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DIGITALLY VERIFIED RECORD

SG STRUCTURAL ENGINEERS
ENGINEERS | ARCHITECTS
SINCE 1991

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GSTIN: 33ABTPV8085E1ZZ

STABILITY CERTIFICATE

(To be furnished while filing application for registration of building)

1. The detailed engineering and structural design of the proposed apartment building construction of stilt +5 floors at Ramanathapuram village, Coimbatore. TS.Nos. 1760/3A1, 3A2, 3A2, 3A3, 3B2 & 3B3, Ward No.J(10), Block No.27, Ramanathapuram Village, Coimbatore South Taluk, Coimbatore District and Corporation, has been done by us based on the report of geotechnical investigation (soil test) done by M/s.Geodesign India Private Limited Report No. GEO-073-2019-20 Dated. 13-07-2019 to 14-07-2019 and considering the functional requirement of the building.

2. It is certified that among other factors, the proposed building has been designed to resist earthquake. We have checked various parameters and found that the proposed building would be safe.

3. We further certify that:

(i) The minimum grade of concrete is M25.

(ii) The design and analysis has been done using the code of practice for plain and reinforced concrete as per IS 456, design loads as per IS 875 and design of earthquake resistant structure as per IS 1893.

4. The building will be safe and sound when used for the purpose for which it is designed.

Stamp and Signature
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Encl: Structural Design Calculations

S.G.STRUCTURAL ENGINEERS					
Project	MILIR APARTMENT	Doc. No	DBR-BLOCK A–STR		
		Prepared	SS	Chkd	VS
Title	**Design Basis Report**	Rev	00	Date	09.04.2025

DESIGN BASIS REPORT

PROPOSED CONSTRUCTION OF RESIDENTIAL APARTMENT BUILDING RAMANATHAPURAM VILLAGE, COIMBATORE.

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1.0 SCOPE:

This Document covers the requirement of RCC structural Design of Apartment Building (MILIR APARTMENT – BLOCK A) (Stilt+5) at Ramanathapuram ,Coimbatore.

2.0 DETAILED DESCRIPTION FOR APARTMENT BUILDING:

S. No.	Description	Description
1	Building Size	
1.1	Width of Building (O/O of wall)	58'-0"
1.2	Length of Building (O/O of wall)	62'-11½"
2	Column Spacing	As per architectural drawings mentioned below.
3	Floor height	10'0" from FFL
4	Headroom height	9'0" from terrace FFL
5	Staircase	RCC Staircase with waist slab.
6	Overhead tank	9000 Liters Capacity.

3.0 TECHNICAL SPECIFICATION:

S. No.	Parameter	Specifications
1.	**Type of Building**	Rigid Frame Type
2.	**Design Consideration**	Designed as per IS CODE (Refer:6.0).
3.	**Geometrical Requirements of Components**	
3.1	Beams	RCC
3.2	Columns	RCC
3.3	Slab	RCC
4.	**Grades of Material**	
4.1	Grade of concrete	M25
4.2	Grade of steel	Fe500

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4.0 GENERAL:

All design calculations are carried out in SI System.

5.0 SITE LEVELS:

FFL is assumed as (+) 0.610m level from NGL.

6.0 STANDARDS AND CODES:

Designs are in accordance with the latest editions of the Standards and Codes of Practice as described below:

IS: 456 – 2000 (Reaffirmed in 2021) - Code of Practice for Plain & Reinforced concrete.

IS: 875-1987 & 2015 (Part 1to5)- Code of Practice for Design loads (other than Earthquake) for Buildings and structures.

IS: 1893-2016- Criteria for Earthquake resistant design of structures.

IS: 13920-2016– Ductile detailing of reinforced concrete structures subjected to seismic force.

7.0 LOADINGS:

Load and Load combinations are generally as per IS:875 (Part 1 to 5)-1987& 2015, unless noted otherwise.

Dead Loads:

Dead Loads are generally taken as per unit weights given in IS: 875 (Part 1)-1987 and as per construction elements like RC slab, floor finishes, screeds, waterproofing, masonry wall, etc.

The following table gives the density of the major materials.

MATERIALS	DENSITY (kN/m³)
PCC	24.0
Reinforced concrete	25.0
Brick work & Light weight	20.0 & 10.0
Structural steel	78.5

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A. BRICK MASONRY LOAD CALCULATION

Type-I (Basement Wall Load)

Height of the wall	=	0.61	m
Width of the wall	=	0.23	m
Unit Weight of the Brick Masonry	=	20.00	KN/m^3
Effective Height of the wall	=	0.61	m
Weight per meter length of wall	=	2.806	KN/m
Total UDL	=	2.806	KN/m

Type-II (Main wall 6" thick)
Stilt, Typical & terrace Floor

Height of the wall from beam top	=	2.743	m
Width of the wall	=	0.15	m
Unit Weight of the Brick Masonry	=	10.00	KN/m^3
Effective Height of the wall	=	2.743	m
Weight per meter length of wall	=	4.1145	KN/m
Total UDL	=	4.1145	KN/m

Type-III (Main wall 4½" thick)
Typical Floor

Height of the wall from beam top	=	2.743	m
Width of the wall	=	0.115	m
Unit Weight of the Brick Masonry	=	10.00	KN/m^3
Effective Height of the wall	=	2.743	m
Weight per meter length of wall	=	3.15445	KN/m
Total UDL	=	3.15445	KN/m

Type-IV(Parapet wall 8"thick)

Height of the wall	=	1.2	m
Width of the wall	=	0.20	m
Unit Weight of the Brick Masonry	=	20.00	KN/m^3

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Effective Height of the wall = 1.2 m

Weight per meter length of wall = 4.8 KN/m

Total UDL = 4.8 KN/m

Type-V (Parapet wall 4½" thick)

Typical Floor

Height of the wall from beam top = 0.9 m

Width of the wall = 0.115 m

Unit Weight of the Brick Masonry = 20.00 KN/m^3

Effective Height of the wall = 0.9 m

Weight per meter length of wall = 2.07 KN/m

Total UDL = 2.07 KN/m

Type-VI (RCC Wall 8" thick)

Terrace Floor

Height of the wall from beam top = 1.5 m

Width of the wall = 0.20 m

Unit Weight of the Brick Masonry = 25.00 KN/m^3

Effective Height of the wall = 1.5 m

Weight per meter length of wall = 7.5 KN/m

Total UDL = 7.5 KN/m

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<u>Stilt Floor and Typical floor Roof</u> :

(i) Self weight of slab(Thk of slab* 25 KN/m^3) = 3.75 KN/m^2

(ii) Floor finish, Ceiling finish & Fixtures = 1.5 KN/m^2

(iii) Total dead load on slab = 5.25 KN/m^2

<u>Terrace floor and headroom floor Roof</u>

(i) Self weight of slab(Thk of slab* 25 KN/m^3) = 3.75 KN/m^2

(ii) Floor finish, Ceiling finish & Fixtures = 2.25 KN/m^2

(iii) Total dead load on slab = 6.00 KN/m^2

Toilet sunk load :

(i) Depth of the toilet sunk = 0.23 m

(ii) Unit Weight of the Brick Masonry = 10 KN/m3

(iii) Total dead load on slab = 2.3KN/m^2

Live Loads:

Live Loads are considered as per IS: 875 – 1987 Part 2.

The load is considered as indicated below

i) Room & Toilet	=	2.00	KN/m2
ii) Balcony	=	3.00	KN/m2
iii) Lift ,Passage and staircase	=	4.00	KN/m2
iii) Terrace	=	3.0&1.50	KN/m2

Seismic Loads:

The Seismic loads on the structure are calculated as per IS: 1893 – 2016. The zone factor considered as indicated below.

Seismic Zone - III

Soil type and Depth of foundation has been taken as per soil investigation report.

Load Combinations:

The load combinations are giving for the most critical conditions on foundations, structures or individual members shall be taken into account.

The load combination indicated in IS:875 (Part 5)-1987& IS:

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1893 – 2016 is adopted for the design of civil / structural members. The load combination with corresponding load factor is indicated below.

a) 1.0[DL+LL]

b) 1.0DL+0.8[LL+EQX+]

c) 1.0DL+0.8[LL+EQX-]

d) 1.0DL+0.8[LL+EQZ+]

e) 1.0DL+0.8[LL+EQZ-]

f) 1.0[DL+EQX+]

g) 1.0[DL+EQX-]

h) 1.0[DL+EQZ+]

i) 1.0[DL+EQZ-]

j) 1.5[DL+LL]

k) 1.2[DL+LL+EQX+]

l) 1.2[DL+LL+EQX-]

m)1.2[DL+LL+EQZ+]

n) 1.2[DL+LL+EQZ-]

o) 1.5[DL+EQX+]

p) 1.5[DL+EQX-]

q) 1.5[DL+EQZ+]

r) 1.5[DL+EQZ-]

s) 0.9DL+1.5EQX+]

t) 0.9DL+1.5EQX-]

u) 0.9DL+1.5EQZ+]

v) 0.9DL+1.5EQZ-]



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Where,

DL - Dead Load

LL - Live load

EQL - Earthquake Load

8.0 METHOD OF DESIGN:

Equivalent Static analysis is carried out using Staad Pro v8i Software and load combinations giving the most critical conditions are considered for the design of foundations.

Sub structure is designed for critical load combination by manual calculation.

Reinforced cement concrete - Design as per IS: 456 – 2000 using Staad Pro v8i Software.Ductile detailing is considered as per 13920 -2016.

9.0 SOIL INFORMATION:

Safe Bearing Capacity of soil – 368.5kN/m^2 at a depth of 3.0m below NGL is considered as per soil report.

10.0 DESIGN:

10.1 FOUNDATIONS:

Foundation is designed to carry all the loads from super-structure.

10.2 RCC COLUMNS:

RCC columns are designed using the STAAD pro analysis software for critical load conditions and are tabulated in the provided drawing.

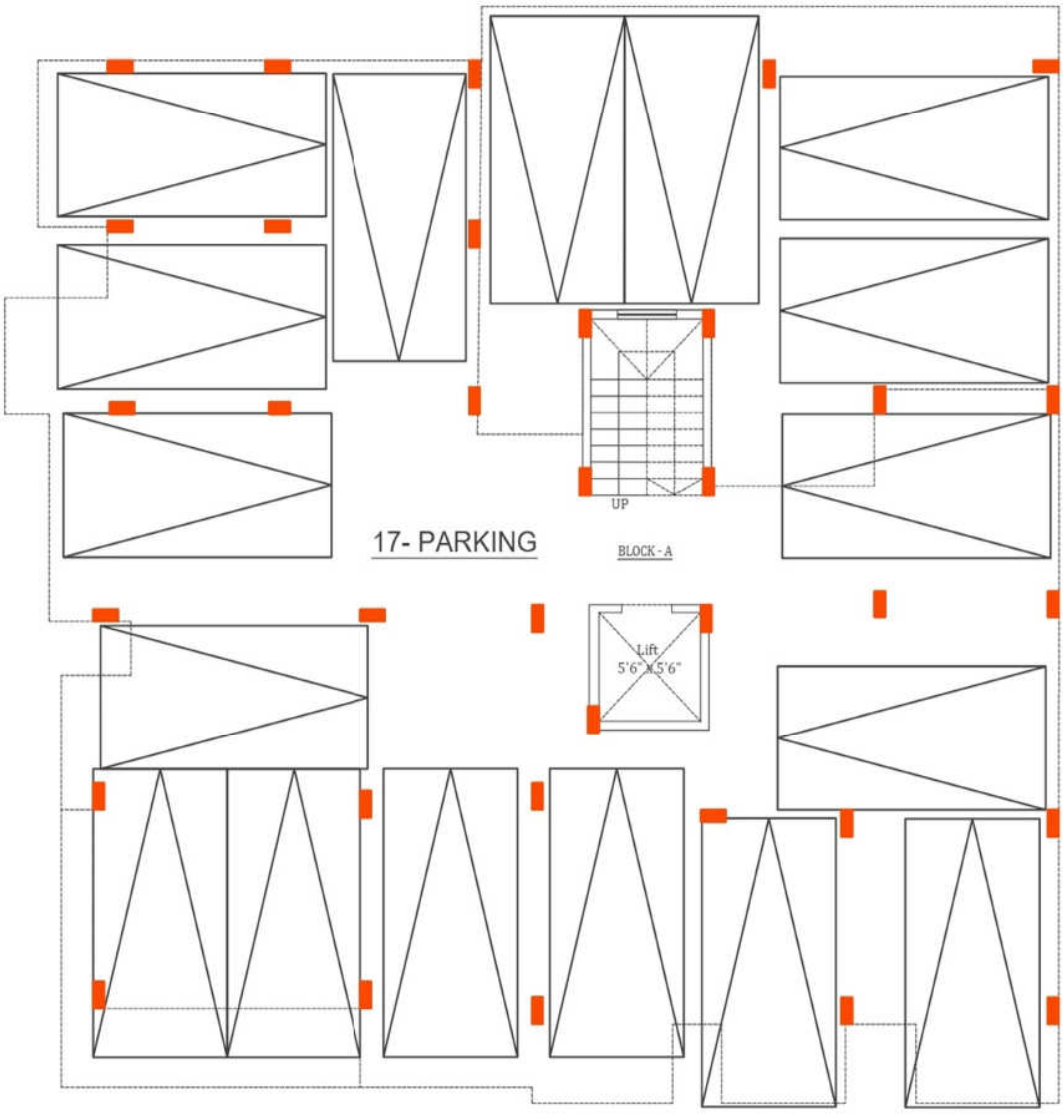
10.2 ROOF SLABS AND BEAMS:

All beams are designed using STAAD pro analysis software for critical load conditions. Slab design is carried out manually.

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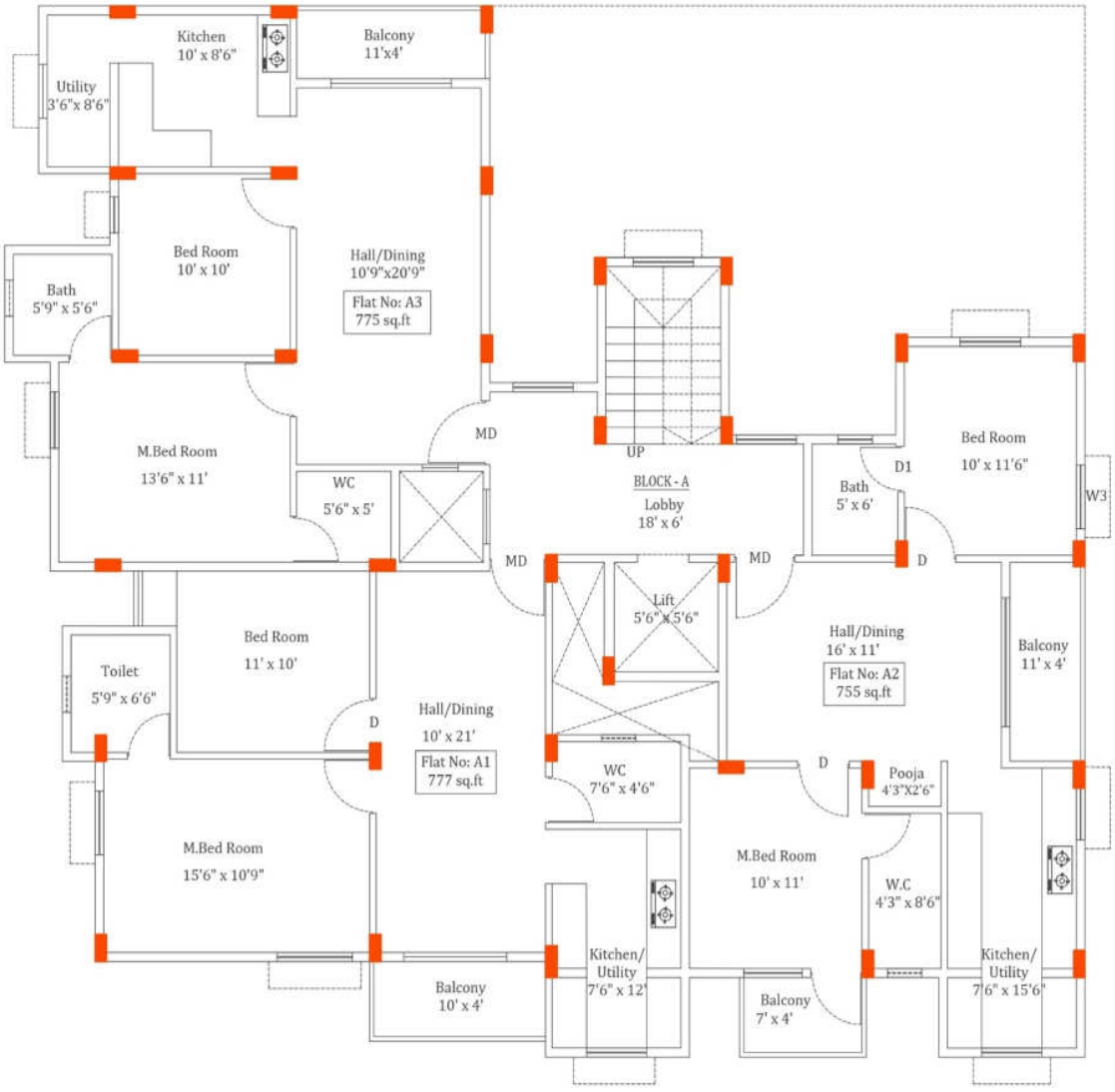
11.0 FLOOR PLANS:

STILT FLOOR PLAN



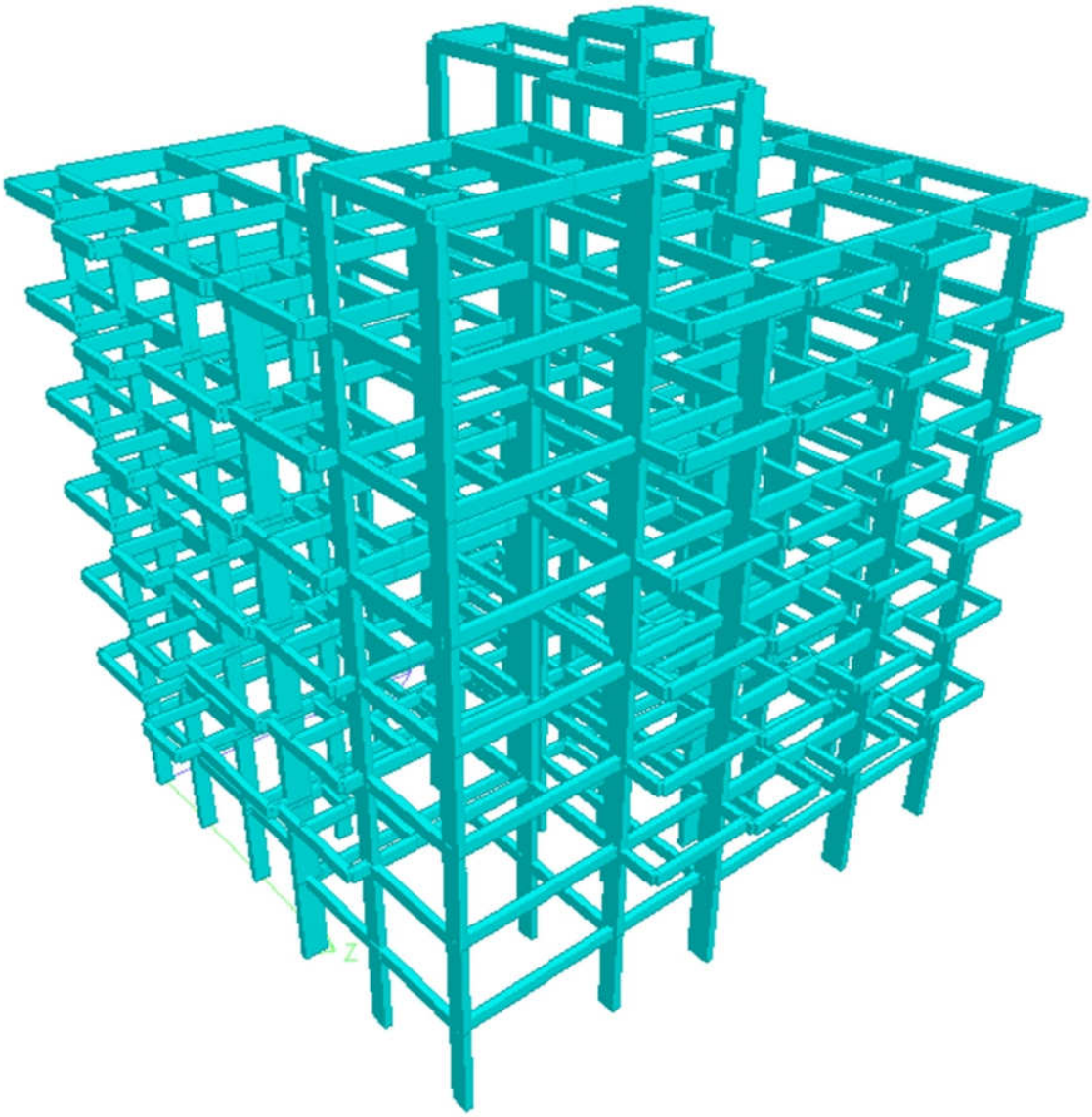
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TYPICAL FLOOR PLAN



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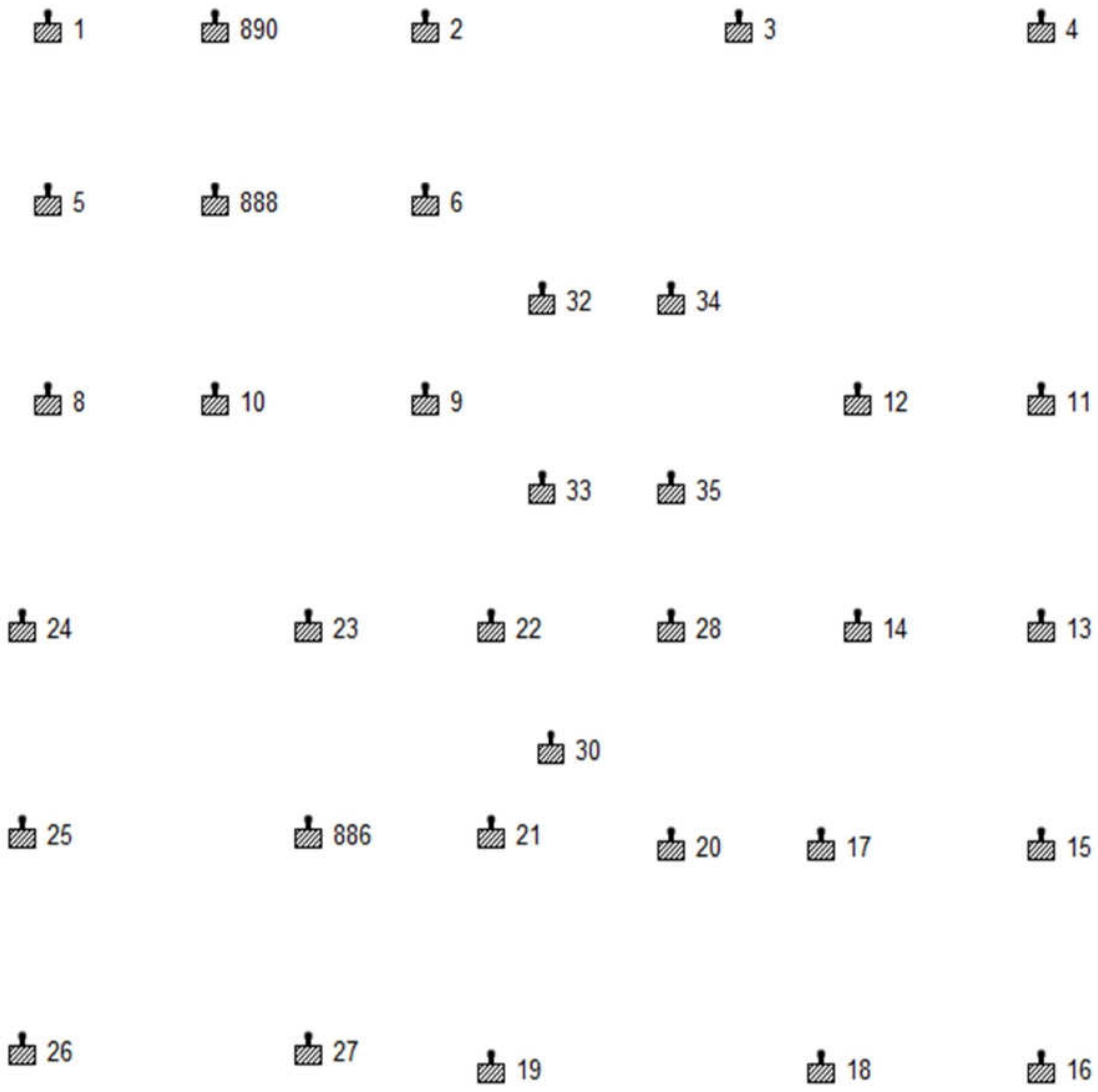
12.0 STAAD IMAGE:



