DESIGN OF HOSTEL COMPLEX IN STAAD.Pro

Project Report Submitted in partial fulfillment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

CIVIL ENGINEERING

Under the supervision of

Dr. Ashish Kumar
(Associate Professor)

By

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to

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY

WAKNAGHAT, SOLAN – 173234

HIMACHAL PRADESH, INDIA

MAY-2018

CERTIFICATE

This is to certify that the work which is being presented in the project report entitled **"DESIGN OF HOSTEL COMPLEX IN STAAD.Pro"** in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology in Civil Engineering and submitted to the Department of Civil Engineering, Jaypee University of Information Technology, Waknaghat is an authentic record of work carried out by **ABHISHEK (141615), KUNAL SAURABH (141679),** during a period from July 2017 to May 2018 under the supervision of **Dr. ASHISH KUMAR (Associate Professor),** Department of Civil Engineering, Jaypee University of Information Technology, Waknaghat.

The above statement made is correct to the best of our knowledge.

Date: - _ _/May/ 2018

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ACKNOWLEDGEMENT

I take upon this opportunity endowed upon me by grace of the almighty, to thank all those who have been part of this endeavor.

I also want to thank my supervisor 'Dr.. Ashish Kumar'for giving me the correct heading and legitimate direction in regards to the subject. Without his dynamic association and the correct direction this would not have been conceivable. I earnestly thank our 'Prof. (Dr. Ashish Kumar) for giving me the shot and also the support for all the time being.

Last however not the minimum, I generously welcome each one of those individuals who have helped me straightforwardly or in a roundabout way in making this project a win. In this unique situation, I might want to thank the various staff individuals, both educating and non-instructing, which have developed their convenient help and facilitated my undertaking

CONTENTS

ABSTRACT

The principle objective of this project is to analyse and design a multi-storeyed (Hostel and Mess) building for 800 students using STAAD Pro software. This involves loads calculation manually and analyzing of the building along with designing of various component of the building in STAAD Pro.

STAAD.Pro has a very interactive user interface which allows the users to draw the frame and input the load values and dimensions. Then according to the specified criteria assigned it analysis the structure and designs the members with reinforcement details for RCC frames..

High rise buildings need very time taking and cumbersome calculations using conventional manual methods. STAAD.pro provides us fast, efficient, easy to use and accurate platform for designing structures.

The size of Hostel block is 65ft * 60ft, with room dimension of 13ft * 11ft along with 26ft * 12ft bathroom dimension.

The size of Mess building is 72ft * 60ft, with mess dimensions of 50ft * 47ft.

Both the structure will be arrange in rectangular pattern.

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

1.1. General

Our project involves analysis and design of multi-storeyed building [G + 6] using a very popular designing software STAAD Pro. We have chosen STAAD Pro because of its following advantages:

- easy to use interface,
- conformation with the Indian Standard Codes
- versatile nature of solving any type of problem.

STAAD.Pro has a very interactive user interface which allows the users to draw the frame and input the load values and dimensions. Then according to the specified criteria assigned it analysis the structure and designs the members with reinforcement details for RCC frames..

High rise buildings need very time taking and cumbersome calculations using conventional manual methods. STAAD.pro provides us fast, efficient, easy to use and accurate platform for designing structures.

We use IS code (Indian Standard Code) for our design purpose.

CHAPTER 2:PLAN OF HOSTEL COMPLEX

2.1. Key Requirements& Information :

- Located in Bhopal (M.P)
- Capacity of 800-850 students.
- Indoor facilities such as gym, snooker, table tennis, badminton court.
- Basketball court and a playground.
- Utility shops inside hostel complex.
- Separate building for 1st year students.
- Mess for students.

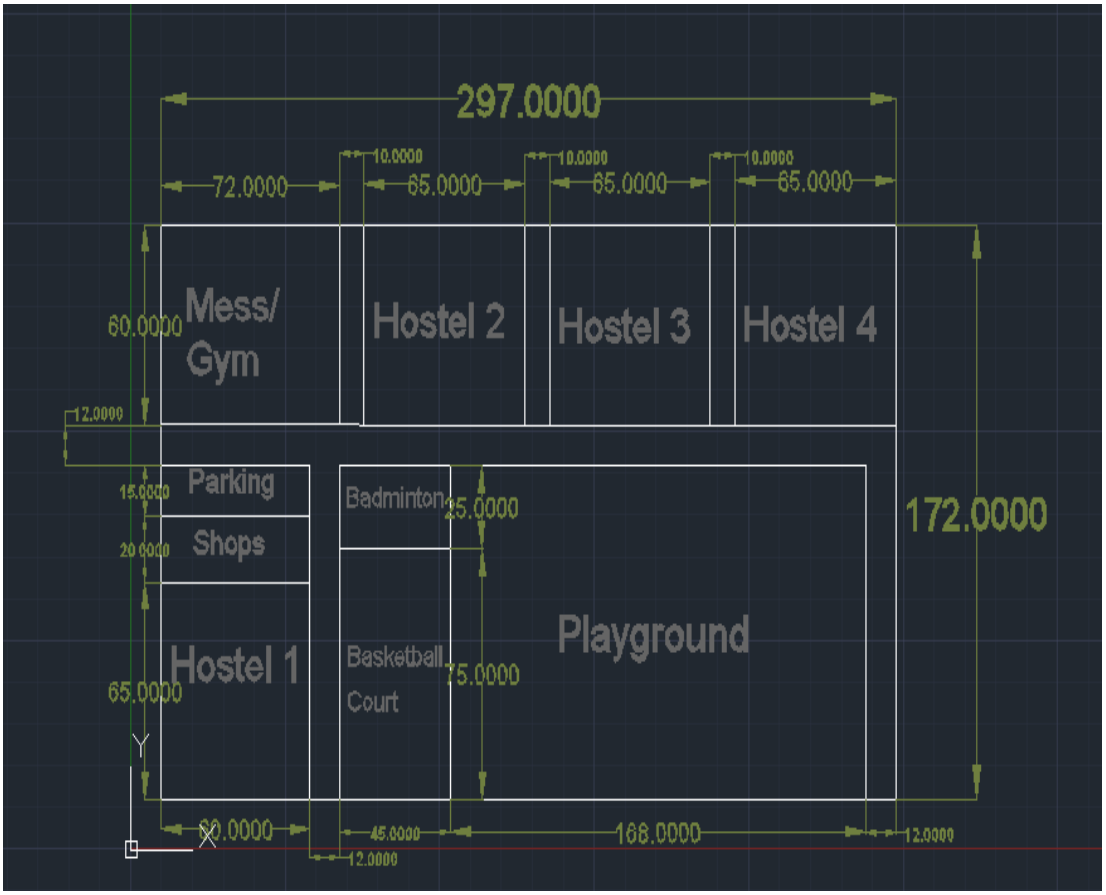


Figure 1-Plan of hostel complex

2.1.1. Hostel building:

- 4 hostel buildings (1 separate building for 1st year students)
- Each hostel has capacity of above 200 students
- Each has G+6 floors
- 15 double rooms on each floor
- Common washroom on each floor.

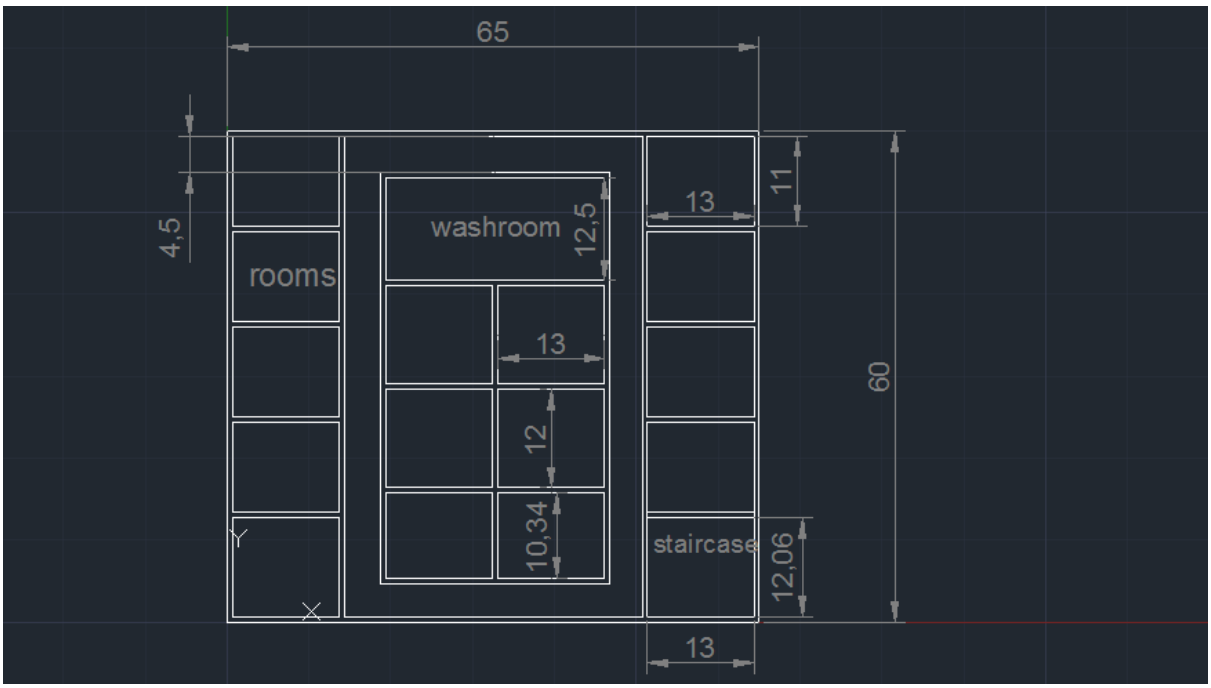


Figure 2-Plan of hostel building

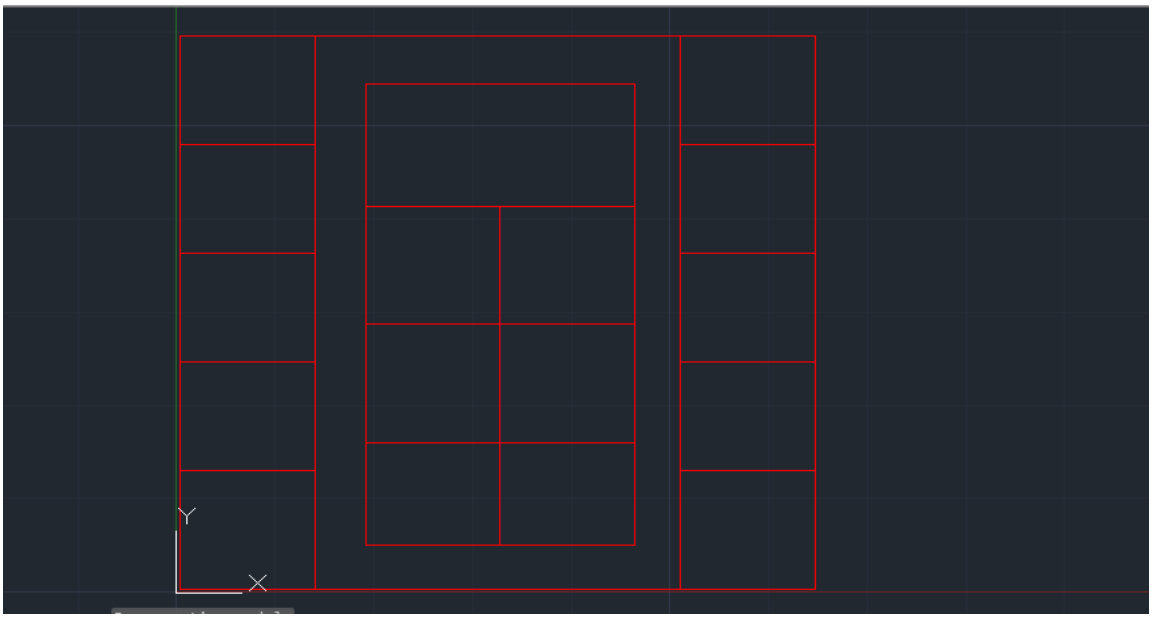


Figure 3-Center line diagram of hostel building

2.1.2. Mess/gym building

- G+2 floors
- Ground and first floors are for mess whereas third floor is for gym and indoor games like snooker and table tennis.

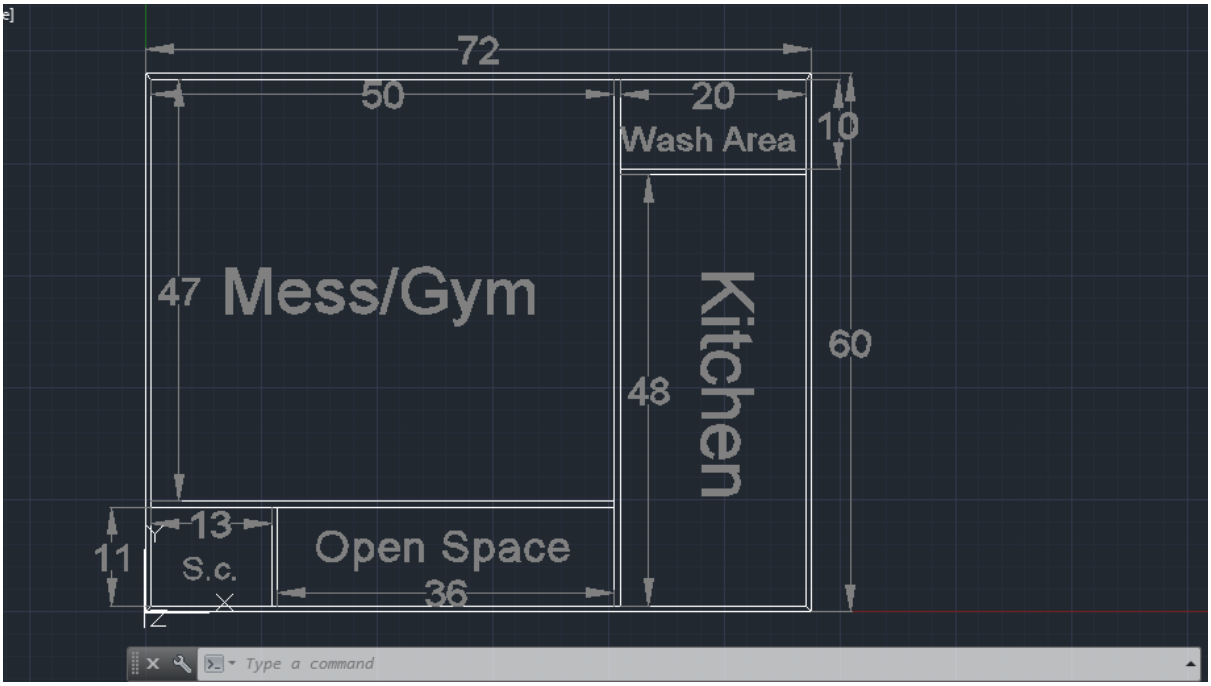


Figure 4-Plan of mess/gym building

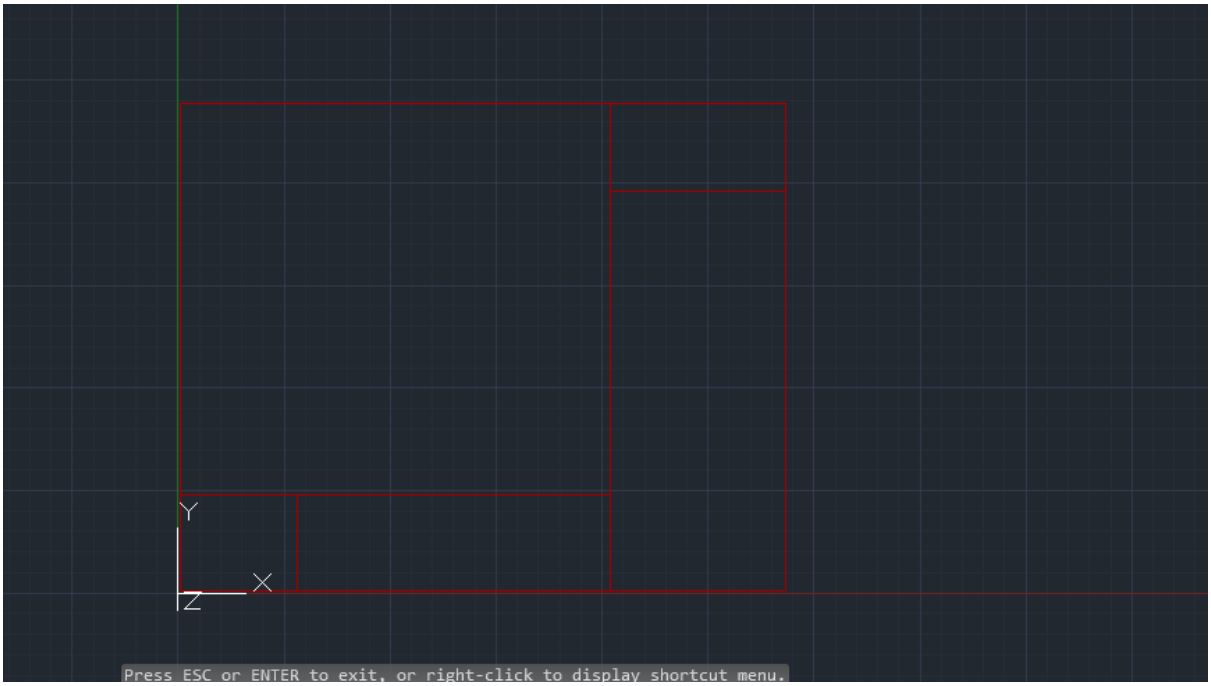


Figure 5-Center line diagram of mess/gym building

CHAPTER 3:WORKING WITH STAAD.Pro:

3.1. Generation of the structure:

We have generated the structure by importing the centre line diagram of autocad in staad pro (in DXF format). Further with translational repeat in y direction, structure is created of G+6 floors (Hostel) and G+2 floors (Mess).

