

NAVAL TECHNOLOGIES

We Support Your Construction Needs



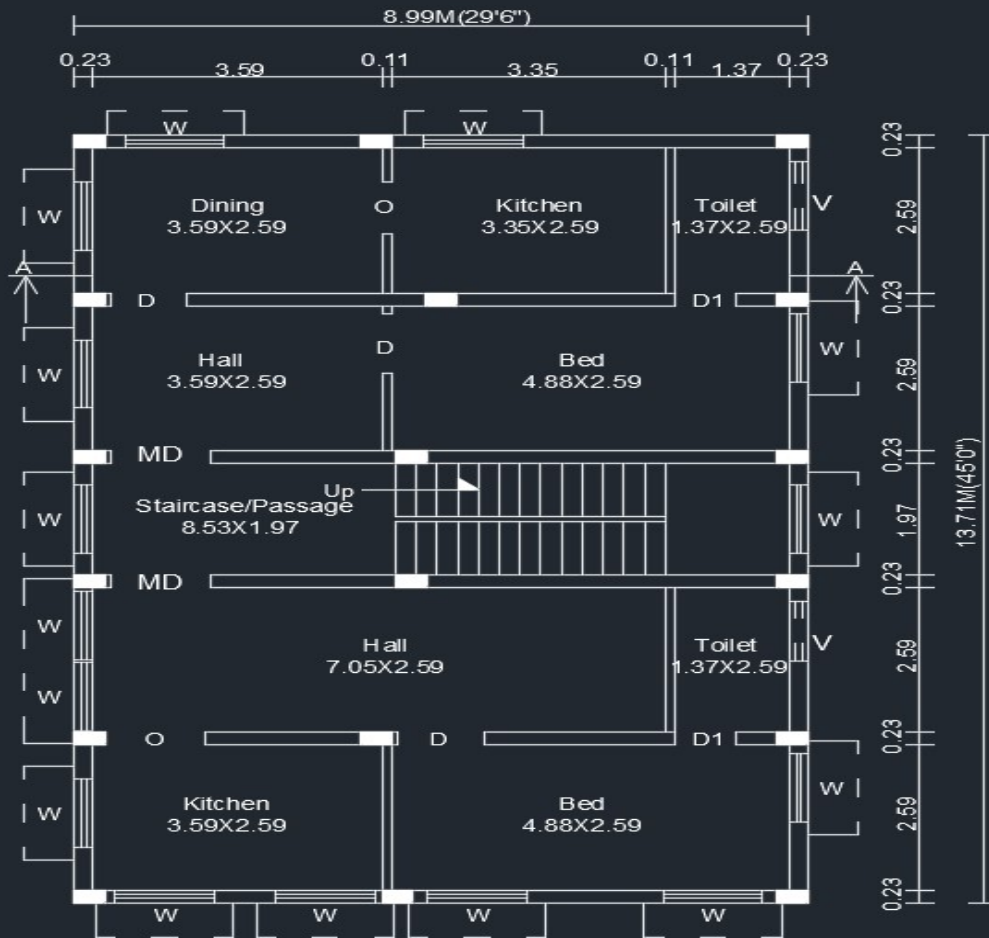
WHO WE ARE...

- Located at Chennai and Karur, Tamil Nadu, India. We provide complex Engineering services in Civil Engineering for Our clients.
 - More than 12 years of experience in engineering and detailing services
 - A strong team of 10 engineers with expertise in diverse designing and detailing services.
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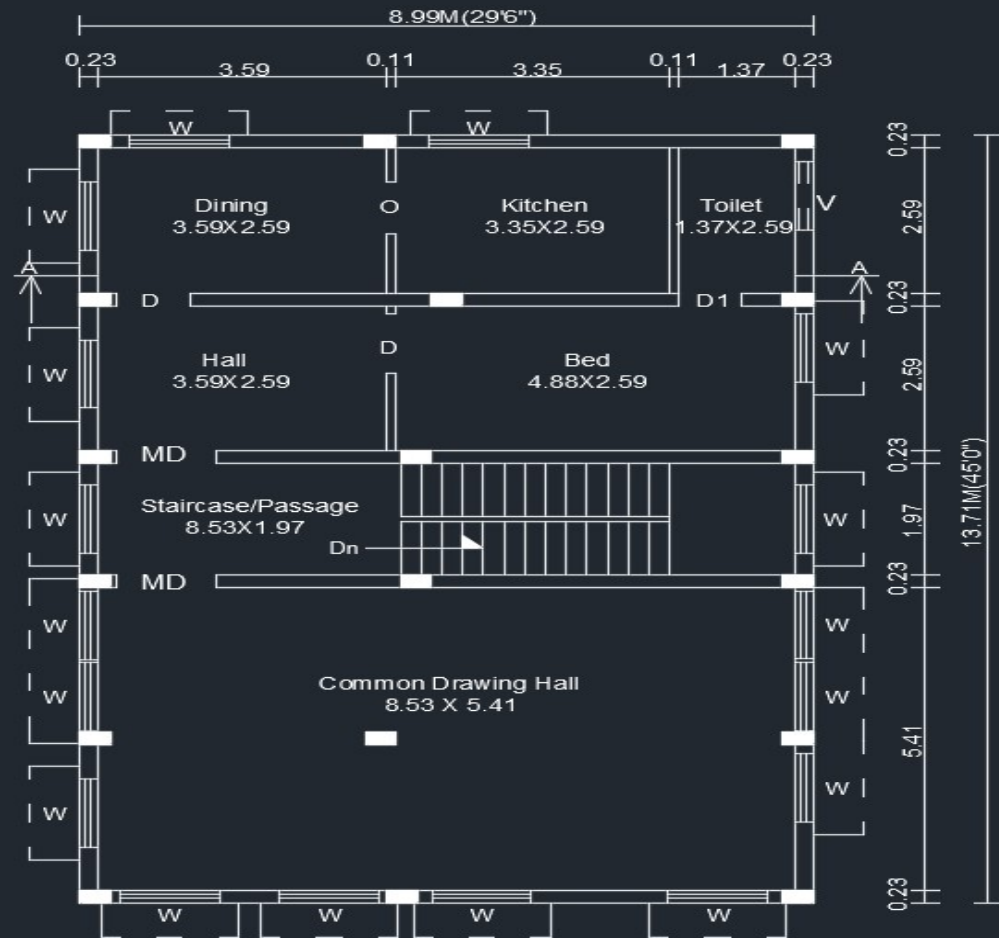
WE DO... DESIGN AND DETAILING SERVICE FOR ...