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13.0 DESIGN CALCULATION:

NODE NUMBERS



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FOOTING DESIGN

GENERAL DATA

NODE:33

Design Method	=	Limit-State of IS:456-2000	
Unfactored axial load (without selfwt)	=	545	kN
Unfactored moment about X (Anticlock +ve)	=	26	kN.m
Unfactored moment about Z (Anticlock +ve)	=	1	kN.m
Net Safe bearing capacity of soil @ 2.3 m below Finished grade lvl	=	368.5	kN/m²
Concrete mix	=	M 25	
Density of concrete	=	25	kN/m³
Density of soil	=	18	kN/m³
Factor of Safety	=	1.50	
Provide size of footing	=	1.6 x 1.295 x 0.45	m
Size of Column	=	0.45 x 0.2	m
Depth of footing below ground level	=	3	m
Clear cover to steel	=	75	mm

VERTICAL LOAD:

Weight of entire foundation

(1.6*1.295*0.45*25)

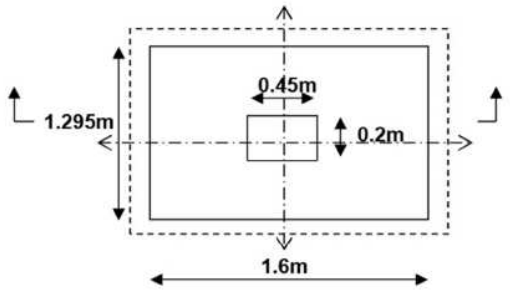
= 23.31 kN

Weight of soil

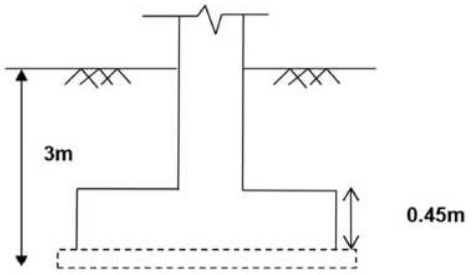
(1.6*1.295*2.55*18)

= 95.10 kN

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PLAN



SECTION

DESIGN CALCULATION

CHECK FOR BEARING PRESSURE:

Total Vertical Load

a) Weight of foundation = 23.31 kN

b) Weight of soil = 95.105 kN

c) Vertical load from structures = 545 kN

TOTAL DOWNWARD LOAD = 23.31+95.1+545
= **663.4 kN**

Section Modulus about XX (Zxx) = 1.6*1.295^2/6
= 0.447 Cum

Section Modulus about YY (Zyy) = 1.295*1.6^2/6
= 0.553 Cum

Actual base pressure = **(663.41/1.6/1.295)+(ABS(26)/0.447)**
+(ABS(1)/0.553)

qmax = **380.15 kN/m²**

qmin = **260.2 kN/m²** **Hence Safe**

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Max Net Pressure, qmax-γ H = 380.15-3*18

= **326.15 kN/m²**
< **368.5 kN/m²**
Hence Safe

DESIGN OF FOOTING SLAB:

Maximum base pressure = 380.15 kN/m²

Maximum overhang of pad = (1.6-0.45)/2 =
= 0.58 m

Pressure due to over burden of soil & pad = (3-0.45)*18+0.45*25

= 57.15 kN/m²

Base pressure at face of the pedestal = = (260.204705066123+((380.15-260.204705066123)/1.6*(1.6-
= 336.67 kN/m²

Maximum cantilever moment at the face of pedestal = 0.5*(380.15+336.67)*0.58*(0.58/3*(336.67+2*380.15)/(336.67+380.15))-57.15*0.58*(0.58/2)

= 51.890 kNm

Overall depth provided 450 mm
Diameter of reinforcement bar = 10 mm
Effective depth provided = 450-75-10/2
= 370 mm

Mu/bd² = 1.5*51.89*1000000/(1000*370^2)
= 0.5686

Percentage of reinforcement required (Pt) = 0.133
(As per Table 2 of SP16)

A_{st} required = 0.133/100*(1000*370)

= 492.1 mm²

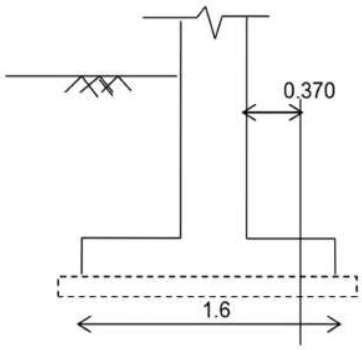
Minimum reinforcement = 0.12/100*(1000*370) = 444 mm²

Provide 10 @ 150 c/c m both ways at bottom.
(A_{st} provided = 524 mm²)
Pt provided = 100*524/(1000*370)= 0.142 **mm²** **Hence Safe**

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CHECK FOR SHEAR

One Way Shear



Overhang of footing beyond critical section for shear	=	(1.6-0.45)/2-0.37 0.205 m
Maximum base pressure	=	380.15 KN/m²
Depth at Critical Section	=	0.37 m
Base pressure at a distance "d" from face of the pedestal =	=	(260.204705066123+((380.15-260.204705066123)/1.6*(1.6- 352.41 KN/m²
Downward force from footing	=	57.15 KN/m²
Shear force at critical section V	=	0.5*(380.15+352.41)*0.205-57.15*0.205 63.372 kN/m
Shear stress τ_v	=	1.5*63.372*1000/(1000*1000*0.37)
	=	0.2569 N/mm²
τ_c (Table 19 of IS 456-2000)	=	0.284 N/mm² **Hence Safe**

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Two Way Shear

Perimeter of the critical section = ((0.45+2*(370/2/1000))*2)+((0.2+2*(370/2/1000))*2)
around the pedetal at a distance d/2 = 2.780 m
from face of pedestal

Depth at Critical Section = 0.37 m

Allowable punching shear stress

$\tau_c' = k_s \cdot \tau_c$

$ks = 0.5 + \beta_c$

$\beta_c = 0.45/0.2 = 2.25$

ks = 0.5 + 2
= 2.8

ks should not be greater than 1 = 1

$\tau_c = 0.25 \sqrt{f_{ck}}$ = 0.25 x √ 25
= **1.25 N/mm²**

Allowable maximum load (unfactored) on pedestal from punching shear point of view = 1.25*(2.78*1000)*0.37/1.5
= 857.167 kN

Total Downward load = 545 kN

Hence Safe

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COLUMN DESIGN

NODE NUMBER : 33

```
==========================================================================
            IS-456    L I M I T    S T A T E    D E S I G N
         C O L U M N    N O.     30  D E S I G N   R E S U L T S

      M25                     Fe500 (Main)              Fe500 (Sec.)

LENGTH:  3000.0 mm   CROSS SECTION:  200.0 mm X  450.0 mm  COVER: 40.0 mm

** GUIDING LOAD CASE:   19  SHORT(Z)        /BRACED LONG(Y)

  STAAD SPACE                                              -- PAGE NO. 1230


REQD. STEEL AREA   :     1113.02 Sq.mm.
REQD. CONCRETE AREA:    88886.98 Sq.mm.
MAIN REINFORCEMENT : Provide   8 - 16 dia. (1.79%,   1608.50 Sq.mm.)
                     (Equally distributed)
TIE REINFORCEMENT  : Provide  8 mm dia. rectangular ties @ 200 mm c/c

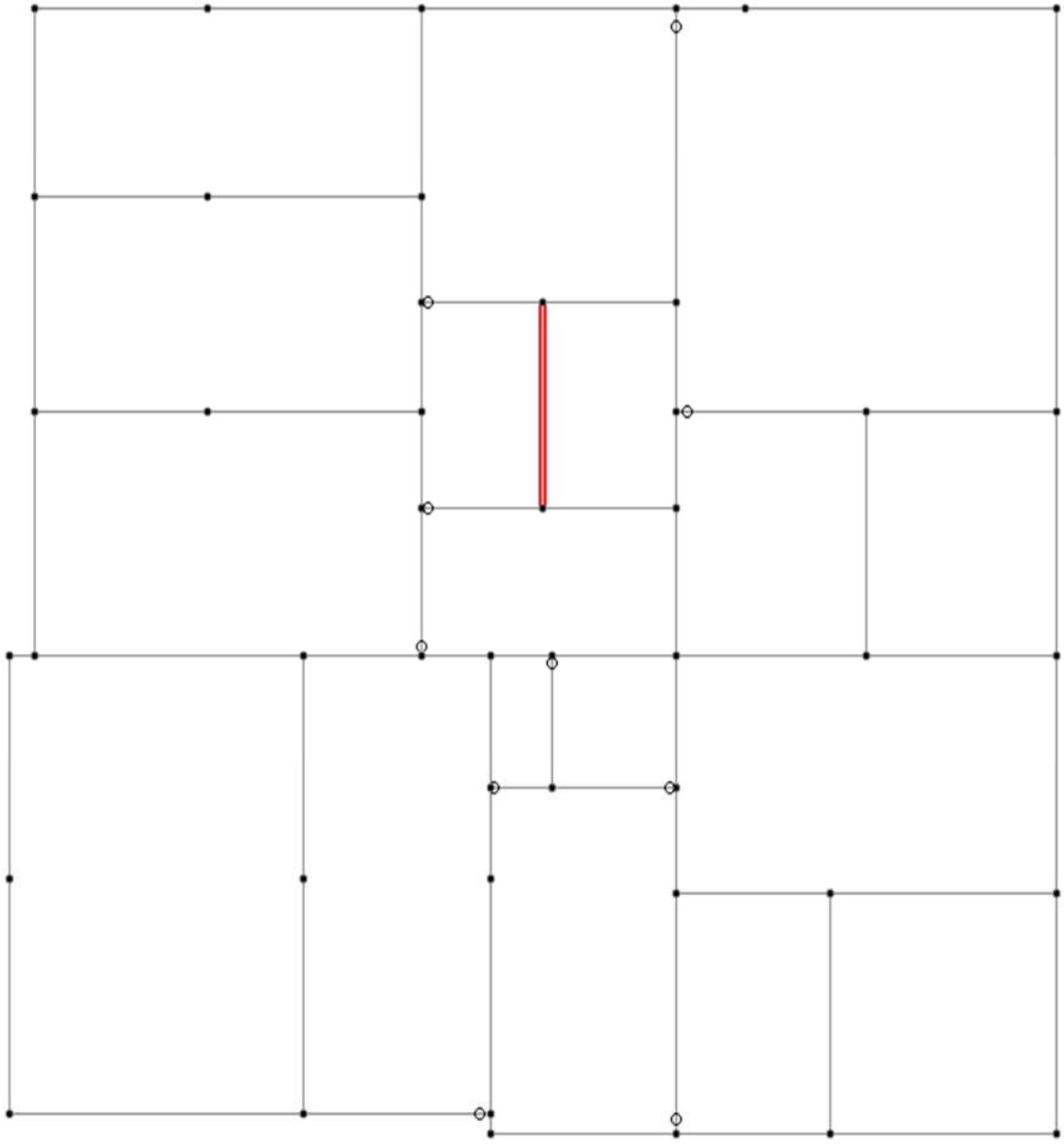
SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)
----------------------------------------------------------
Puz :   1417.36   Muz1 :     95.36   Muy1 :     34.17

INTERACTION RATIO: 0.98 (as per Cl. 39.6, IS456:2000)

SECTION CAPACITY BASED ON REINFORCEMENT PROVIDED (KNS-MET)
----------------------------------------------------------
WORST LOAD CASE:    19
Puz :   1597.59   Muz :    121.32   Muy :     39.66   IR: 0.80
==========================================================================
```


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PLINTH BEAM DESIGN



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```
                IS-456    L I M I T    S T A T E    D E S I G N
               B E A M  N O.      49   D E S I G N  R E S U L T S

     M25                      Fe500 (Main)                Fe500 (Sec.)

   LENGTH:  2928.0 mm      SIZE:   200.0 mm X  380.0 mm   COVER: 35.0 mm

                        SUMMARY OF REINF. AREA (Sq.mm)
-------------------------------------------------------------------------------
SECTION      0.0 mm      732.0 mm     1464.0 mm     2196.0 mm     2928.0 mm
-------------------------------------------------------------------------------
 TOP          491.38       177.85          0.00        162.92        455.35
REINF.      (Sq. mm)     (Sq. mm)      (Sq. mm)      (Sq. mm)      (Sq. mm)

BOTTOM       342.28       196.28        115.60        192.06        338.84
REINF.      (Sq. mm)     (Sq. mm)      (Sq. mm)      (Sq. mm)      (Sq. mm)
-------------------------------------------------------------------------------

  STAAD SPACE                                                -- PAGE NO.  593

                      SUMMARY OF PROVIDED REINF. AREA
-------------------------------------------------------------------------------
SECTION      0.0 mm      732.0 mm     1464.0 mm     2196.0 mm     2928.0 mm
-------------------------------------------------------------------------------
 TOP        7-10d         3-10d         2-10d         3-10d         6-10d
REINF.   2 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)    2 layer(s)


                      SUMMARY OF PROVIDED REINF. AREA
-------------------------------------------------------------------------------
SECTION      0.0 mm      732.0 mm     1464.0 mm     2196.0 mm     2928.0 mm
-------------------------------------------------------------------------------
 TOP        7-10d         3-10d         2-10d         3-10d         6-10d
REINF.   2 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)    2 layer(s)

BOTTOM      5-10d         3-10d         2-10d         3-10d         5-10d
REINF.   2 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)    2 layer(s)

SHEAR   2 legged  8d  2 legged  8d  2 legged  8d  2 legged  8d  2 legged  8d
REINF.  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c
-------------------------------------------------------------------------------


SHEAR DESIGN RESULTS AT DISTANCE d (EFFECTIVE DEPTH) FROM FACE OF THE SUPPORT
-------------------------------------------------------------------------------

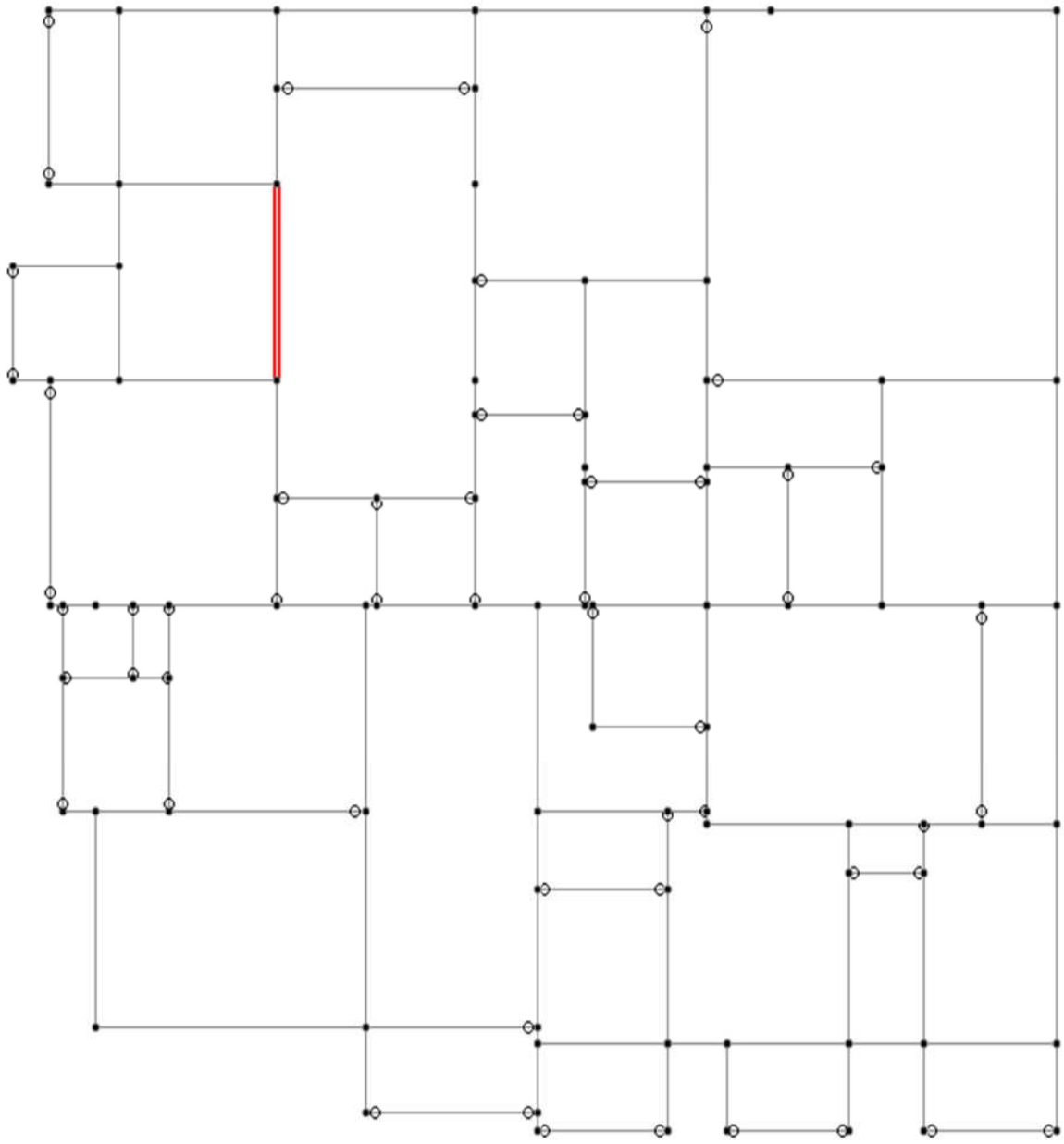
SHEAR DESIGN RESULTS AT   594.3 mm AWAY FROM START SUPPORT
  VY =    45.40 MX =     0.32 LD=   20
  Provide 2 Legged  8d  @ 110 mm c/c

SHEAR DESIGN RESULTS AT   556.7 mm AWAY FROM END SUPPORT
  VY =   -44.76 MX =    -0.30 LD=   19
  Provide 2 Legged  8d  @ 110 mm c/c

===============================================================================
```


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STILT FLOOR ROOF BEAM DESIGN



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================================================================================
                IS-456    L I M I T    S T A T E    D E S I G N
                B E A M  N O.     307   D E S I G N  R E S U L T S

      M25                     Fe500 (Main)                Fe500 (Sec.)

    LENGTH:  3073.0 mm      SIZE:   200.0 mm X  530.0 mm   COVER: 35.0 mm

                        SUMMARY OF REINF. AREA (Sq.mm)
--------------------------------------------------------------------------------
SECTION      0.0 mm      768.3 mm     1536.5 mm     2304.8 mm     3073.0 mm
--------------------------------------------------------------------------------
 TOP         440.70       177.62       166.26        166.26        213.93
REINF.      (Sq. mm)     (Sq. mm)     (Sq. mm)      (Sq. mm)      (Sq. mm)

BOTTOM       166.26       166.26       166.26        166.26        166.26
REINF.      (Sq. mm)     (Sq. mm)     (Sq. mm)      (Sq. mm)      (Sq. mm)
--------------------------------------------------------------------------------


                        SUMMARY OF PROVIDED REINF. AREA
--------------------------------------------------------------------------------
SECTION      0.0 mm      768.3 mm     1536.5 mm     2304.8 mm     3073.0 mm
--------------------------------------------------------------------------------
 TOP        4-12d        2-12d        2-12d         2-12d         2-12d
REINF.    1 layer(s)   1 layer(s)   1 layer(s)    1 layer(s)    1 layer(s)

BOTTOM      2-12d        2-12d        2-12d         2-12d         2-12d
REINF.    1 layer(s)   1 layer(s)   1 layer(s)    1 layer(s)    1 layer(s)

SHEAR    2 legged  8d  2 legged  8d  2 legged  8d  2 legged  8d  2 legged  8d
REINF.  @ 135 mm c/c  @ 135 mm c/c  @ 135 mm c/c  @ 135 mm c/c  @ 135 mm c/c
--------------------------------------------------------------------------------

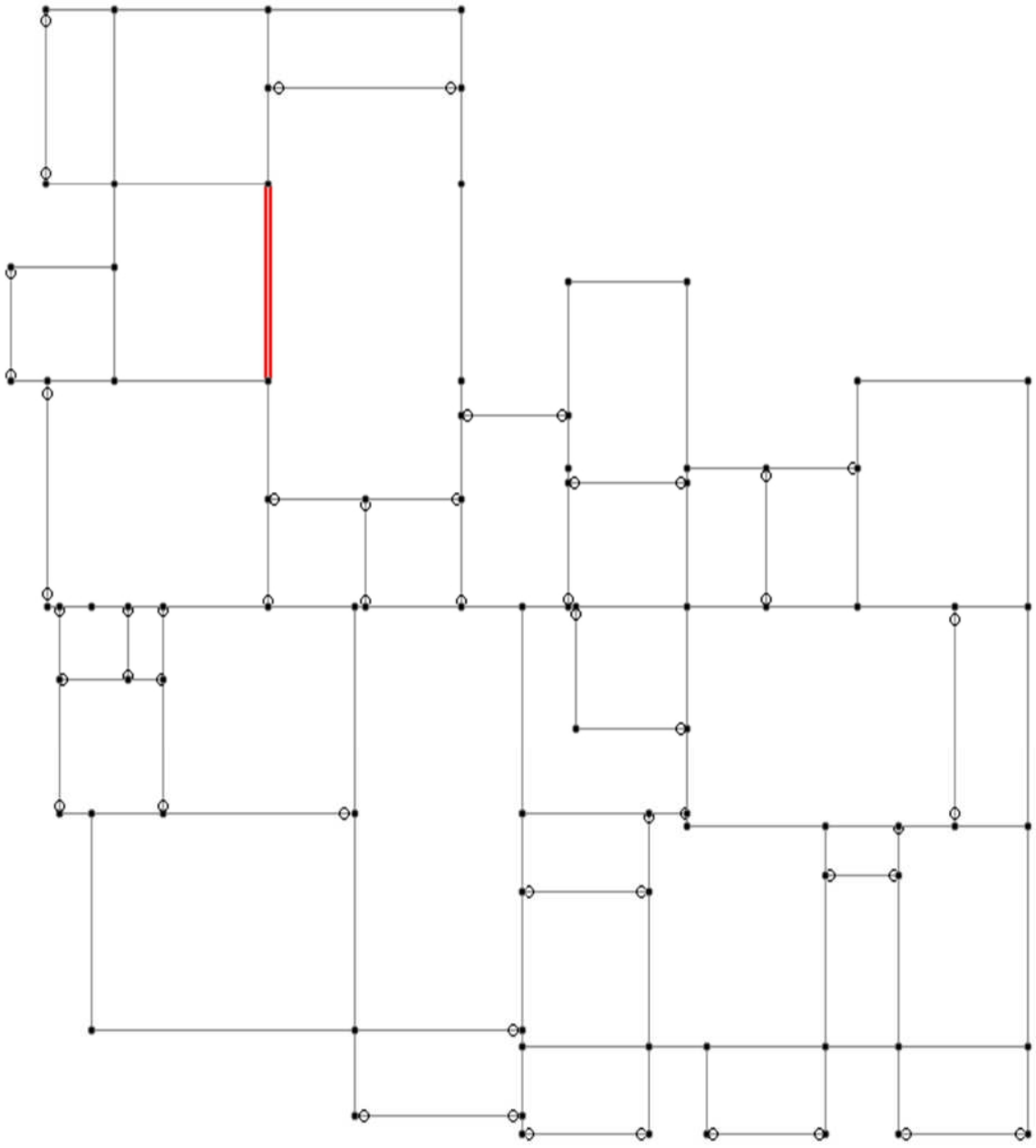

SHEAR DESIGN RESULTS AT DISTANCE d (EFFECTIVE DEPTH) FROM FACE OF THE SUPPORT
--------------------------------------------------------------------------------

SHEAR DESIGN RESULTS AT   589.0 mm AWAY FROM START SUPPORT
  VY =    59.51 MX =     0.55 LD=   19
  Provide 2 Legged  8d  @ 135 mm c/c

SHEAR DESIGN RESULTS AT   589.0 mm AWAY FROM END SUPPORT
  VY =   -38.09 MX =    -0.02 LD=   20
  Provide 2 Legged  8d  @ 135 mm c/c
```


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TYPICAL FLOOR ROOF BEAM DESIGN



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IS-456 L I M I T S T A T E D E S I G N
B E A M N O. 1096 D E S I G N R E S U L T S

M25 Fe500 (Main) Fe500 (Sec.)