Supports: Support are specified as Pinned, Fixed, or Fixed with different releases (known as FIXED BUT). A fixed support has restraint against all direction of movements.

We use Fixed Support for our structure.

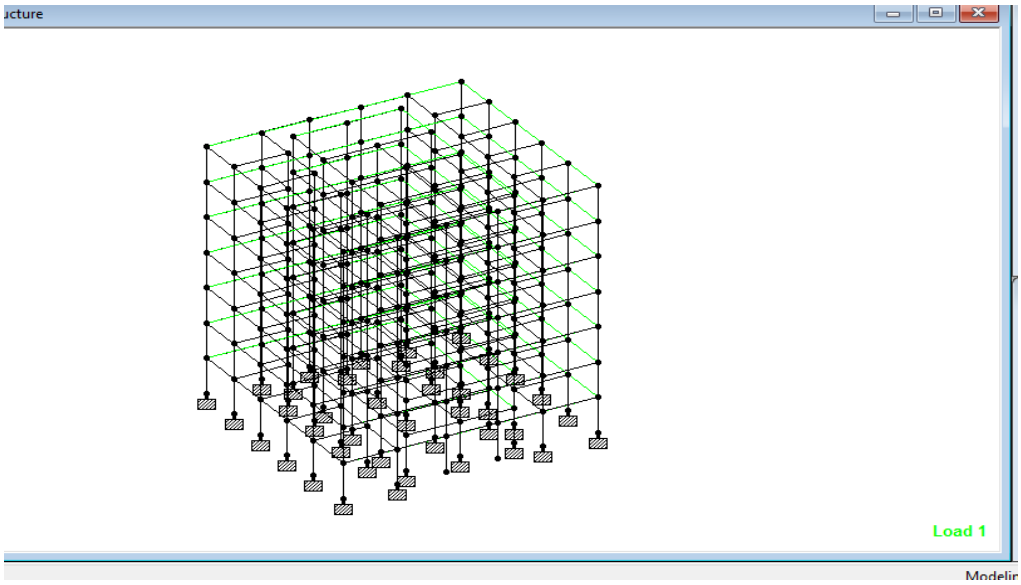


Figure 6-Generation of hostel building structure

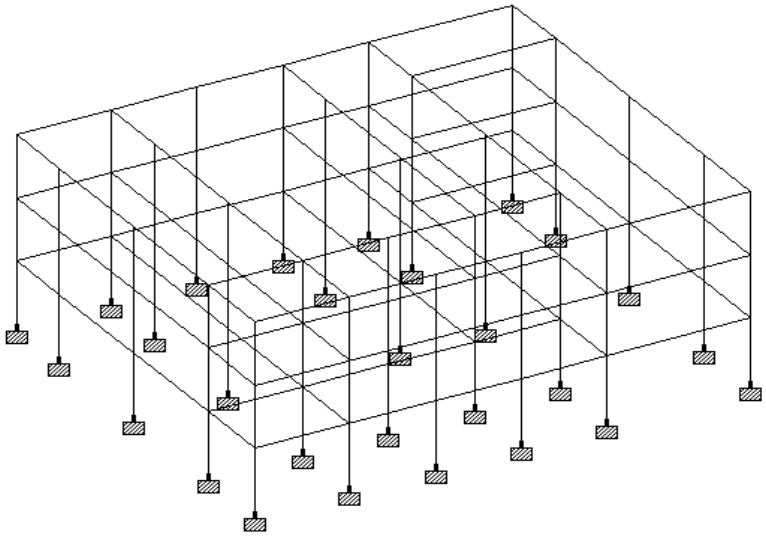


Figure 7- Generation of mess building structure

3.2. Loads Considered :-

Dead Load:

All permanent construction of the structure form the dead load. The dead load comprises of the weights of walls, partitions floor finishes, false ceilings, false floors and the other permanent construction in the building.

We have taken following dead load into consideration:

Calculation for Dead Load

Self-weight

Generation of self weight of the structure (by STAAD.Pro taken itself) with the self weight command in the load case column.

Dead load from Slab

Dead load from slab can also be generated by STAAD.Pro by specify the floor thickness and the load on the floor per sq m. Calculation are as follows:

Self weight of slab=0.175*25=4.375 kN/sq.m

Weight of floor finish=0.75 kN/sq.m

Weight of unknown partitions=0.5kN/sq.m

Total floor load=5.625 kN/sq.m

Dead load from walls

External walls=thickness*height*unit weight=0.23*3.048*19=13.31kN/sq.

Internal walls=0.115*3.048*19=6.65kN/sq.m

Parapet walls=0.23*0.75*19=3.2775kN/sq.m

Live Load:

Refers to load that do, or can, Change over time, such as people walking around the building or Movable objects such as furniture. The weight of the people or goods present in the structure or vehicle load.

Calculation for Live Load

Bathrooms= 2kN/sq.m

Dining rooms for mess = 4kN/sq.m

Corridors, passages, stair cases= 4 kN/sq.m

Rooms=2kn/sq.m

Gym= 4 kN/sq.m

Wind Load:

Wind is air in motion relative to the surface of the earth. Wind load are randomly applied Dynamic load. The intensity of wind pressure on the surface of structure depends upon the wind velocity, air density, orientation of the structure, area of contact surface and shape of structure.

Design Wind Speed (V,)

The basic wind speed (V,) for any site shall be obtained from and shall be modified to include the following effects to get design wind velocity at any height (V,) for the chosen structure:

a) Risk level

b) Height and size of structure

c) Topography of local area

It can be mathematically expressed as follows :

V = Vb * kl * k* ks

Where:

Vb = Design wind speed at any height z (m/s)

kl = probability factor (risk coefficient)

k = terrain, height and size of structure

ks = topography factor

Calculations for Wind Load

Height (m)	**Design wind speed, Vz (m/s)**	**Design wind pressure, Pz (kN/m2)**
10	36.036	0.779
15	38.493	0.889
20	40.131	0.966

3.3. Load combination:

The structure has been analyzed for load combinations considering all the previous loads in proper ratio. In the first case the combination of dead load, live load, wind load in +X was taken into consideration and in second case wind load in -X was also taken into consideration whereas in third case wind load in +Z direction is taken and finally in the 4^{th} case wind load in –Z direction is taken.

3.4. Section Types for Concrete Design:

The following types of cross sections for concrete members can be designed.

For Beams Prismatic (Rectangular & Square)

For Columns Prismatic (Rectangular, Square and Circular)

Material for the structure:

The material for the structure were specified as concrete with their various constants as per standard IS code of practice.

Beam Design:

Beams is designed for flexure, shear and Torsion. For design to be performed as per IS: 13920 the width of the member shall not be less than 200 mm. Also the member shall preferable have a width-to-depth ratio of more than 0.3.

Column Design:

Columns are designed for axial forces and biaxial moments as per IS 456:2000. Column are also designed for shear force. However following clauses have been satisfied to incorporate provisions of IS 13920:

1 The minimum grade of concrete be M20

2. Steel reinforcements of grade Fe415 or less only shall be used.

3. The minimum dimension for column member shall not be less than 200 mm. For columns having unsupported length exceeding 4m, the shortest dimension of column shall not be less than 300 mm

CHAPTER 4: ANALYSIS

4.1. Analysis of both RCC Framed Building using STAAD.Pro

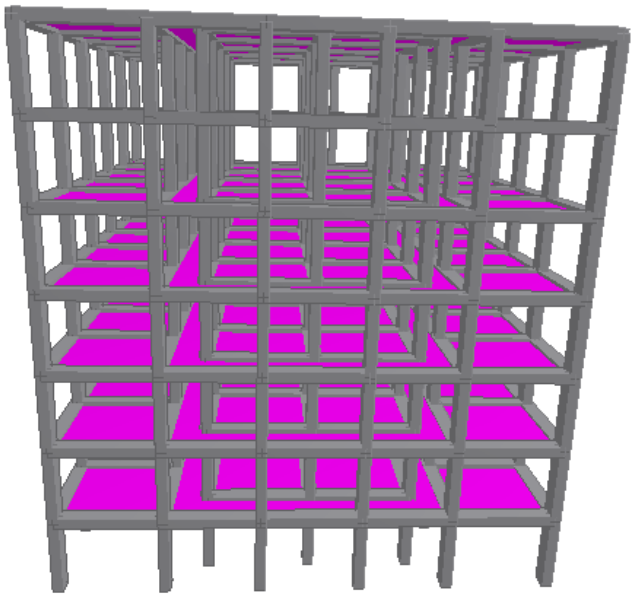


Figure 8- 3D Rendered View of G+6 hostel building

4.1.1. Physical parameters of buildings (Hostel) :

All columns = 0.40 * 0.60 m

All beams = 0.4 * 0.6 m

All slabs = 0.175 m thick

Hostel building:

Length = 65 ft

Width =60 ft

Height = 10 ft + 6 storeys @ 10 ft = 70 ft

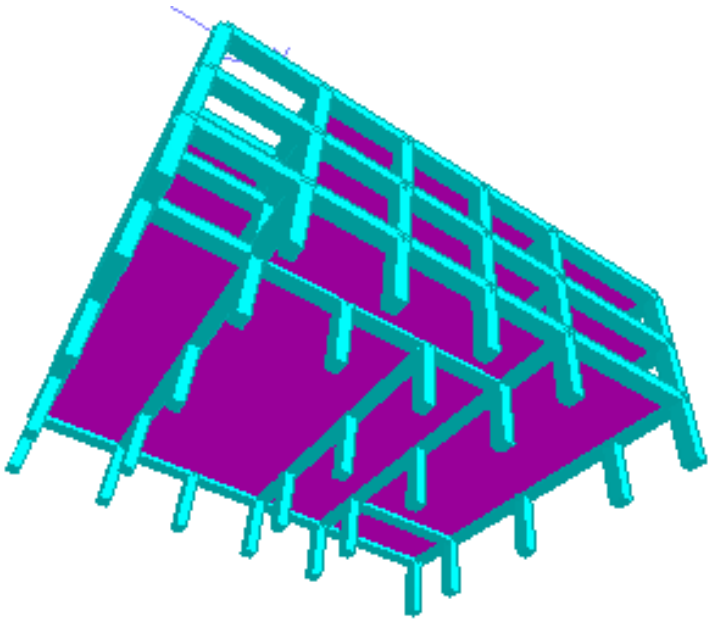


Figure 9- 3D Rendered View of G+2 mess building

4.1.2. Physical parameters of building (Mess) :

All columns = 0.50 * 0.70 m

All beams = 0.5 * 0.7 m

All slabs = 0.175 m thick

Mess\ gym building:

Length= 72 ft

Width= 60 ft

Height= 10ft+ 2 storeys@ 10ft= 30 ft

4.2. Grade of concrete and steel used:

Used M25 grade of concrete and Fe 415 for steel.

Generation of member property:

Generation of members property can be done in STAAD.Pro**.** The member section is selected and the dimensions has been specified. The beams and columns are having a dimension of 0.4 * 0.6 m for Hostel and 0.5 * 0.7 for Mess. Whereas slabs are having thickness of 0.175 m.

