SMT.S.R.PATELENGINEERING COLLAGE

DEPARTMENT OF CIVIL ENGINEERING

8th Semester - 2013

Design Of Multistoried Residential Building Using STAAD.Pro Package Analyzed For Earthquake Forces With Ductile Detailing As Per IS: 13920.

Prepared by

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Guided by

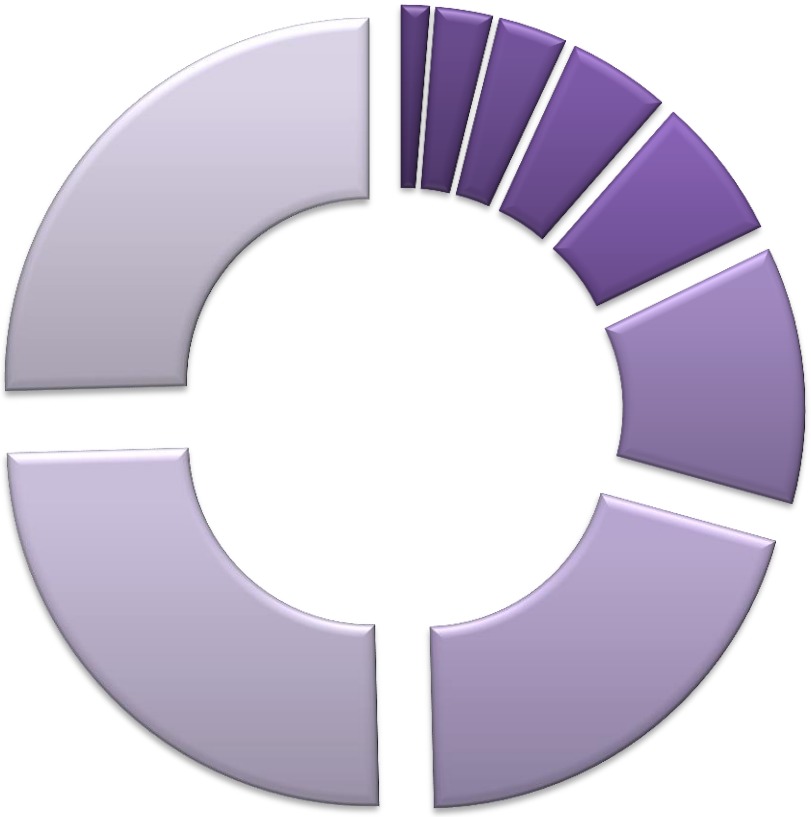
Prof. Z.R.Chhaya

Ms. Kinjal R. Patel

Flow of work

- Time line diagram
- Introduction
- Scope of work
- Aim of project
- Introduction of analysis and design
- Design of structural elements
  - Beam
  - Column
  - Slab
  - Stairs
  - Footing
  - Shear wall
- Problem definition
  - Plan of residential building
- Analysis and design of building in STAAD. Pro.

Time line diagram



- August
- September
- October

Subject understanding

- November

Planning

- December

Modeling in STAAD.Pro

- January
- February

Analysis and Designing

- March
- April

Detailing and report writing

Introduction

In every aspect of human civilization we needed structures to live in or to get what we need. But it is not only building structures but to build efficient structures so that it can fulfill the main purpose for what it was made for. Here comes the role of civil engineering and more precisely the role of analysis of structure.

There are many classical methods to solve design problem, and with time new software's also coming into play. Here in this project work based on software named staad pro has been used.

Few standard problems also have been solved to show how staad pro can be used in different cases. These typical problems have been solved using basic concept of loading, analysis, condition as per IS code. These basic techniques may be found useful for further analysis of problems.

Scope of work

Following points will be covered in project work

- Study of design of various elements of building
- Planning of various components of a building with column positioning
- Introduction of STAAD.Pro
- Modeling of the building in the STAAD.Pro giving all boundary conditions (supports, loading etc…)
- Analysis and Design of various structural components of the modal building
- Study of analysis Data of the software
- Detailing of beams, columns, slab with section proportioning and reinforcement.

AIM OF PROJECT

This project aims for relearning of concept of structural design with the help of computer aids. Briefly we have gone through following points through out of the project work.

- Understanding of design and detailing concept.
- Main objective i.e. learning of STAAD.Pro software package.
- Learning of analysis and design methodology which can be very useful in the field.
- Understanding of earthquake resistance design concept.
- Approach for professional practice in the field of structural engineering

Introduction of Analysis and design

Analysis : Analysis of the structure means to determination of the internal forces like axial compression bending moment, shear force etc. in the component member for which the member are to be designed under the action of given external load.