LENGTH: 3073.0 mm SIZE: 200.0 mm X 530.0 mm COVER: 35.0 mm

SUMMARY OF REINF. AREA (Sq.mm)

SECTION	0.0 mm	768.3 mm	1536.5 mm	2304.8 mm	3073.0 mm
TOP REINF.	461.23 (Sq. mm)	178.42 (Sq. mm)	166.60 (Sq. mm)	166.60 (Sq. mm)	246.40 (Sq. mm)
BOTTOM REINF.	166.26 (Sq. mm)	166.26 (Sq. mm)	166.26 (Sq. mm)	166.26 (Sq. mm)	166.26 (Sq. mm)

SUMMARY OF PROVIDED REINF. AREA

SECTION	0.0 mm	768.3 mm	1536.5 mm	2304.8 mm	3073.0 mm
TOP REINF.	6-10d 2 layer(s)	3-10d 1 layer(s)	3-10d 1 layer(s)	3-10d 1 layer(s)	4-10d 1 layer(s)
BOTTOM REINF.	2-12d 1 layer(s)	2-12d 1 layer(s)	2-12d 1 layer(s)	2-12d 1 layer(s)	2-12d 1 layer(s)
SHEAR REINF.	2 legged 8d @ 135 mm c/c	2 legged 8d @ 135 mm c/c	2 legged 8d @ 135 mm c/c	2 legged 8d @ 135 mm c/c	2 legged 8d @ 135 mm c/c

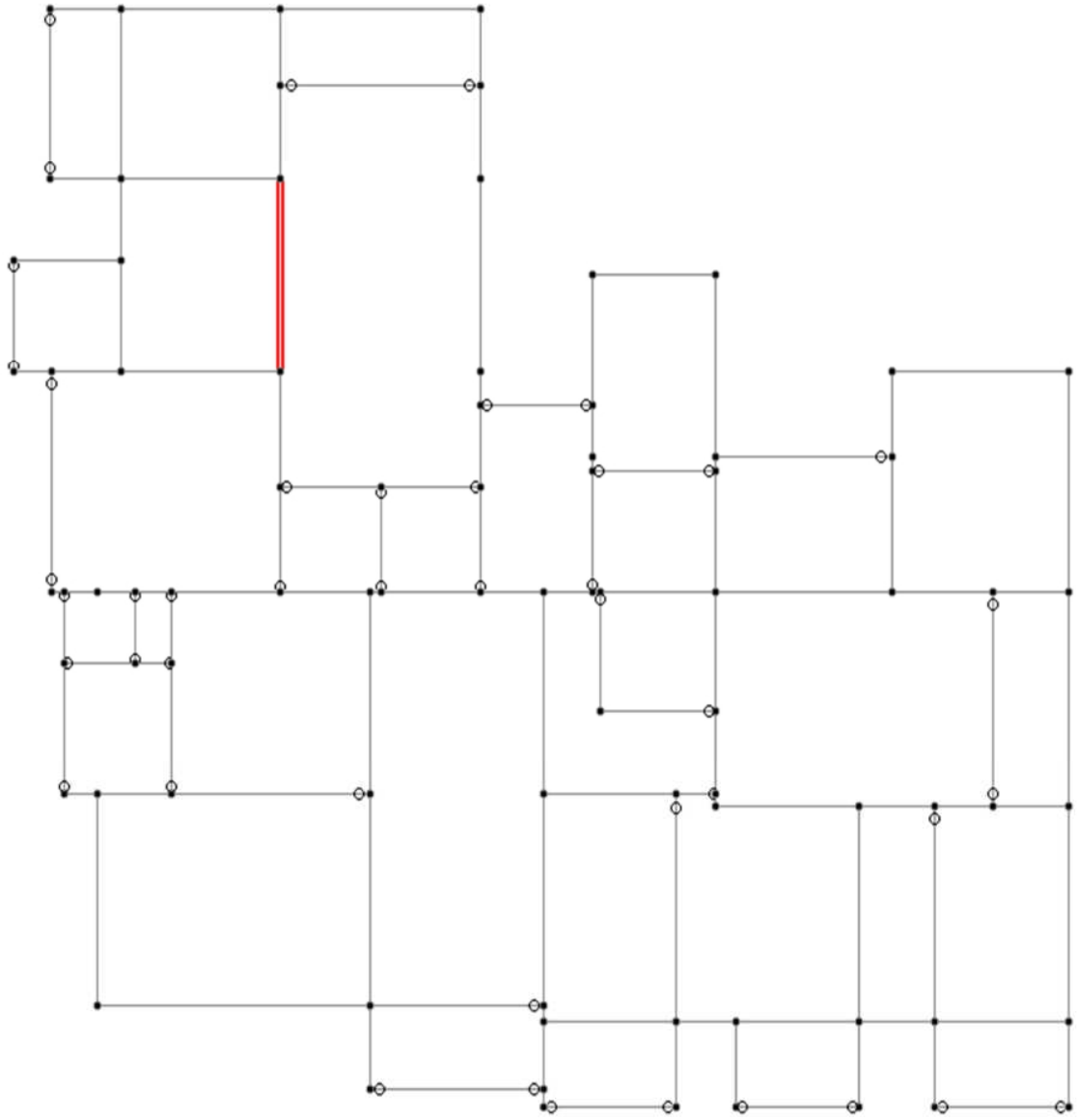
SHEAR DESIGN RESULTS AT DISTANCE d (EFFECTIVE DEPTH) FROM FACE OF THE SUPPORT

SHEAR DESIGN RESULTS AT 581.7 mm AWAY FROM START SUPPORT
VY = 61.92 MX = 0.50 LD= 19
Provide 2 Legged 8d @ 135 mm c/c

SHEAR DESIGN RESULTS AT 590.0 mm AWAY FROM END SUPPORT
VY = -42.50 MX = -0.41 LD= 20
Provide 2 Legged 8d @ 135 mm c/c

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TERRACE FLOOR ROOF BEAM DESIGN



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================================================================================
                IS-456    L I M I T    S T A T E    D E S I G N
                B E A M  N O.     929   D E S I G N  R E S U L T S

      M25                      Fe500 (Main)              Fe500 (Sec.)

    LENGTH:  3073.0 mm      SIZE:   200.0 mm X  530.0 mm   COVER: 35.0 mm
```

SUMMARY OF REINF. AREA (Sq.mm)

SECTION	0.0 mm	768.3 mm	1536.5 mm	2304.8 mm	3073.0 mm
TOP REINF.	286.13 (Sq. mm)	166.60 (Sq. mm)	166.60 (Sq. mm)	166.60 (Sq. mm)	166.60 (Sq. mm)
BOTTOM REINF.	0.00 (Sq. mm)	0.00 (Sq. mm)	166.26 (Sq. mm)	166.26 (Sq. mm)	0.00 (Sq. mm)

SUMMARY OF PROVIDED REINF. AREA

SECTION	0.0 mm	768.3 mm	1536.5 mm	2304.8 mm	3073.0 mm
TOP REINF.	4-10d 1 layer(s)	3-10d 1 layer(s)	3-10d 1 layer(s)	3-10d 1 layer(s)	3-10d 1 layer(s)
BOTTOM REINF.	2-12d 1 layer(s)	2-12d 1 layer(s)	2-12d 1 layer(s)	2-12d 1 layer(s)	2-12d 1 layer(s)
SHEAR REINF.	2 legged 8d @ 135 mm c/c	2 legged 8d @ 135 mm c/c	2 legged 8d @ 135 mm c/c	2 legged 8d @ 135 mm c/c	2 legged 8d @ 135 mm c/c

```
SHEAR DESIGN RESULTS AT DISTANCE d (EFFECTIVE DEPTH) FROM FACE OF THE SUPPORT
--------------------------------------------------------------------------------

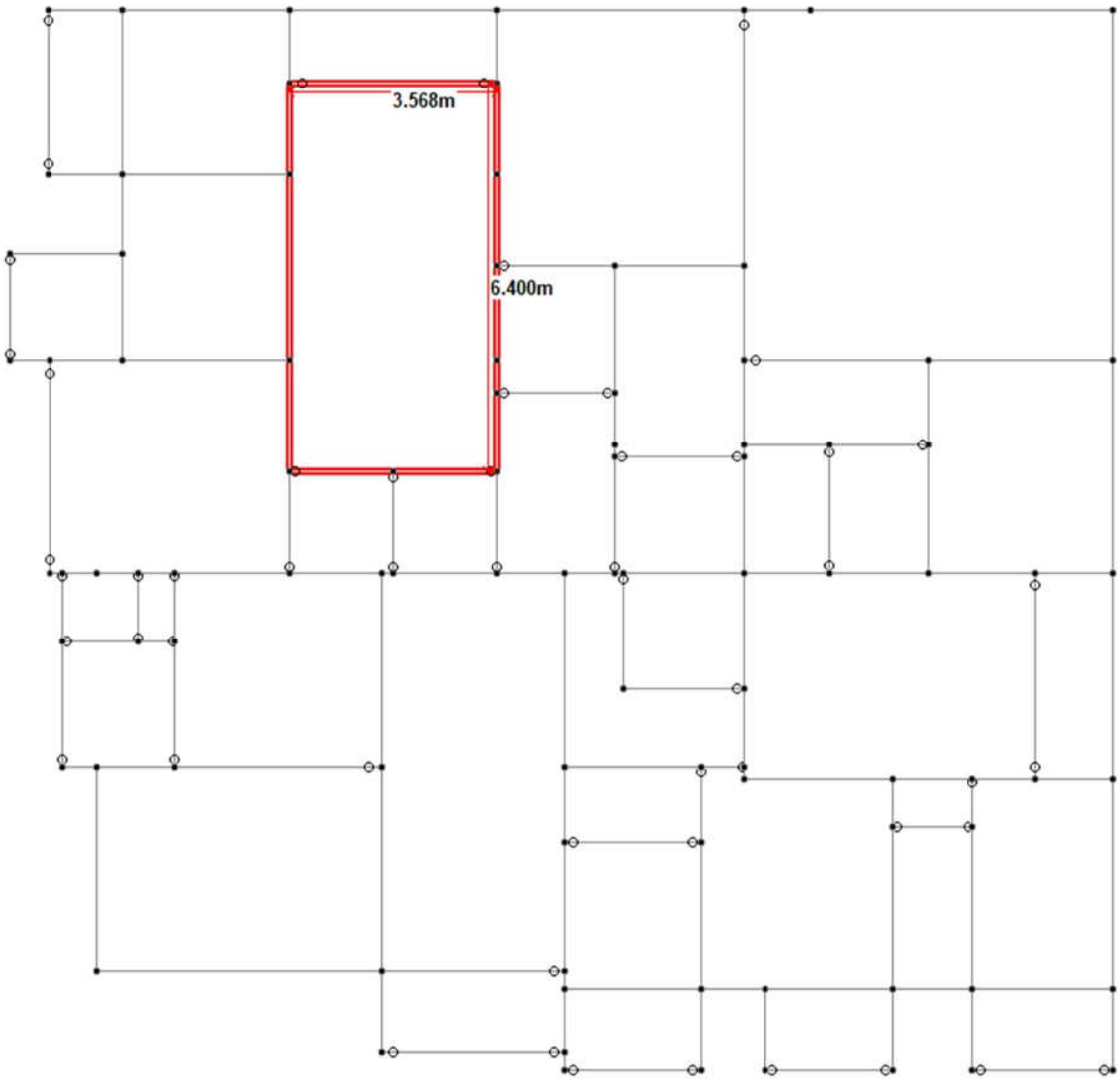
SHEAR DESIGN RESULTS AT   590.0 mm AWAY FROM START SUPPORT
  VY =    52.04 MX =    -0.22 LD=   16
  Provide 2 Legged  8d  @ 135 mm c/c

SHEAR DESIGN RESULTS AT   590.0 mm AWAY FROM END SUPPORT
  VY =   -29.66 MX =    -0.22 LD=   16
  Provide 2 Legged  8d  @ 135 mm c/c

================================================================================
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SLAB DESIGN

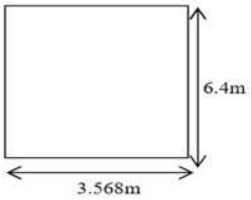


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S.G.STRUCTURAL ENGINEERS					
Project	MILIR APARTMENT	Doc. No	DBR-BLOCK A–STR		
		Prepared	SS	Chkd	VS
Title	**Design Basis Report**	Rev	00	Date	09.04.2025

GENERAL DATA

Shorter dimension of slab, l_x		3.57	m
Longer dimension of slab, l_y		6.40	m
	l_y/l_x	1.79	**Twoway Slab**
Assuming thickness of slab		150	mm
Consider width		1000	mm
	f_{ck}	25	kN/m^2
	f_y	500	kN/m^2



Type of panel - Interior panel

Clear cover to reinforcement 20 mm

Loads

Live load	2	kN/m^2
Dead load	3.75	kN/m^2
Floor Finish	1.5	kN/m^2
Total load	7.25	kN/m^2
Fact. load	10.88	kN/m^2

Typical design calculation

Mu = Coeff*W_u*l_x*l_x (Coefficient from IS:456)

= 0.06*10.88*3.568*3.568

= 8.32 kN-m

Mu /bd^2 = (8.32*10^6)/(1000*125^2)

0.532 N/mm^2

P_t = 0.13 (From SP-16, Table-3)

Ast = (0.13*1000*125)/100

= 162.5 mm^2

Spacing = (3.14*10*10/4/162.5)*1000

483.08 mm

Short span direction	Coeff	Mu (kNm)	Mu /bd^2	P_t	Ast	Dia	Spacing
Negative moment @ continuous edge	0.06	8.31	0.532	0.13	162.5	10	483.08
Positive moment @ midspan	0.045	6.23	0.40	0.118	147.5	10	532.21

Long span direction	Coeff	Mu (kNm)	Mu /bd^2	P_t	Ast	Dia	Max. Spacing
Negative moment @ continuous edge	0.032	4.43	0.28	0.118	147.5	8	340.62
Positive moment @ midspan	0.024	3.32	0.21	0.118	147.5	8	340.62

Reinforcement provided

Ast provided in short span = 523.33 mm^2

Spacing provided in short span = 150.00 mm

P_t provided in short span = 0.42

Hence spacing is safe

Ast provided in long spa 334.93 mm^2

Spacing provided in lon 150.00 mm

P_t provided in long span 0.27

Hence spacing is safe

Minimum effective depth required dreqd. = 49.08 mm (SQRT(MAX(Mu/0.138*fck*1000)))*1000

Minimum effective depth provided dprov. = (150-20-10/2)

125 mm

Minimum reinforcement Ast min = (0.12*1000*125/100)

= 150 mm^2

Depth provided is greater than minimum effective depth required

Hence safe

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Check for shear

Maximum shear force @ support — $Vu = Wl_x/2$
$= (10.88*3.568)/2$
$= 19.41$ kN

Actual shear force — $\zeta v = Vu / bd$
$= (19.41*1000)/(1000*125)$
$= 0.16$ N/mm^2

% of tension rft. provided in support pt = 0.42

IS:456-2000 Table-19
Allowable shear stress — $\zeta c = 0.425$

As per IS:456,cl:40.2.1.1 k value for slab = 1.3

Design shear stress for concrete — $k \times \zeta c = 0.5525$

Actual shear stress < Design shear stress
Hence safe

Check for deflection

Type of slab — Simply suppoerted
Allowable span / depth ratio = l/d = 20 [As per IS:456-2000, Cl:23.2.1(a)]

Percentage of tension reinforcement = 0.42
Steel stress of service loads — fs= 0.58fy(Area of steel required/Area of steel provided)
81.74 N/mm^2

Corresponding comp. rft.
Percentage of comp. reinforcement = 0.27

Modification factor for tension rft. F1= 2.00 (From fig:4 ,IS:456-2000)
Modification factor for comp. rft. F2= 1.090 (From fig:5 ,IS:456-2000)
Modified span/depth ratio = l/d x F1x F2
43.6
Actual span/ depth ratio = 28.54

Actual span/ depth ratio < Modified span / depth ratio
Hence safe

At Short span direction

Provided T10@ 150mm c/c

At Longer span direction

Provided T8@ 150mm c/c

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S.G.STRUCTURAL ENGINEERS					
Project	MILIR APARTMENT	Doc. No	DBR-BLOCK B–STR		
		Prepared	SS	Chkd	VS
Title	**Design Basis Report**	Rev	00	Date	09.04.2025

DESIGN BASIS REPORT

PROPOSED CONSTRUCTION OF RESIDENTIAL APARTMENT BUILDING RAMANATHAPURAM VILLAGE, COIMBATORE.

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3.0	TECHNICAL SPECIFICATION	3
4.0	GENERAL	4
5.0	SITE LEVELS	4
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11.0	FLOOR PLAN	10
12.0	STAAD IMAGE	12
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1.0 SCOPE:

This Document covers the requirement of RCC structural Design of Apartment Building (MILIR APARTMENT – BLOCK B) (Stilt+5) at Ramanathapuram ,Coimbatore.

2.0 DETAILED DESCRIPTION FOR APARTMENT BUILDING:

S. No.	Description	Description
1	Building Size	
1.1	Width of Building (O/O of wall)	60'-7"
1.2	Length of Building (O/O of wall)	74'-7"
2	Column Spacing	As per architectural drawings mentioned below.
3	Floor height	10'0" from FFL
4	Headroom height	9'0" from terrace FFL
5	Staircase	RCC Staircase with waist slab.
6	Overhead tank	12000 Liters Capacity.

3.0 TECHNICAL SPECIFICATION:

S. No.	Parameter	Specifications
1.	**Type of Building**	Rigid Frame Type
2.	**Design Consideration**	Designed as per IS CODE (Refer:6.0).
3.	**Geometrical Requirements of Components**	
3.1	Beams	RCC
3.2	Columns	RCC
3.3	Slab	RCC
4.	**Grades of Material**	
4.1	Grade of concrete	M25
4.2	Grade of steel	Fe500

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4.0 GENERAL:

All design calculations are carried out in SI System.

5.0 SITE LEVELS:

FFL is assumed as (+) 0.610m level from NGL.

6.0 STANDARDS AND CODES:

Designs are in accordance with the latest editions of the Standards and Codes of Practice as described below:

IS: 456 – 2000 (Reaffirmed in 2021) - Code of Practice for Plain & Reinforced concrete.

IS: 875-1987 & 2015 (Part 1to5)- Code of Practice for Design loads (other than Earthquake) for Buildings and structures.

IS: 1893-2016- Criteria for Earthquake resistant design of structures.

IS: 13920-2016– Ductile detailing of reinforced concrete structures subjected to seismic force.

7.0 LOADINGS:

Load and Load combinations are generally as per IS:875 (Part 1 to 5)-1987& 2015, unless noted otherwise.

Dead Loads:

Dead Loads are generally taken as per unit weights given in IS: 875 (Part 1)-1987 and as per construction elements like RC slab, floor finishes, screeds, waterproofing, masonry wall, etc.

The following table gives the density of the major materials.

MATERIALS	DENSITY (kN/m³)
PCC	24.0
Reinforced concrete	25.0
Brick work & Light weight	20.0 & 10.0
Structural steel	78.5

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A. BRICK MASONRY LOAD CALCULATION

Type-I (Basement Wall Load)

Height of the wall	=	0.61	m
Width of the wall	=	0.23	m
Unit Weight of the Brick Masonry	=	20.00	KN/m^3
Effective Height of the wall	=	0.61	m
Weight per meter length of wall	=	2.806	KN/m
Total UDL	=	2.806	KN/m

Type-II (Main wall 6" thick)
Stilt, Typical & terrace Floor

Height of the wall from beam top	=	2.743	m
Width of the wall	=	0.15	m
Unit Weight of the Brick Masonry	=	10.00	KN/m^3
Effective Height of the wall	=	2.743	m
Weight per meter length of wall	=	4.1145	KN/m
Total UDL	=	4.1145	KN/m

Type-III (Main wall 4½" thick)
Stilt, Typical &
terrace Floor

Height of the wall from beam top	=	2.743	m
Width of the wall	=	0.115	m
Unit Weight of the Brick Masonry	=	10.00	KN/m^3
Effective Height of the wall	=	2.743	m
Weight per meter length of wall	=	3.15445	KN/m
Total UDL	=	3.15445	KN/m

Type-IV(Parapet wall 8"thick)

Height of the wall	=	1.2	m
Width of the wall	=	0.20	m

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Unit Weight of the Brick Masonry	=	20.00	KN/m^3
Effective Height of the wall	=	1.2	m
Weight per meter length of wall	=	4.8	KN/m
Total UDL	=	4.8	KN/m

Type-V (Parapet wall 4½" thick)
Typical Floor

Height of the wall from beam top	=	0.9 m
Width of the wall	=	0.115 m
Unit Weight of the Brick Masonry	=	20.0 KN/m^3
Effective Height of the wall	=	0.9 m
Weight per meter length of wall	=	2.07 KN/m
Total UDL	=	2.07 KN/m

Type-VI (RCC Wall 8" thick)
Terrace Floor

Height of the wall from beam top	=	1.5 m
Width of the wall	=	0.20 m
Unit Weight of the Brick Masonry	=	25.0 KN/m^3
Effective Height of the wall	=	1.5 m
Weight per meter length of wall	=	7.5 KN/m
Total UDL	=	7.5 KN/m

Stilt Floor and Typical floor Roof :

(i) Self weight of slab(Thk of slab* 25 KN/m^3)	=	3.75	KN/m^2
(ii) Floor finish, Ceiling finish & Fixtures	=	1.5	KN/m^2
(iii) Total dead load on slab	=	5.25	KN/m^2

Terrace floor and headroom floor Roof

(i) Self weight of slab(Thk of slab* 25 KN/m^3)	=	3.75	KN/m^2
(ii) Floor finish, Ceiling finish & Fixtures	=	2.25	KN/m^2

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Toilet sunk load :

(i) Depth of the toilet sunk = 0.23 m

(ii) Unit Weight of the Brick Masonry = 10 KN/m^3

(iii) Total dead load on slab = $2.3KN/m^2$

Live Loads:

Live Loads are considered as per IS: 875 – 1987 Part 2.