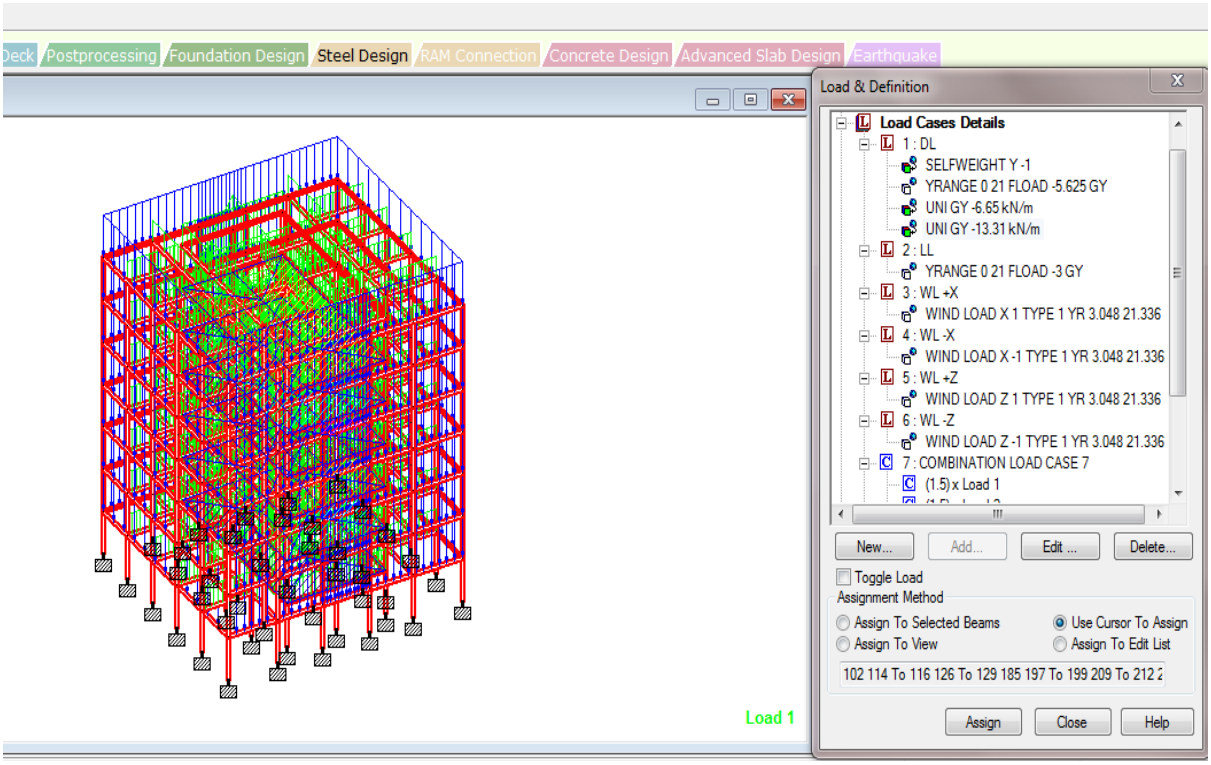


Figure 10 -load combination and its application in hostel building

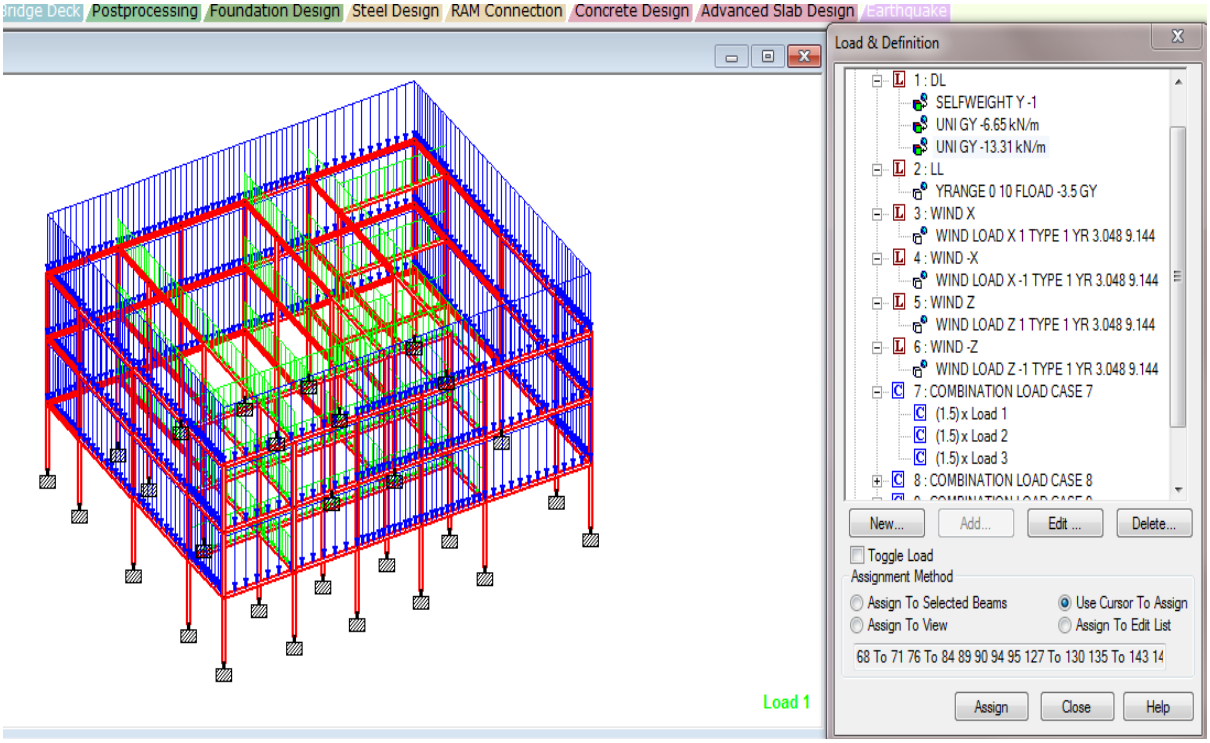


Figure 11-load combination and its application in mess building

Analysis of Hostel Building

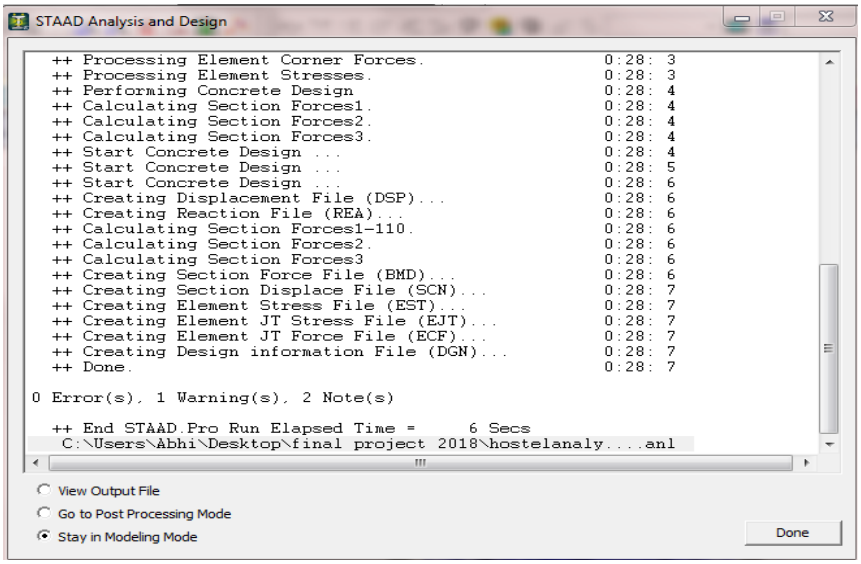


Figure 12 - Analysis

Analysis of Mess Building

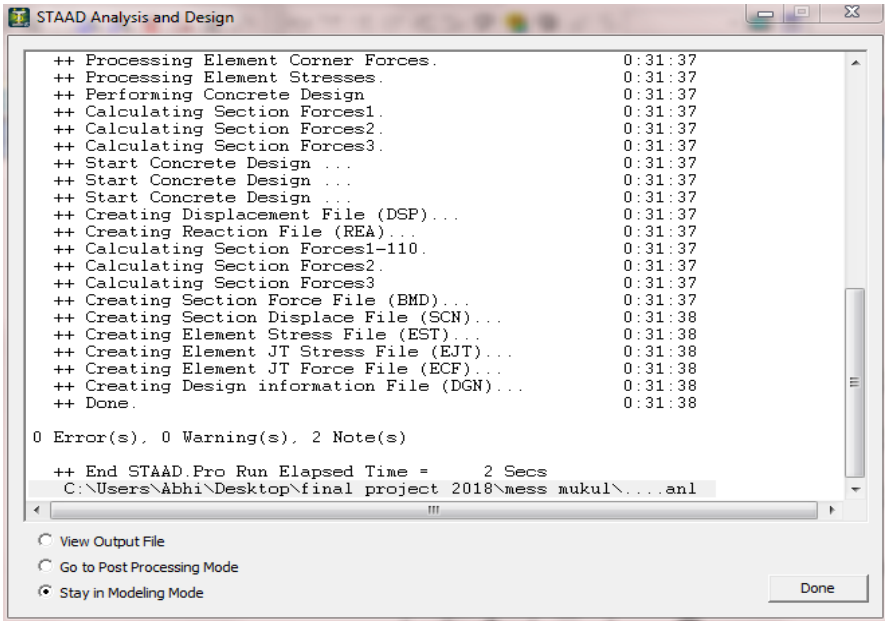


Figure 13 - Analysis

4.3. Design of both RCC Framed Building using STAAD.Pro

The structure was designed for concrete in accordance with IS code. The parameters such as clear cover, Fy, Fc, etc were specified. The input window shown below is for the design purpose. Then it has to be specify which member are to be design as beams and which member are to be design as columns.

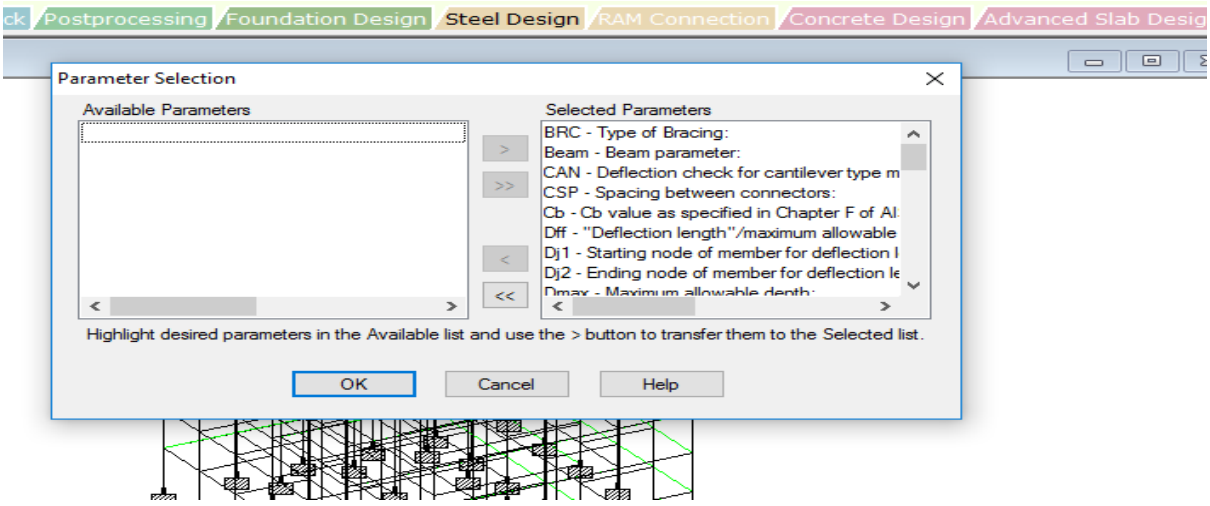


Figure 14-input window for parameters selection

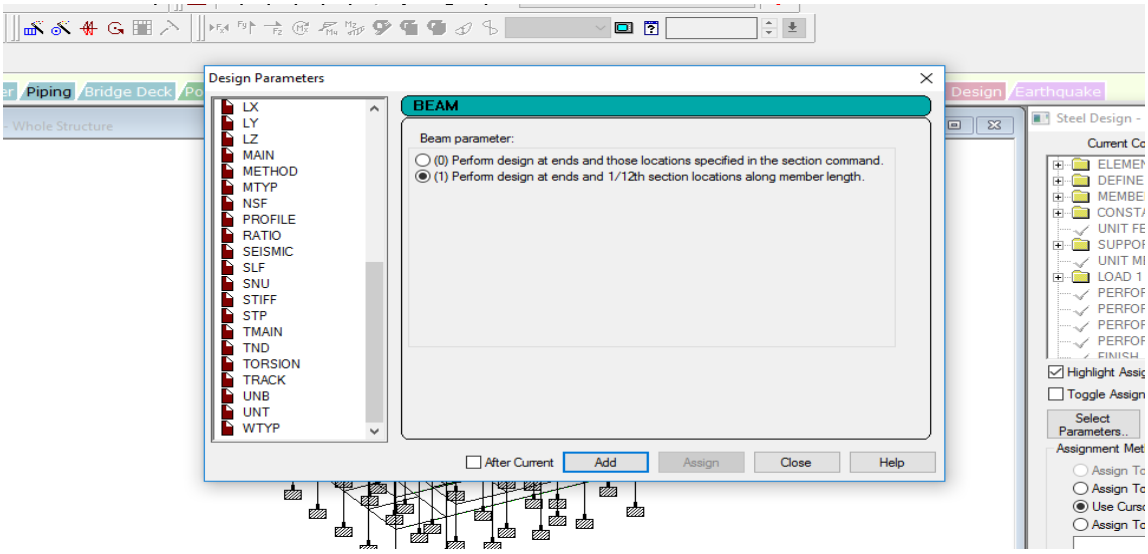


Figure 15- input window for design parameters

CHAPTER 5: DESIGN RESULTS OF HOSTEL

5.1. Critical Members

After applying all the loads we get the critical members which are having maximum displacement. Although we get the design of that members from the STAAD.Pro.

	Beam	L/C	Node	Fx kN	Fy kN	Fz kN	Mx kip-in	My kip-in	Mz kip-in
Max Fx	53	9 COMBINATION LOAD CASE 9	9	3356.03	5.879	-16.769	0.209	281.754	51.606
Min Fx	57	3 WL +X	15	-38.474	8.322	-0.069	-0.02	1.261	138.345
Max Fy	531	8 COMBINATION LOAD CASE 8	408	-3.532	119.212	-0.311	-23.34	4.293	1090.612
Min Fy	101	7 COMBINATION LOAD CASE 7	72	-1.975	-120.701	0.13	16.008	2.043	766.778
Max Fz	546	7 COMBINATION LOAD CASE 7	401	198.913	21.221	38.269	1.984	-446.665	263.781
Min Fz	561	7 COMBINATION LOAD CASE 7	288	247.354	-0.029	-38.852	-0.002	458.93	-0.364
Max Mx	818	8 COMBINATION LOAD CASE 8	323	10.478	63.496	-0.87	61.936	13.078	262.144
Min Mx	613	8 COMBINATION LOAD CASE 8	412	9.595	73.151	1.019	-62.171	-18.236	468.723
Max My	546	7 COMBINATION LOAD CASE 7	406	173.06	21.221	38.269	1.984	585.716	-308.703
Min My	561	7 COMBINATION LOAD CASE 7	331	221.501	-0.029	-38.852	-0.002	-589.173	0.419
Max Mz	544	8 COMBINATION LOAD CASE 8	314	7.867	114.22	-0.129	-6.468	2.328	1246.34
Min Mz	563	7 COMBINATION LOAD CASE 7	413	209.958	51.842	-28.806	1.343	-437.675	-783.446

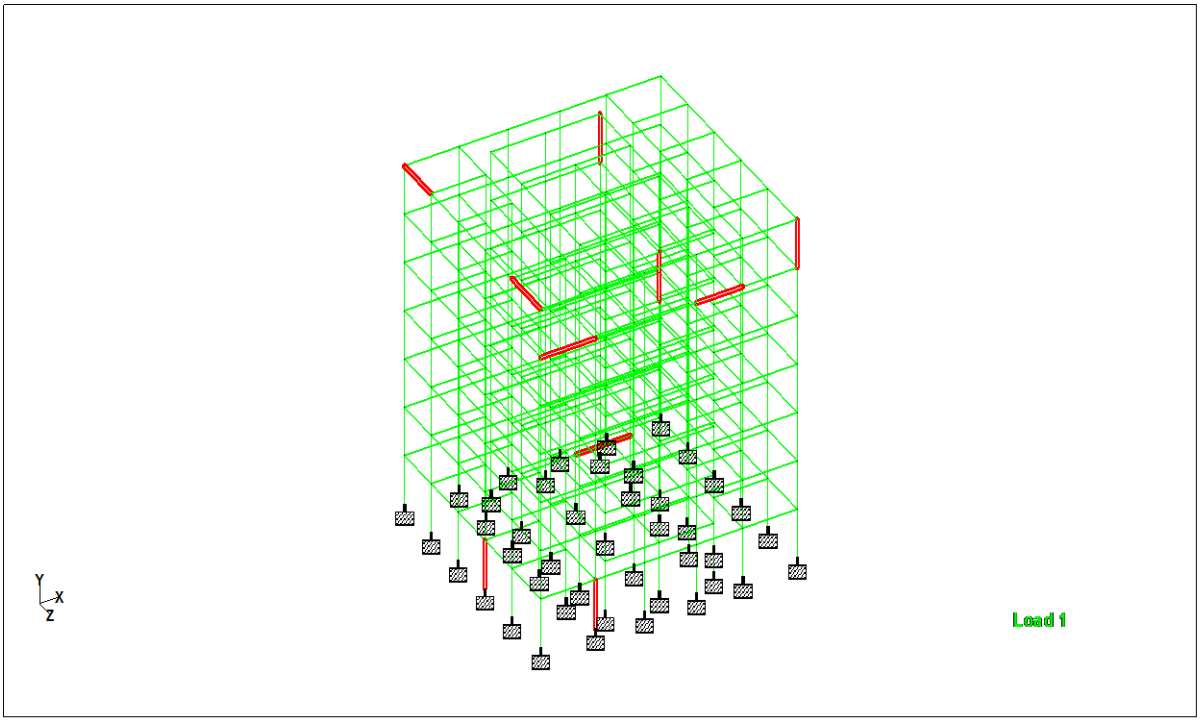
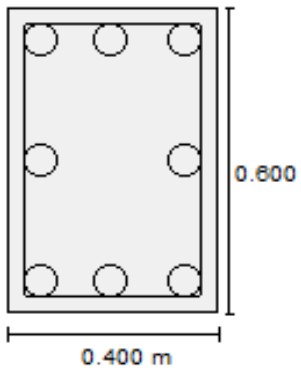