- R.C.C Multi-Story residential buildings
- Commercial buildings
- Individual Houses
- Factory buildings
- Other R.C.C Structures
- Design of steel structures
- Telecom towers
- Substation Structures

ARCHITECTURAL PLAN AND COLUMN PLACEMENT



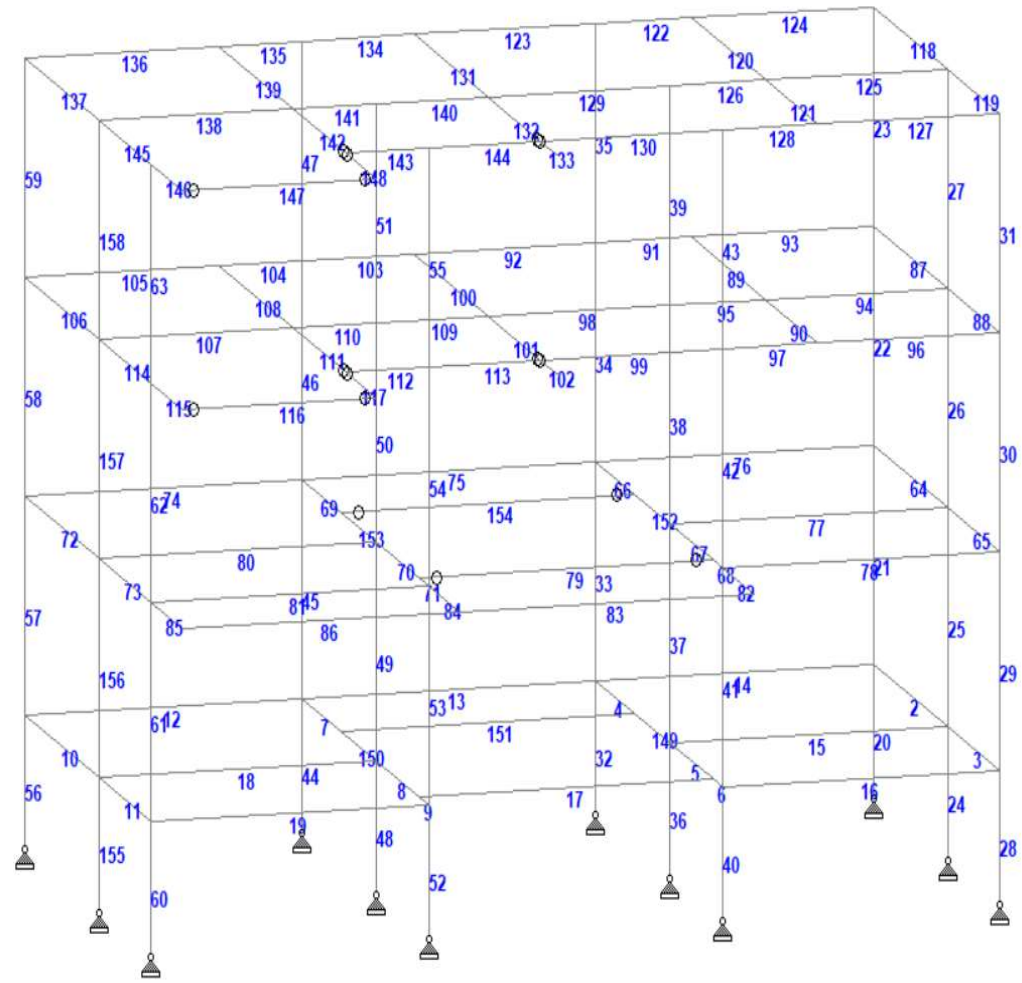
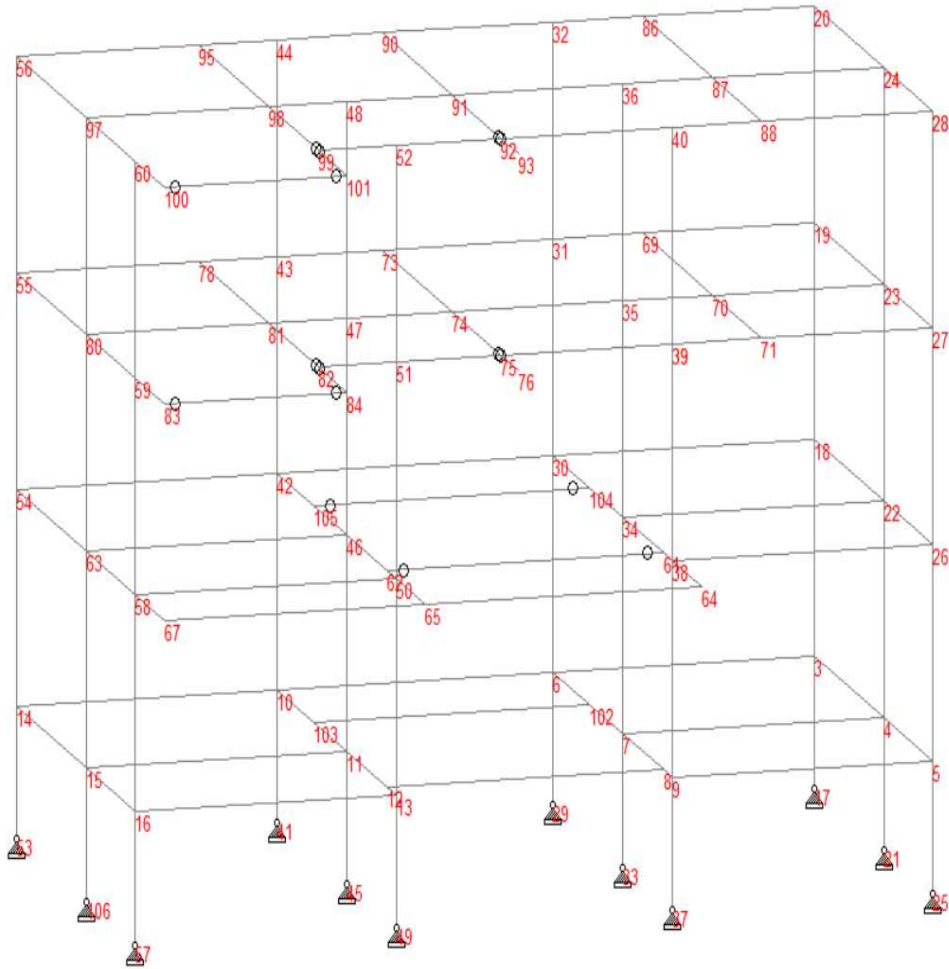
GROUND FLOOR PLAN