The load is considered as indicated below

i) Room & Toilet	=	2.00	KN/m2
ii) Balcony	=	3.00	KN/m2
iii) Lift ,Passage and staircase	=	4.00	KN/m2
iii) Terrace	=	3.0&1.50	KN/m2

Seismic Loads:

The Seismic loads on the structure are calculated as per IS: 1893 – 2016. The zone factor considered as indicated below.

Seismic Zone - III

Soil type and Depth of foundation has been taken as per soil investigation report.

Load Combinations:

The load combinations are giving for the most critical conditions on foundations, structures or individual members shall be taken into account.

The load combination indicated in IS:875 (Part 5)-1987& IS: 1893 – 2016 is adopted for the design of

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civil / structural members. The load combination with corresponding load factor is indicated below.

a) 1.0[DL+LL]

b) 1.0DL+0.8[LL+EQX+]

c) 1.0DL+0.8[LL+EQX-]

d) 1.0DL+0.8[LL+EQZ+]

e) 1.0DL+0.8[LL+EQZ-]

f) 1.0[DL+EQX+]

g) 1.0[DL+EQX-]

h) 1.0[DL+EQZ+]

i) 1.0[DL+EQZ-]

j) 1.5[DL+LL]

k) 1.2[DL+LL+EQX+]

l) 1.2[DL+LL+EQX-]

m)1.2[DL+LL+EQZ+]

n) 1.2[DL+LL+EQZ-]

o) 1.5[DL+EQX+]

p) 1.5[DL+EQX-]

q) 1.5[DL+EQZ+]

r) 1.5[DL+EQZ-]

s) 0.9DL+1.5EQX+]

t) 0.9DL+1.5EQX-]

u) 0.9DL+1.5EQZ+]

v) 0.9DL+1.5EQZ-]

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Where,

DL - Dead Load

LL - Live load

EQL - Earthquake Load

8.0 METHOD OF DESIGN:

Equivalent Static analysis is carried out using Staad Pro v8i Software and load combinations giving the most critical conditions are considered for the design of foundations.

Sub structure is designed for critical load combination by manual calculation.

Reinforced cement concrete - Design as per IS: 456 – 2000 using Staad Pro v8i Software.

Ductile detailing is considered as per 13920 -2016.

9.0 SOIL INFORMATION:

Safe Bearing Capacity of soil – 368.5kN/m^2 at a depth of 3.0m below NGL is considered as per soil report.

10.0 DESIGN:

10.1 FOUNDATIONS:

Foundation is designed to carry all the loads from super-structure.

10.2 RCC COLUMNS:

RCC columns are designed using the STAAD pro analysis software for critical load conditions and are tabulated in the provided drawing.

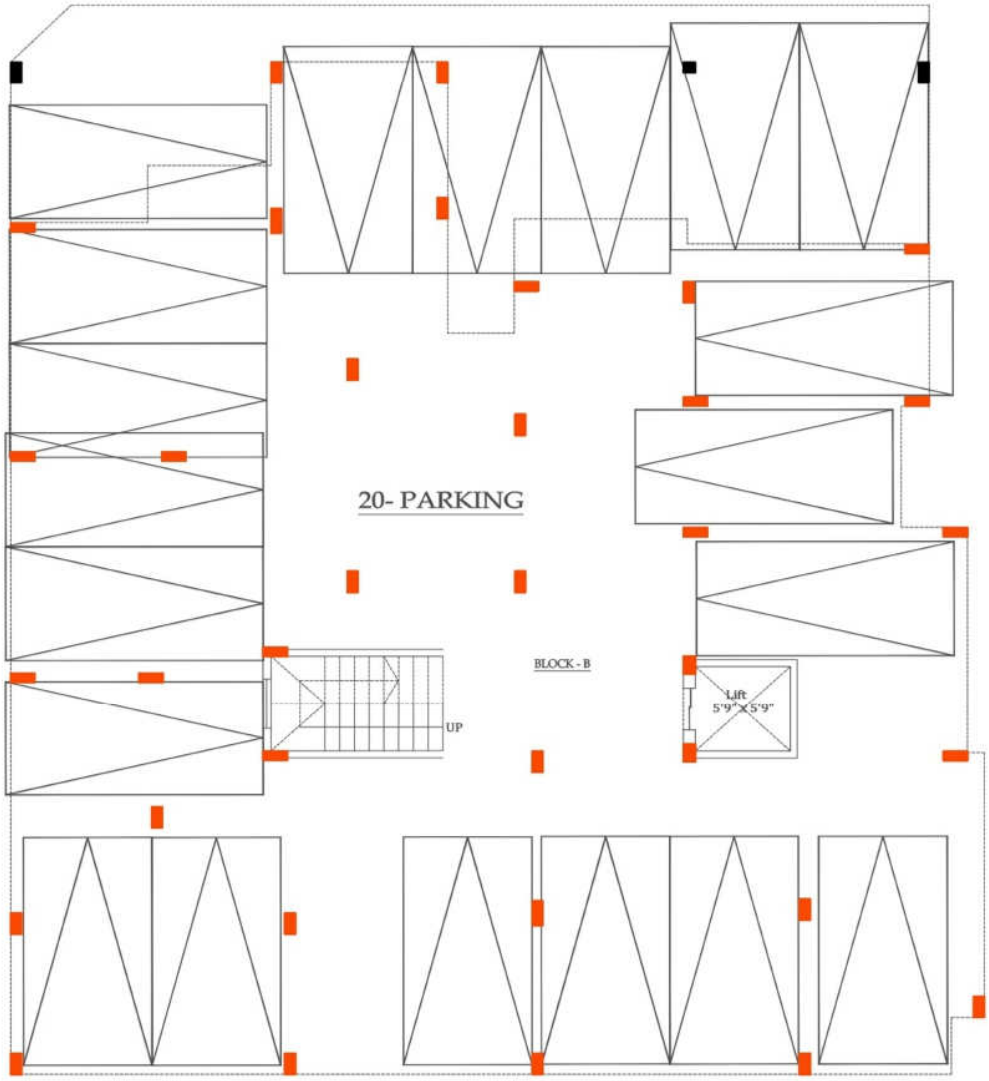
10.2 ROOF SLABS AND BEAMS:

All beams are designed using STAAD pro analysis software for critical load conditions. Slab design is carried out manually.

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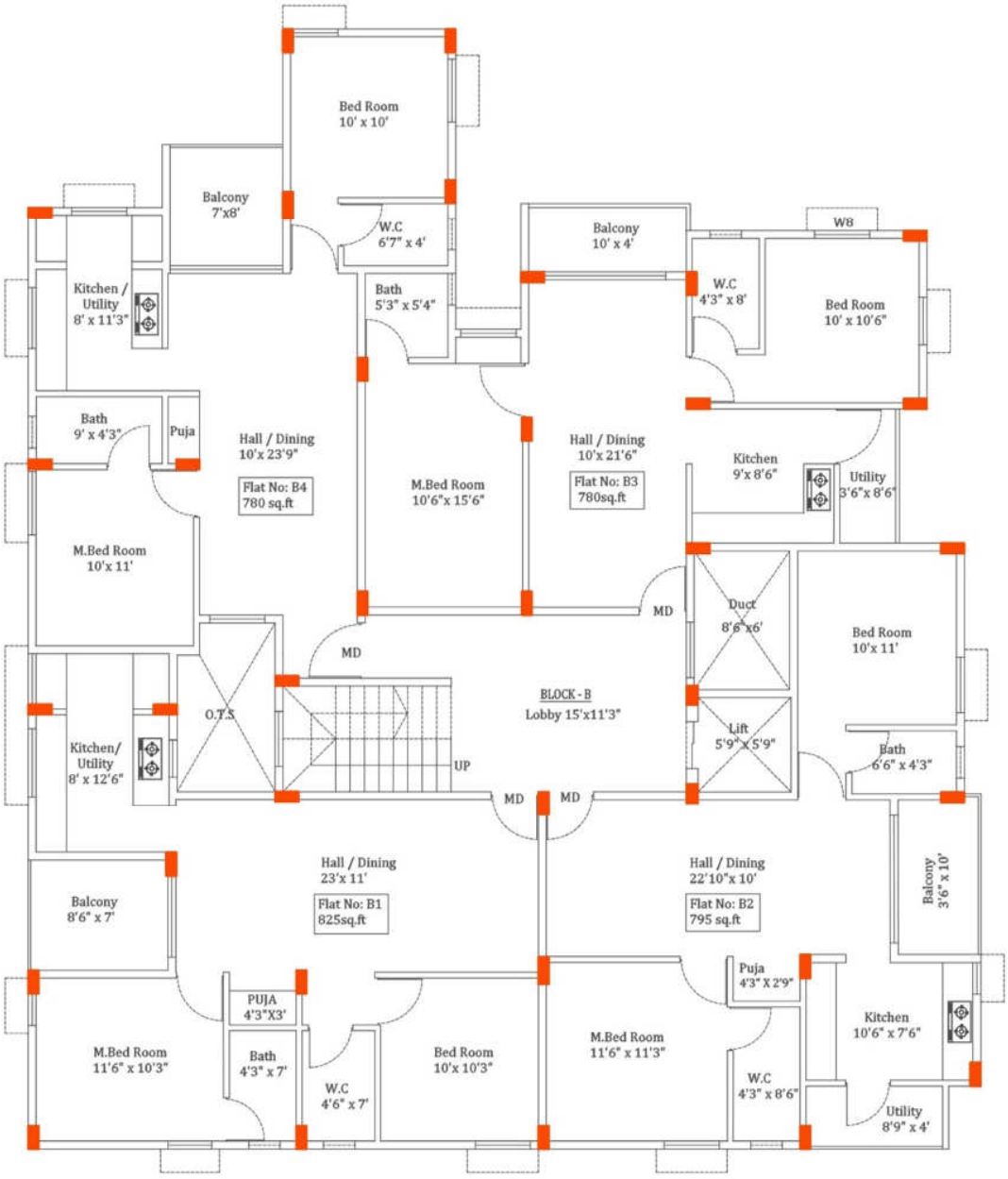
11.0 FLOOR PLANS:

STILT FLOOR PLAN



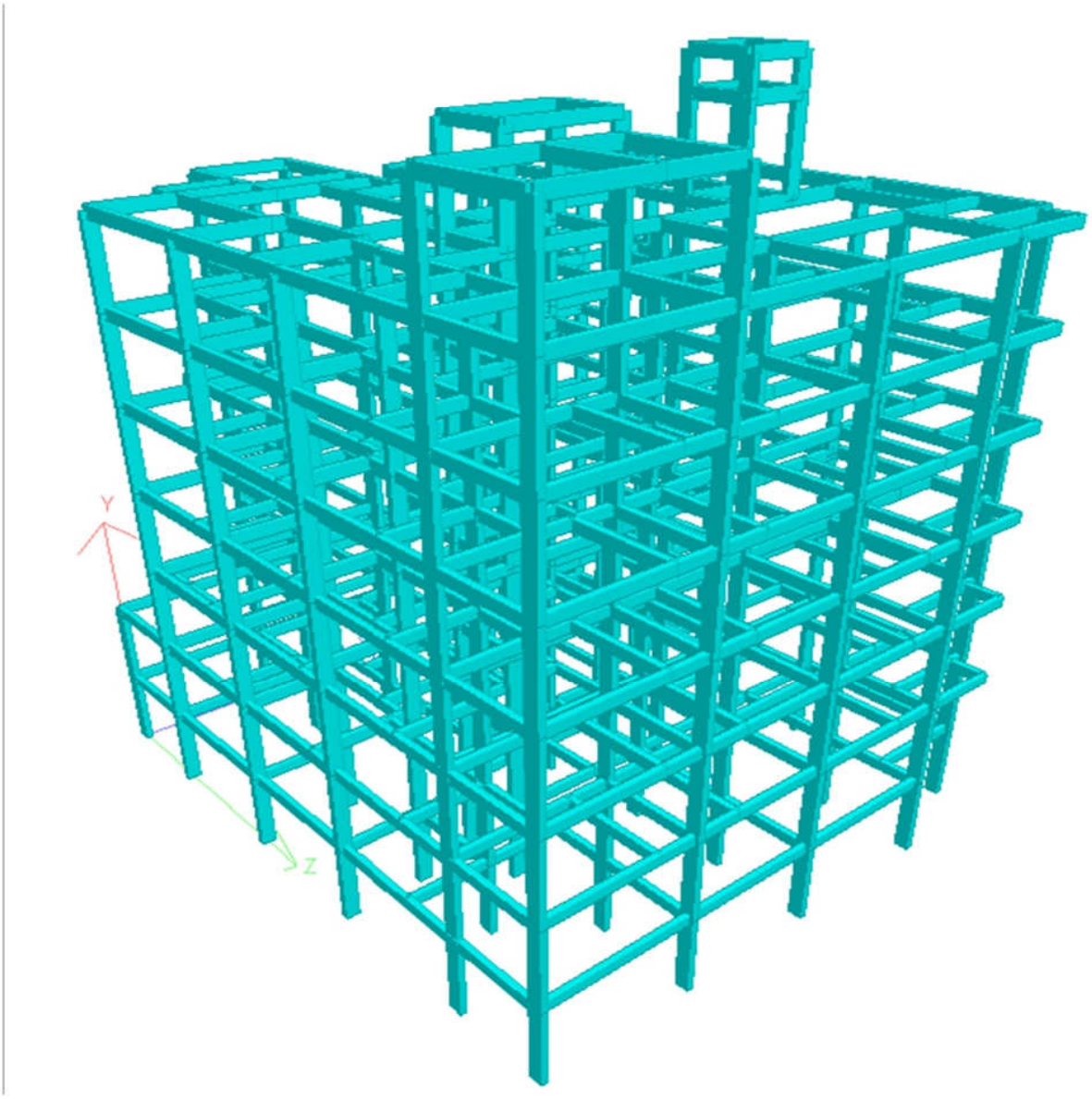
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TYPICAL FLOOR PLAN



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12.0 STAAD IMAGE:



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13.0 DESIGN CALCULATION:

NODE NUMBERS



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FOOTING DESIGN

GENERAL DATA

NODE:35

Design Method	=	Limit-State of IS:456-2000	
Unfactored axial load (without selfwt)	=	900	kN
Unfactored moment about X (Anticlock +ve)	=	39	kN.m
Unfactored moment about Z (Anticlock +ve)	=	1	kN.m
Net Safe bearing capacity of soil @ 2.3 m below Finished grade lvl	=	368.5	kN/m²
Concrete mix	=	M 25	
Density of concrete	=	25	kN/m³
Density of soil	=	18	kN/m³
Factor of Safety	=	1.50	
Provide size of footing	=	1.905 x 1.6 x 0.6	m
Size of Column	=	0.53 x 0.2	m
Depth of footing below ground level	=	3	m
Clear cover to steel	=	75	mm

VERTICAL LOAD:

Weight of entire foundation

(1.905*1.6*0.6*25)

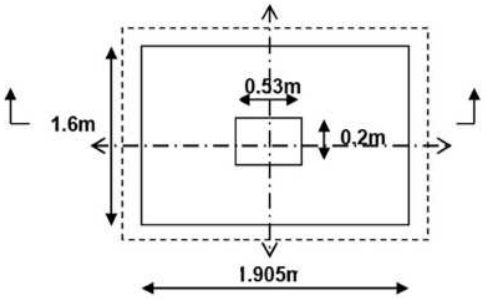
= 45.72 kN

Weight of soil

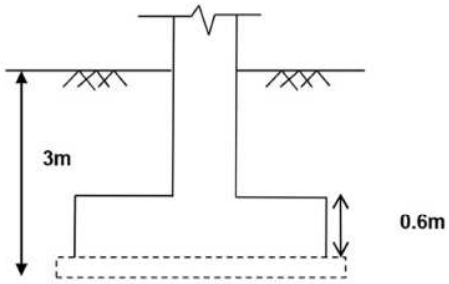
(1.905*1.6*2.4*18)

= 131.67 kN

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PLAN



SECTION

DESIGN CALCULATION

CHECK FOR BEARING PRESSURE:

Total Vertical Load

a) Weight of foundation = 45.72 kN

b) Weight of soil = 131.67 kN

c) Vertical load from structures = 900 kN

TOTAL DOWNWARD LOAD = 45.72+131.67+900
= **1077.4 kN**

Section Modulus about XX (Zxx) = 1.905*1.6^2/6
= 0.813 Cum

Section Modulus about YY (Zyy) = 1.6*1.905^2/6
= 0.968 Cum

Actual base pressure = **(1077.39/1.905/1.6)+(ABS(39)/0.813)+(ABS(1)/0.968)**

qmax = **402.48 kN/m²**

qmin = **304.47 kN/m²** **Hence Safe**

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Max Net Pressure, qmax-γ H = 402.48-3*18

= **348.48 kN/m²**
< **368.5 kN/m²**
Hence Safe

DESIGN OF FOOTING SLAB:

Maximum base pressure = 402.48 kN/m²

Maximum overhang of pad = (1.905-0.53)/2 =
= 0.69 m

Pressure due to over burden of soil & pad = (3-0.6)*18+0.6*25

= 58.2 kN/m²

Base pressure at face of the pedestal = = (304.470871892782+((402.48-304.470871892782)/1.905*(1.9
= 366.98 kN/m²

Maximum cantilever moment at the face of pedestal = 0.5*(402.48+366.98)*0.69*(0.69/3*(366.98+2*402.48)/(366.98+402.48))-58.2*0.69*(0.69/2)
= 79.140 kNm

Overall depth provided 600 mm
Diameter of reinforcement bar = 10 mm
Effective depth provided = 600-75-10/2
= 520 mm

Mu/bd² = 1.5*79.14*1000000/(1000*520^2)
= 0.439

Percentage of reinforcement required (Pt) = 0.118
(As per Table 2 of SP16)

A_{st} required = 0.118/100*(1000*520)

= 613.6 mm²

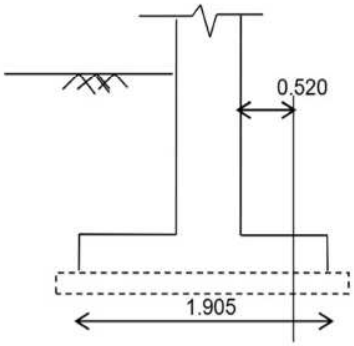
Minimum reinforcement = 0.12/100*(1000*520) = 624 mm²

Provide 10 @ 125 c/c m both ways at bottom.
(A_{st} provided = 628 mm²)
Pt provided = 100*628/(1000*520)= 0.121 **mm²** **Hence Safe**

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CHECK FOR SHEAR

One Way Shear



Overhang of footing beyond	=	(1.905-0.53)/2-0.52
critical section for shear	=	0.1675 m
Maximum base pressure	=	402.48 KN/m²
Depth at Critical Section	=	0.52 m
Base pressure at a distance "d"	=	(304.470871892782+((402.48-
from face of the pedestal =		304.470871892782)/1.905*(1.905-
	=	375.73 KN/m²
Downward force from footing	=	58.2 KN/m²
Shear force at critical section V	=	0.5*(402.48+375.73)*0.168-
		58.2*0.168
	=	55.427 kN/m
Shear stress τ_v	=	1.5*55.427*1000/(1000*1000*0.52)
	=	0.1599 N/mm²
τ_c (Table 19 of IS 456-2000)	=	0.264 N/mm²

Hence Safe

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Two Way Shear

Perimeter of the critical section around the pedetal at a distance d/2 from face of pedestal = ((0.53+2*(520/2/1000))*2)+((0.2+2*(520/2/1000))*2)
= 3.540 m

Depth at Critical Section = 0.52 m

Allowable punching shear stress

$\tau_c' = k_s \cdot \tau_c$

$ks = 0.5 + \beta_c$

$\beta_c = 0.53/0.2 = 2.65$

ks = 0.5 + 3
= 3.2

ks should not be greater than 1 = 1

$\tau_c = 0.25 \sqrt{f_{ck}}$ = 0.25 x √ 25
= **1.25 N/mm²**

Allowable maximum load (unfactored) on pedestal from punching shear point of view = 1.25*(3.54*1000)*0.52/1.5
= 1534.000 kN

Total Downward load = 900 kN

Hence Safe

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COLUMN DESIGN

NODE NUMBER : 35

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================================================================================
            IS-456    L I M I T    S T A T E    D E S I G N
         C O L U M N    N O.     34  D E S I G N    R E S U L T S

      M25                     Fe500 (Main)              Fe500 (Sec.)