Figure 16 - Critical Members

5.2.Designing of critical members

1. Column 53

Beam no. = 53 Design code : IS-456



Design Load

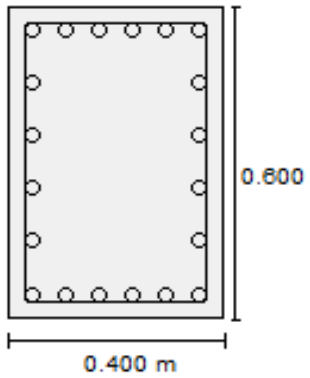
Load	9
Location	End 1
Pu(Kns)	3356.03
Mz(Kns-Mt)	5.83
My(Kns-Mt)	31.83

Design Parameter

Fy(Mpa)	415
Fc(Mpa)	30
As Reqd(mm²)	2496
As (%)	1.04
Bar Size	20
Bar No	8

2. Column 57

Beam no. = 57 Design code : IS-456



Design Load

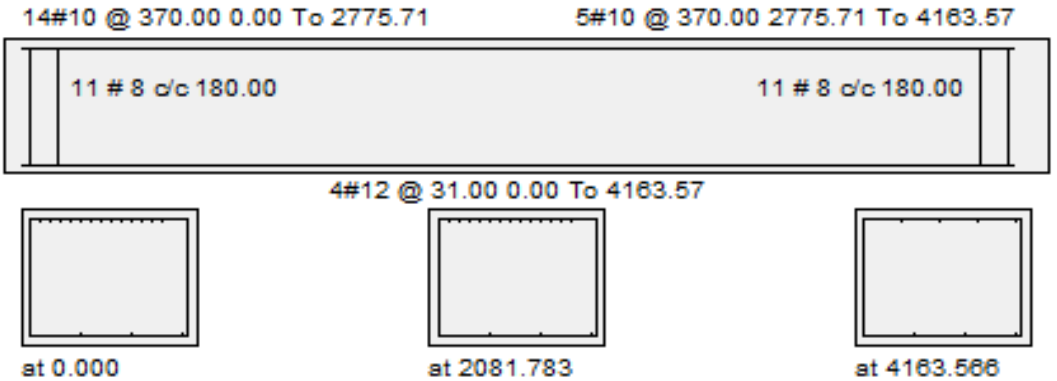
Load	3
Location	End 1
Pu(Kns)	-38.47
Mz(Kns-Mt)	15.63
My(Kns-Mt)	0.14

Design Parameter

Fy(Mpa)	415
Fc(Mpa)	30
As Reqd(mm²)	1920
As (%)	0.94
Bar Size	12
Bar No	20

3. Beam 531

Beam no. = 531 Design code : IS-456



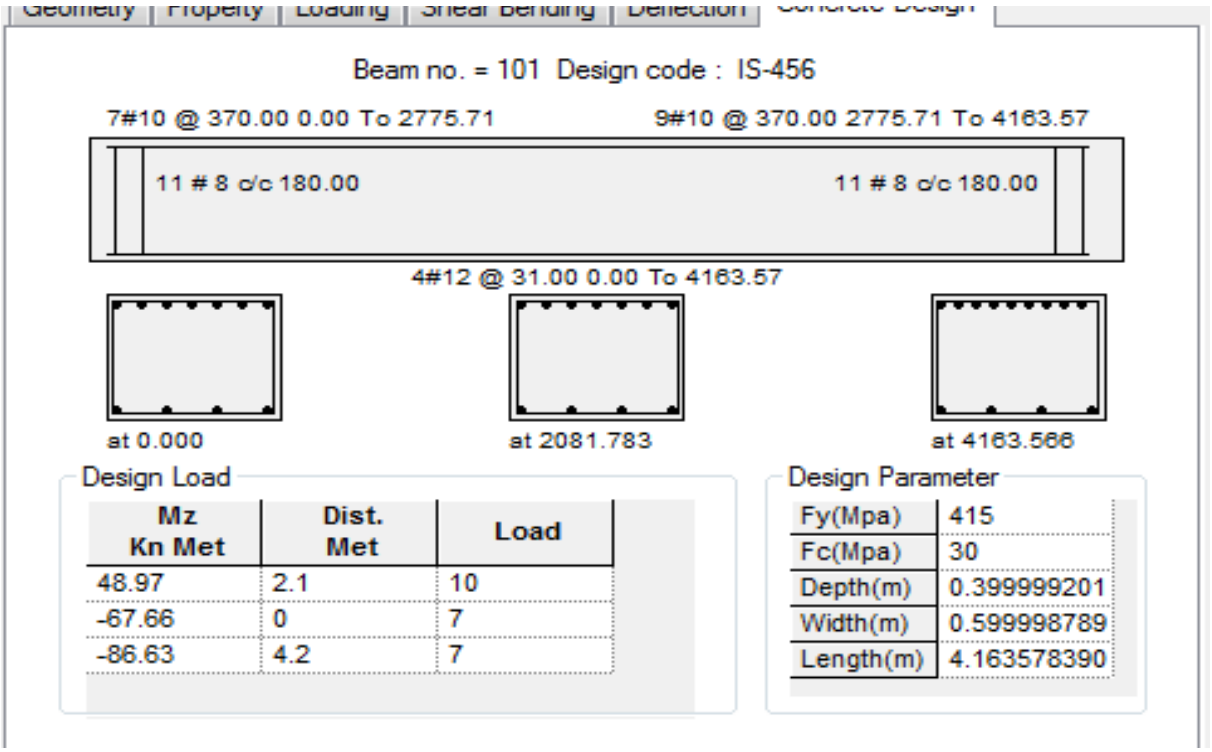
Design Load

Mz Kn Met	Dist. Met	Load
53.64	2.8	8
-123.22	0	8
-4.85	4.2	2

Design Parameter

Fy(Mpa)	415
Fc(Mpa)	30
Depth(m)	0.399999201
Width(m)	0.599998789
Length(m)	4.163553585

4. Beam 101



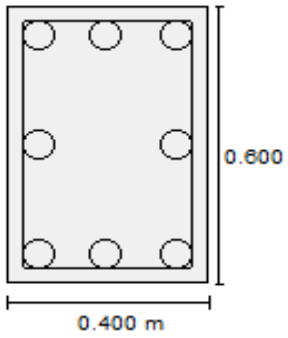
Design Load

Mz Kn Met	Dist. Met	Load
48.97	2.1	10
-67.66	0	7
-86.63	4.2	7

Design Parameter

Fy(Mpa)	415
Fc(Mpa)	30
Depth(m)	0.399999201
Width(m)	0.599998789
Length(m)	4.163578390

5. Column 546



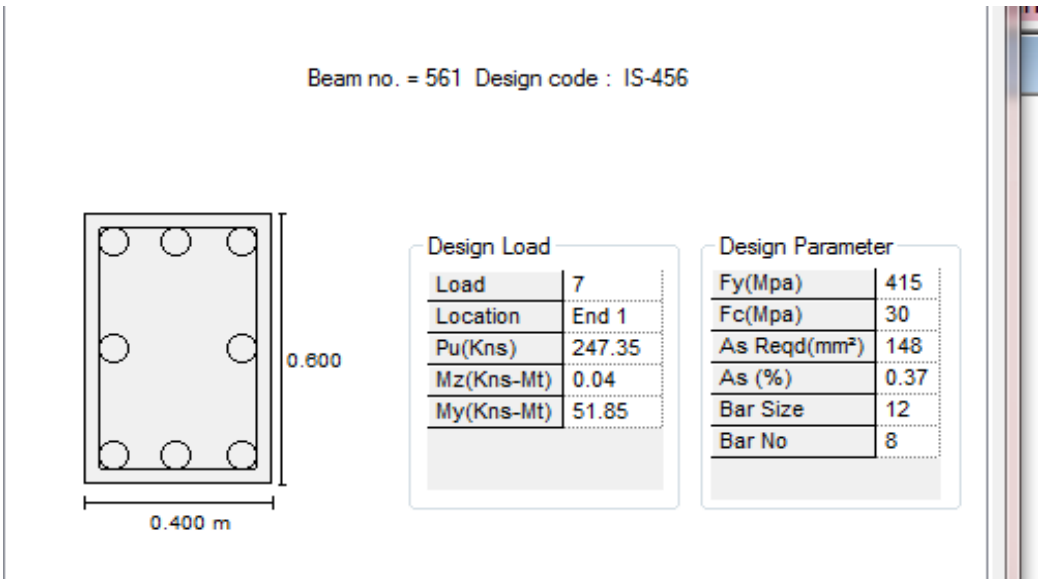
Design Load

Load	7
Location	End 2
Pu(Kns)	173.06
Mz(Kns-Mt)	34.88
My(Kns-Mt)	66.18

Design Parameter

Fy(Mpa)	415
Fc(Mpa)	30
As Reqd(mm²)	794
As (%)	0.37
Bar Size	12
Bar No	8

6. Column 561



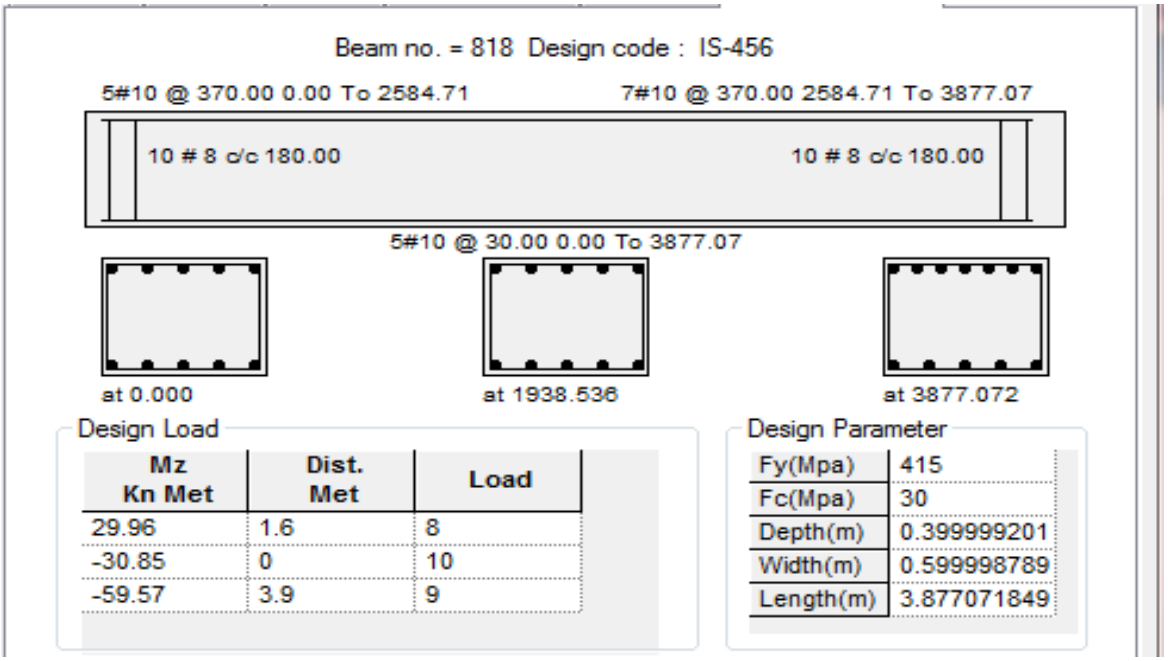
Design Load

Load	7
Location	End 1
Pu(Kns)	247.35
Mz(Kns-Mt)	0.04
My(Kns-Mt)	51.85

Design Parameter

Fy(Mpa)	415
Fc(Mpa)	30
As Reqd(mm²)	148
As (%)	0.37
Bar Size	12
Bar No	8

7. Beam 818



Design Load

Mz Kn Met	Dist. Met	Load
29.96	1.6	8
-30.85	0	10
-59.57	3.9	9

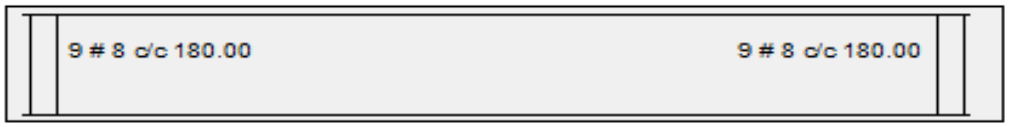
Design Parameter

Fy(Mpa)	415
Fc(Mpa)	30
Depth(m)	0.399999201
Width(m)	0.599998789
Length(m)	3.877071849

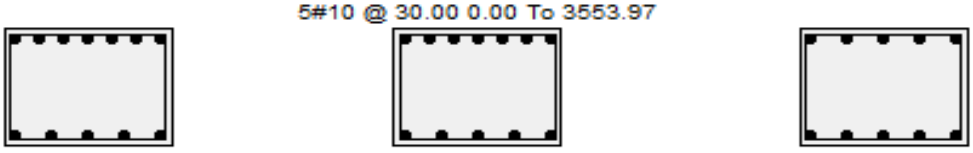
8. Beam 613

Beam no. = 613 Design code : IS-456

7#10 @ 370.00 0.00 To 2369.31 5#10 @ 370.00 2369.31 To 3553.97



5#10 @ 30.00 0.00 To 3553.97



at 0.000 at 1776.983 at 3553.966

Design Load

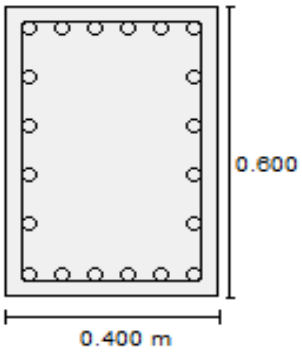
Mz Kn Met	Dist. Met	Load
25.14	2.1	8
-53.49	0	10
-20.92	3.6	9

Design Parameter

Fy(Mpa)	415
Fc(Mpa)	30
Depth(m)	0.399999201
Width(m)	0.599998789
Length(m)	3.553965992

9. Column 563

Beam no. = 563 Design code : IS-456



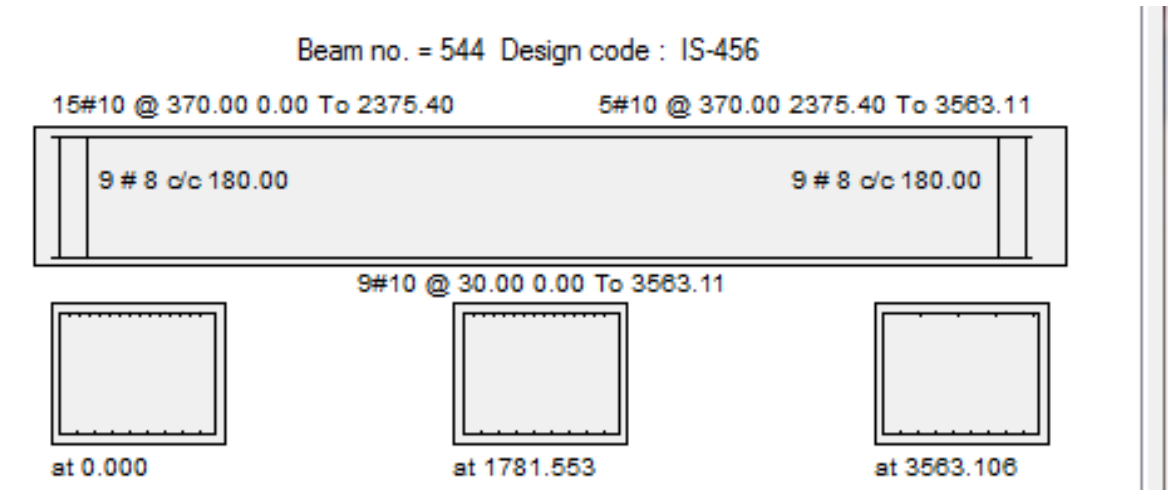
Design Load

Load	4
Location	End 1
Pu(Kns)	-0.55
Mz(Kns-Mt)	0.28
My(Kns-Mt)	0.16

Design Parameter

Fy(Mpa)	415
Fc(Mpa)	30
As Reqd(mm²)	1920
As (%)	0.94
Bar Size	12
Bar No	20

10. Beam 544



Design Load

Mz Kn Met	Dist. Met	Load
85.58	3.6	8
-140.82	0	8
-3.61	3.6	3

Design Parameter

Fy(Mpa)	415
Fc(Mpa)	30
Depth(m)	0.399999201
Width(m)	0.599998789
Length(m)	3.563106519