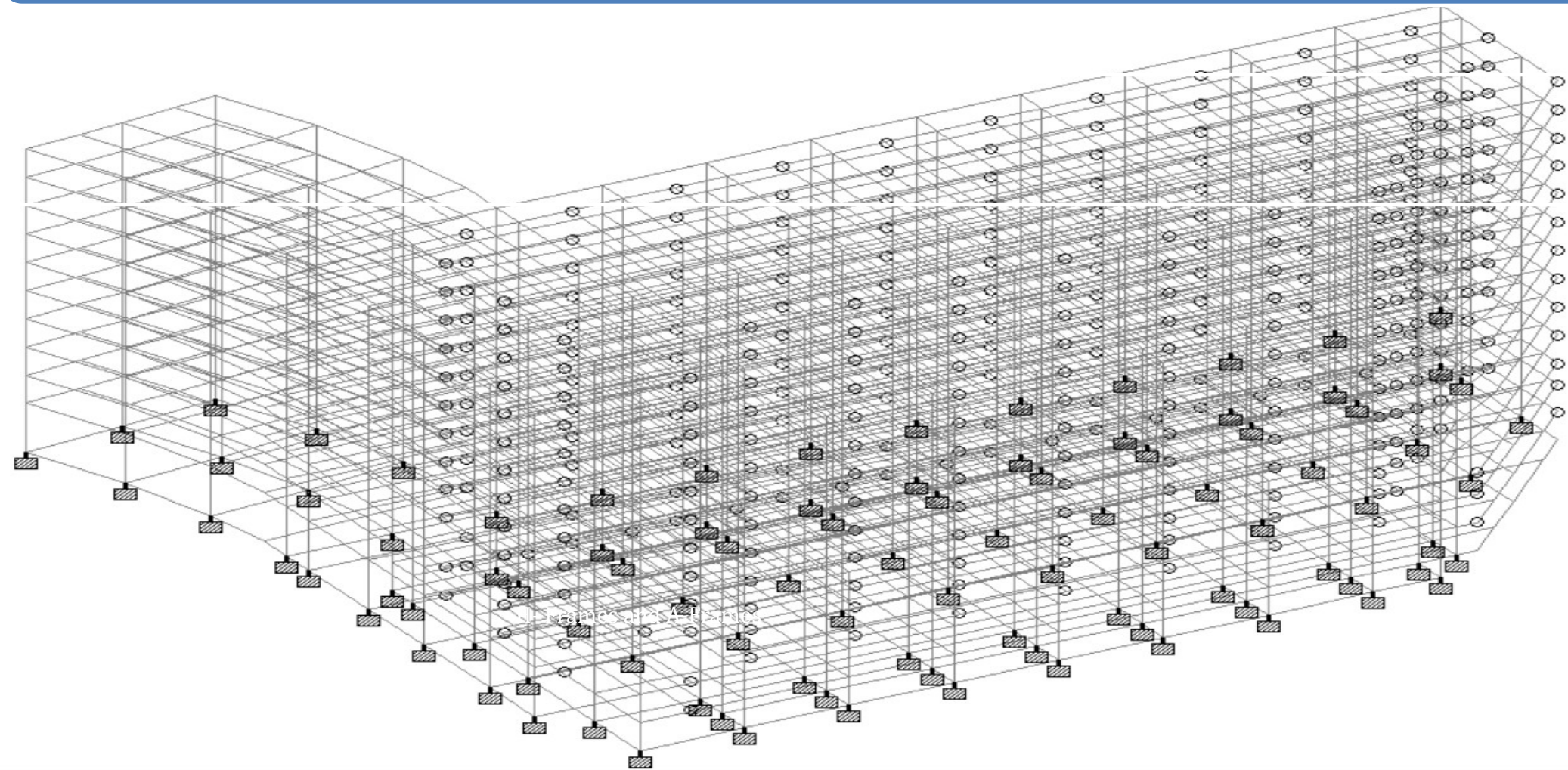
FIRST FLOOR PLAN

SCALE : 1:100

PREPARING STAAD MODEL



PREPARING STAAD MODEL



STAAD MODEL ANALYSIS

The screenshot displays the STAAD Analysis and Design software interface. The main window shows a 3D wireframe model of a multi-story building frame. A terminal window is open in the foreground, displaying the following analysis results:

```
++ Calculating Section Forces2.      13: 5:58
++ Calculating Section Forces3.     13: 5:58
++ Start Concrete Design ...        13: 6: 9
++ Start Concrete Design ...        13: 6:10
++ Start Concrete Design ...        13: 6:13
++ Start Concrete Design ...        13: 6:17
++ Start Concrete Design ...        13: 6:20
++ Start Concrete Design ...        13: 6:24
++ Start Concrete Design ...        13: 6:29
++ Start Concrete Design ...        13: 6:34
++ Start Concrete Design ...        13: 6:38
++ Start Concrete Design ...        13: 6:43
++ Start Concrete Design ...        13: 6:48
++ Start Concrete Design ...        13: 6:52
++ Start Concrete Design ...        13: 6:57
++ Start Concrete Design ...        13: 7: 1
++ Start Concrete Design ...        13: 7: 6
++ Creating Displacement File (DSP) ... 13: 7:12
++ Creating Reaction File (REA) ...    13: 7:12
++ Calculating Section Forces1-110.  13: 7:12
++ Calculating Section Forces2.      13: 7:14
++ Calculating Section Forces3.     13: 7:15
++ Creating Section Force File (BMD) ... 13: 7:28
++ SECT DISP member 7826 - 5454 of 5461
++ Creating Section Displace File (SCN) ... 13: 7:32
++ Creating Design information File (DGN) ... 13: 7:33
++ Done.                             13: 7:33
```