LENGTH:  3000.0 mm   CROSS SECTION:  200.0 mm X  530.0 mm  COVER: 40.0 mm

** GUIDING LOAD CASE:   19  SHORT(Z)        /BRACED LONG(Y)

  STAAD SPACE                                              -- PAGE NO. 1339


REQD. STEEL AREA    :     2464.62 Sq.mm.
REQD. CONCRETE AREA:   103535.37 Sq.mm.
MAIN REINFORCEMENT : Provide   8 - 20 dia. (2.37%,   2513.27 Sq.mm.)
                     (Equally distributed)
TIE REINFORCEMENT  : Provide  8 mm dia. rectangular ties @ 200 mm c/c

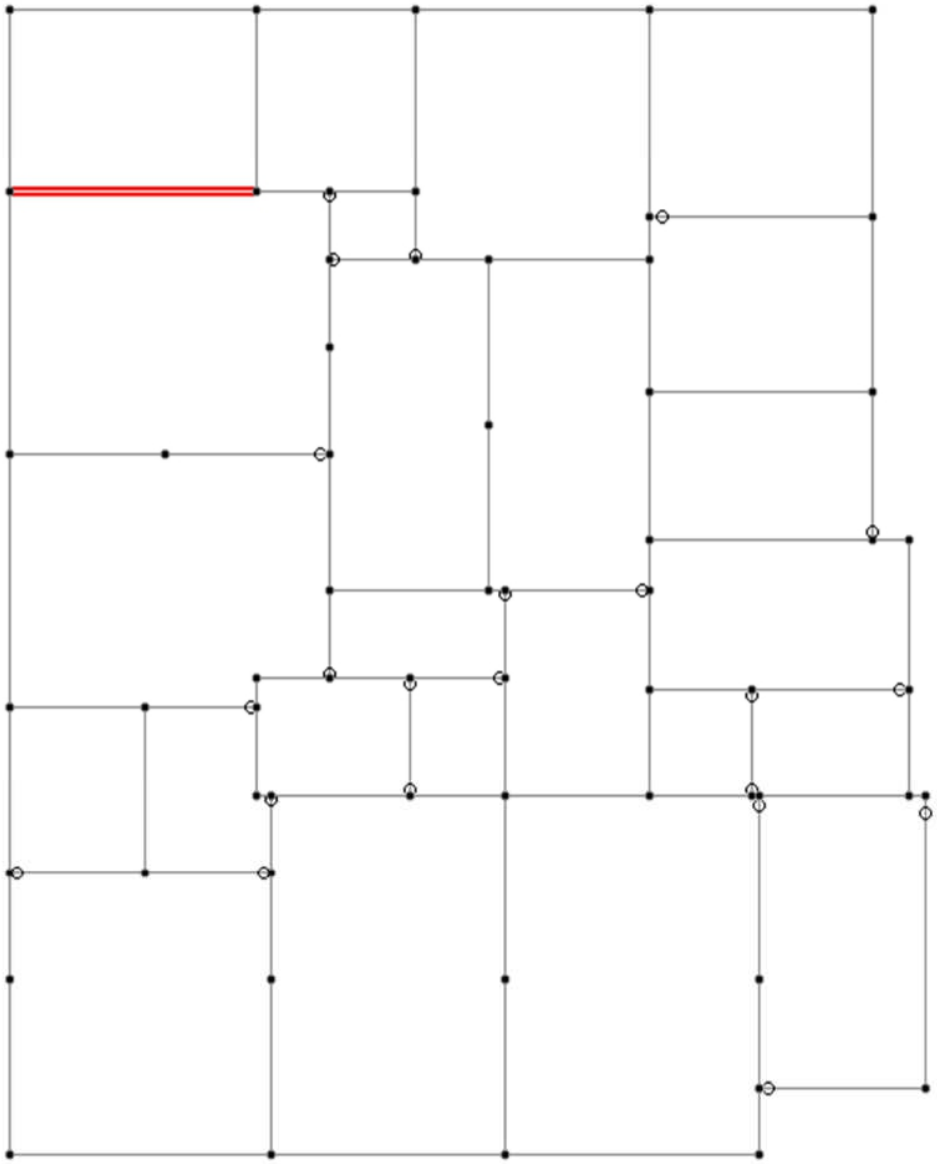
SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)
----------------------------------------------------------
Puz :   2089.00   Muz1 :    169.70   Muy1 :     46.07

INTERACTION RATIO: 0.99 (as per Cl. 39.6, IS456:2000)

SECTION CAPACITY BASED ON REINFORCEMENT PROVIDED (KNS-MET)
----------------------------------------------------------
WORST LOAD CASE:    16
Puz :   2106.70   Muz :    162.89   Muy :     43.35   IR: 0.90
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PLINTH BEAM DESIGN



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                IS-456    L I M I T    S T A T E    D E S I G N
                B E A M  N O.      50   D E S I G N  R E S U L T S

      M25                      Fe500 (Main)              Fe500 (Sec.)

    LENGTH:  4925.0 mm      SIZE:   200.0 mm X  380.0 mm   COVER: 35.0 mm


                      SUMMARY OF REINF. AREA (Sq.mm)
--------------------------------------------------------------------------------
SECTION       0.0 mm     1231.2 mm     2462.5 mm     3693.8 mm     4925.0 mm
--------------------------------------------------------------------------------
 TOP          502.90        190.19        115.60        115.60        271.14
REINF.       (Sq. mm)      (Sq. mm)      (Sq. mm)      (Sq. mm)      (Sq. mm)

BOTTOM        216.33        171.98        115.26        115.26        145.38
REINF.       (Sq. mm)      (Sq. mm)      (Sq. mm)      (Sq. mm)      (Sq. mm)
--------------------------------------------------------------------------------

                    SUMMARY OF PROVIDED REINF. AREA
--------------------------------------------------------------------------------
SECTION       0.0 mm     1231.2 mm     2462.5 mm     3693.8 mm     4925.0 mm
--------------------------------------------------------------------------------
 TOP          7-10d         3-10d         2-10d         2-10d         4-10d
REINF.    2 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)

BOTTOM       2-12d         2-12d         2-12d         2-12d         2-12d
REINF.    1 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)

SHEAR    2 legged  8d  2 legged  8d  2 legged  8d  2 legged  8d  2 legged  8d
REINF.  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c
--------------------------------------------------------------------------------


SHEAR DESIGN RESULTS AT DISTANCE d (EFFECTIVE DEPTH) FROM FACE OF THE SUPPORT
--------------------------------------------------------------------------------

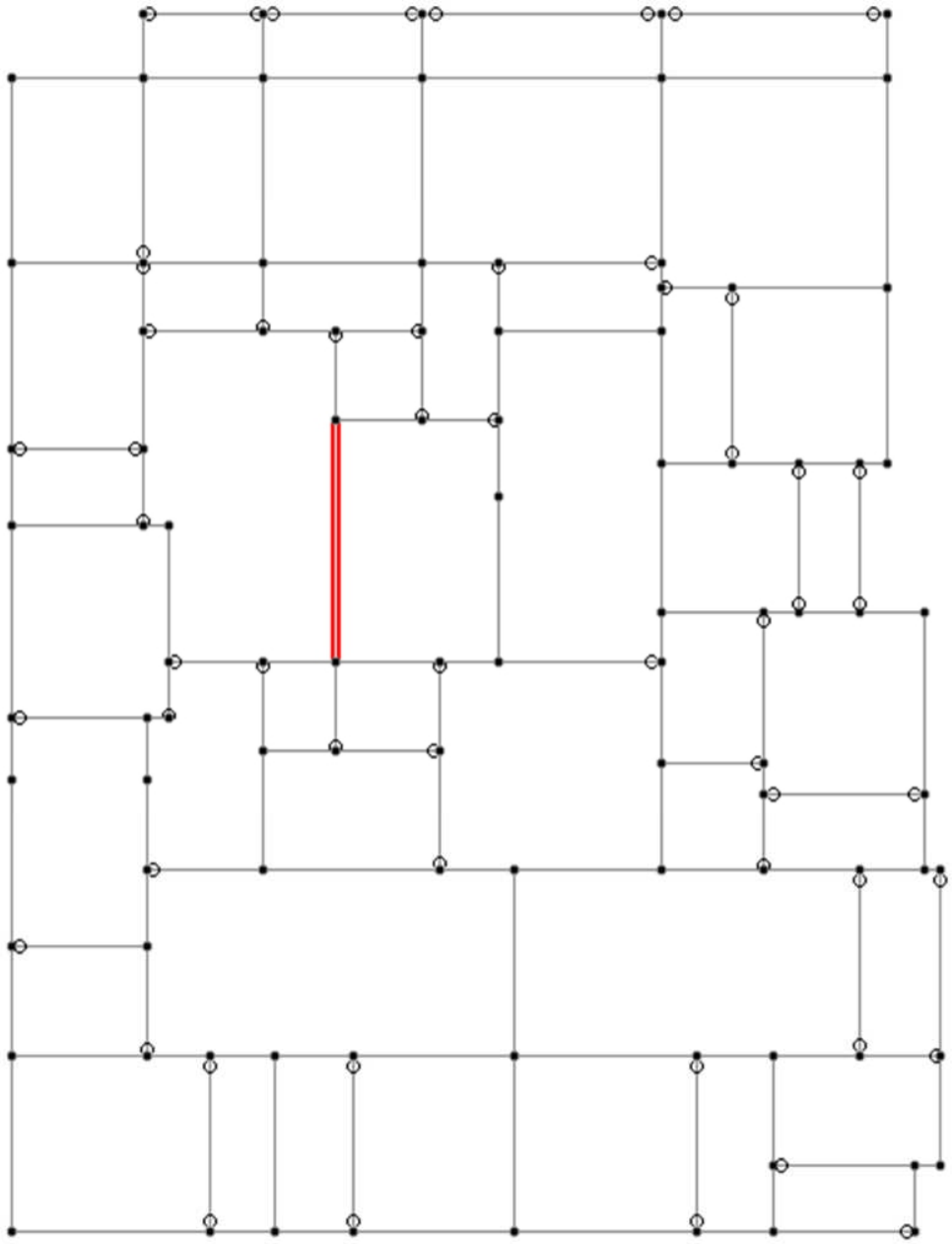
SHEAR DESIGN RESULTS AT    594.3 mm AWAY FROM START SUPPORT
  VY =     14.18 MX =      2.61 LD=    20
  Provide 2 Legged  8d  @ 110 mm c/c

SHEAR DESIGN RESULTS AT    440.0 mm AWAY FROM END SUPPORT
  VY =    -12.62 MX =      2.61 LD=    20
  Provide 2 Legged  8d  @ 110 mm c/c

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STILT FLOOR ROOF BEAM DESIGN



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                IS-456    L I M I T    S T A T E    D E S I G N
                B E A M  N O.     371   D E S I G N  R E S U L T S

      M25                      Fe500 (Main)              Fe500 (Sec.)

    LENGTH:  4544.0 mm      SIZE:   200.0 mm X  380.0 mm   COVER: 35.0 mm

                        SUMMARY OF REINF. AREA (Sq.mm)
--------------------------------------------------------------------------------
SECTION       0.0 mm     1136.0 mm     2272.0 mm     3408.0 mm     4544.0 mm
--------------------------------------------------------------------------------
 TOP          912.64        172.17          0.00        168.83        825.72
REINF.       (Sq. mm)      (Sq. mm)       (Sq. mm)      (Sq. mm)      (Sq. mm)

BOTTOM        320.31        236.61         261.11        257.53        227.02
REINF.       (Sq. mm)      (Sq. mm)       (Sq. mm)      (Sq. mm)      (Sq. mm)
--------------------------------------------------------------------------------


                        SUMMARY OF PROVIDED REINF. AREA
 --------------------------------------------------------------------------------
 SECTION       0.0 mm     1136.0 mm     2272.0 mm     3408.0 mm     4544.0 mm
 --------------------------------------------------------------------------------
  TOP         3-20d         2-20d         2-20d         2-20d         3-20d
 REINF.    1 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)

 BOTTOM       3-12d         3-12d         3-12d         3-12d         3-12d
 REINF.    1 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)

 SHEAR    2 legged  8d  2 legged  8d  2 legged  8d  2 legged  8d  2 legged  8d
 REINF.  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c
 --------------------------------------------------------------------------------


 SHEAR DESIGN RESULTS AT DISTANCE d (EFFECTIVE DEPTH) FROM FACE OF THE SUPPORT
 --------------------------------------------------------------------------------

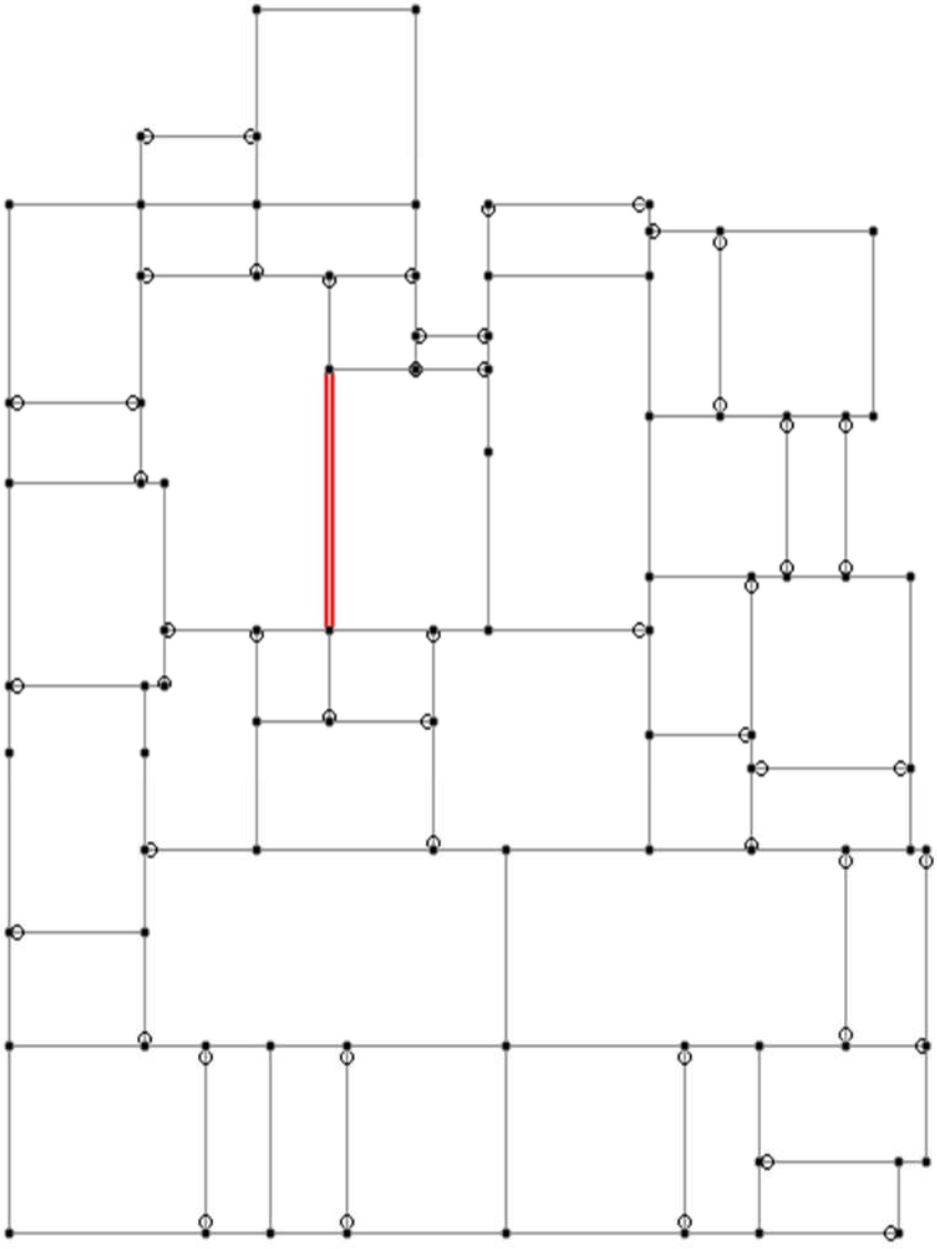
 SHEAR DESIGN RESULTS AT   600.0 mm AWAY FROM START SUPPORT
   VY =    73.49 MX =    -1.83 LD=   20
   Provide 2 Legged  8d  @ 110 mm c/c

 SHEAR DESIGN RESULTS AT   600.0 mm AWAY FROM END SUPPORT
   VY =   -66.28 MX =    -1.28 LD=   19
   Provide 2 Legged  8d  @ 110 mm c/c

 ================================================================================
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TYPICAL FLOOR ROOF BEAM DESIGN



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```
================================================================================
                IS-456   L I M I T   S T A T E   D E S I G N
               B E A M  N O.    661   D E S I G N  R E S U L T S

      M25                    Fe500 (Main)              Fe500 (Sec.)

    LENGTH:  4544.0 mm      SIZE:   200.0 mm X  380.0 mm   COVER: 35.0 mm


                    SUMMARY OF REINF. AREA (Sq.mm)
--------------------------------------------------------------------------------
SECTION      0.0 mm     1136.0 mm     2272.0 mm     3408.0 mm     4544.0 mm
--------------------------------------------------------------------------------
 TOP          886.20        163.13          0.00        169.63        838.42
REINF.      (Sq. mm)      (Sq. mm)      (Sq. mm)      (Sq. mm)      (Sq. mm)

BOTTOM       291.94        242.06        251.94        240.48        240.65
REINF.      (Sq. mm)      (Sq. mm)      (Sq. mm)      (Sq. mm)      (Sq. mm)
--------------------------------------------------------------------------------


                    SUMMARY OF PROVIDED REINF. AREA
--------------------------------------------------------------------------------
SECTION      0.0 mm     1136.0 mm     2272.0 mm     3408.0 mm     4544.0 mm
--------------------------------------------------------------------------------
 TOP         8-12d         2-12d         2-12d         2-12d         8-12d
REINF.    2 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)    2 layer(s)

BOTTOM       4-10d         4-10d         4-10d         4-10d         4-10d
REINF.    1 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)

SHEAR    2 legged  8d  2 legged  8d  2 legged  8d  2 legged  8d  2 legged  8d
REINF.  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c
--------------------------------------------------------------------------------


SHEAR DESIGN RESULTS AT DISTANCE d (EFFECTIVE DEPTH) FROM FACE OF THE SUPPORT
--------------------------------------------------------------------------------

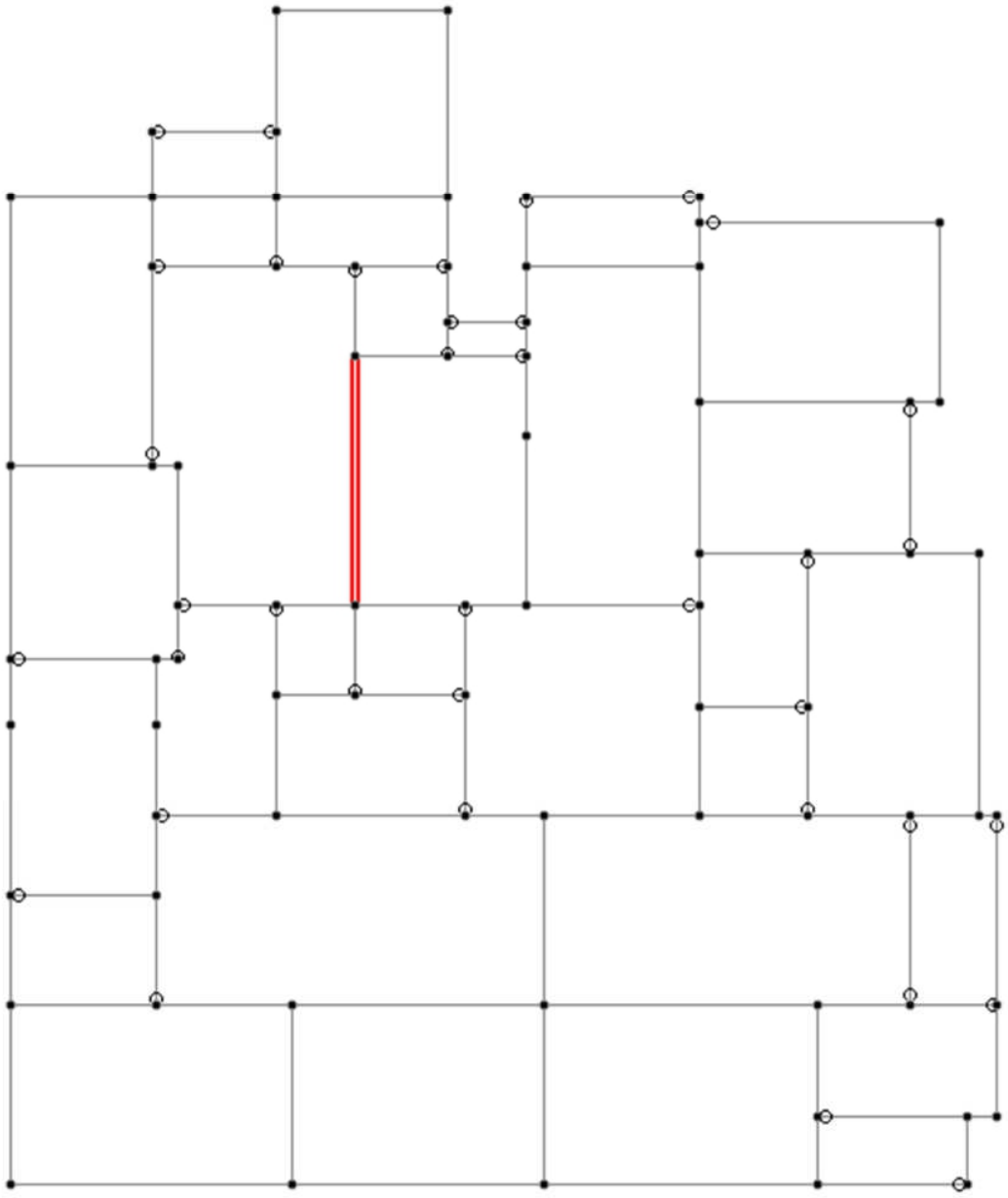
SHEAR DESIGN RESULTS AT   590.5 mm AWAY FROM START SUPPORT
  VY =    72.53 MX =    -1.20 LD=   20
  Provide 2 Legged  8d  @ 110 mm c/c

SHEAR DESIGN RESULTS AT   590.5 mm AWAY FROM END SUPPORT
  VY =   -67.55 MX =    -0.68 LD=   19
  Provide 2 Legged  8d  @ 110 mm c/c

================================================================================
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TERRACE FLOOR ROOF BEAM DESIGN



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================================================================================
                IS-456    L I M I T    S T A T E    D E S I G N
                B E A M  N O.     515   D E S I G N  R E S U L T S

      M25                      Fe500 (Main)                Fe500 (Sec.)