5.3. Slab Details

Slab Design				
ELEMENT	LONG. REINF	MOM-X /LOAD	TRANS. REINF	MOM-Y /LOAD
	(SQ.MM/ME)	(KN-M/M)	(SQ.MM/ME)	(KN-M/M)
845 TOP :	186	0.62 / 10	186	0.33 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
846 TOP :	186	0.61 / 10	186	0.23 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
847 TOP :	186	0.23 / 10	186	0.61 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
848 TOP :	186	0.07 / 4	186	0.06 / 6
BOTT:	186	-0.192857143	186	-0.058888889
849 TOP :	186	1.36 / 7	186	0.18 / 10
BOTT:	186	-0.0025	186	0
850 TOP :	186	1.38 / 7	186	0.60 / 10
BOTT:	186	-0.0175	186	-0.012
851 TOP :	186	0.00 / 4	186	0.00 / 4
BOTT:	186	-0.194285714	186	-0.02
852 TOP :	186	0.00 / 4	186	0.00 / 4
BOTT:	186	-0.194285714	186	-0.022
853 TOP :	186	0.71 / 10	186	0.28 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
854 TOP :	186	0.00 / 0	186	0.00 / 0
BOTT:	186	-0.071	186	-0.029
855 TOP :	186	0.53 / 9	186	1.37 / 8
BOTT:	186	-0.01	186	-0.023333333
856 TOP :	186	1.36 / 8	186	0.14 / 8
BOTT:	186	0	186	0

857 TOP :	186	0.00 / 3	186	0.00 / 3
BOTT:	186	-0.17	186	-0.022
858 TOP :	186	0.01 / 3	186	0.00 / 5
BOTT:	186	-0.17	186	-0.019
859 TOP :	186	0.71 / 10	186	0.24 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
860 TOP :	186	0.71 / 10	186	0.24 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
861 TOP :	186	1.40 / 8	186	0.60 / 10
BOTT:	186	-0.023333333	186	-0.012
862 TOP :	186	0.00 / 2	186	0.00 / 3
BOTT:	186	-0.01	186	-0.024
863 TOP :	186	0.55 / 10	186	0.27 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
864 TOP :	186	0.63 / 10	186	0.21 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
865 TOP :	186	0.21 / 10	186	0.63 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
866 TOP :	186	0.06 / 4	186	0.06 / 6
BOTT:	186	-0.174285714	186	-0.051111111
867 TOP :	186	1.11 / 7	186	0.12 / 7
BOTT:	186	0	186	0
868 TOP :	186	1.24 / 7	186	0.52 / 10
BOTT:	186	-0.015	186	-0.012
869 TOP :	186	0.00 / 4	186	0.00 / 5
BOTT:	186	-0.158571429	186	-0.009
870 TOP :	186	0.00 / 4	186	0.00 / 4

BOTT:	186	-0.157142857	186	-0.016
871 TOP :	186	0.69 / 10	186	0.29 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
872 TOP :	186	0.00 / 0	186	0.00 / 0
BOTT:	186	-0.07	186	-0.029
873 TOP :	186	0.47 / 9	186	1.24 / 8
BOTT:	186	-0.01	186	-0.02
874 TOP :	186	1.11 / 8	186	0.09 / 10
BOTT:	186	0	186	0
875 TOP :	186	0.00 / 3	186	0.00 / 3
BOTT:	186	-0.1375	186	-0.016
876 TOP :	186	0.00 / 3	186	0.00 / 3
BOTT:	186	-0.13875	186	-0.015
877 TOP :	186	0.74 / 10	186	0.32 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
878 TOP :	186	0.75 / 10	186	0.32 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
879 TOP :	186	1.26 / 8	186	0.52 / 10
BOTT:	186	-0.02	186	-0.012
880 TOP :	186	0.00 / 2	186	0.00 / 3
BOTT:	186	-0.00625	186	-0.02875
881 TOP :	186	0.59 / 10	186	0.28 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
882 TOP :	186	0.71 / 10	186	0.22 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
883 TOP :	186	0.22 / 10	186	0.71 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
884 TOP :	186	0.05 / 4	186	0.05 / 6
BOTT:	186	-0.188571429	186	-0.053333333

885 TOP :	186	1.16 / 7	186	0.11 / 9
BOTT:	186	0	186	0
886 TOP :	186	1.35 / 7	186	0.54 / 10
BOTT:	186	-0.0125	186	-0.01
887 TOP :	186	0.00 / 4	186	0.00 / 5
BOTT:	186	-0.165714286	186	-0.008
888 TOP :	186	0.00 / 4	186	0.00 / 4
BOTT:	186	-0.164285714	186	-0.022857143
889 TOP :	186	0.77 / 10	186	0.33 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
890 TOP :	186	0.00 / 0	186	0.00 / 0
BOTT:	186	-0.078	186	-0.033
891 TOP :	186	0.48 / 9	186	1.35 / 8
BOTT:	186	-0.008333333	186	-0.016666667
892 TOP :	186	1.16 / 8	186	0.08 / 10
BOTT:	186	0	186	0
893 TOP :	186	0.00 / 3	186	0.00 / 3
BOTT:	186	-0.14375	186	-0.02
894 TOP :	186	0.00 / 3	186	0.00 / 6
BOTT:	186	-0.14625	186	-0.012222222
895 TOP :	186	0.85 / 10	186	0.39 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
896 TOP :	186	0.85 / 10	186	0.39 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
897 TOP :	186	1.37 / 8	186	0.54 / 10
BOTT:	186	-0.016666667	186	-0.01
898 TOP :	186	0.00 / 2	186	0.00 / 3

BOTT:	186	-0.00875	186	-0.0325
899 TOP :	186	0.61 / 10	186	0.27 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
900 TOP :	186	0.77 / 10	186	0.23 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
901 TOP :	186	0.23 / 10	186	0.77 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
902 TOP :	186	0.04 / 4	186	0.04 / 6
BOTT:	186	-0.192857143	186	-0.052222222
903 TOP :	186	1.15 / 7	186	0.09 / 9
BOTT:	186	0	186	0
904 TOP :	186	1.38 / 7	186	0.53 / 10
BOTT:	186	-0.01	186	-0.008
905 TOP :	186	0.00 / 4	186	0.00 / 5
BOTT:	186	-0.164285714	186	-0.006
906 TOP :	186	0.00 / 4	186	0.00 / 4
BOTT:	186	-0.162857143	186	-0.021428571
907 TOP :	186	0.82 / 10	186	0.36 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
908 TOP :	186	0.00 / 0	186	0.00 / 0
BOTT:	186	-0.082	186	-0.036
909 TOP :	186	0.47 / 9	186	1.38 / 8
BOTT:	186	-0.006666667	186	-0.013333333
910 TOP :	186	1.15 / 8	186	0.07 / 10
BOTT:	186	0	186	0
911 TOP :	186	0.00 / 3	186	0.00 / 3
BOTT:	186	-0.1425	186	-0.01875

912 TOP :	186	0.00 / 3	186	0.00 / 6
BOTT:	186	-0.14375	186	-0.011111111
913 TOP :	186	0.92 / 10	186	0.44 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
914 TOP :	186	0.92 / 10	186	0.44 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
915 TOP :	186	1.40 / 8	186	0.54 / 10
BOTT:	186	-0.013333333	186	-0.008
916 TOP :	186	0.01 / 2	186	0.00 / 3
BOTT:	186	-0.01125	186	-0.035
917 TOP :	186	0.63 / 10	186	0.28 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
918 TOP :	186	0.82 / 10	186	0.24 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
919 TOP :	186	0.24 / 10	186	0.82 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
920 TOP :	186	0.03 / 4	186	0.03 / 6
BOTT:	186	-0.201428571	186	-0.052222222
921 TOP :	186	1.18 / 7	186	0.08 / 9
BOTT:	186	0	186	-0.001666667
922 TOP :	186	1.44 / 7	186	0.54 / 10
BOTT:	186	-0.0075	186	-0.006
923 TOP :	186	0.00 / 4	186	0.01 / 1
BOTT:	186	-0.168571429	186	-0.005
924 TOP :	186	0.00 / 4	186	0.00 / 4
BOTT:	186	-0.167142857	186	-0.021428571
925 TOP :	186	0.87 / 10	186	0.38 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6

926 TOP :	186	0.00 / 0	186	0.00 / 0
BOTT:	186	-0.087	186	-0.038
927 TOP :	186	0.48 / 9	186	1.43 / 8
BOTT:	186	-0.005	186	-0.01
928 TOP :	186	1.18 / 8	186	0.06 / 10
BOTT:	186	0	186	-0.002
929 TOP :	186	0.00 / 3	186	0.00 / 3
BOTT:	186	-0.14625	186	-0.01875
930 TOP :	186	0.00 / 3	186	0.01 / 6
BOTT:	186	-0.1475	186	-0.01
931 TOP :	186	0.98 / 10	186	0.48 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
932 TOP :	186	0.98 / 10	186	0.48 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
933 TOP :	186	1.46 / 8	186	0.54 / 10
BOTT:	186	-0.01	186	-0.006
934 TOP :	186	0.01 / 2	186	0.00 / 3
BOTT:	186	-0.011	186	-0.0375
935 TOP :	186	0.58 / 10	186	0.23 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
936 TOP :	186	0.77 / 10	186	0.19 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
937 TOP :	186	0.19 / 10	186	0.76 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
938 TOP :	186	0.02 / 4	186	0.01 / 6
BOTT:	186	-0.178571429	186	-0.044444444
939 TOP :	186	1.05 / 10	186	0.08 / 9
BOTT:	186	0	186	-0.001666667
940 TOP :	186	1.28 / 7	186	0.46 / 10

BOTT:	186	-0.005	186	-0.002
941 TOP :	186	0.00 / 4	186	0.01 / 1
BOTT:	186	-0.116666667	186	-0.005
942 TOP :	186	0.00 / 3	186	0.00 / 4
BOTT:	186	-0.13	186	-0.017142857
943 TOP :	186	0.82 / 10	186	0.36 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
944 TOP :	186	0.00 / 0	186	0.00 / 0
BOTT:	186	-0.082	186	-0.036
945 TOP :	186	0.40 / 9	186	1.27 / 8
BOTT:	186	-0.001666667	186	-0.006666667
946 TOP :	186	1.05 / 9	186	0.06 / 10
BOTT:	186	0	186	-0.01
947 TOP :	186	0.00 / 4	186	0.00 / 3
BOTT:	186	-0.148571429	186	-0.015
948 TOP :	186	0.00 / 3	186	0.01 / 6
BOTT:	186	-0.105	186	-0.008888889
949 TOP :	186	0.93 / 10	186	0.48 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
950 TOP :	186	0.94 / 10	186	0.48 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
951 TOP :	186	1.30 / 8	186	0.46 / 10
BOTT:	186	-0.006666667	186	-0.002
952 TOP :	186	0.01 / 2	186	0.00 / 0
BOTT:	186	-0.011	186	-0.03375
953 TOP :	186	0.95 / 10	186	0.51 / 10
BOTT:	186	0.00 / 6	186	-0.005

954 TOP :	186	1.31 / 10	186	0.47 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
955 TOP :	186	0.47 / 10	186	1.31 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
956 TOP :	186	0.03 / 2	186	0.01 / 6
BOTT:	186	-0.318571429	186	-0.078888889
957 TOP :	186	1.75 / 7	186	0.06 / 9
BOTT:	186	-0.03	186	-0.001666667
958 TOP :	186	2.27 / 7	186	0.82 / 10
BOTT:	186	-0.015	186	-0.002
959 TOP :	186	0.06 / 2	186	0.03 / 9
BOTT:	186	-0.247142857	186	-0.01
960 TOP :	186	0.06 / 2	186	0.01 / 2
BOTT:	186	-0.242857143	186	-0.031428571
961 TOP :	186	1.31 / 10	186	0.63 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
962 TOP :	186	0.00 / 0	186	0.00 / 0
BOTT:	186	-0.132	186	-0.063
963 TOP :	186	0.73 / 9	186	2.26 / 8
BOTT:	186	-0.001666667	186	-0.015
964 TOP :	186	1.74 / 8	186	0.02 / 2
BOTT:	186	-0.03	186	-0.02
965 TOP :	186	0.06 / 2	186	0.01 / 2
BOTT:	186	-0.2125	186	-0.0275
966 TOP :	186	0.06 / 2	186	0.01 / 6
BOTT:	186	-0.21875	186	-0.006666667
967 TOP :	186	1.50 / 10	186	0.77 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6

968 TOP :	186	1.50 / 10	186	0.78 / 10
BOTT:	186	0.00 / 6	186	0.00 / 6
969 TOP :	186	2.31 / 8	186	0.84 / 10
BOTT:	186	-0.015	186	-0.002
970 TOP :	186	0.01 / 2	186	0.00 / 0
BOTT:	186	-0.023	186	-0.065714286

CHAPTER 6: DESIGN RESULTS OF MESS

6.1. Critical Members

After applying all the loads we get the critical members which are having maximum displacement. Although we get the design of that members from the STAAD.Pro.

	Beam	L/C	Node	FxkN	FykN	FzkN	MxkNm	My kNm	MzkNm
Max Fx	48	9 COMBINATION LOAD CASE 9	15	2197.585	-15.779	-45.451	0.028	48.946	-15.016
Min Fx	149	9 COMBINATION LOAD CASE 9	88	-19.732	129.074	-1.759	-1.626	8.451	165.54
Max Fy	204	10 COMBINATION LOAD CASE 10	112	26.594	183.712	-0.74	3.394	3.806	291.739
Min Fy	192	9 COMBINATION LOAD CASE 9	112	12.694	-177.704	0.751	-2.065	3.479	274.699
Max Fz	165	10 COMBINATION LOAD CASE 10	74	647.64	-26.977	81.725	0.334	-103.138	-36.11
Min Fz	166	8 COMBINATION LOAD CASE 8	75	725.182	-48.532	-86.625	0.058	109.328	-65.279
Max Mx	189	10 COMBINATION LOAD CASE 10	98	24.202	50.885	-4.075	15.432	15	23.419
Min Mx	196	10 COMBINATION LOAD CASE 10	108	-12.904	111.399	4.665	-14.234	-4.33	102.654
Max My	165	10 COMBINATION LOAD CASE 10	102	609.849	-26.977	81.725	0.334	145.96	46.116
Min My	166	9 COMBINATION LOAD CASE 9	103	688.814	-44.173	-86.416	-0.064	-155.817	74.933
Max Mz	204	10 COMBINATION LOAD CASE 10	112	26.594	183.712	-0.74	3.394	3.806	291.739
Min Mz	159	10 COMBINATION LOAD CASE 10	96	388.829	59.628	19.957	-0.155	35.805	-104.848