0 Error(s), 146 Warning(s), 2 Note(s)

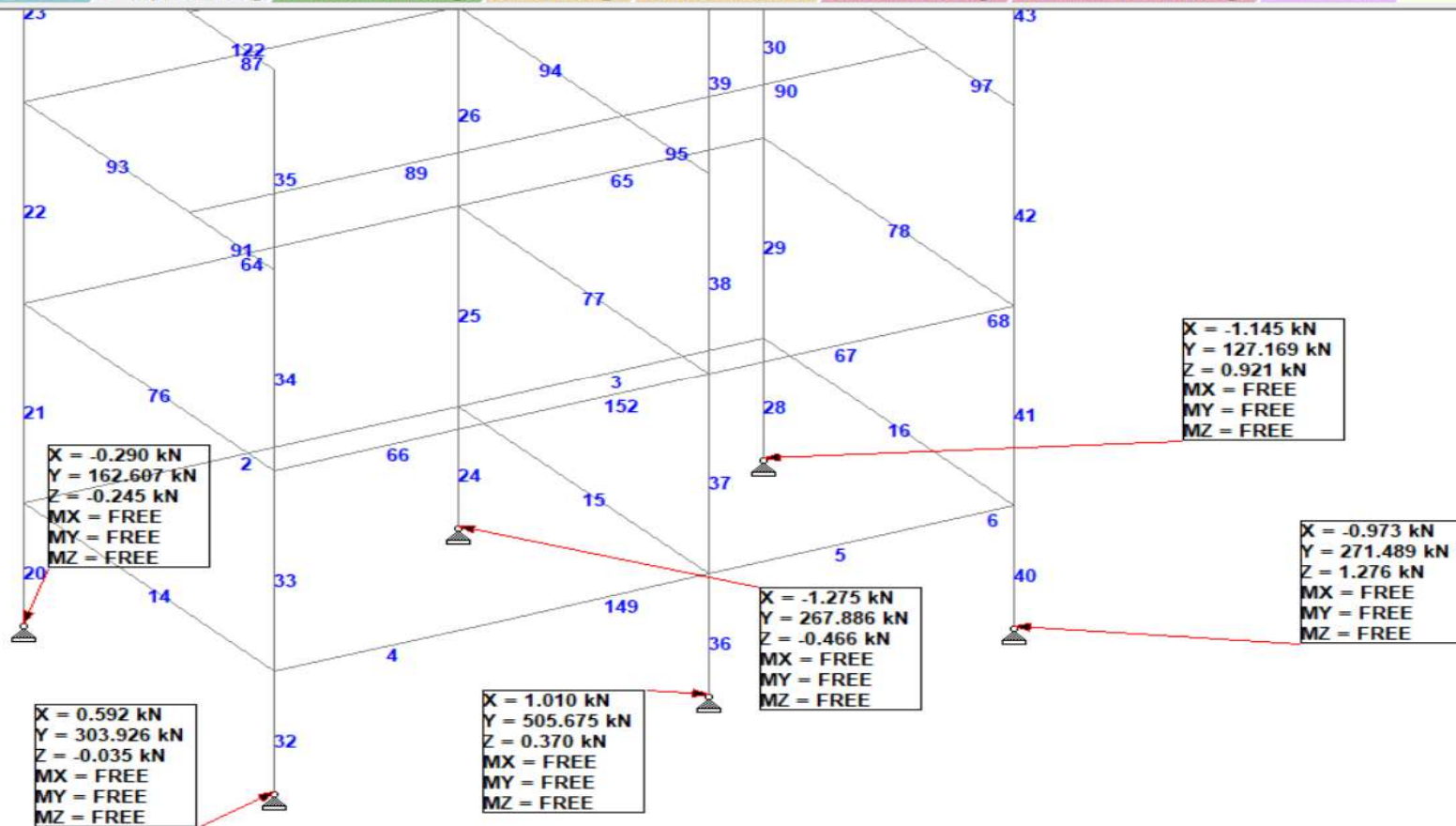
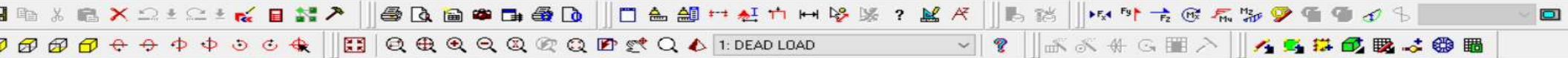
++ End STAAD.Pro Run Elapsed Time = 195 Secs
D:\Windows10 Backups\For Me Personal\DATA\From SBS\...an1

View Output File
 Go to Post Processing Mode
 Stay in Modeling Mode

Done

Load 1

CALCULATION OF FOUNDATION LOADS



DESIGNING COLUMN SIZES AND REINFORCEMENT

STAAD.Pro V8i (SELECTseries 6) - [Str1 - Whole Structure]

File Edit View Tools Select Geometry Commands Analyze Mode Window Help

1: DEAD LOAD

Modeling Building Planner Piping Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design Earthquake