Design : The design is process of section percussion from the analysis results by using suitable analysis method.

The aim of design is to achievement of an acceptable probability that structures being designed will perform satisfactorily during their intended life.

Design of Structural Elements

The design of any structure is categorized into the following two main types:

- Functional design
- Structural design

Stages in structural design :

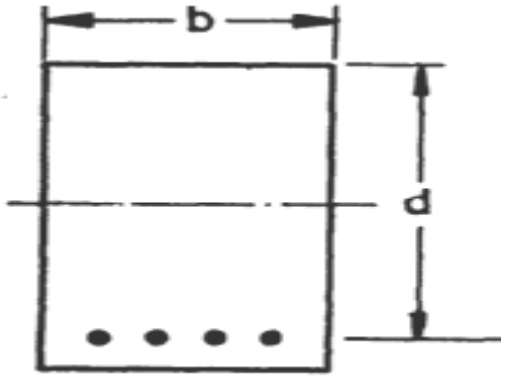
- The process of structural design involves the following stages:
  - Structural planning
  - Action of forces and computation of loads
  - Method of analysis
  - Member design
  - Detailing, drawing and preparation of schedules

BEAM

- There are three types of reinforced concrete beams
  - ❖ Single reinforced beams
  - ❖ Double reinforced beams
  - ❖ Flanged beams

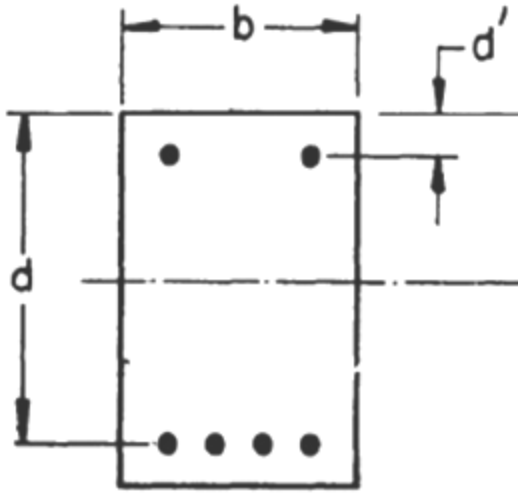
Single reinforced beams :

In singly reinforced simply supported beams steel bars are placed near the bottom of the beam where they are effective in resisting in the tensile bending stress.



Double reinforced beams:

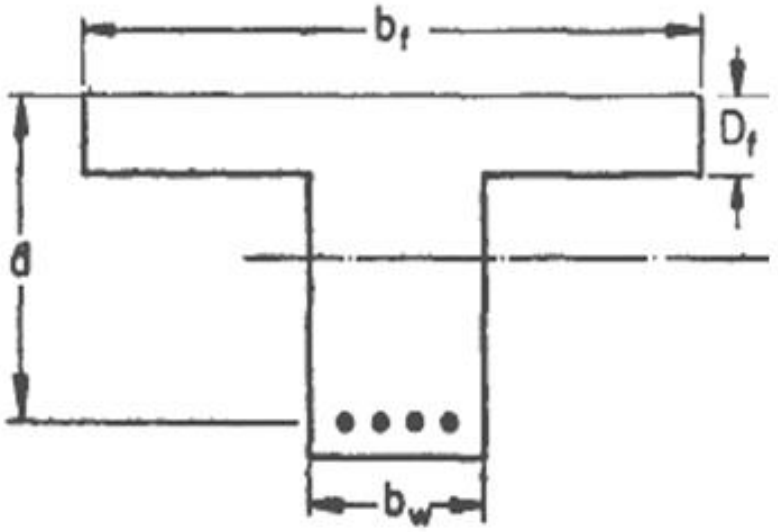
It is reinforced under compression tension regions. The necessities of steel of compression region arise due to two reasons. When depth of beam is restricted. The strength availability singly reinforced beam is in adequate.



Flanged beams:

There are two types of flanged beam

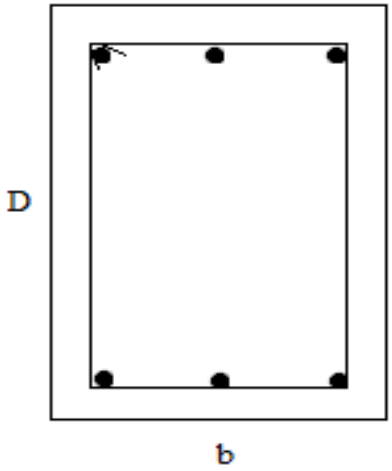
1. T - beam
2. L - beam



COLUMN

A column may be defined as an element used primary to support axial compressive loads and with a height of a least three times its lateral dimension.