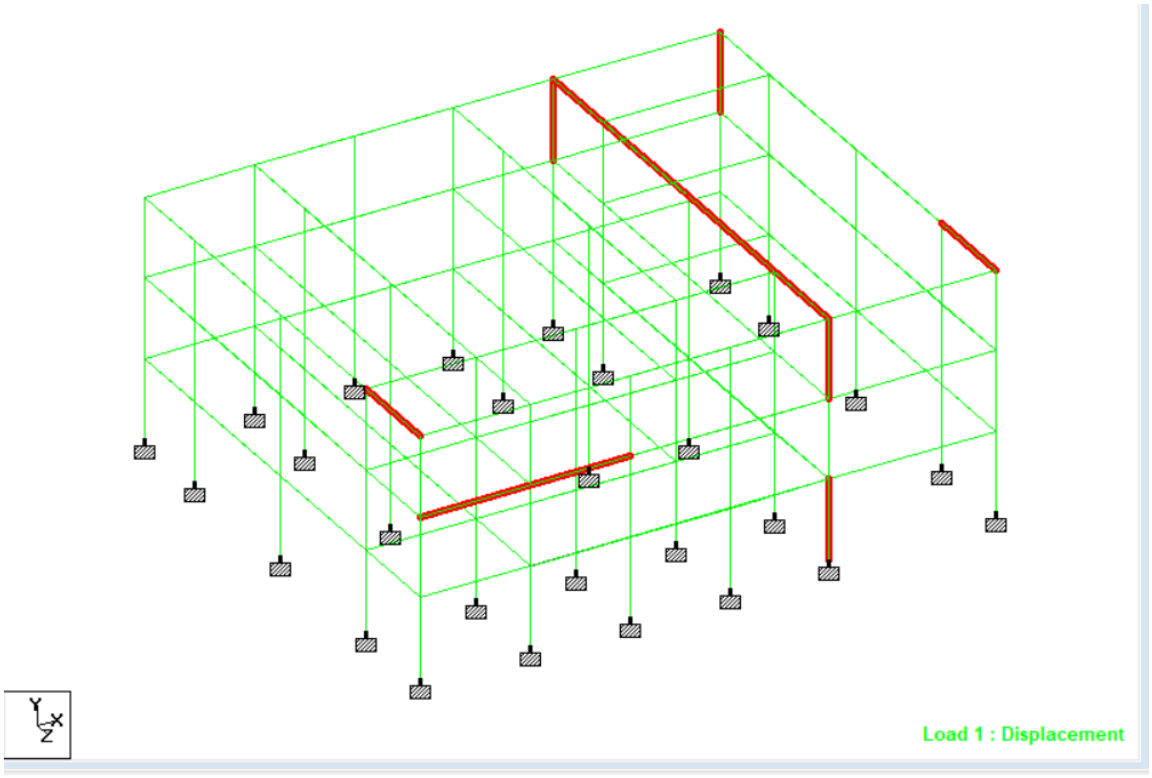


Figure 17 - Critical Members

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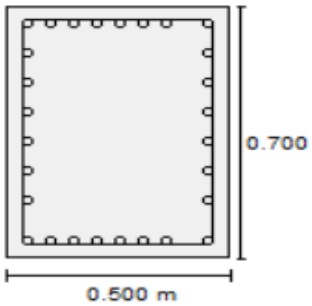
Designing of critical members

1. Column 48

Beam no. = 48 Design code : IS-456



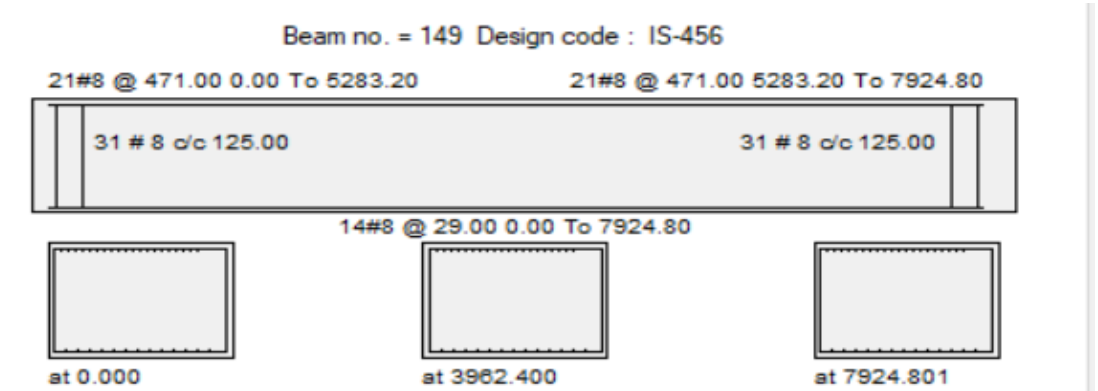
Design Load

Load	4
Location	End 1
Pu(Kns)	-0.91
Mz(Kns-Mt)	10.44
My(Kns-Mt)	0.85

Design Parameter

Fy(Mpa)	415
Fc(Mpa)	25
As Reqd(mm²)	2800
As (%)	0.90
Bar Size	12
Bar No	28

2. Beam 149



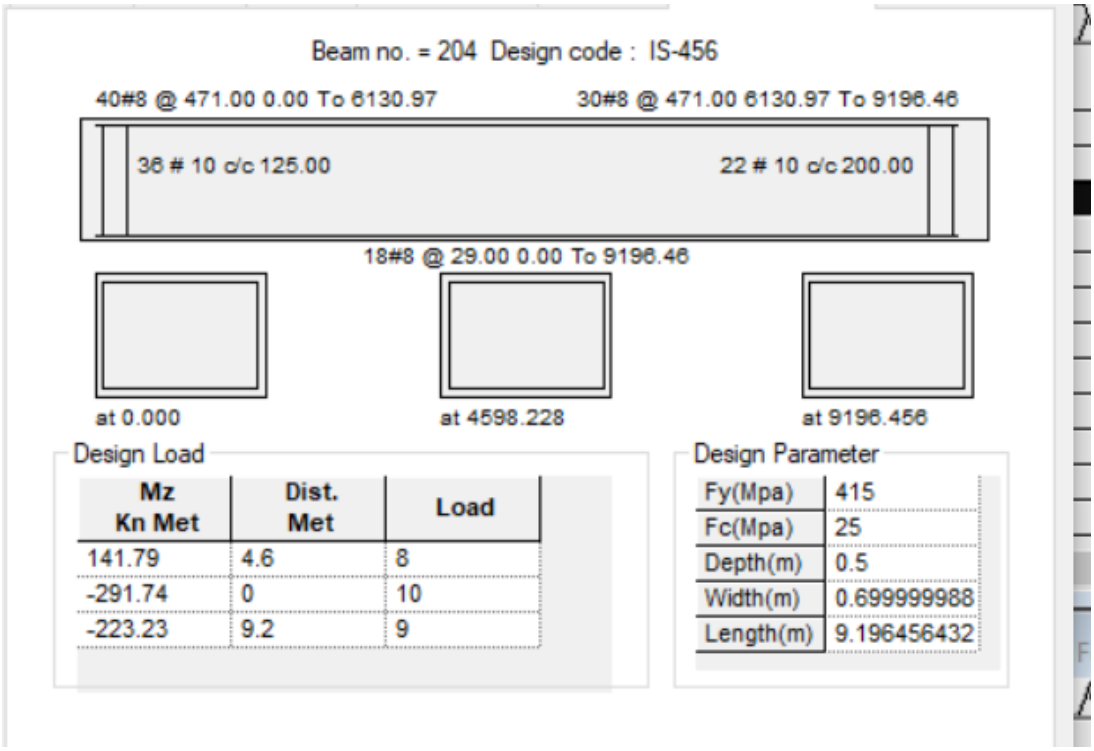
Design Load

Mz Kn Met	Dist. Met	Load
85.34	4.6	9
-165.54	0	9
-165.02	7.9	8

Design Parameter

Fy(Mpa)	415
Fc(Mpa)	25
Depth(m)	0.5
Width(m)	0.699999988
Length(m)	7.924799442

3. Beam 204



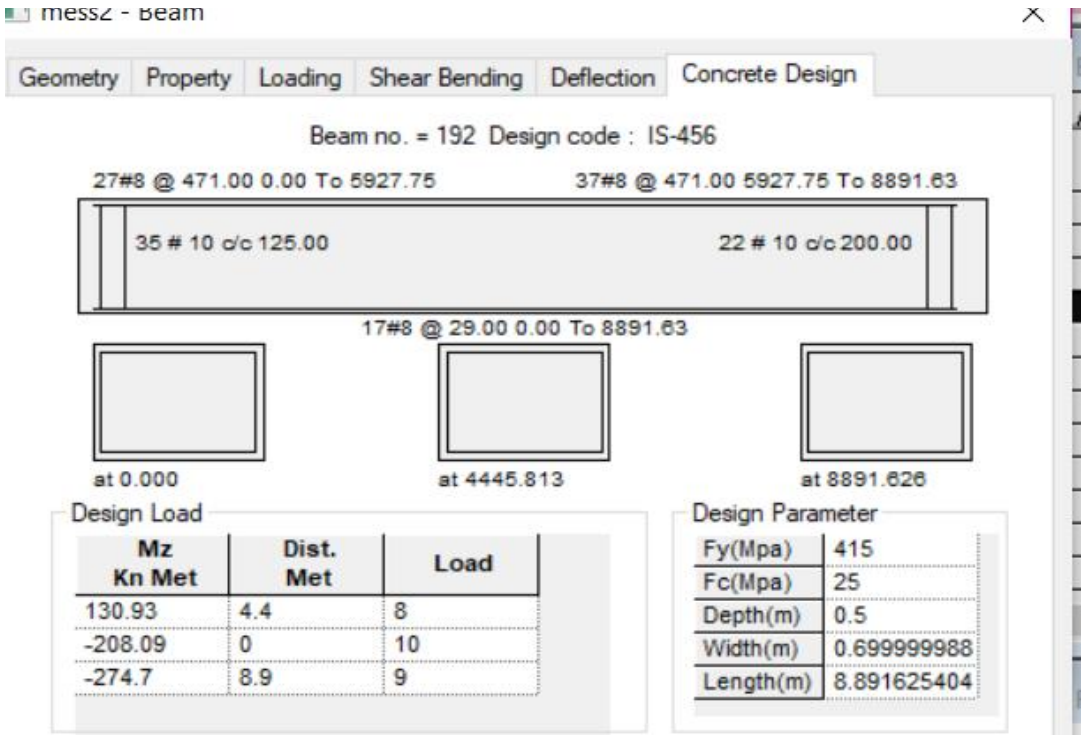
Design Load

Mz Kn Met	Dist. Met	Load
141.79	4.6	8
-291.74	0	10
-223.23	9.2	9

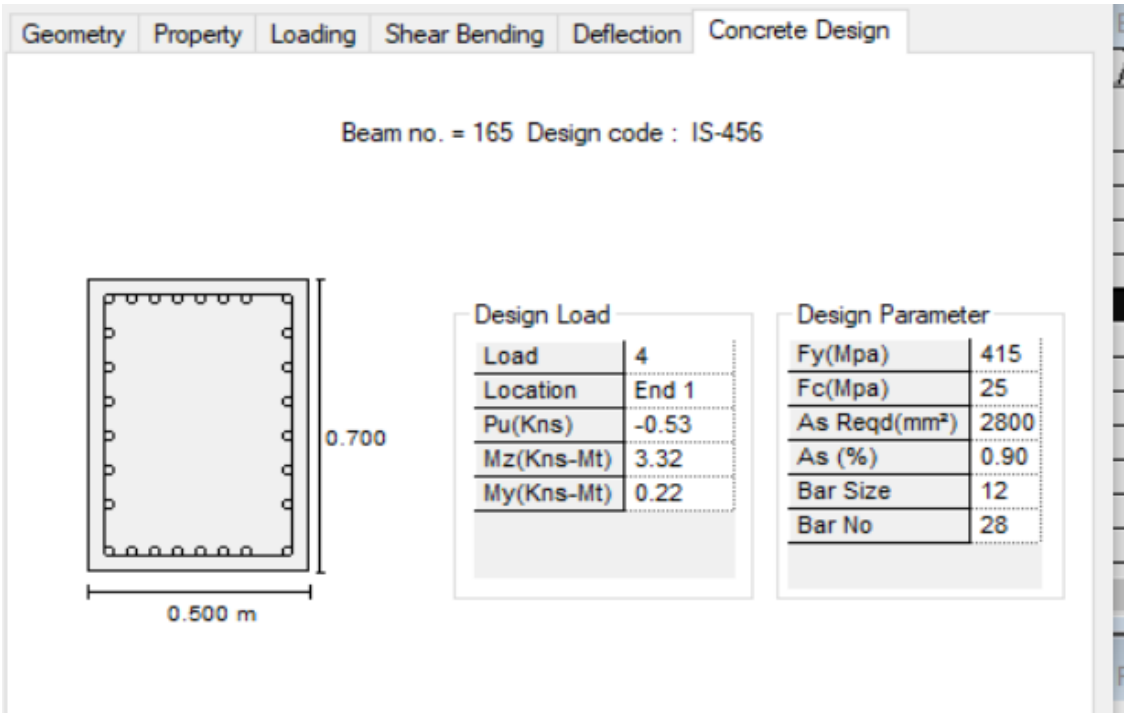
Design Parameter

Fy(Mpa)	415
Fc(Mpa)	25
Depth(m)	0.5
Width(m)	0.699999988
Length(m)	9.196456432

4. Beam 192

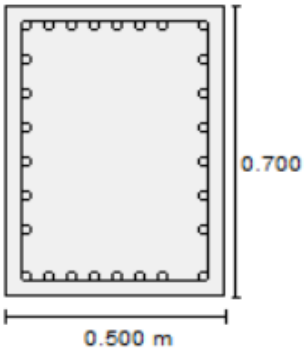


5. Column 165



6. Column 166

Beam no. = 166 Design code : IS-456



Design Load

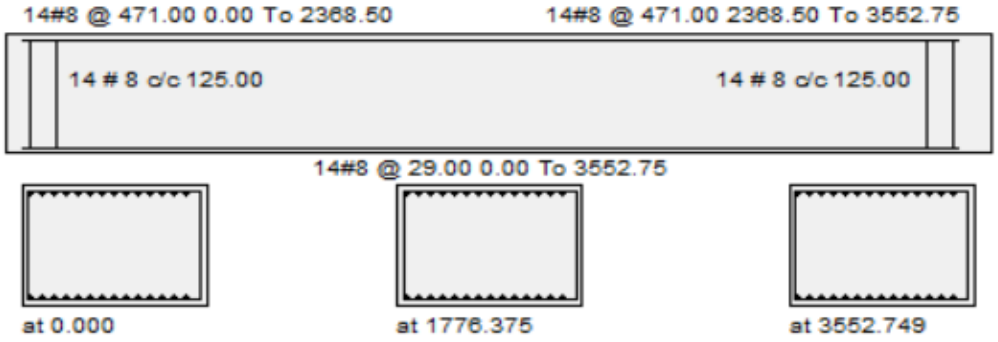
Load	4
Location	End 1
Pu(Kns)	-0.19
Mz(Kns-Mt)	3.17
My(Kns-Mt)	1.34