Str1 - Beam

Geometry Property Loading Shear Bending Deflection Concrete Design

Beam no. = 37 Design code : IS-456

Design Load		Design Parameter	
Load	5	Fy(Mpa)	415
Location	Long Col	Fc(Mpa)	25
Pu(Kns)	1198.86	As Reqd(mm ²)	2898
Mz(Kns-Mt)	19.03	As (%)	3.79
My(Kns-Mt)	48.2	Bar Size	25
		Bar No	8

Print Close

Load 1

DESIGNING BEAM SIZES AND REINFORCEMENT

STAAD.Pro V8i (SELECTSeries 6) - Raja_Final

File Edit View Tools Select Geometry Commands Analyze Mode Window Help

1: DEAD LOAD

Modeling Building Planner Piping Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design Earthquake

Raja_Final - Whole Structure

Raja_Final - Job Info

Raja_Final - Beam

Beam no. = 565 Design code : IS-456

4#10 @ 270.00 0.00 To 2184.41 3#10 @ 270.00 2184.41 To 3276.61

14 # 8 c/c 110.00 14 # 8 c/c 110.00

3#10 @ 30.00 0.00 To 3276.61

at 0.000 at 1638.305 at 3276.610

Mz	Dist. Met	Load
9.03	1.9	4
-18.87	0	4
-7.69	3.3	4

Fy(Mpa)	500
Fc(Mpa)	25
Depth(m)	0.300000011
Width(m)	0.230000004
Length(m)	3.276609897

Print Close

Job:
 Client:
 Job No.:
 Rev.:
 Part:
 Ref:

File
 Filename : Raja_Final.std
 Directory : D:\Naval
 Date / Time : 08-Feb-2021 04:29 PM
 File size : 6441

Engineer: Checker: Approved:

Name:
 Date: 15-Sep-07

Comment:

For Help, press F1

Modeling Mo Load 1 : DEAD LOAD Input Units: kN-m

FOUNDATION SIZE MANUAL CALCULATION

Geometry Of Foundation

Length of Foundation	(l)	=	5.0	m	Length of Pedestal (lc)	=	0.50	m
Width of Foundation	(b)	=	2.8	m	Width of Pedestal (bc)	=	0.50	m
Distance between two pedestal along length	(lp)	=	5.9	m	Depth of Fdn. (d)	=	3.0	m
Distance between two pedestal along width	(bp)	=	0.0	m	Ht. of Pedestal above FGL	=	0.3	m
Thickness Of slab	(h)	=	0.40	m	Wt Density of Concrete	=	25.0	kN/m ³
Wt Density of soil below fdn. Base		=	18.0	kN/m ³	Wt Density of soil above fdn.	=	18.0	kN/m ³
Net SBC (With Out Wind/Seismic)		=	150.0	kN/m ²				
Net SBC (With Wind/Seismic)		=	187.5	kN/m ²				
Gross SBC (With Out Wind/Seismic)		=	196.8	kN/m ²				
Gross SBC (With Wind/Seismic)		=	234.3	kN/m ²				

LOAD COMBINATION	Node 1 (A1)			Node 2 (B1)		
	FX (Ton)	FY (Ton)	FZ (Ton)	FX (Ton)	FY (Ton)	FZ (Ton)
101 DL+LL+WLX	4.5	-84.0	0.0	4.5	178.0	0.0
103 DL+WLX	4.0	-50.0	0.0	4.0	78.0	0.0

Foundation area	=	14	m ²
Section Modulus Zxx	=	6.53	m ³
Section Modulus Zzz	=	11.67	m ³
Foundation Wt	=	140	kN

Page 1

FOUNDATION SIZE MANUAL CALCULATION

Design for bottom reinforcement

$$\frac{M_u}{bd^2} = 0.00 \text{ N/mm}^2$$

$$P_t \text{ required} = 0.08$$

$$A_{st} \text{ required} = 5.41 \text{ cm}^2$$

Therefore provide = 6 number of 16 dia bars
 Area of steel provided = 12.07 cm²

CHECK FOR SHEAR

$$V_{\max} = 118.8 - 36 \times (0.35 + 1.127 + 0.3) = 54.8 \text{ T}$$

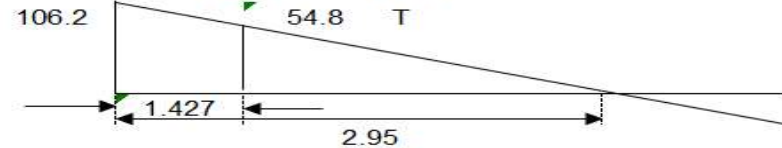
(at $d = 1.127$ m from face of support)

$$\tau_v = \frac{V_u}{bd} = 1.22 \text{ N/mm}^2$$

$$\tau_c = 0.33 \text{ N/mm}^2 \text{ (Percentage of steel provided)} = 0.18$$

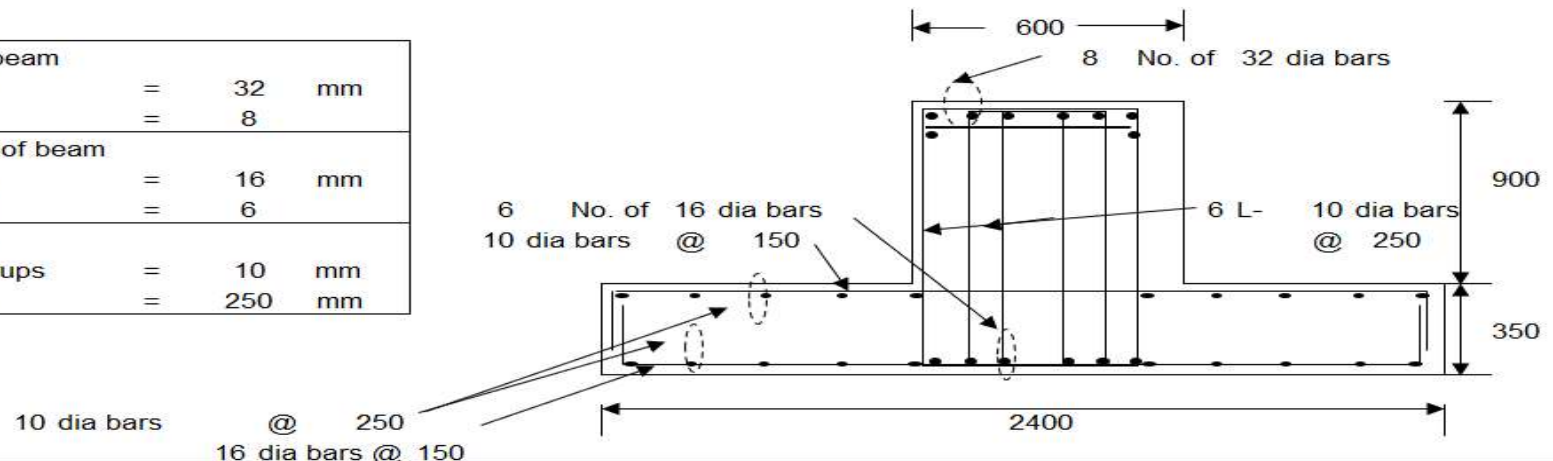
$$V_{us} = (V_{u\max} - \tau_c \times bd) = 599 \text{ KN}$$