    LENGTH:  4544.0 mm      SIZE:   200.0 mm X  380.0 mm   COVER: 35.0 mm

                        SUMMARY OF REINF. AREA (Sq.mm)
--------------------------------------------------------------------------------
SECTION       0.0 mm      1136.0 mm      2272.0 mm      3408.0 mm      4544.0 mm
--------------------------------------------------------------------------------
 TOP          551.03         115.60           0.00         115.60         555.64
REINF.       (Sq. mm)       (Sq. mm)       (Sq. mm)       (Sq. mm)       (Sq. mm)

BOTTOM         0.00         118.50         247.65         115.60           0.00
REINF.       (Sq. mm)       (Sq. mm)       (Sq. mm)       (Sq. mm)       (Sq. mm)
--------------------------------------------------------------------------------


                        SUMMARY OF PROVIDED REINF. AREA
--------------------------------------------------------------------------------
SECTION       0.0 mm      1136.0 mm      2272.0 mm      3408.0 mm      4544.0 mm
--------------------------------------------------------------------------------
 TOP          5-12d          2-12d          2-12d          2-12d          5-12d
REINF.     2 layer(s)     1 layer(s)     1 layer(s)     1 layer(s)     2 layer(s)

BOTTOM       2-10d          2-10d          4-10d          2-10d          2-10d
REINF.     1 layer(s)     1 layer(s)     1 layer(s)     1 layer(s)     1 layer(s)

SHEAR    2 legged  8d  2 legged  8d  2 legged  8d  2 legged  8d  2 legged  8d
REINF.  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c
--------------------------------------------------------------------------------


SHEAR DESIGN RESULTS AT DISTANCE d (EFFECTIVE DEPTH) FROM FACE OF THE SUPPORT
--------------------------------------------------------------------------------

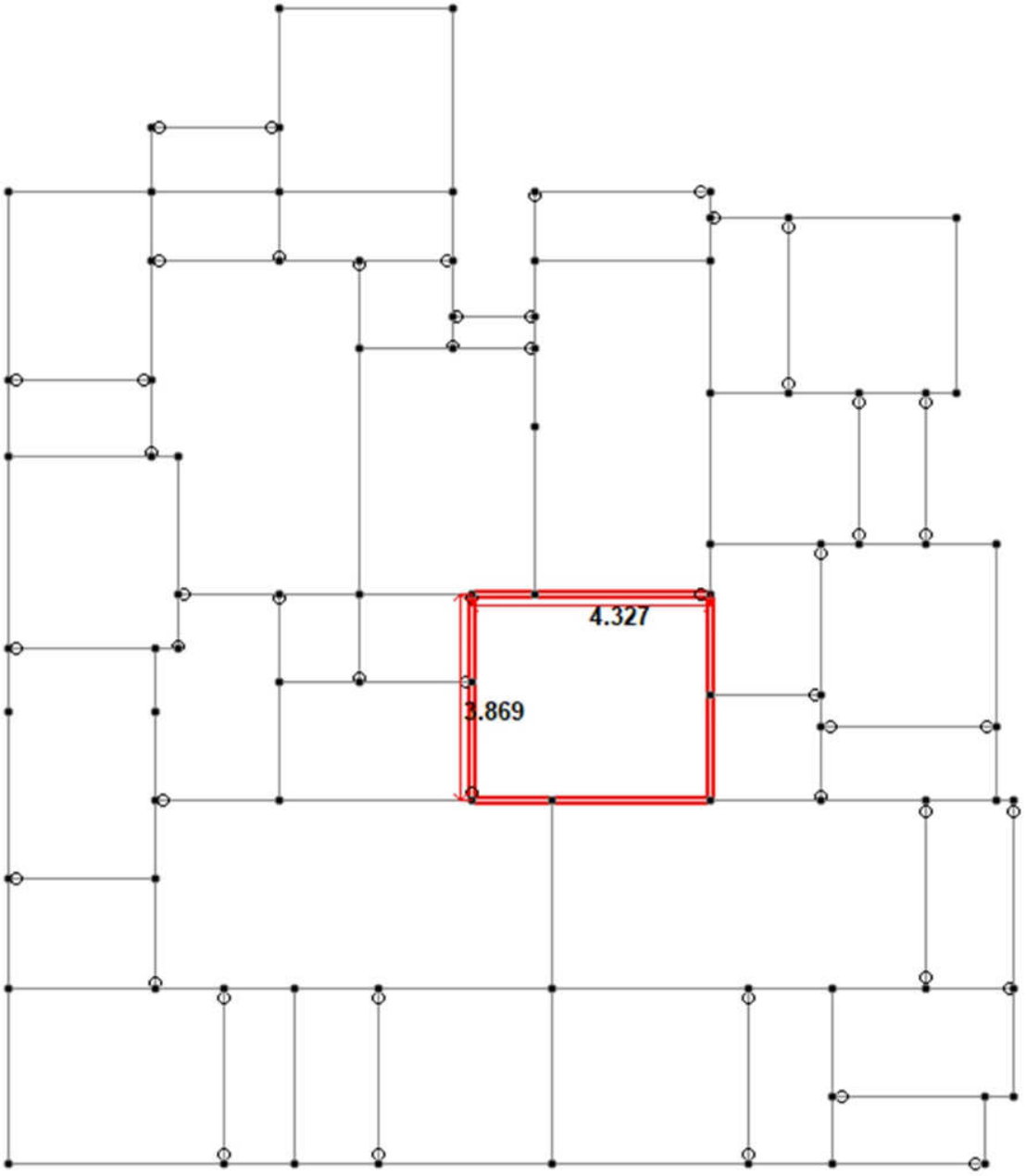
SHEAR DESIGN RESULTS AT    598.6 mm AWAY FROM START SUPPORT
  VY =     61.99 MX =     -0.92 LD=    16
  Provide 2 Legged  8d  @ 110 mm c/c

SHEAR DESIGN RESULTS AT    598.6 mm AWAY FROM END SUPPORT
  VY =    -58.55 MX =     -0.92 LD=    16
  Provide 2 Legged  8d  @ 110 mm c/c

================================================================================
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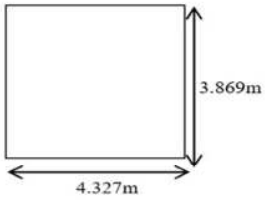
SLAB DESIGN



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GENERAL DATA

Shorter dimension of slab, l_x		4.33	m
Longer dimension of slab, l_y		3.87	m
	l_y/l_x	0.89	**Twoway Slab**
Assuming thickness of slab		150	mm
Consider width		1000	mm
	f_{ck}	25	kN/m^2
	f_y	500	kN/m^2



Type of panel - Interior panel

Clear cover to reinforcement 20 mm

Loads

Live load	4	kN/m^2
Dead load	3.75	kN/m^2
Floor Finish	1.5	kN/m^2
Total load	9.25	kN/m^2
Fact. load	13.88	kN/m^2

Typical design calculation

Mu = Coeff*W_u*l_x*l_x (Coefficient from IS:456)

= 0.032*13.88*4.327*4.327

= 8.32 kN-m

Mu/bd^2 = (8.32*10^6)/(1000*125^2)

0.532 N/mm^2

P_t = 0.242 (From SP-16, Table-3)

Ast = (0.242*1000*125)/100

= 302.5 mm^2

Spacing = (3.14*10*10/4/302.5)*1000

259.51 mm

Short span direction	Coeff	Mu (kNm)	Mu/bd^2	P_t	Ast	Dia	Spacing
Negative moment @ continuous edge	0.032	8.32	0.532	0.125	156.25	10	502.4
Positive moment @ midspan	0.024	6.24	0.40	0.118	147.5	10	532.21

Long span direction	Coeff	Mu (kNm)	Mu/bd^2	P_t	Ast	Dia	Max. Spacing
Negative moment @ continuous edge	0.032	8.32	0.53	0.125	156.25	10	502.4
Positive moment @ midspan	0.024	6.24	0.40	0.118	147.5	10	532.21

Reinforcement provided

Ast provided in short span = 523.33 mm^2

Spacing provided in short span = 150.00 mm

P_t provided in short span = 0.42

Hence spacing is safe

Ast provided in long spa 523.33 mm^2

Spacing provided in lon 150.00 mm

P_t provided in long span 0.42

Hence spacing is safe

Minimum effective depth required dreqd. = 49.10 mm (SQRT(MAX(Mu/0.138*fck*1000)))*1000

Minimum effective depth provided dprov. = (150-20-10/2)

125 mm

Minimum reinforcement Ast min = (0.12*1000*125/100)

= 150 mm^2

Depth provided is greater than minimum effective depth required

Hence safe

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Check for shear

Maximum shear force @ support — $Vu = Wl_x/2$
$= (13.88*4.327)/2$
$= 30.03$ kN

Actual shear force — $\zeta v = Vu / bd$
$= (30.03*1000)/(1000*125)$
$= 0.24$ N/mm^2

% of tension rft. provided in support pt = 0.42

IS:456-2000 Table-19
Allowable shear stress — $\zeta c = 0.425$

As per IS:456,cl:40.2.1.1 k value for slab = 1.3

Design shear stress for concrete — $k \times \zeta c = 0.5525$

Actual shear stress < Design shear stress
Hence safe

Check for deflection

Type of slab — Simply suppoerted
Allowable span / depth ratio = l/d = 20 [As per IS:456-2000, Cl:23.2.1(a)]

Percentage of tension reinforcement = 0.42
Steel stress of service loads — fs= 0.58fy(Area of steel required/Area of steel provided)
81.74 N/mm^2

Corresponding comp. rft.
Percentage of comp. reinforcement = 0.42

Modification factor for tension rft. F1= 2.00 (From fig:4 ,IS:456-2000)
Modification factor for comp. rft. F2= 1.120 (From fig:5 ,IS:456-2000)
Modified span/depth ratio = l/d x F1x F2
44.8
Actual span/ depth ratio = 34.62

Actual span/ depth ratio < Modified span / depth ratio
Hence safe

At Short span direction

Provided T10@ 150mm c/c

At Longer span direction

Provided T10@ 150mm c/c

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S.G.STRUCTURAL ENGINEERS					
Project	MILIR APARTMENT	Doc. No	DBR-BLOCK C–STR		
		Prepared	MP	Chkd	VS
Title	**Design Basis Report**	Rev	00	Date	09.04.2025

DESIGN BASIS REPORT

PROPOSED CONSTRUCTION OF RESIDENTIAL APARTMENT BUILDING RAMANATHAPURAM VILLAGE, COIMBATORE.

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2.0	DETAILED DESCRIPTION FOR APARTMENT BUILDING	3
3.0	TECHNICAL SPECIFICATION	3
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5.0	SITE LEVELS	4
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1.0 SCOPE:

This Document covers the requirement of RCC structural Design of Apartment Building (MILIR APARTMENT – BLOCK C) (Stilt+5) at Ramanathapuram ,Coimbatore.

2.0 DETAILED DESCRIPTION FOR APARTMENT BUILDING:

S. No.	Description	Description
1	Building Size	
1.1	Width of Building (O/O of wall)	57'-11½"
1.2	Length of Building (O/O of wall)	69'-8½"
2	Column Spacing	As per architectural drawings mentioned below.
3	Floor height	10'0" from FFL
4	Headroom height	9'0" from terrace FFL
5	Staircase	RCC Staircase with waist slab.
6	Overhead tank	12000 Liters Capacity.

3.0 TECHNICAL SPECIFICATION:

S. No.	Parameter	Specifications
1.	**Type of Building**	Rigid Frame Type
2.	**Design Consideration**	Designed as per IS CODE (Refer:6.0).
3.	**Geometrical Requirements of Components**	
3.1	Beams	RCC
3.2	Columns	RCC
3.3	Slab	RCC
4.	**Grades of Material**	
4.1	Grade of concrete	M25
4.2	Grade of steel	Fe500

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4.0 GENERAL:

All design calculations are carried out in SI System.

5.0 SITE LEVELS:

FFL is assumed as (+) 0.610m level from NGL.

6.0 STANDARDS AND CODES:

Designs are in accordance with the latest editions of the Standards and Codes of Practice as described below:

IS: 456 – 2000 (Reaffirmed in 2021) - Code of Practice for Plain & Reinforced concrete.

IS: 875-1987 & 2015 (Part 1to5)- Code of Practice for Design loads (other than Earthquake) for Buildings and structures.

IS: 1893-2016- Criteria for Earthquake resistant design of structures.

IS: 13920-2016– Ductile detailing of reinforced concrete structures subjected to seismic force.

7.0 LOADINGS:

Load and Load combinations are generally as per IS:875 (Part 1 to 5)-1987& 2015, unless noted otherwise.

Dead Loads:

Dead Loads are generally taken as per unit weights given in IS: 875 (Part 1)-1987 and as per construction elements like RC slab, floor finishes, screeds, waterproofing, masonry wall, etc.

The following table gives the density of the major materials.

MATERIALS	DENSITY (kN/m³)
PCC	24.0
Reinforced concrete	25.0
Brick work & Light weight	20.0 & 10.0
Structural steel	78.5

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A. BRICK MASONRY LOAD CALCULATION

Type-I (Basement Wall Load)

Height of the wall	=	0.61	m
Width of the wall	=	0.23	m
Unit Weight of the Brick Masonry	=	20.00	KN/m^3
Effective Height of the wall	=	0.61	m
Weight per meter length of wall	=	2.806	KN/m
Total UDL	=	2.806	KN/m

Type-II (Main wall 6" thick)
Stilt, Typical & terrace Floor

Height of the wall from beam top	=	2.743	m
Width of the wall	=	0.15	m
Unit Weight of the Brick Masonry	=	10.00	KN/m^3
Effective Height of the wall	=	2.743	m
Weight per meter length of wall	=	4.1145	KN/m
Total UDL	=	4.1145	KN/m

Type-III (Main wall 4½" thick)
Typical Floor

Height of the wall from beam top	=	2.743	m
Width of the wall	=	0.115	m
Unit Weight of the Brick Masonry	=	10.00	KN/m^3
Effective Height of the wall	=	2.743	m
Weight per meter length of wall	=	3.15445	KN/m
Total UDL	=	3.15445	KN/m

Type-IV(Parapet wall 8"thick)

Height of the wall	=	1.2	m
Width of the wall	=	0.20	m
Unit Weight of the Brick Masonry	=	20.00	KN/m^3

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Effective Height of the wall = 1.2 m

Weight per meter length of wall = 4.8 KN/m

Total UDL = 4.8 KN/m

Type-V (Parapet wall 4½" thick)

Typical Floor

Height of the wall from beam top = 0.9 m

Width of the wall = 0.115m

Unit Weight of the Brick Masonry = 20.00 KN/m^3

Effective Height of the wall = 0.9 m

Weight per meter length of wall = 2.07 KN/m

Total UDL = 2.07 KN/m

Type-VI (RCC Wall 8" thick)

Terrace Floor

Height of the wall from beam top = 1.5 m

Width of the wall = 0.20 m

Unit Weight of the Brick Masonry = 25.00 KN/m^3

Effective Height of the wall = 1.5 m

Weight per meter length of wall = 7.5 KN/m

Total UDL = 7.5 KN/m

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Stilt Floor and Typical floor Roof :

(i) Self weight of slab(Thk of slab* 25 KN/m^3) = 3.75 KN/m^2

(ii) Floor finish, Ceiling finish & Fixtures = 1.5 KN/m^2

(iii) Total dead load on slab = 5.25 KN/m^2

Terrace floor and headroom floor Roof

(i) Self weight of slab(Thk of slab* 25 KN/m^3) = 3.75 KN/m^2

(ii) Floor finish, Ceiling finish & Fixtures = 2.25 KN/m^2

(iii) Total dead load on slab = 6.00 KN/m^2

Toilet sunk load :

(i) Depth of the toilet sunk = 0.23 m

(ii) Unit Weight of the Brick Masonry = 10 KN/m3

(iii) Total dead load on slab = 2.3KN/m^2

Live Loads:

Live Loads are considered as per IS: 875 – 1987 Part 2.

The load is considered as indicated below

i) Room & Toilet	=	2.00	KN/m2
ii) Balcony	=	3.00	KN/m2
iii) Lift ,Passage and staircase	=	4.00	KN/m2
iii) Terrace	=	3.0&1.50	KN/m2

Seismic Loads:

The Seismic loads on the structure are calculated as per IS: 1893 – 2016. The zone factor considered as indicated below.

Seismic Zone - III

Soil type and Depth of foundation has been taken as per soil investigation report.

Load Combinations:

The load combinations are giving for the most critical conditions on foundations, structures or individual members shall be taken into account.The load combination indicated in

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IS:875 (Part 5)-1987& IS: 1893 – 2016 is adopted for the design of civil / structural members. The load combination with corresponding load factor is indicated below.

a) 1.0[DL+LL]

b) 1.0DL+0.8[LL+EQX+]

c) 1.0DL+0.8[LL+EQX-]

d) 1.0DL+0.8[LL+EQZ+]

e) 1.0DL+0.8[LL+EQZ-]

f) 1.0[DL+EQX+]

g) 1.0[DL+EQX-]

h) 1.0[DL+EQZ+]

i) 1.0[DL+EQZ-]

j) 1.5[DL+LL]

k) 1.2[DL+LL+EQX+]

l) 1.2[DL+LL+EQX-]

m)1.2[DL+LL+EQZ+]

n) 1.2[DL+LL+EQZ-]

o) 1.5[DL+EQX+]

p) 1.5[DL+EQX-]

q) 1.5[DL+EQZ+]

r) 1.5[DL+EQZ-]

s) 0.9DL+1.5EQX+]

t) 0.9DL+1.5EQX-]

u) 0.9DL+1.5EQZ+]

v) 0.9DL+1.5EQZ-]



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Where,

DL - Dead Load

LL - Live load

EQL - Earthquake Load

8.0 METHOD OF DESIGN:

Equivalent Static analysis is carried out using Staad Pro v8i Software and load combinations giving the most critical conditions are considered for the design of foundations.

Sub structure is designed for critical load combination by manual calculation.

Reinforced cement concrete - Design as per IS: 456 – 2000 using Staad Pro v8i Software.Ductile detailing is considered as per 13920 -2016.

9.0 SOIL INFORMATION:

Safe Bearing Capacity of soil – 368.5kN/m^2 at a depth of 3.0m below NGL is considered as per soil report.

10.0 DESIGN:

10.1 FOUNDATIONS:

Foundation is designed to carry all the loads from super-structure.

10.2 RCC COLUMNS:

RCC columns are designed using the STAAD pro analysis software for critical load conditions and are tabulated in the provided drawing.

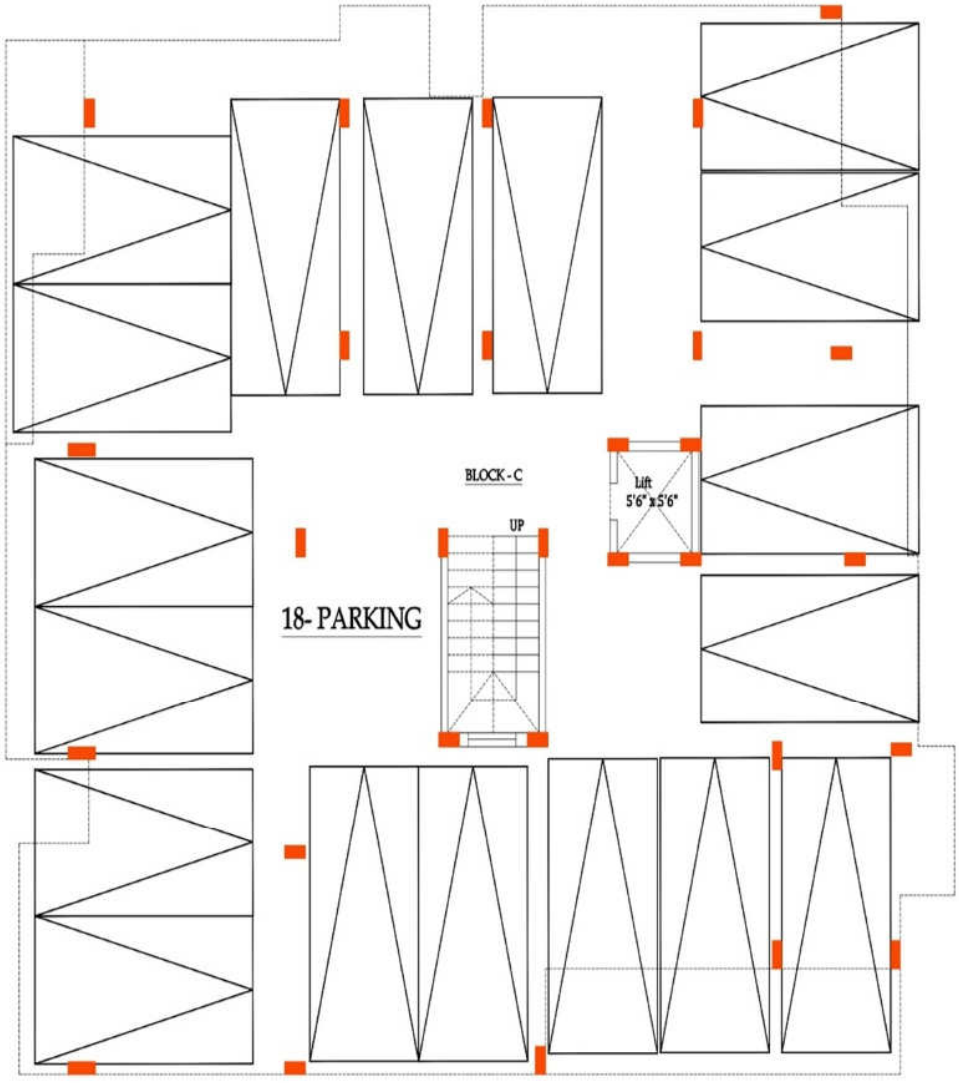
10.2 ROOF SLABS AND BEAMS:

All beams are designed using STAAD pro analysis software for critical load conditions. Slab design is carried out manually.

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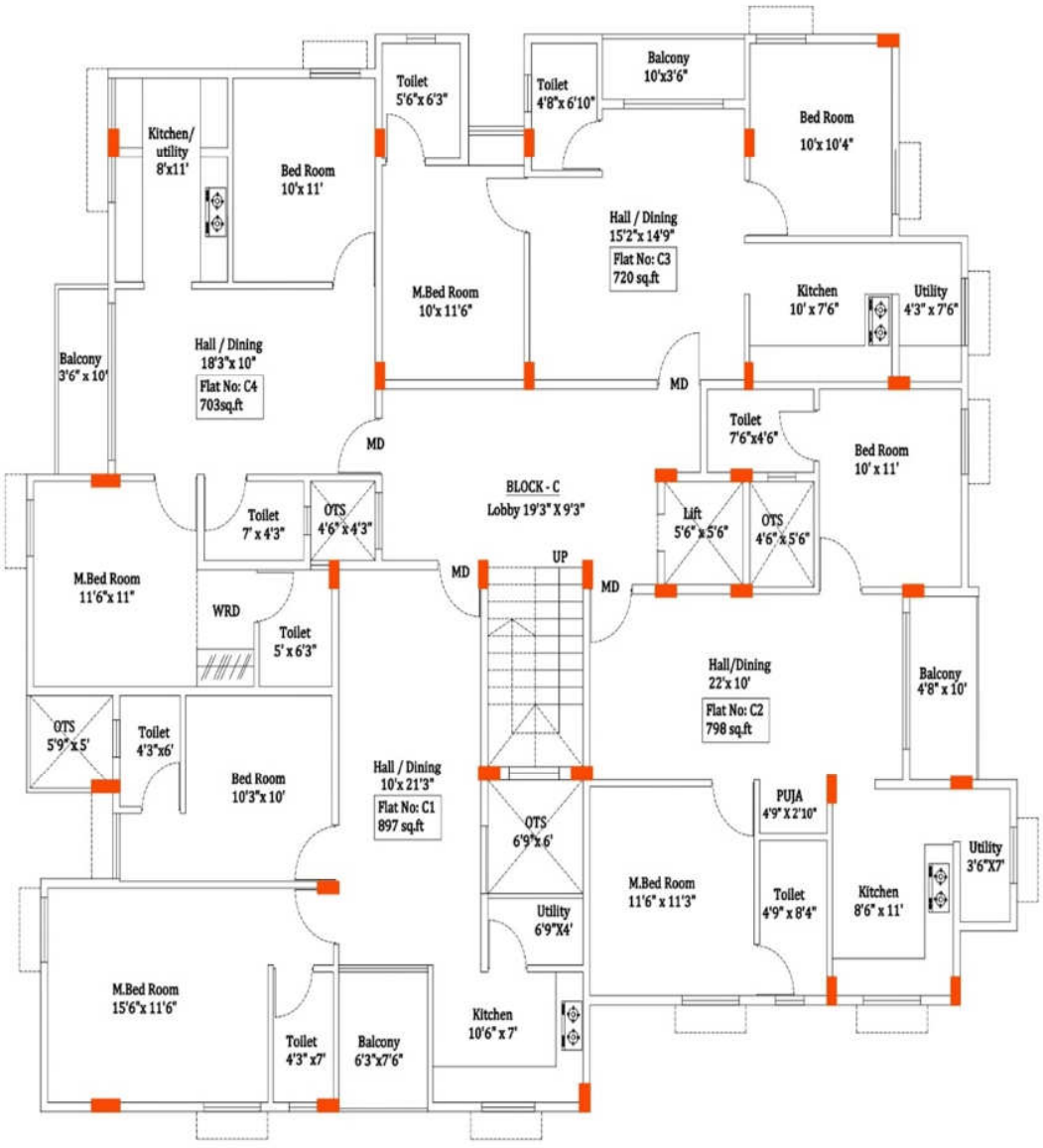
11.0 FLOOR PLANS:

STILT FLOOR PLAN



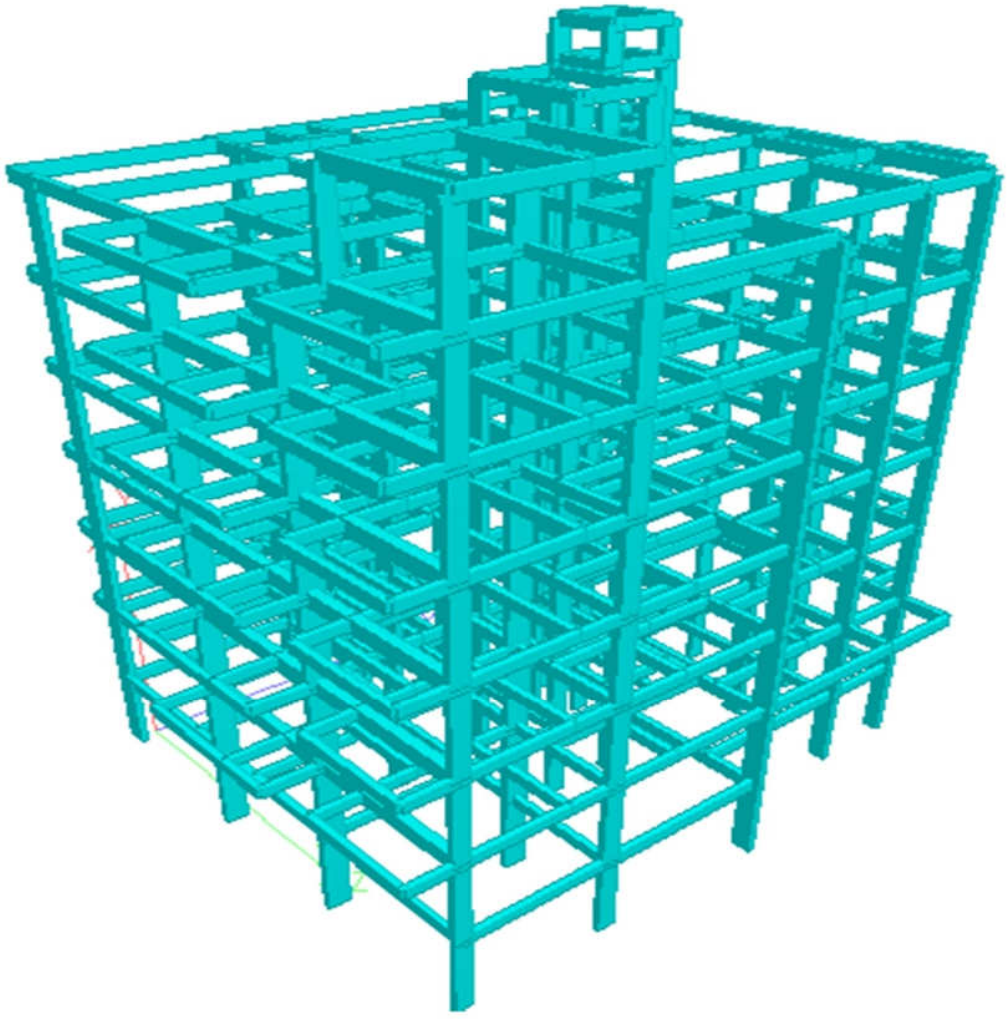
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TYPICAL FLOOR PLAN



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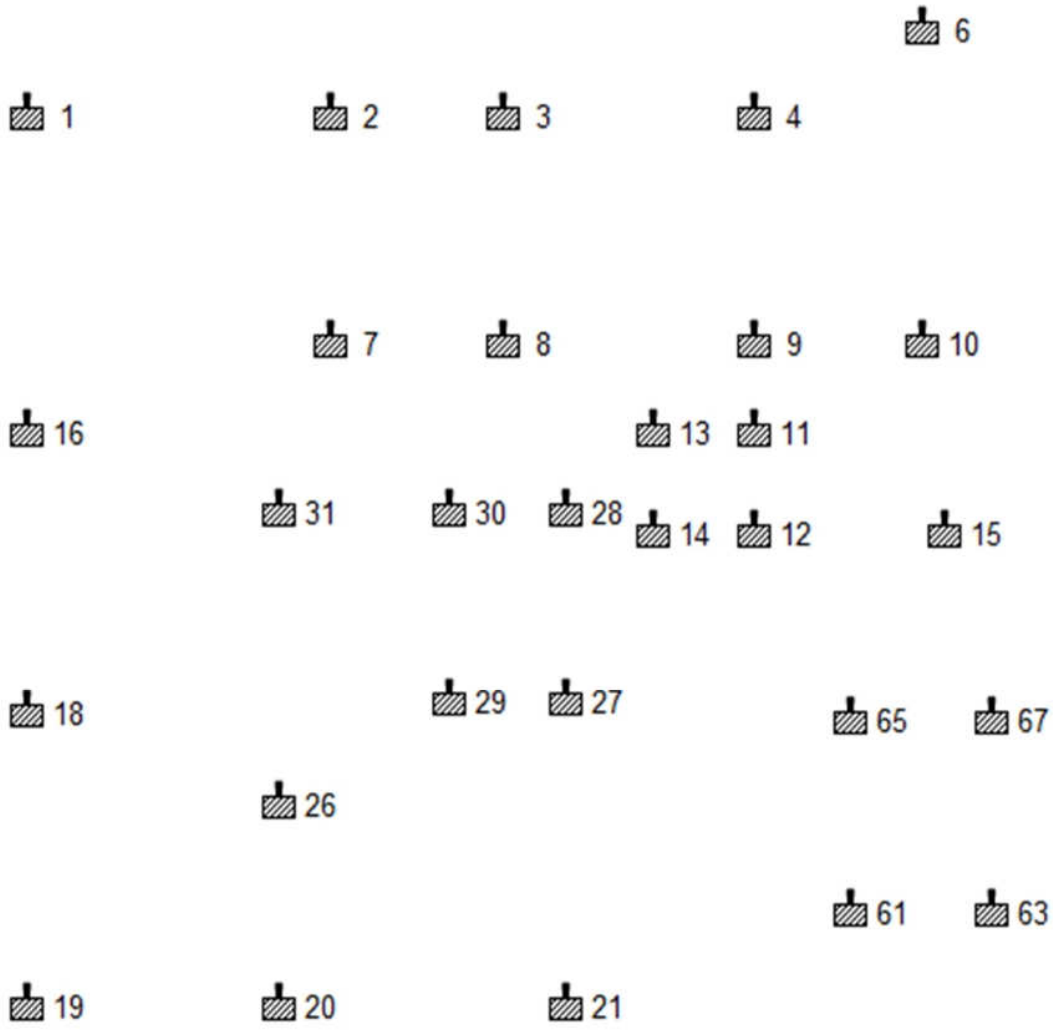
12.0 STAAD IMAGE:



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13.0 DESIGN CALCULATION:

NODE NUMBERS



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FOOTING DESIGN

GENERAL DATA

NODE:30

Design Method	=	Limit-State of IS:456-2000
Unfactored axial load (without selfwt)	=	747 kN
Unfactored moment about X (Anticlock +ve)	=	59 kN.m
Unfactored moment about Z (Anticlock +ve)	=	1 kN.m
Net Safe bearing capacity of soil @ 2.3 m below Finished grade lvl	=	368.5 kN/m²
Concrete mix	=	M 25
Density of concrete	=	25 kN/m³
Density of soil	=	18 kN/m³
Factor of Safety	=	1.50
Provide size of footing	=	1.82 x 1.68 x 0.45 m
Size of Column	=	0.45 x 0.2 m
Depth of footing below ground level	=	3 m
Clear cover to steel	=	75 mm

VERTICAL LOAD:

Weight of entire foundation

(1.82*1.68*0.45*25)

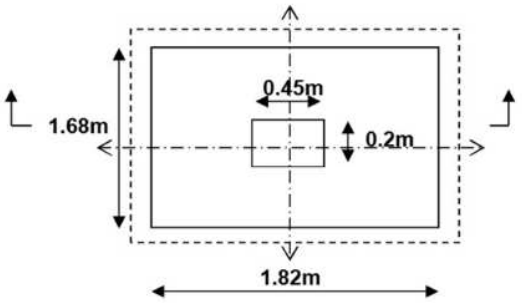
= 34.40 kN

Weight of soil

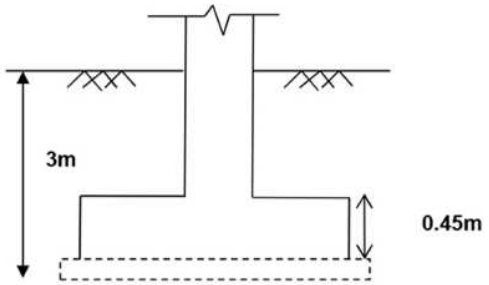
(1.82*1.68*2.55*18)

= 140.34 kN

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PLAN



SECTION

DESIGN CALCULATION

CHECK FOR BEARING PRESSURE:

Total Vertical Load

a) Weight of foundation = 34.40 kN

b) Weight of soil = 140.34 kN

c) Vertical load from structures = 747 kN

TOTAL DOWNWARD LOAD = 34.4+140.34+747
= **921.7 kN**

Section Modulus about XX (Zxx) = 1.82*1.68^2/6
= 0.856 Cum

Section Modulus about YY (Zyy) = 1.68*1.82^2/6
= 0.927 Cum

Actual base pressure = **(921.74/1.82/1.68)+(ABS(59)/0.856)**
+(ABS(1)/0.927)

qmax = **371.46 kN/m²**

qmin = **231.45 kN/m²** **Hence Safe**

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Max Net Pressure, qmax-γ H = 371.46-3*18

= **317.46 kN/m²**

< **368.5 kN/m²**

Hence Safe

DESIGN OF FOOTING SLAB:

Maximum base pressure = 371.46 kN/m²

Maximum overhang of pad = (1.82-0.45)/2 =

= 0.69 m

Pressure due to over burden of soil & pad = (3-0.45)*18+0.45*25

= 57.15 kN/m²

Base pressure at face of the pedestal = = (231.454678090808+((371.46-231.454678090808)/1.82*(1.82-

= 318.38 kN/m²

Maximum cantilever moment at the face of pedestal = 0.5*(371.46+318.38)*0.69*(0.69/3*(318.38+2*371.46)/(318.38+371.46))-57.15*0.69*(0.69/2)

= 70.610 kNm

Overall depth provided 450 mm

Diameter of reinforcement bar = 10 mm

Effective depth provided = 450-75-10/2

= 370 mm

Mu/bd² = 1.5*70.61*1000000/(1000*370^2)

= 0.7737

Percentage of reinforcement required (Pt) = 0.133 **(As per Table 2 of SP16)**

A_{st} required = 0.133/100*(1000*370)

= 492.1 mm²

Minimum reinforcement = 0.12/100*(1000*370) = 444 mm²

Provide 10 @ 150 c/c m both ways at bottom.

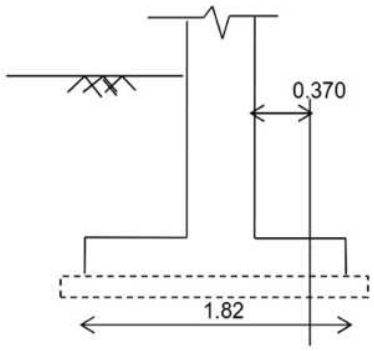
(A_{st} provided = 524 mm²)

Pt provided = 100*524/(1000*370)= 0.142 **mm²** **Hence Safe**

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CHECK FOR SHEAR

One Way Shear



Overhang of footing beyond critical section for shear = (1.82-0.45)/2-0.37
= 0.315 m

Maximum base pressure = 371.46 KN/m²

Depth at Critical Section = 0.37 m

Base pressure at a distance "d" from face of the pedestal = (231.454678090808+((371.46-231.454678090808)/1.82*(1.82-
= 343 KN/m²

Downward force from footing = 57.15 KN/m²

Shear force at critical section V = 0.5*(371.46+343)*0.315-57.15*0.315
= 94.525 kN/m

Shear stress τ_v = 1.5*94.525*1000/(1000*1000*0.37)

= 0.3832 N/mm^2

τ_c (Table 19 of IS 456-2000) = 0.42 N/mm²

Hence Safe

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Two Way Shear

Perimeter of the critical section = ((0.45+2*(370/2/1000))*2)+((0.2+2*(370/2/1000))*2)
around the pedetal at a distance d/2 = 2.780 m
from face of pedestal

Depth at Critical Section = 0.37 m

Allowable punching shear stress

$\tau_c' = k_s \cdot \tau_c$

$ks = 0.5 + \beta_c$

β_c = 0.45/0.2 = 2.25

ks = 0.5 + 2
= 2.8

ks should not be greater than 1 = 1

$\tau_c = 0.25 \sqrt{f_{ck}}$ = 0.25 x √ 25
= **1.25 N/mm²**

Allowable maximum load (unfactored) on pedestal from punching shear point of view = 1.25*(2.78*1000)*0.37/1.5
= 857.167 kN

Total Downward load = 747 kN

Hence Safe

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COLUMN DESIGN

NODE NUMBER : 30

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==========================================================================
            IS-456    L I M I T    S T A T E    D E S I G N
         C O L U M N    N O.     30  D E S I G N   R E S U L T S

      M25                     Fe500 (Main)              Fe500 (Sec.)

LENGTH:  3000.0 mm   CROSS SECTION:  200.0 mm X  450.0 mm  COVER: 40.0 mm

** GUIDING LOAD CASE:   19  SHORT(Z)        /BRACED LONG(Y)

  STAAD SPACE                                              -- PAGE NO. 1230


REQD. STEEL AREA    :     1113.02 Sq.mm.
REQD. CONCRETE AREA:    88886.98 Sq.mm.
MAIN REINFORCEMENT : Provide   8 - 16 dia. (1.79%,   1608.50 Sq.mm.)
                     (Equally distributed)
TIE REINFORCEMENT  : Provide  8 mm dia. rectangular ties @ 200 mm c/c

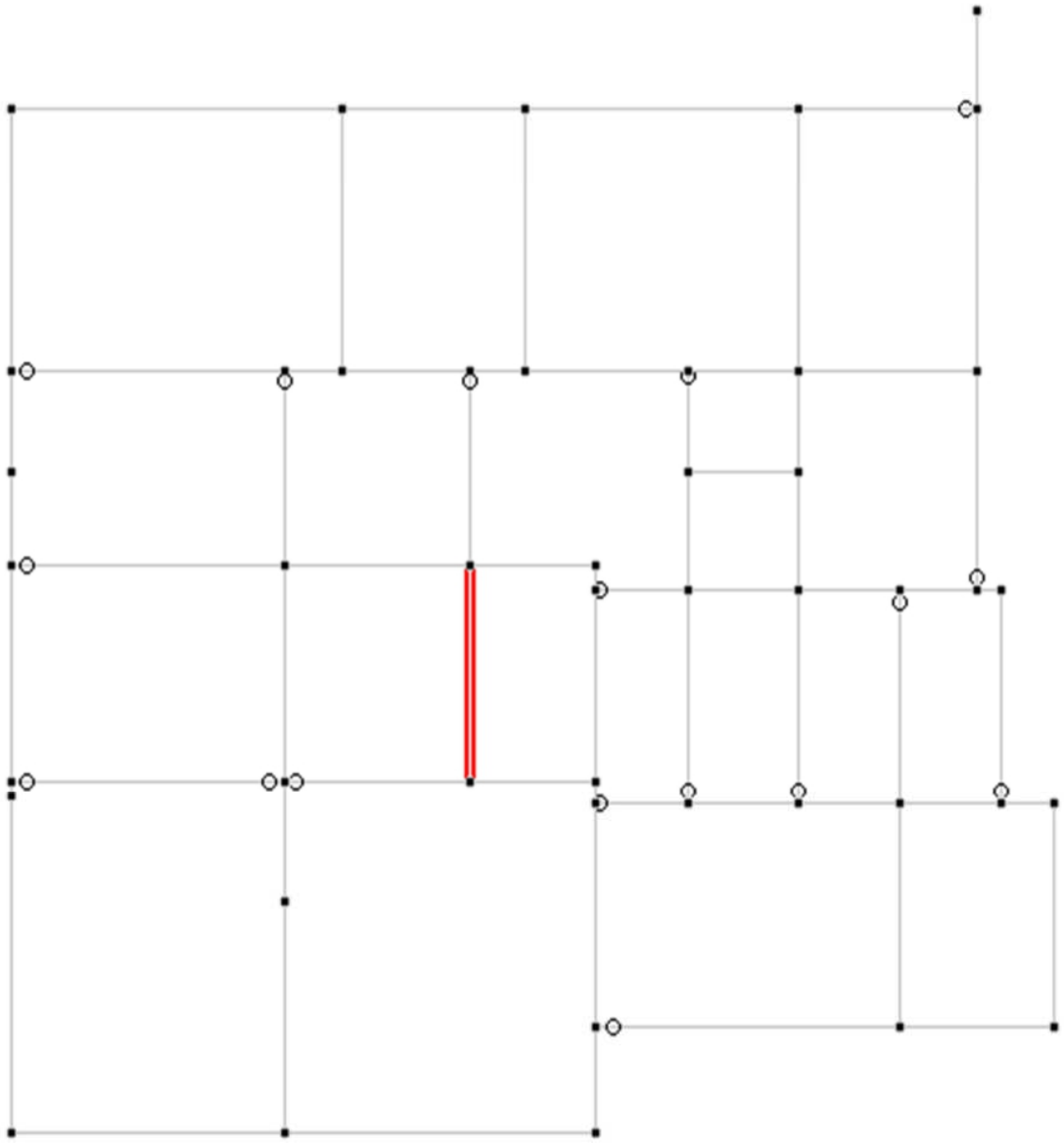
SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)
----------------------------------------------------------
Puz :   1417.36   Muz1 :     95.36   Muy1 :     34.17

INTERACTION RATIO: 0.98 (as per Cl. 39.6, IS456:2000)

SECTION CAPACITY BASED ON REINFORCEMENT PROVIDED (KNS-MET)
----------------------------------------------------------
WORST LOAD CASE:    19
Puz :   1597.59   Muz :    121.32   Muy :     39.66   IR: 0.80
==========================================================================
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PLINTH BEAM DESIGN



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                IS-456    L I M I T    S T A T E    D E S I G N
               B E A M  N O.      58   D E S I G N  R E S U L T S

      M25                     Fe500 (Main)                Fe500 (Sec.)

    LENGTH:  3387.0 mm      SIZE:   200.0 mm X  380.0 mm   COVER: 35.0 mm

                        SUMMARY OF REINF. AREA (Sq.mm)
--------------------------------------------------------------------------------
SECTION      0.0 mm      846.8 mm     1693.5 mm     2540.3 mm     3387.0 mm
--------------------------------------------------------------------------------
 TOP          701.26       252.11          0.00        134.66        418.65
REINF.      (Sq. mm)     (Sq. mm)       (Sq. mm)      (Sq. mm)      (Sq. mm)

BOTTOM       394.57       246.13        115.26        239.63        404.13
REINF.      (Sq. mm)     (Sq. mm)       (Sq. mm)      (Sq. mm)      (Sq. mm)
--------------------------------------------------------------------------------

  STAAD SPACE                                              -- PAGE NO.  702


                        SUMMARY OF PROVIDED REINF. AREA
--------------------------------------------------------------------------------
SECTION      0.0 mm      846.8 mm     1693.5 mm     2540.3 mm     3387.0 mm
--------------------------------------------------------------------------------
 TOP         7-12d         3-12d         2-12d         2-12d         4-12d
REINF.   2 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)

BOTTOM       4-12d         3-12d         2-12d         3-12d         4-12d
REINF.   1 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)

SHEAR   2 legged  8d  2 legged  8d  2 legged  8d  2 legged  8d  2 legged  8d
REINF.  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c
--------------------------------------------------------------------------------


SHEAR DESIGN RESULTS AT DISTANCE d (EFFECTIVE DEPTH) FROM FACE OF THE SUPPORT
--------------------------------------------------------------------------------

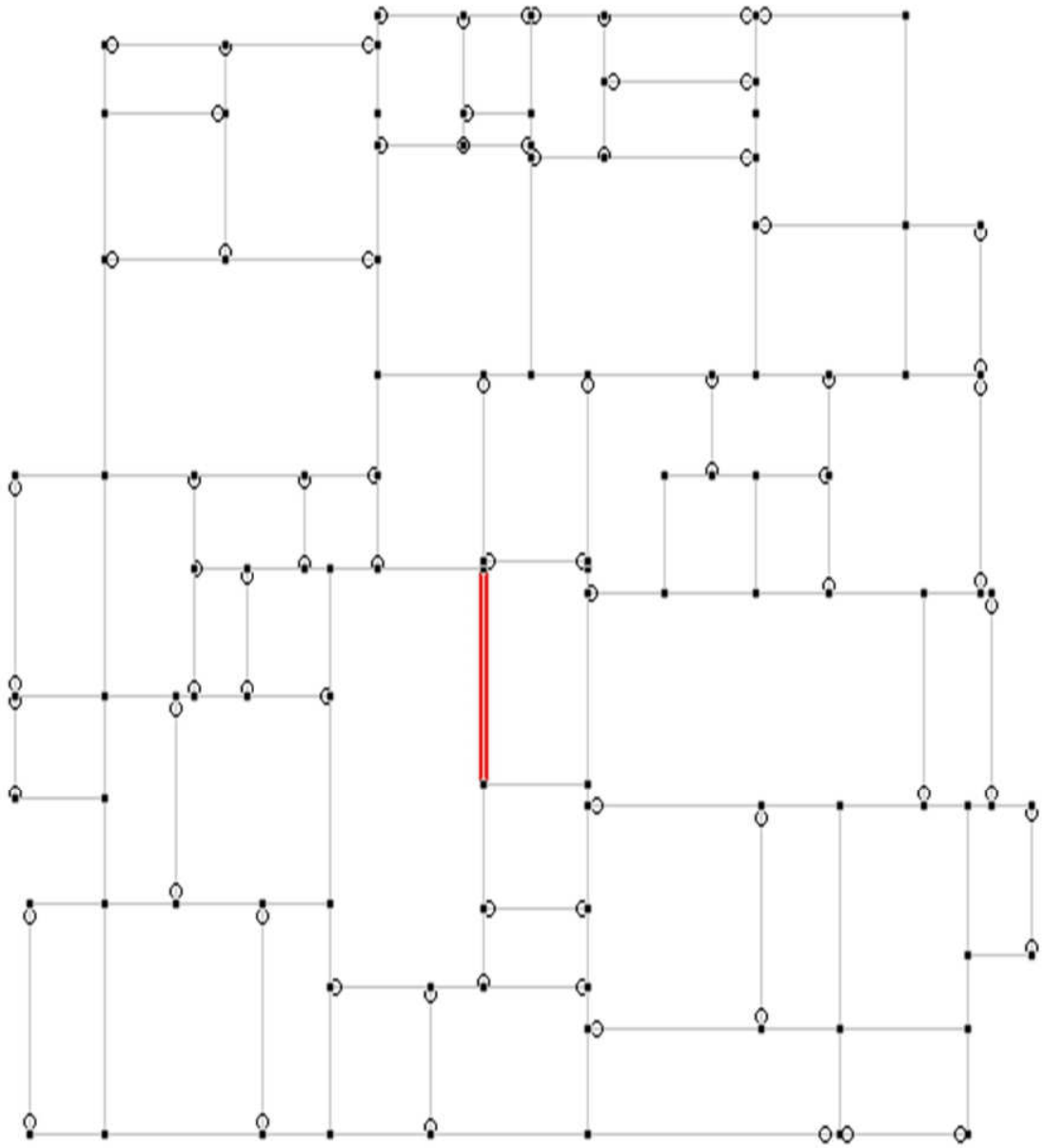
SHEAR DESIGN RESULTS AT   592.4 mm AWAY FROM START SUPPORT
  VY =    53.55 MX =    -0.19 LD=   20
  Provide 2 Legged  8d  @ 110 mm c/c

SHEAR DESIGN RESULTS AT   454.0 mm AWAY FROM END SUPPORT
  VY =   -45.01 MX =     0.09 LD=   19
  Provide 2 Legged  8d  @ 110 mm c/c

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STILT FLOOR ROOF BEAM DESIGN



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                IS-456    L I M I T    S T A T E    D E S I G N
                B E A M  N O.     302   D E S I G N  R E S U L T S

      M25                     Fe500 (Main)              Fe500 (Sec.)

