.
6. THE SPAN LENGTH INDICATED ARE NOT TO BE USED FOR SETTING OUT OR MEASUREMENT.
7. IF SAME SIZE OF THE REINFORCEMENT BARS IS INDICATED THROUGHOUT FOR BOTTOM OR TOP REINFORCEMENT, THE LAP PROVIDED FOR THE REINFORCEMENT CAN BE OMITTED BY PROVIDING STRAIGHT BARS FOR THE WHOLE LENGTH OF THE BEAM
8. LAP LENGTH FOR BARS SHOULD BE SAME AS TENSION ANCHORAGE LENGTH BASED UPON THE LARGER BAR DIAMETER FOR UNEQUAL SIZE OF BARS
9. FIRST STIRRUP OF BEAM SHOULD BE 50mm (MAXIMUM) FROM THE COLUMN FACE



TYPE 1 TYPE 1a TYPE 2 TYPE 2a TYPE 3

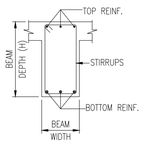


TYPE 4 TORSIONAL LINKS TYPE 5 TORSIONAL LINKS TYPE 5a

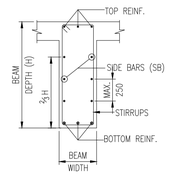


TYPE 6

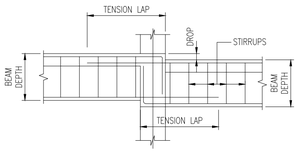
STIRRUPS TYPE



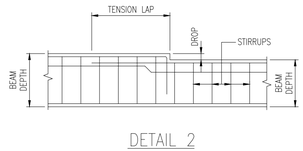
TYP. BEAM SECTION



TYP. SIDE BARS DETAIL FOR BEAM DEPTH > 750

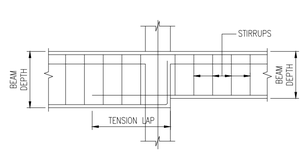


DETAIL 1

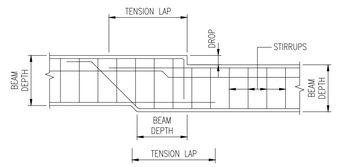


DETAIL 2

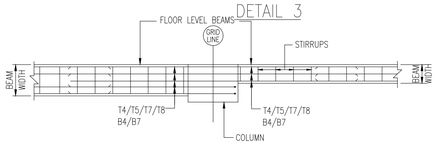
Wherever the drop is less than or equivalent to 50
The reinforcement bars can be bent at 1:10 and continued



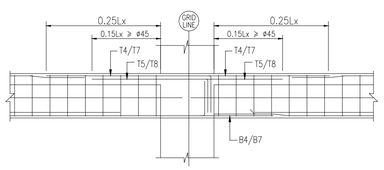
DETAIL 3



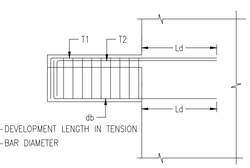
DETAIL 4



DETAIL 5
(PLAN VIEW)

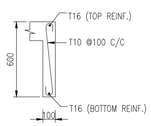


DETAIL 5
(SECTIONAL VIEW)



DETAIL 8

⊛ INDICATES IN 2ND LAYER FOR FULL LENGTH OF BEAM



TYP. BEAM SECTION (A302HB34) (100X600)

NOTES:

1. ALL DIMENSIONS ARE IN MM
2. FOR GENERAL NOTES REFER TO DWG. NO. BEI286_S-/NT/--/01.
3. FOR STANDARD DETAILS REFER TO DWG. NO. BEI286_S-/SD/--/01.
4. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE KEY PLAN, ARCHITECTURAL AND ALL OTHER RELEVANT SERVICES DRAWINGS.
5. CONCRETE GRADE:

PODIUM / EXTENDED BASEMENT	
FOOTINGS	: M35
BASEMENT WALL	: M35
BASEMENT SLAB	: M35
COLUMNS	: M35
STILT FLOOR RC BEAMS/SLABS	: M35
FIRST FLOOR (LANDSCAPE PODIUM) RC BEAMS/SLABS	: M35
TOWERS	
BASEMENT SLAB	: M35
COLUMN	: M40
FIRST FLOOR LEVEL TRANSFER BEAM/SLAB	: M35
SHEAR WALL (UPTO 11TH FLOOR)	: M40
RC BEAMS/SLABS	: M40
SHEAR WALL (ABOVE 11TH FLOOR)	: M30
RC BEAMS/SLABS	: M30

HFC

APPROVED DESIGN MIX SHALL BE ADOPTED IN CONSTRUCTION FOR ALUMINUM FORM WORK (FOR BLOCKS A3 & A4 SUPER STRUCTURE) HIGH FLOW CONCRETE (HFC) SHALL BE USED. DESIGN MIX WITH WORKABILITY AND STRENGTH REPORT SHALL BE SUBMITTED FOR REVIEW & APPROVAL.

6. STEEL GRADE: Fe550 CONFORMING TO IS:1786–2008.
7. CLEAR COVER FOR FOOTINGS–60MM, COLUMN–40mm, SLAB–25mm, BEAM–30mm, RAFT–60mm.
   300MM THICK RC WALL –40mm
   200MM THICK RC WALL –30mm
   170MM THICK RC WALL –30mm
8. SEISMIC LOAD HAS BEEN CONSIDERED AS PER IS:16700–2017 & 1893–2016 WITH THE SEISMIC ZONE III. DUCTILE DESIGN & DETAILING CARRIED OUT AS PER THE STIPULATIONS MADE IN IS:13920–2016.
9. STRUCTURE TO BE CONSTRUCTED IN ACCORDANCE WITH I.S.456–2000, NBC (SP7–1983) AND RELAVANT INDIAN CODE STIPULATIONS
10. ONUS OF CONSTRUCTION LIES WITH CONTRACTOR/ PROMOTER / BUILDER / OWNER.

REV. NO.	AMENDMENTS	BY	DATE
–	CONSTRUCTION DRAWING	RLM	25/05/2024

Client :

NAVIN'S

NAVIN HOUSING & PROPERTIES (P)LTD.
NAVIN'S Triumph
[Opposite to Cosmopolitan Golf Ground Annex, Near GR Complex] No. 802 & 804, Anna Salai, Nandanam, Chennai - 600 035 INDIA.
web site: www.navinhousing.com

LANDSCAPE CONSULTANTS

Resident Architect :

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2/154, EAST COAST ROAD,
INJAMBAKKAM,CHENNAI - 600 041.
TEL : 65485655 FAX : 4211 4661
E-mail : anandarchitects@gmail.com

PLUMBING CONSULTANTS

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CONSTRUCTION DRAWING

STRUCTURAL

project title

STARWOOD TOWERS PHASE-III

drawing title

2ND FLOOR BEAM SCHEDULE
(BLOCK–A3) (SHEET 04 OF 04)

scale	AS SHOWN	design by	MSK
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drawing no.	BEI286_S-/BM/02/A3/04	revision	–

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Zoning & Land Use Analysis

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

Property Documentation & Workflow Tools

Forms & Templates, Document Generator, Document Translation, Dictionary

Vastu & Property Management Tools

Home Vastu Shastra, Plot Vastu Shastra, Property Management

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

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