$$\frac{V_{us}}{d} = 5.3 \text{ KN/cm}$$



Therefore provide = 10 dia 6 L stirrups @ 250 mm c/c spacing
 $V \text{ capacity} = 0.87 \times 415 \times A_{sv} \times d / s_v = 0.87 \times 415 \times 471 \times 1127 / 250 = 767 \text{ KN} > 599 \text{ KN}$ OK

Therefore provide at top of beam			
Diameter of bar	=	32	mm
Number of bar	=	8	
Therefore provide at bottom of beam			
Diameter of bar	=	16	mm
Number of bar	=	6	
Provid 6 Legged stirrups			
Diameter of stirrups	=	10	mm
Spacing of bar	=	250	mm



COLUMN SIZE MANUAL CALCULATION

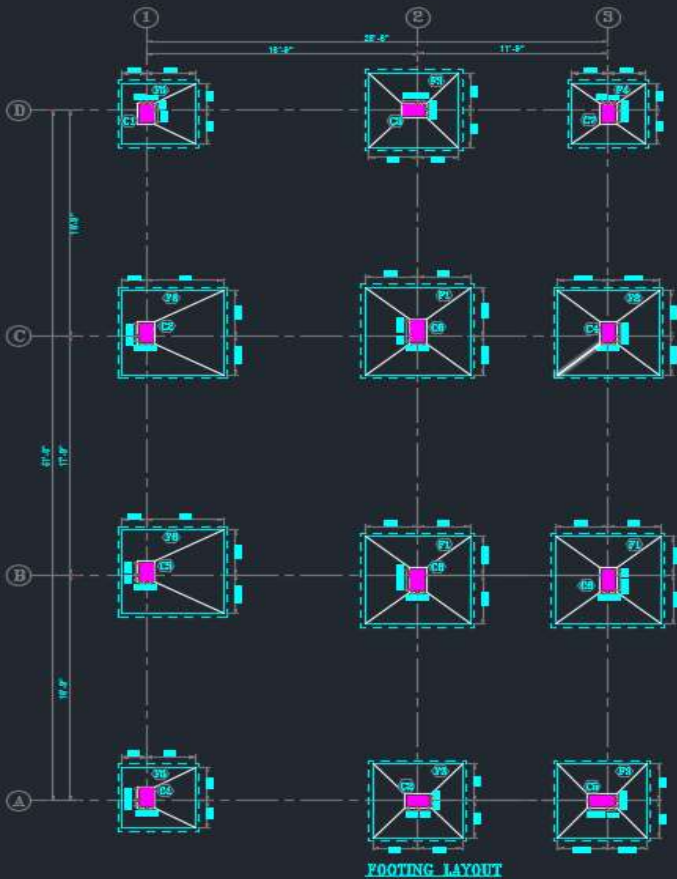
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W				
1 Design of Column - C1 (Member No.155. L/C - 103-SL+SELF+DL+LL)																										
2 Size of Colum															3 Net moment :		=		1.58+0.57							
4 Breadth b = 350 mm															Muy		=		2.15 t-m							
5 Depth D = 350 mm															Muz		=		1.53+0.566							
6 Unsupported Length of column = lx = 4.5 m																			2.10 t-m							
7 Unsupported Length of column = ly = 4.5 m																			=		4 Nos		20 mm dia Ba (Area=		12.57 cm ²)	
12															Percentage of reinf Provided		=		1.03 %							
13 Grade of concrete fck = 25 N/mm ²															Provided Reinforcement is Enough											
14 Grade of Steel fy = 500 N/mm ²															Puz/A		=		16 N/mm ²							
15 Factor of safety = 1.50																			(Refer Chart 63 after knowing reinforcement % and Fy)							
16															Puz		=		16x350x350/1000							
17 Axial load Pu = 13.00 t																			1960 t							
18 Moment My = 1.05 t-m															Pu / Puz		=		19.5/1960							
19 Moment Mz = 1.02 t-m																			0.01							
20															pt / fck		=		1.03/25							
21 Factored load Pu = 1.5 x 13																			0.041							
22 = 19.50 t															Pu / fckbD		=		19.5x10000/(25x350x350)							
23 Factored moment Muy = 1.5 x 1.05																			0.064							
24 = 1.58 t-m															Mux1/FckbD ²		=		0.07							
25 Factored moment Muz = 1.5x1.02																			0.14							
26 = 1.53 t-m																			(Refer Chart 49 depending upon d'/D ratio), d'/D							
27															Mux1		=		0.07x25x350x350x350/1000000							
28 Lex/D = 4.5/0.35																			75.03125 kN-m							
29 = 12.857 So column is slender column in this axis																										
30 eax/D = 0.083 [Refer Table 1 (Clause 3.4),page- 106 : SP – 16]]															Muz1/FckbD ²		=		0.07							
31																			0.14							
32 Ley/b = 4.5/0.35																			(Refer chart 49 depending upon d'/D ratio), d'/b							
33 = 12.857 So column is slender column in this axis															Muz1		=		0.07x25x350x350x350/1000000							
34 eay/b = 0.083 [Refer Table 1 (Clause 3.4),page- 106 : SP – 16]]																			75.03125 kN-m							
35																										
36 So Additional Moment My = 19.5x0.083x0.35															Mux/Mux1 + Muy / Muy1		=		2.15/75.03125 + 2.096/75.03125							
37 = 0.57 t-m																			0.566 < 1							
38 So Additional Moment Mz = 19.5x0.083x0.35																			THE DESIGN IS SAFE							
39 = 0.57 t-m																										
40																										