The strength of column depends upon the strength of materials, shape and size of cross section, length and degree of proportional and dedicational restrains at its ends.



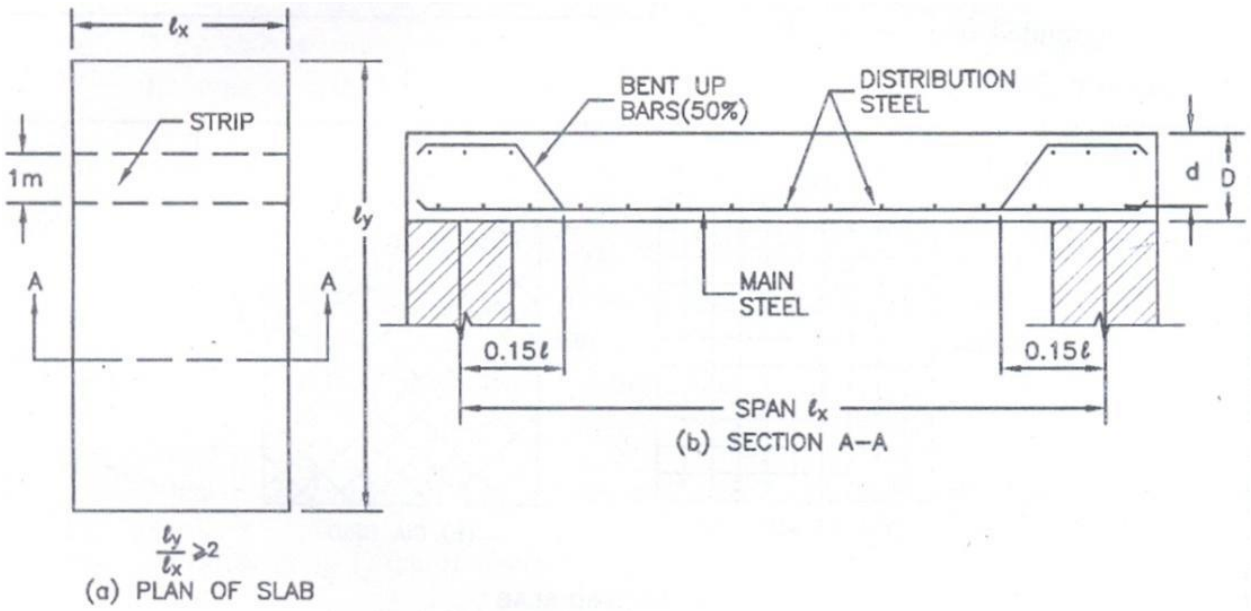
SLAB

Slabs are most widely used structural elements forming floor and roof of building. Slab support mainly transverse load and transfer them to supports by bending actions more or one directions.

On the basis of spanning direction: It is two type one way slabs and two way slab.

One way slab: When the slab is supported on two opposite side parallel edges, it spans only in the directions perpendicular to the supporting edges. It bends in one directions and main steel is provided in the directions of the span. Such a slab is known as one- way slab.

One way simply supported slab



Design steps:

a) Effective depth (d):

As per IS: 456-2000, P.37, Cl.23.2.1

l/d= 20* M.F.

b) Effective span: (IS 456-2000, P 34)

c) Reinforcement requirements

Minimum reinforcement : (As per IS: 456-2000, P.48, Cl.26.5.2.1)

For Fe-250 pt = 0.15% of total c/s area (b*D)

For Fe-415
For Fe-500 } pt = 0.12% of total c/s area

d) Check for cracking : (as per IS:456-2000,P.46)

e) Check for deflection:

Allowable l/d= 20* M.F.