Design Parameter

Fy(Mpa)	415
Fc(Mpa)	25
As Reqd(mm²)	2800
As (%)	0.90
Bar Size	12
Bar No	28

7. Beam 189

Beam no. = 189 Design code : IS-456



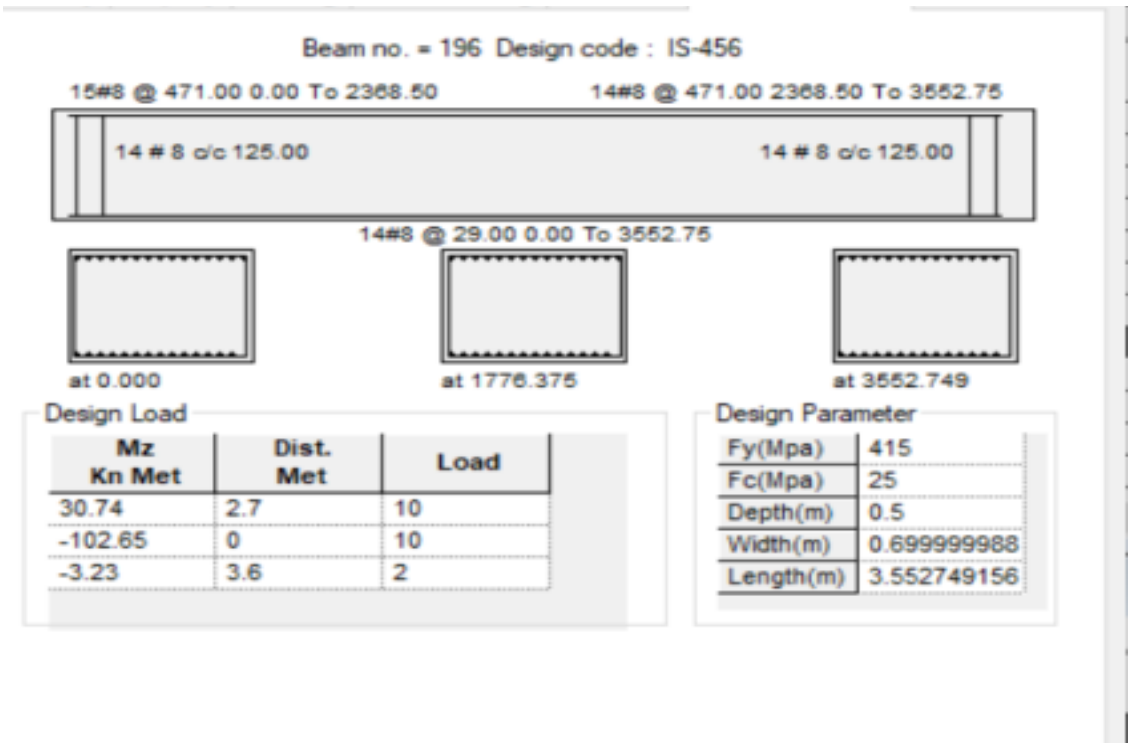
Design Load

Mz Kn Met	Dist. Met	Load
16.45	1.5	10
-30.69	0	9
-46.88	3.6	10

Design Parameter

Fy(Mpa)	415
Fc(Mpa)	25
Depth(m)	0.5
Width(m)	0.699999988
Length(m)	3.552749156

8. Beam 196



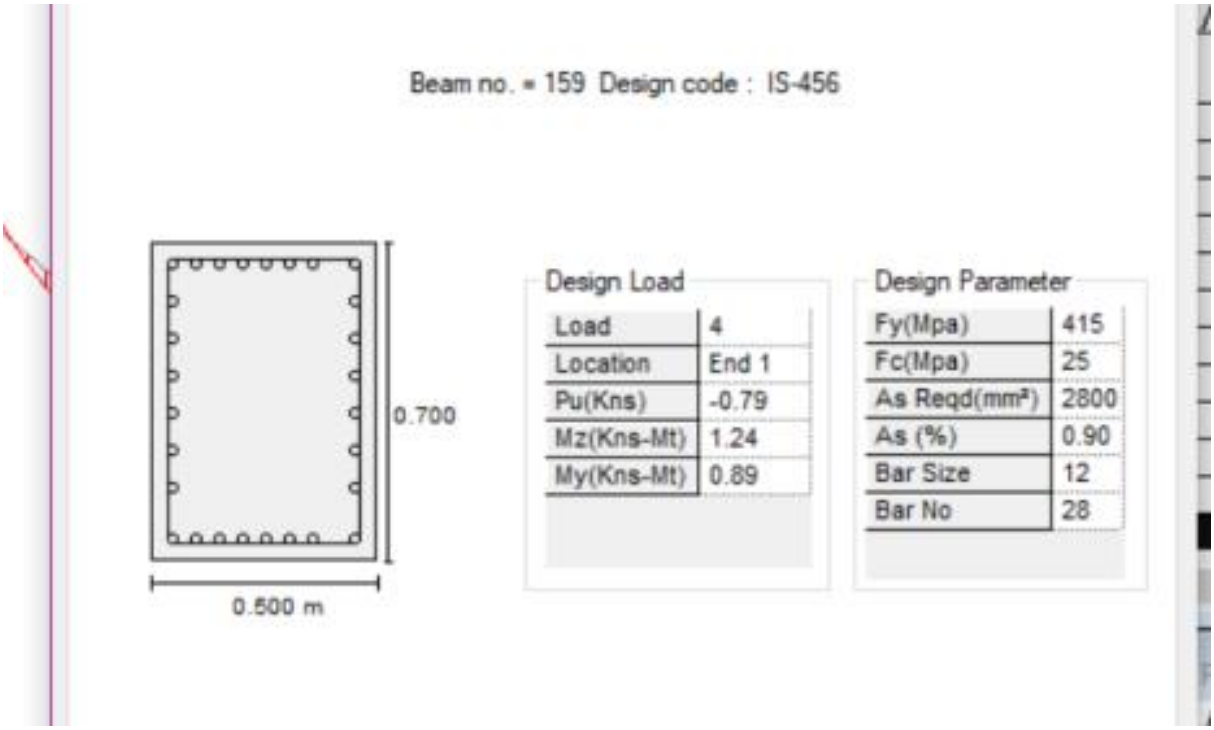
Design Load

Mz Kn Met	Dist. Met	Load
30.74	2.7	10
-102.65	0	10
-3.23	3.6	2

Design Parameter

Fy(Mpa)	415
Fc(Mpa)	25
Depth(m)	0.5
Width(m)	0.699999988
Length(m)	3.552749156

9. Column 159



Design Load

Load	4
Location	End 1
Pu(Kns)	-0.79
Mz(Kns-Mt)	1.24
My(Kns-Mt)	0.89

Design Parameter

Fy(Mpa)	415
Fc(Mpa)	25
As Reqd(mm²)	2800
As (%)	0.90
Bar Size	12
Bar No	28

6.2. Slab Details

Slab Design				
ELEMENT	LONG. REINF	MOM-X /LOAD	TRANS. REINF	MOM-Y /LOAD
	(SQ.MM/ME)	(KN-M/M)	(SQ.MM/ME)	(KN-M/M)
218 TOP :	174	0.71 / 8	174	0.25 / 8
BOTT:	174	-0.006666667	174	0
219 TOP :	174	0.02 / 2	174	0.06 / 9
BOTT:	174	-0.03	174	0
220 TOP :	174	0.28 / 9	174	0.10 / 9
BOTT:	174	-0.005	174	0
221 TOP :	174	0.53 / 8	174	0.17 / 8
BOTT:	174	-0.003333333	174	0
222 TOP :	174	0.02 / 2	174	0.03 / 9
BOTT:	174	-0.04	174	0
223 TOP :	174	0.65 / 9	174	0.22 / 9
BOTT:	174	-0.0025	174	0
224 TOP :	174	1.17 / 8	174	0.41 / 8
BOTT:	174	-0.003333333	174	0
225 TOP :	174	0.03 / 2	174	0.08 / 9
BOTT:	174	-0.011	174	0
228 TOP :	174	0.50 / 8	174	0.00 / 3
BOTT:	174	-0.003333333	174	-0.00375
229 TOP :	174	0.01 / 3	174	0.00 / 3
BOTT:	174	-0.1375	174	-0.0425
230 TOP :	174	0.00 / 3	174	0.00 / 4
BOTT:	174	-0.1325	174	-0.065
231 TOP :	174	0.07 / 2	174	0.00 / 5

BOTT:	174	-0.11	174	-0.017
234 TOP :	174	0.04 / 2	174	0.00 / 3
BOTT:	174	-0.04	174	-0.0075
235 TOP :	174	0.01 / 3	174	0.00 / 4
BOTT:	174	-0.05	174	-0.024
236 TOP :	174	0.01 / 3	174	0.00 / 3
BOTT:	174	-0.055	174	-0.0175
237 TOP :	174	0.03 / 8	174	0.01 / 3
BOTT:	174	0	174	-0.02375
238 TOP :	174	0.03 / 4	174	0.00 / 4
BOTT:	174	-0.035555556	174	-0.013333333
239 TOP :	174	0.01 / 3	174	0.02 / 8
BOTT:	174	-0.035	174	0
241 TOP :	174	0.06 / 9	174	0.00 / 3
BOTT:	174	-0.005	174	-0.0125
242 TOP :	174	0.01 / 3	174	0.00 / 4
BOTT:	174	-0.0775	174	-0.038
243 TOP :	174	0.01 / 3	174	0.00 / 3
BOTT:	174	-0.0775	174	-0.02625

CHAPTER 7: FOUNDATION DESIGN

7.1. INTRODUCTION

Transfer above data in staad foundation and then go to generate load combination which is shown in figure below.

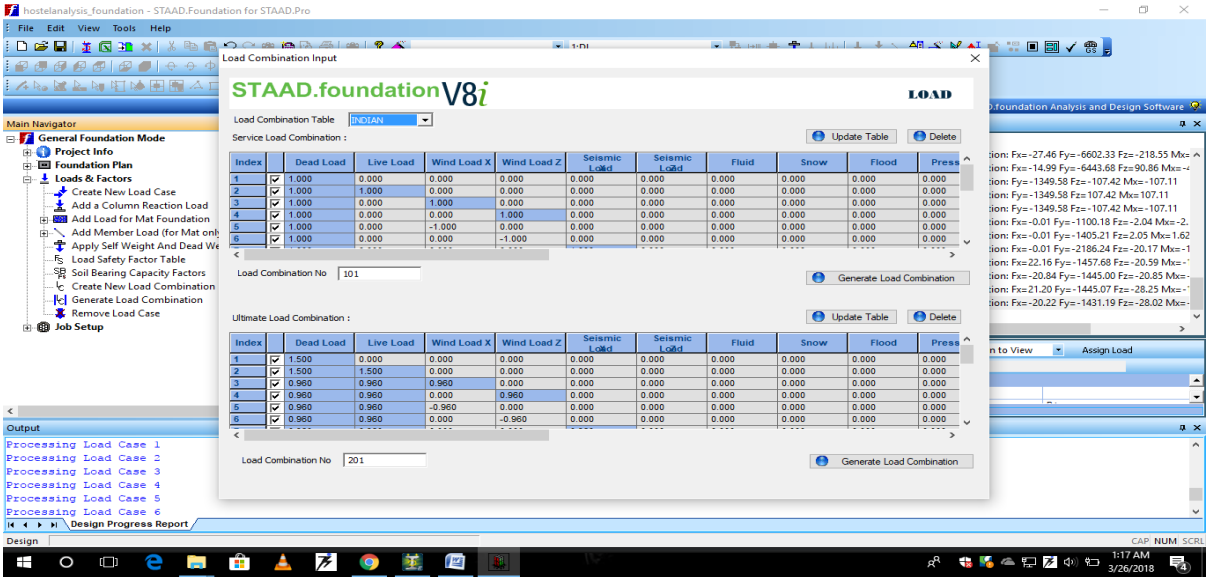


Figure 18-Input window for generation of load combination

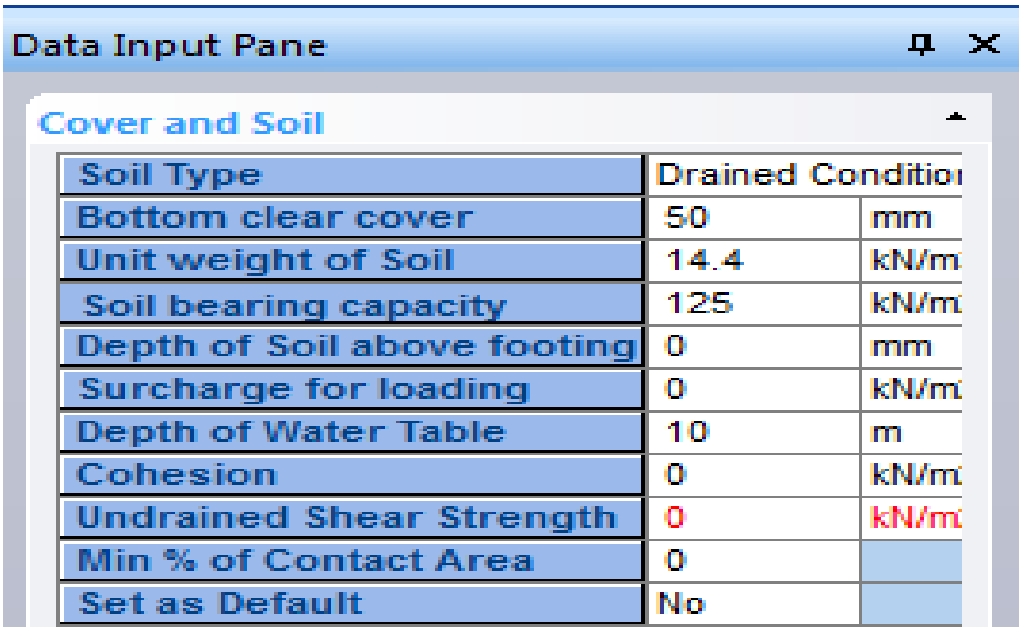


Figure 19 - Design Parameters

Foundation Design (Hostel)

For the foundation design we consider the following data

Unit weight of black cotton soil = 14.4KN\m3

Soil Bearing capacity = 125KN\m2

Footing Plan

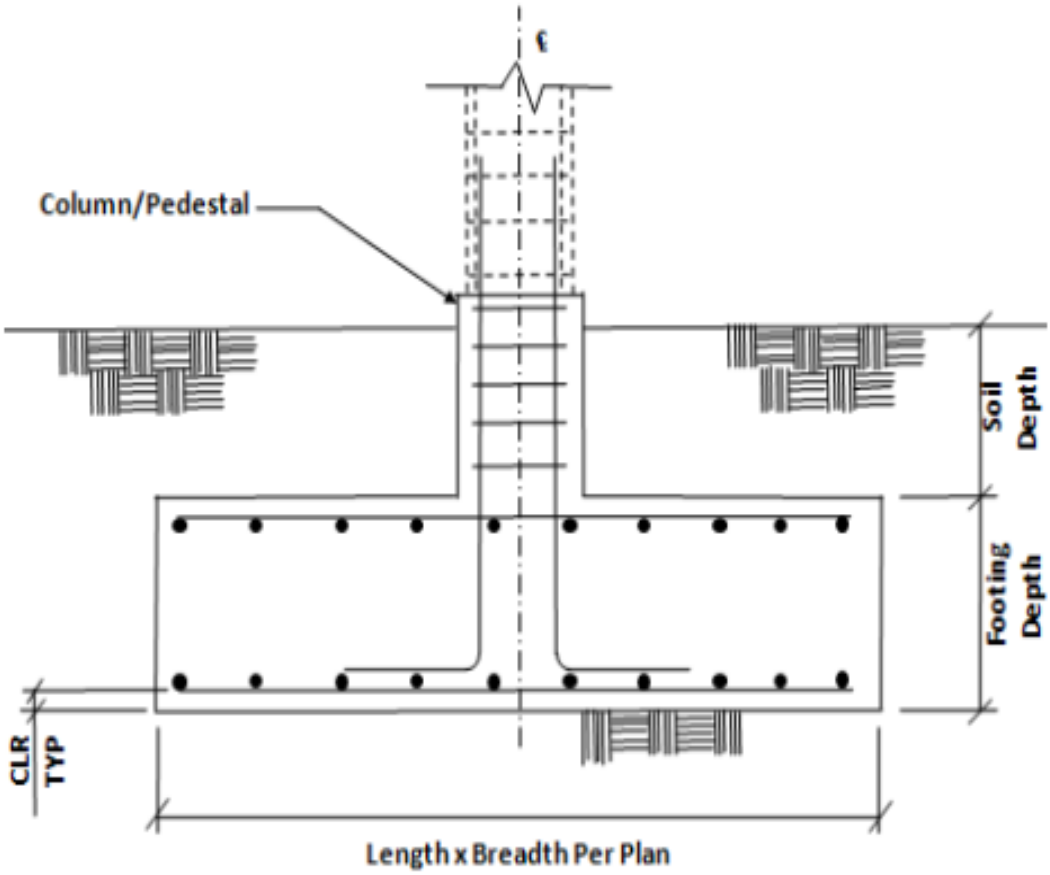


Figure 20 - Footing Details

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete :	25.000 kN/m3
Strength of Concrete :	25.000 N/mm2
Yield Strength of Steel :	415.000 N/mm2
Minimum Bar Size :	Ø6
Maximum Bar Size :	Ø32
Minimum Bar Spacing :	50.000 mm
Maximum Bar Spacing :	500.000 mm
Pedestal Clear Cover (P, CL) :	50.000 mm
Footing Clear Cover (F, CL) :	50.000 mm

Final footing size (Footing 1)