SLAB DESIGN CALCULATION

Design of Two Way Slab :

Slab Size :		Slab End condition :		Interior Panels		Long Span (ly) :		α_y	$\alpha_y * Mu$ (kn $\alpha_y * Mu / b * d$ pt(%))	Ast req.(mm ²)
Size of slab :		Ly =		6 m		Support (-ve Mu)		0.032	7.800	195
		Lx =		5 m		Span (+ve Mu)		0.024	5.850	145
		Ly/Lx =		1.20		In Support Provide		8 mm Dia bar	200 mm c/c	251 mm ²
Designing as a		Two way slab				in Span Provide		8 mm Dia bar	200 mm c/c	251 mm ²
Materials :		Grade of Concrete = fck =		25 N/mm ²		Provided Reinforcement is Enough				
		Grade of steel = fy =		415 N/mm ²		Checks :				
		Overall depth of slab = D =		140 mm		1) For Deflection				
		Clear cover to reinforcement =		20 mm		Actual Lx/d =		43.86 mm		
		Bar diameter considered = ϕ =		12 mm		Percentage of tension reinforcement Pt =		0.23		And fck = 25 N/mm ²
		Effective depth = d =		114 mm		Allowable L/d =		25		(From SP:16, Chart -22)
Loads :		Slab Dead Load =		3.5 kN/m ²		Fs = (0.58 * fy * Ast Req / Ast. Prv.) Fs =		179.087 N/mm ²		
		Floor Finishes + Plastering =		1 kN/m ²		Modification Factor = M.F =		2 (From IS:456-2000, Fig:4)		
		Live load =		2 kN/m ²		Permissible L/d = (M.F x Allowable L/d) =		50 mm Safe in Deflection		
		Total Load = W =		6.5 kN/m ²		2) Effective depth required for bending =				
		Factor of Safty =		1.5		3) For Cracking				
		Design Load (W*1.5) = Wu =		9.75 kN/m ²		Ast Provided =		0.299 %		Ast prov. is > 0.12% So Safe
		Moment Wu*Lx^2 = Mux =		243.8 kN-m		Spacing of Steel				
Short Span (lx) :		α_x		$\alpha_x * Mu$ (kn-m $\alpha_x * Mu / b * d$ pt(%))		Reinforcement in lx =		200 mm		<= (3*d or 300, Safe)
		Support (-ve Mu)		0.043 10.481 0.806 0.232 265		Reinforcement in ly =		200 mm		<= (5*d or 450, Safe)
		Span (+ve Mu)		0.032 7.800 0.600 0.171 195		Dia of Steel =		12 mm		< D/8, Safe
		In Support Provide		8 mm Dia bar @ 200 mm c/c 251 mm ²						
		In Span Provide		8 mm Dia bar @ 200 mm c/c 251 mm ²						
		Provided Reinforcement is Not Enough								