    LENGTH:  3387.0 mm      SIZE:   200.0 mm X  380.0 mm   COVER: 35.0 mm


                      SUMMARY OF REINF. AREA (Sq.mm)
--------------------------------------------------------------------------------
SECTION      0.0 mm      846.8 mm     1693.5 mm     2540.3 mm     3387.0 mm
--------------------------------------------------------------------------------
 TOP          789.13       295.95        115.60        301.10        913.78
REINF.      (Sq. mm)     (Sq. mm)      (Sq. mm)      (Sq. mm)      (Sq. mm)

BOTTOM       509.81       339.10        115.60        117.37        301.22
REINF.      (Sq. mm)     (Sq. mm)      (Sq. mm)      (Sq. mm)      (Sq. mm)
--------------------------------------------------------------------------------


                      SUMMARY OF PROVIDED REINF. AREA
--------------------------------------------------------------------------------
SECTION      0.0 mm      846.8 mm     1693.5 mm     2540.3 mm     3387.0 mm
--------------------------------------------------------------------------------
 TOP         3-20d         2-20d         2-20d         2-20d         3-20d
REINF.    1 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)

BOTTOM       7-10d         5-10d         2-10d         2-10d         4-10d
REINF.    2 layer(s)    2 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)

SHEAR    2 legged  8d  2 legged  8d  2 legged  8d  2 legged  8d  2 legged  8d
REINF.  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c
--------------------------------------------------------------------------------


SHEAR DESIGN RESULTS AT DISTANCE d (EFFECTIVE DEPTH) FROM FACE OF THE SUPPORT
--------------------------------------------------------------------------------

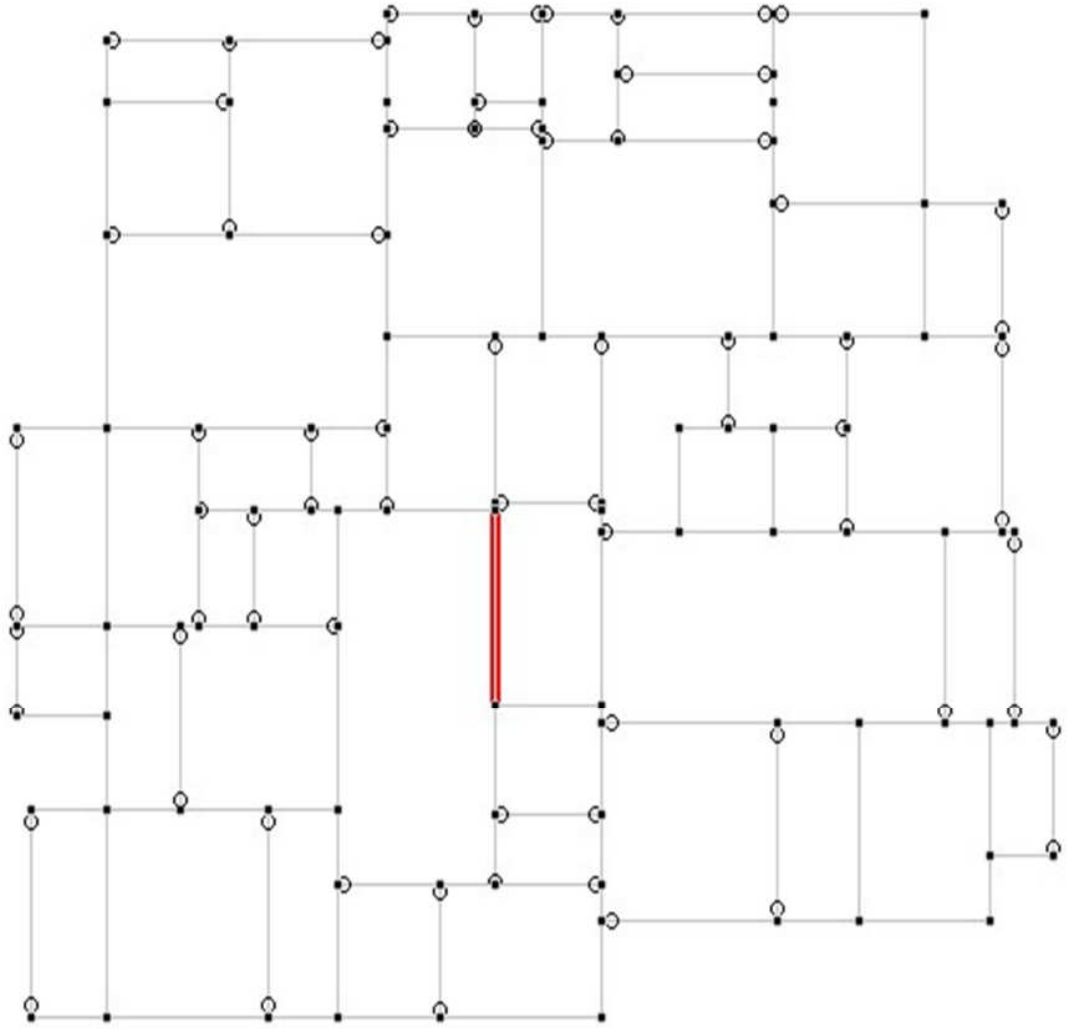
SHEAR DESIGN RESULTS AT   600.0 mm AWAY FROM START SUPPORT
  VY =    61.47 MX =     0.11 LD=   20
  Provide 2 Legged  8d  @ 110 mm c/c

SHEAR DESIGN RESULTS AT   450.0 mm AWAY FROM END SUPPORT
  VY =   -83.58 MX =     1.09 LD=   19
  Provide 2 Legged  8d  @ 110 mm c/c

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TYPICAL FLOOR ROOF BEAM DESIGN



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                IS-456    L I M I T    S T A T E    D E S I G N
               B E A M  N O.     645   D E S I G N  R E S U L T S

      M25                     Fe500 (Main)                Fe500 (Sec.)

    LENGTH:  3387.0 mm      SIZE:    200.0 mm X  380.0 mm    COVER: 35.0 mm

  STAAD SPACE                                                -- PAGE NO.  974
```

SUMMARY OF REINF. AREA (Sq.mm)

SECTION	0.0 mm	846.8 mm	1693.5 mm	2540.3 mm	3387.0 mm
TOP REINF.	844.18 (Sq. mm)	295.99 (Sq. mm)	115.60 (Sq. mm)	262.32 (Sq. mm)	877.54 (Sq. mm)
BOTTOM REINF.	464.02 (Sq. mm)	309.22 (Sq. mm)	115.60 (Sq. mm)	136.78 (Sq. mm)	282.65 (Sq. mm)

SUMMARY OF PROVIDED REINF. AREA

SECTION	0.0 mm	846.8 mm	1693.5 mm	2540.3 mm	3387.0 mm
TOP REINF.	8-12d 2 layer(s)	3-12d 1 layer(s)	2-12d 1 layer(s)	3-12d 1 layer(s)	8-12d 2 layer(s)
BOTTOM REINF.	6-10d 2 layer(s)	4-10d 1 layer(s)	2-10d 1 layer(s)	2-10d 1 layer(s)	4-10d 1 layer(s)
SHEAR REINF.	2 legged 8d @ 110 mm c/c	2 legged 8d @ 110 mm c/c	2 legged 8d @ 110 mm c/c	2 legged 8d @ 110 mm c/c	2 legged 8d @ 110 mm c/c

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SHEAR DESIGN RESULTS AT DISTANCE d (EFFECTIVE DEPTH) FROM FACE OF THE SUPPORT
--------------------------------------------------------------------------------

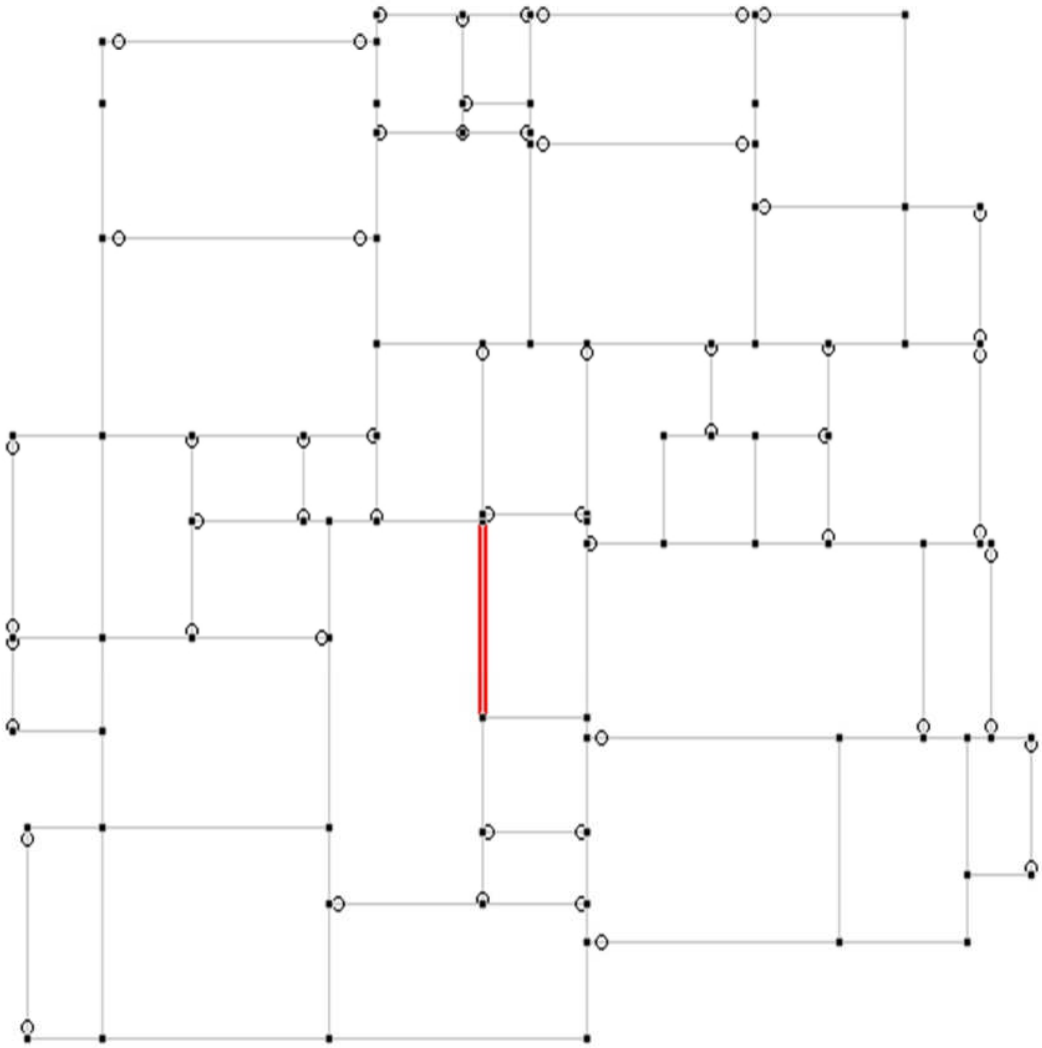
SHEAR DESIGN RESULTS AT   590.5 mm AWAY FROM START SUPPORT
  VY =    64.82 MX =     0.09 LD=   20
  Provide 2 Legged  8d  @ 110 mm c/c

SHEAR DESIGN RESULTS AT   440.5 mm AWAY FROM END SUPPORT
  VY =   -79.59 MX =     1.00 LD=   19
  Provide 2 Legged  8d  @ 110 mm c/c

================================================================================
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TERRACE FLOOR ROOF BEAM DESIGN



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================================================================================
                IS-456    L I M I T    S T A T E    D E S I G N
                B E A M  N O.     457   D E S I G N  R E S U L T S

      M25                      Fe500 (Main)                Fe500 (Sec.)

    LENGTH:  3387.0 mm      SIZE:   200.0 mm X  380.0 mm   COVER: 35.0 mm


                        SUMMARY OF REINF. AREA (Sq.mm)
--------------------------------------------------------------------------------
SECTION      0.0 mm      846.8 mm     1693.5 mm     2540.3 mm     3387.0 mm
--------------------------------------------------------------------------------
 TOP          378.32       115.60          0.00        169.89        613.67
REINF.      (Sq. mm)     (Sq. mm)      (Sq. mm)      (Sq. mm)      (Sq. mm)

BOTTOM       115.60       115.60        115.60        115.60          0.00
REINF.      (Sq. mm)     (Sq. mm)      (Sq. mm)      (Sq. mm)      (Sq. mm)
--------------------------------------------------------------------------------


                        SUMMARY OF PROVIDED REINF. AREA
--------------------------------------------------------------------------------
SECTION      0.0 mm      846.8 mm     1693.5 mm     2540.3 mm     3387.0 mm
--------------------------------------------------------------------------------
 TOP        2-20d         2-20d         2-20d         2-20d         2-20d
REINF.   1 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)

BOTTOM      2-10d         2-10d         2-10d         2-10d         2-10d
REINF.   1 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)    1 layer(s)

SHEAR   2 legged  8d  2 legged  8d  2 legged  8d  2 legged  8d  2 legged  8d
REINF.  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c  @ 110 mm c/c
--------------------------------------------------------------------------------


SHEAR DESIGN RESULTS AT DISTANCE d (EFFECTIVE DEPTH) FROM FACE OF THE SUPPORT
--------------------------------------------------------------------------------

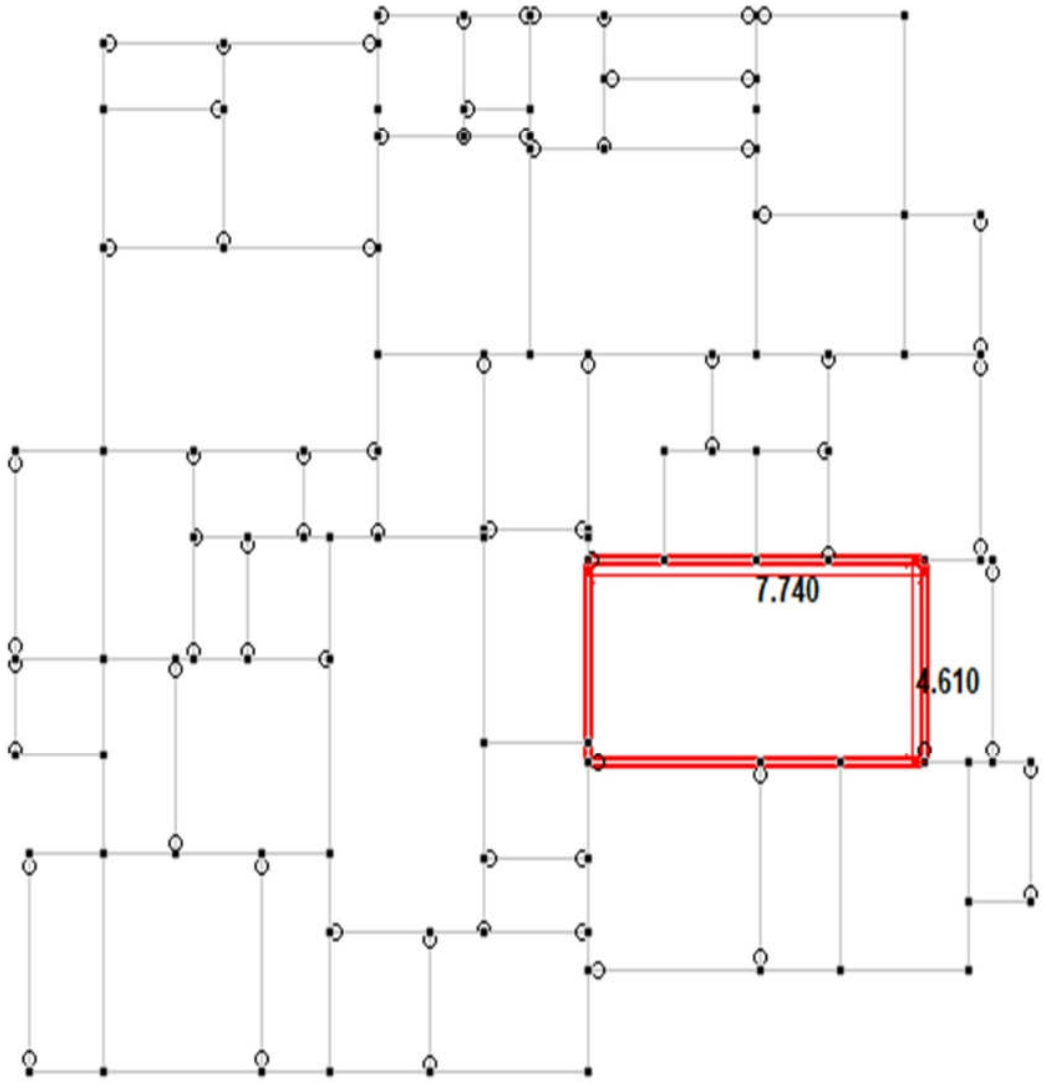
SHEAR DESIGN RESULTS AT   600.0 mm AWAY FROM START SUPPORT
  VY =    38.22 MX =     0.91 LD=   16
  Provide 2 Legged  8d  @ 110 mm c/c

SHEAR DESIGN RESULTS AT   450.0 mm AWAY FROM END SUPPORT
  VY =   -59.55 MX =     2.01 LD=   21
  Provide 2 Legged  8d  @ 110 mm c/c

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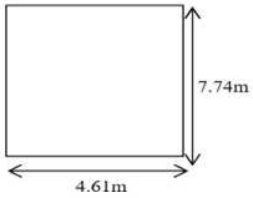
SLAB DESIGN



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GENERAL DATA

Shorter dimension of slab, l_x		4.61	m
Longer dimension of slab, l_y		7.74	m
	l_y/l_x	1.68	**Twoway Slab**
Assuming thickness of slab		150	mm
Consider width		1000	mm
	f_{ck}	25	kN/m^2
	f_y	500	kN/m^2



Type of panel - Interior panel

Clear cover to reinforcement 20 mm

Loads

Live load	2	kN/m^2
Dead load	3.75	kN/m^2
Floor Finish	1.5	kN/m^2
Total load	7.25	kN/m^2
Fact. load	10.88	kN/m^2

Typical design calculation

Mu = Coeff*W_u*l_x*l_x (Coefficient from IS:456)

= 0.058*10.88*4.61*4.61

= 13.42 kN-m

Mu /bd^2 = (13.42*10^6)/(1000*125^2)

0.859 N/mm^2

P_t = 0.21 (From SP-16, Table-3)

Ast = (0.21*1000*125)/100

= 262.5 mm^2

Spacing = (3.14*10*10/4/262.5)*1000

299.05 mm

Short span direction	Coeff	Mu (kNm)	Mu /bd^2	P_t	Ast	Dia	Spacing
Negative moment @ continuous edge	0.058	13.41	0.858	0.204	255	10	307.85
Positive moment @ midspan	0.044	10.17	0.65	0.154	192.5	10	407.8

Long span direction	Coeff	Mu (kNm)	Mu /bd^2	P_t	Ast	Dia	Max. Spacing
Negative moment @ continuous edge	0.032	7.40	0.47	0.118	147.5	8	340.62
Positive moment @ midspan	0.024	5.55	0.36	0.118	147.5	8	340.62

Reinforcement provided

Ast provided in short span = 523.33 mm^2

Spacing provided in short span = 150.00 mm

P_t provided in short span = 0.42

Hence spacing is safe

Ast provided in long spa 334.93 mm^2

Spacing provided in lon 150.00 mm

P_t provided in long span 0.27

Hence spacing is safe

Minimum effective depth required dreqd. = 62.35 mm (SQRT(MAX(Mu/0.138*fck*1000)))*1000

Minimum effective depth provided dprov. = (150-20-10/2)

125 mm

Minimum reinforcement Ast min = (0.12*1000*125/100)

= 150 mm^2

Depth provided is greater than minimum effective depth required

Hence safe

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Check for shear

Maximum shear force @ support — $Vu = Wl_x/2$
$= (10.88*4.61)/2$
$= 25.08$ kN

Actual shear force — $\zeta v = Vu / bd$
$= (25.08*1000)/(1000*125)$
$= 0.20$ N/mm^2

% of tension rft. provided in support pt = 0.42

IS:456-2000 Table-19
Allowable shear stress — $\zeta c = 0.425$

As per IS:456,cl:40.2.1.1 k value for slab = 1.3

Design shear stress for concrete — $k \times \zeta c = 0.5525$

Actual shear stress < Design shear stress
Hence safe

Check for deflection

Type of slab: Simply suppoerted
Allowable span / depth ratio = l/d = 20 [As per IS:456-2000, Cl:23.2.1(a)]

Percentage of tension reinforcement = 0.42
Steel stress of service loads — fs= 0.58fy(Area of steel required/Area of steel provided)
106.67 N/mm^2

Corresponding comp. rft.
Percentage of comp. reinforcement = 0.27

Modification factor for tension rft. F1= 2.00 (From fig:4 ,IS:456-2000)
Modification factor for comp. rft. F2= 1.090 (From fig:5 ,IS:456-2000)
Modified span/depth ratio = l/d x F1x F2
43.6
Actual span/ depth ratio = 36.88

Actual span/ depth ratio < Modified span / depth ratio
Hence safe

At Short span direction

Provided T10@ 150mm c/c

At Longer span direction

Provided T8@ 150mm c/c

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THE LANDLENS SUITE

Eight ways to know a piece of land before you pay for it.

This report covers one part of the picture. These cover the rest, drawn from the same government records, for any property in Tamil Nadu.

LandLens One
Ask anything about a property and get an answer grounded in live government records, with the sources shown.
/landlens/one

Verify My Land
Every record check run on one property and returned as a single report.
/landlens/verify-my-land

Legal Opinion
An advocate's written opinion on the title, built on the records we pull for it.
/landlens

One Map
Every layer on one map: the parcel, its boundary, zoning, water bodies and what sits around it.
/landlens/one/map

PriceMap
What land actually changed hands for around this plot, taken from the registered deeds.
/landlens/pricemap

Build Scope
What you are allowed to build here: floor space, height, coverage and setbacks.
/landlens/build-scope

Property Tracker
Watch a property and hear about it when something new is registered against it.
/landlens/property-tracker

Deal Room
Run the transaction in one place: documents, stamping, signatures and the parties.
/landlens/deal-room

FREE TOOLS · NO ACCOUNT NEEDED

Twenty-four checks you can run yourself, at no cost.

Records and verification

The registers themselves, read for you.

- Encumbrance Certificate
- Patta and Chitta
- Field Measurement Sketch
- EC Analyzer
- Bank charge check
- Court case search
- Seller background check
- Approval check by survey

Value and duty

What it is worth and what it costs to register.

- Guideline value by street
- Guideline value by survey
- Stamp duty and registration fees
- Capital gains
- Floor space index
- Area unit converter

Zoning and land use

What the plan says can happen on this land.

- Land use zone finder
- CMDA land use check
- Coastal regulation zone
- Master plan check
- Water bodies finder
- Airport height clearance

Registers and directories

Who holds it, and which office keeps the record.

- Find your registering office
- Temple property check
- Waqf property check
- RERA register

Every free tool
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Every claim in this document traces back to a government record.

- Legal opinions, due diligence and title verification
- Building plan, layout and sub-division approvals
- Completion and occupancy certificates, regularisation
- Escrow, negotiation and NRI property management
- Land survey, soil testing, architecture and construction

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Prepared from the registers named on the page each finding sits on. Where a register could not be read, this document says so in its place rather than leaving the gap to be read as a clean result.