Length (L_2) =	7.85m
Width (W_2) =	7.85m
Depth (D_2) =	0.307m
Area (A_2) =	61.623m2

7.2. Design of all Foundations (56) of Hostel Building in STAAD.Pro

Footing No.	Footing Dimensions			Footing Reinforcement			
-	Length	Width	Thickness	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)
1	7.850 m	7.850 m	0.307 m	Ø10 @ 60 mm c/c	Ø10 @ 65 mm c/c	Ø6 @ 75 mm c/c	Ø8 @ 70 mm c/c
2	7.850 m	7.850 m	0.307 m	Ø10 @ 60 mm c/c	Ø10 @ 65 mm c/c	Ø6 @ 75 mm c/c	Ø8 @ 70 mm c/c
3	7.150 m	7.150 m	0.307 m	Ø10 @ 75 mm c/c	Ø8 @ 50 mm c/c	Ø6 @ 75 mm c/c	Ø6 @ 50 mm c/c
4	7.150 m	7.150 m	0.307 m	Ø10 @ 75 mm c/c	Ø8 @ 50 mm c/c	Ø6 @ 75 mm c/c	Ø6 @ 50 mm c/c
6	9.150 m	9.150 m	0.508 m	Ø12 @ 70 mm c/c	Ø10 @ 50 mm c/c	Ø10 @ 50 mm c/c	Ø8 @ 80 mm c/c
7	9.150 m	9.150 m	0.508 m	Ø12 @ 70 mm c/c	Ø10 @ 50 mm c/c	Ø10 @ 50 mm c/c	Ø8 @ 80 mm c/c
9	11.500 m	11.500 m	0.708 m	Ø12 @ 60 mm c/c	Ø12 @ 60 mm c/c	Ø12 @ 60 mm c/c	Ø8 @ 60 mm c/c
11	9.200 m	9.200 m	0.508 m	Ø12 @ 65 mm c/c	Ø10 @ 50 mm c/c	Ø12 @ 70 mm c/c	Ø8 @ 80 mm c/c
12	9.300 m	9.300 m	0.557 m	Ø12 @ 65 mm c/c	Ø10 @ 50 mm c/c	Ø12 @ 70 mm c/c	Ø8 @ 80 mm c/c
14	8.750 m	8.750 m	0.507 m	Ø10 @ 50 mm c/c	Ø10 @ 55 mm c/c	Ø10 @ 55 mm c/c	Ø8 @ 80 mm c/c
15	9.150 m	9.150 m	0.508 m	Ø12 @ 65 mm c/c	Ø10 @ 50 mm c/c	Ø12 @ 70 mm c/c	Ø8 @ 80 mm c/c
17	8.750 m	8.750 m	0.507 m	Ø10 @ 50 mm c/c	Ø10 @ 55 mm c/c	Ø10 @ 55 mm c/c	Ø8 @ 80 mm c/c
18	9.150 m	9.150 m	0.508 m	Ø12 @ 65 mm c/c	Ø10 @ 50 mm c/c	Ø12 @ 70 mm c/c	Ø8 @ 80 mm c/c

20	9.250 m	9.250 m	0.407 m	Ø10 @ 60 mm c/c	Ø10 @ 65 mm c/c	Ø6 @ 75 mm c/c	Ø8 @ 50 mm c/c
21	9.250 m	9.250 m	0.407 m	Ø10 @ 60 mm c/c	Ø10 @ 65 mm c/c	Ø6 @ 75 mm c/c	Ø8 @ 50 mm c/c
22	10.400 m	10.400 m	0.457 m	Ø10 @ 60 mm c/c	Ø10 @ 60 mm c/c	Ø6 @ 75 mm c/c	Ø10 @ 60 mm c/c
23	8.750 m	8.750 m	0.357 m	Ø10 @ 60 mm c/c	Ø10 @ 60 mm c/c	Ø6 @ 75 mm c/c	Ø8 @ 55 mm c/c
24	9.400 m	9.400 m	1.415 m	Ø16 @ 70 mm c/c	Ø16 @ 70 mm c/c	Ø12 @ 65 mm c/c	Ø12 @ 65 mm c/c
25	9.600 m	9.600 m	1.415 m	Ø16 @ 65 mm c/c	Ø16 @ 70 mm c/c	Ø12 @ 60 mm c/c	Ø12 @ 65 mm c/c
27	9.200 m	9.200 m	0.508 m	Ø12 @ 65 mm c/c	Ø10 @ 50 mm c/c	Ø12 @ 70 mm c/c	Ø8 @ 80 mm c/c
28	8.750 m	8.750 m	0.507 m	Ø10 @ 50 mm c/c	Ø10 @ 55 mm c/c	Ø10 @ 55 mm c/c	Ø8 @ 80 mm c/c
30	9.150 m	9.150 m	0.508 m	Ø12 @ 65 mm c/c	Ø10 @ 50 mm c/c	Ø12 @ 70 mm c/c	Ø8 @ 80 mm c/c
31	10.100 m	10.100 m	1.465 m	Ø16 @ 60 mm c/c	Ø16 @ 65 mm c/c	Ø12 @ 60 mm c/c	Ø12 @ 60 mm c/c
33	9.150 m	9.150 m	0.508 m	Ø12 @ 70 mm c/c	Ø10 @ 50 mm c/c	Ø10 @ 50 mm c/c	Ø8 @ 80 mm c/c
34	9.100 m	9.100 m	0.508 m	Ø12 @ 70 mm c/c	Ø10 @ 50 mm c/c	Ø10 @ 50 mm c/c	Ø8 @ 80 mm c/c
36	9.150 m	9.150 m	0.407 m	Ø10 @ 65 mm c/c	Ø10 @ 70 mm c/c	Ø6 @ 75 mm c/c	Ø8 @ 50 mm c/c
37	9.150 m	9.150 m	0.407 m	Ø10 @ 65 mm c/c	Ø10 @ 70 mm c/c	Ø6 @ 75 mm c/c	Ø8 @ 50 mm c/c
39	8.700 m	8.700 m	0.357 m	Ø10 @ 60 mm c/c	Ø10 @ 65 mm c/c	Ø6 @ 75 mm c/c	Ø8 @ 55 mm c/c

40	8.700 m	8.700 m	0.357 m	Ø10 @ 60 mm c/c	Ø10 @ 65 mm c/c	Ø6 @ 75 mm c/c	Ø8 @ 55 mm c/c
42	9.300 m	9.300 m	0.557 m	Ø12 @ 65 mm c/c	Ø10 @ 50 mm c/c	Ø12 @ 65 mm c/c	Ø8 @ 80 mm c/c
43	9.200 m	9.200 m	0.508 m	Ø12 @ 65 mm c/c	Ø10 @ 50 mm c/c	Ø12 @ 70 mm c/c	Ø8 @ 80 mm c/c
44	9.350 m	9.350 m	1.415 m	Ø16 @ 70 mm c/c	Ø16 @ 70 mm c/c	Ø12 @ 65 mm c/c	Ø12 @ 65 mm c/c
45	9.550 m	9.550 m	1.415 m	Ø16 @ 65 mm c/c	Ø16 @ 70 mm c/c	Ø12 @ 60 mm c/c	Ø12 @ 65 mm c/c
47	11.300 m	11.300 m	0.658 m	Ø12 @ 60 mm c/c	Ø12 @ 60 mm c/c	Ø12 @ 60 mm c/c	Ø8 @ 60 mm c/c
48	11.450 m	11.450 m	0.658 m	Ø12 @ 55 mm c/c	Ø12 @ 60 mm c/c	Ø12 @ 60 mm c/c	Ø8 @ 60 mm c/c
49	11.350 m	11.350 m	0.658 m	Ø12 @ 60 mm c/c	Ø12 @ 60 mm c/c	Ø12 @ 60 mm c/c	Ø8 @ 60 mm c/c
50	11.000 m	11.000 m	0.457 m	Ø10 @ 50 mm c/c	Ø10 @ 50 mm c/c	Ø6 @ 75 mm c/c	Ø10 @ 50 mm c/c
51	10.550 m	10.550 m	0.457 m	Ø10 @ 55 mm c/c	Ø10 @ 55 mm c/c	Ø6 @ 75 mm c/c	Ø10 @ 55 mm c/c
52	7.700 m	7.700 m	0.307 m	Ø10 @ 65 mm c/c	Ø10 @ 70 mm c/c	Ø6 @ 75 mm c/c	Ø8 @ 75 mm c/c
53	7.750 m	7.750 m	1.215 m	Ø16 @ 80 mm c/c	Ø12 @ 50 mm c/c	Ø10 @ 50 mm c/c	Ø10 @ 50 mm c/c
54	7.800 m	7.800 m	1.215 m	Ø16 @ 80 mm c/c	Ø16 @ 85 mm c/c	Ø10 @ 50 mm c/c	Ø10 @ 50 mm c/c
55	7.800 m	7.800 m	1.215 m	Ø16 @ 80 mm c/c	Ø16 @ 85 mm c/c	Ø10 @ 50 mm c/c	Ø10 @ 50 mm c/c
56	7.850 m	7.850 m	1.215 m	Ø16 @ 80 mm c/c	Ø16 @ 85 mm c/c	Ø10 @ 50 mm c/c	Ø10 @ 50 mm c/c

Foundation Design (Mess)

For the foundation design we consider the following data

Unit weight of black cotton soil = 14.4KN\m3

Soil Bearing capacity = 125KN\m2

Footing Plan

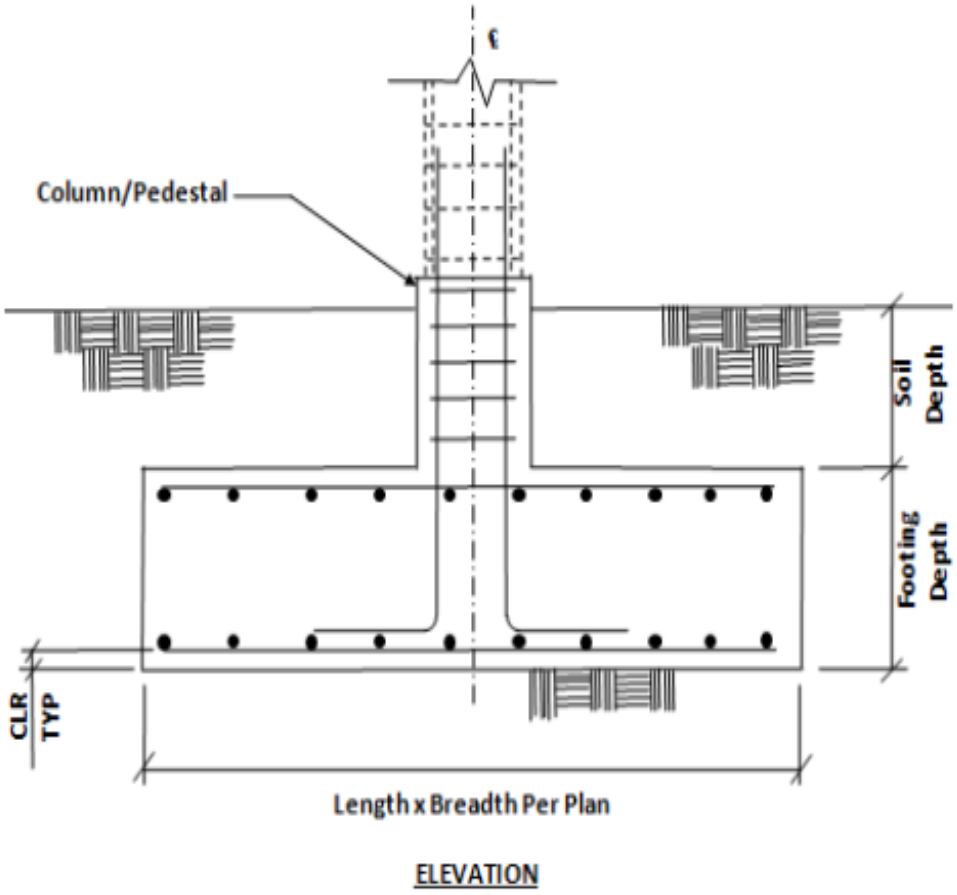


Figure 21 - Footing Details

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete :	25.000 kN/m3
Strength of Concrete :	25.000 N/mm2
Yield Strength of Steel :	415.000 N/mm2
Minimum Bar Size :	Ø6
Maximum Bar Size :	Ø32
Minimum Bar Spacing :	50.000 mm
Maximum Bar Spacing :	500.000 mm
Pedestal Clear Cover (P, CL) :	50.000 mm
Footing Clear Cover (F, CL) :	50.000 mm

Final footing size (Footing 1)

Length (L2) =	6.8m
Width (W2) =	6.8m
Depth (D2) =	0.861m
Area (A2) =	46.24m2

7.3. Design of all Foundations (28) of Mess Building in STAAD.Pro

	Footing Dimensions			Footing Reinforcement			
Footing no.	**Length**	**Width**	**Thickness**	**Reinf(Mz)**		**Reinf(Mx)**	
	(m)	(m)	(m)	Bar	Spacing	Bar	Spacing
1	6.8	6.8	0.86	12 mm	54.82 mm	12 mm	58.67 mm
2	9.05	9.05	1.17	16 mm	80.49 mm	16 mm	85.90 mm
3	10.1	10.1	1.22	16 mm	67.01 mm	16 mm	70.81 mm
4	6.3	6.3	0.81	12 mm	60.67 mm	12 mm	68.76 mm
5	8.05	8.05	1.02	16 mm	84.40 mm	16 mm	89.15 mm
6	4.75	4.75	0.66	10 mm	52.73 mm	10 mm	57.28 mm
7	10.5	10.5	1.27	16 mm	66.14 mm	16 mm	68.32 mm
8	11.5	11.5	1.37	16 mm	61.87 mm	16 mm	63.60 mm
9	10.25	10.25	1.46	Not Found	Not Found	Not Found	Not Found
10	6.35	6.35	0.81	12 mm	57.76 mm	12 mm	63.01 mm
11	7.15	7.15	0.91	12 mm	52.13 mm	12 mm	56.76 mm
12	9.7	9.7	1.17	16 mm	69.45 mm	16 mm	72.61 mm
13	7.45	7.45	0.96	12 mm	51.68 mm	12 mm	54.76 mm
14	6.95	6.95	0.91	12 mm	56.51 mm	12 mm	59.98 mm
15	7	7	0.91	12 mm	54.67 mm	12 mm	58.37 mm
16	6.35	6.35	0.81	12 mm	59.41 mm	12 mm	62.38 mm
17	9.3	9.3	1.17	16 mm	75.28 mm	16 mm	78.50 mm
18	8.45	8.45	1.07	16 mm	80.91 mm	16 mm	85.92 mm
19	7	7	0.91	12 mm	56.46 mm	12 mm	58.87 mm
20	7.7	7.7	1.01	12 mm	51.27 mm	12 mm	54.20 mm
21	4.95	4.95	0.66	12 mm	68.14 mm	10 mm	52.61 mm
22	6.4	6.4	0.81	12 mm	58.22 mm	12 mm	64.16 mm
23	5.85	5.85	0.76	12 mm	63.76 mm	12 mm	69.13 mm
24	9.05	9.05	1.12	16 mm	75.08 mm	16 mm	78.37 mm
25	6.2	6.2	0.81	12 mm	60.28 mm	12 mm	64.77 mm
26	8.95	8.95	1.12	16 mm	76.16 mm	16 mm	80.31 mm
27	6.3	6.3	0.81	12 mm	60.08 mm	12 mm	63.79 mm
28	6.85	6.85	0.91	12 mm	57.59 mm	12 mm	61.25 mm

REFERENCE

- **“STAAD Pro 2004 – Getting started & tutorials”.**

- “STAAD Pro 2004 – Technical reference manual”
- IS code 456-2000, plain and reinforced concrete code of practice
- Is code 875-1987; code of practice for design loads (other than earthquakes) for buildings and structures

  - Part 1- dead loads- unit weight of building materials and stored materials
  - Part 2- imposed loads
  - Part 3-wind load