SAMPLE R.C. DRAWING FOR FOOTING AND COLUMN

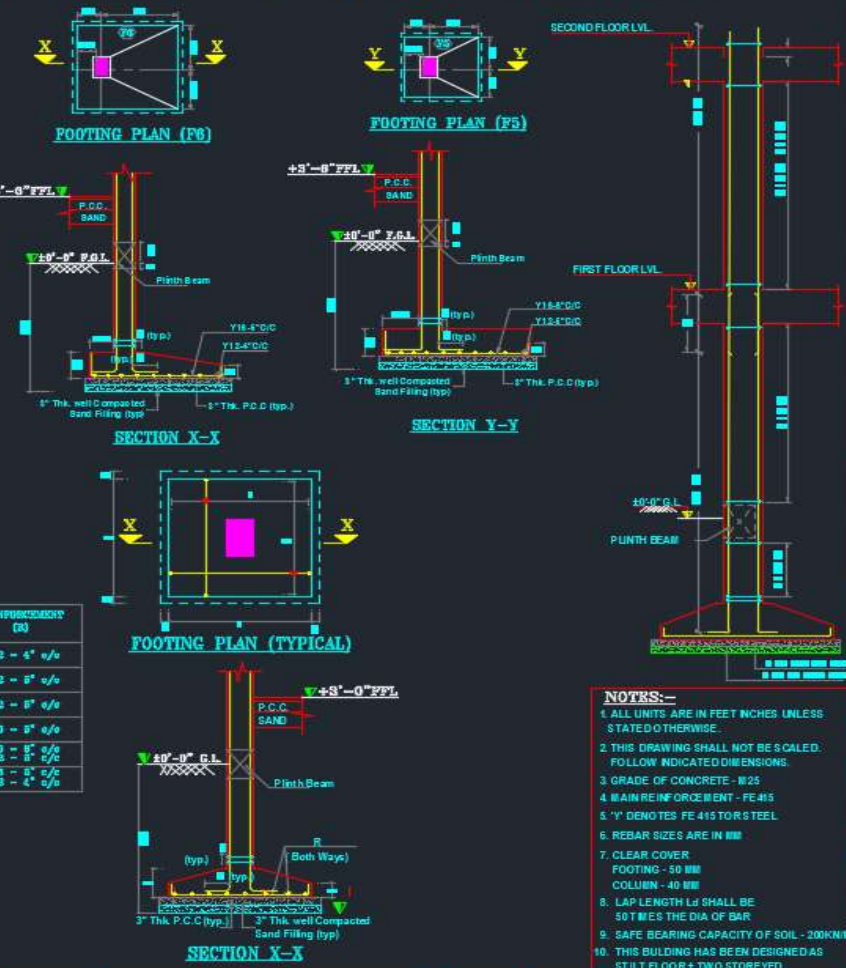


COLUMN SCHEDULE

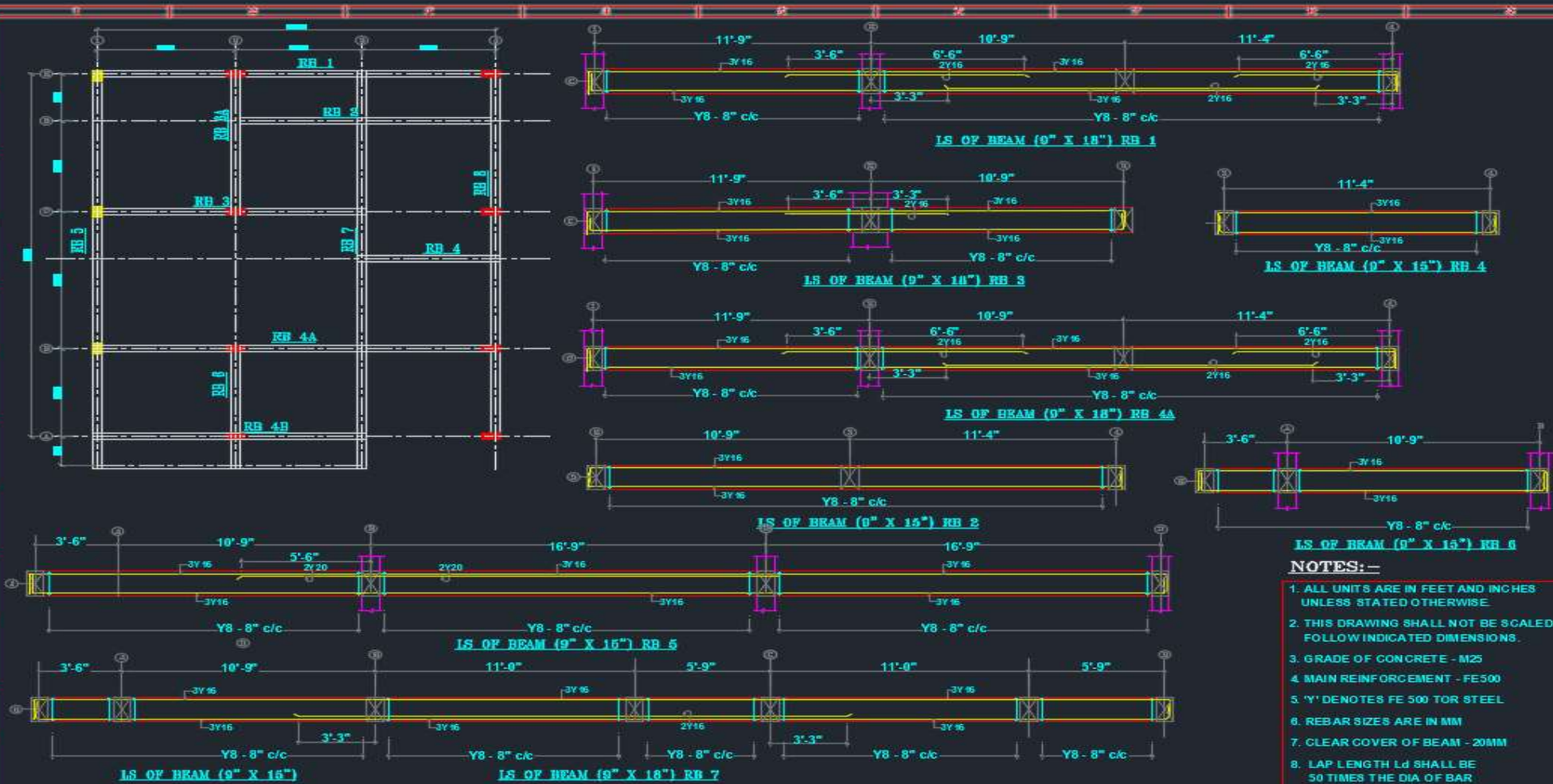
COLUMN TYPE	CYTO RING HEIGHT (A' X B' X H')	SECTION (TRANSVERSE IN 3/4)	REINFORCEMENT (AS SHOWN IN 3/4)
C1	8" x 1'-0"	8-T12	
C2	8" x 1'-0"	8-Y10	
C3	8" x 1'-0"	10-T10	
C4	8" x 1'-0"	8-T10	
C5	8" x 1'-0"	8-T16	
C6	8" x 1'-0"	10-Y20	
C7	8" x 1'-0"	8-Y12	

FOOTING SCHEDULE :-

FOOTING TYPE	FOOTING SIZE (L x B)	THICKNESS (T)	BASE DIMENSION (B)	REINFORCEMENT (R)
F1	6'-0" x 6'-0"	22"	8"	T12 - 4' e/o
F2	6'-0" x 6'-0"	21"	8"	T12 - 6' e/o
F3	6'-0" x 6'-0"	18"	8"	T12 - 8' e/o
F4	6'-0" x 6'-0"	19"	8"	T10 - 8' e/o
F5	6'-0" x 6'-0"	24"	8"	T10 - 8' e/o
F6	6'-0" x 6'-0"	24"	8"	T16 - 4' e/o



SAMPLE R.C. DRAWING FOR BEAM



NOTES: -

1. ALL UNITS ARE IN FEET AND INCHES UNLESS STATED OTHERWISE
2. THIS DRAWING SHALL NOT BE SCALED. FOLLOW INDICATED DIMENSIONS.
3. GRADE OF CONCRETE - M25
4. MAIN REINFORCEMENT - FE500
5. 'Y' DENOTES FE 500 TOR STEEL
6. REBAR SIZES ARE IN MM
7. CLEAR COVER OF BEAM - 20MM
8. LAP LENGTH L_d SHALL BE 50 TIMES THE DIA OF BAR



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