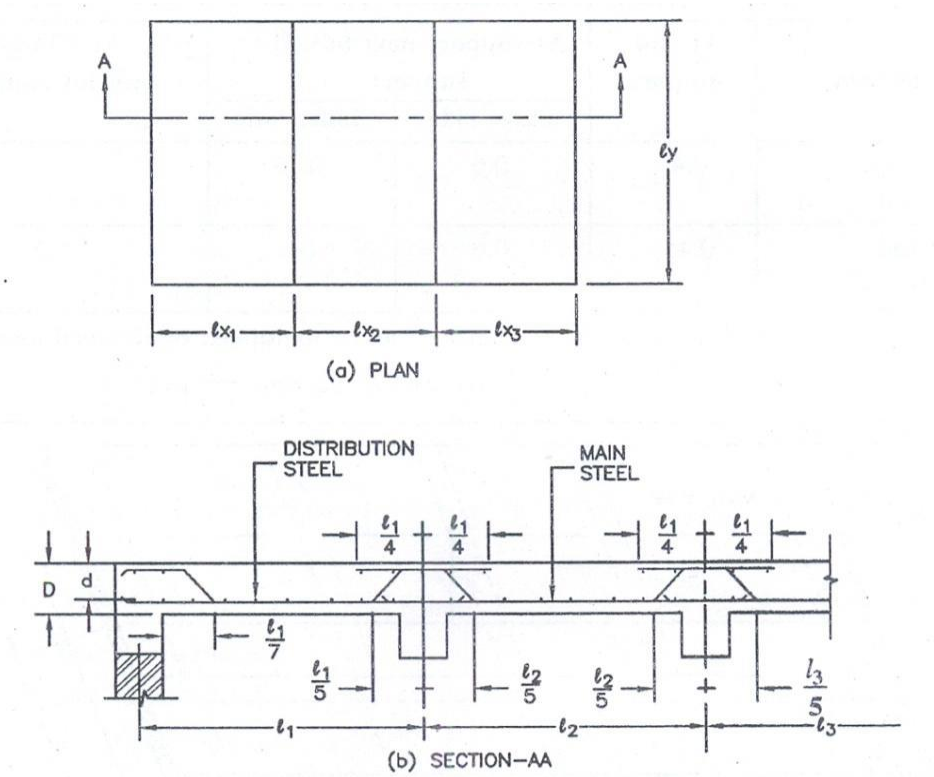
Find Actual l/d

f) Checking for development length (Ld) : (as per IS:456-2000, P.44, Cl.26.2.3.3 (c))

Ld should be $\leq 1.3 M_1 / v + Lo$

One way continuous slab:

In case of large halls, auditoriums, marriage halls, etc. the length is divided into equal bays by providing beams perpendicular to length. The slab provided over such area is called one way continuous slab.

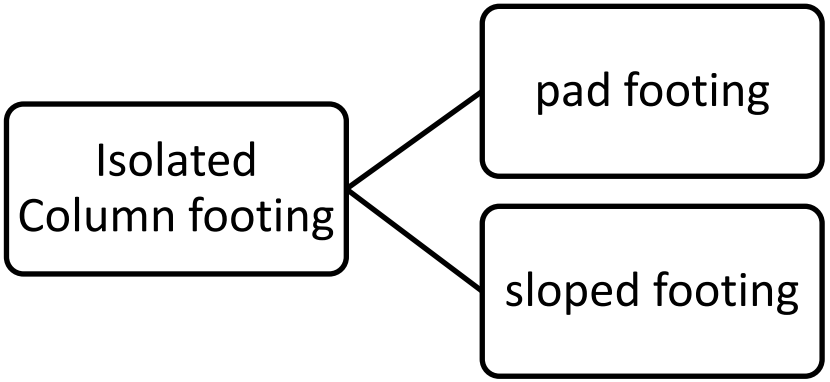


Design steps:

- For calculation of S.F. and B.M., IS: 456-2000, P.36.
- As the coefficient for D.L. and L.L. are different, for D.L. and L.L. are calculated separately.
- In one way continuous slab, negative bending moment will be produced at the top of intermediate supports. Thus, negative reinforcement is provided over intermediate supports.
- For B.M. calculations, coefficient gives in IS: 456, table-12 is multiplied by wl2.
- For S.F. calculations, coefficient gives in IS: 456, table-13 is multiplied by wl.
- Maximum shear occur at the support next to the end support. Therefore, slab must be checked for shear at this support.
- The slab must be checked for deflection at the locations of maximum positive B.M.
- The slab must be checked for development length at the end support.

FOOTING

Foundations are structural elements that transfer loads from the building or individual column to the earth .If these loads are to be properly transmitted, foundations must be designed to prevent excessive settlement or rotation, to minimize differential settlement and to provide adequate safety against sliding and overturning.



Problem definition

Plan of residential Building

- Analysis and design of structural components of G+5 storied building
- Analysis for – Earthquake load
- Location –surat
- Masonry blocks – Siporex
- S.B.C. – 15 T/m^2

Introduction of staad. Pro.

It is one of the effective software which is used for the purpose of analysis and design of structure by the structural engineers. Our project is aimed to complete with the help of Staad.pro
Staad pro gives more precise and accurate results than manual techniques.

Features

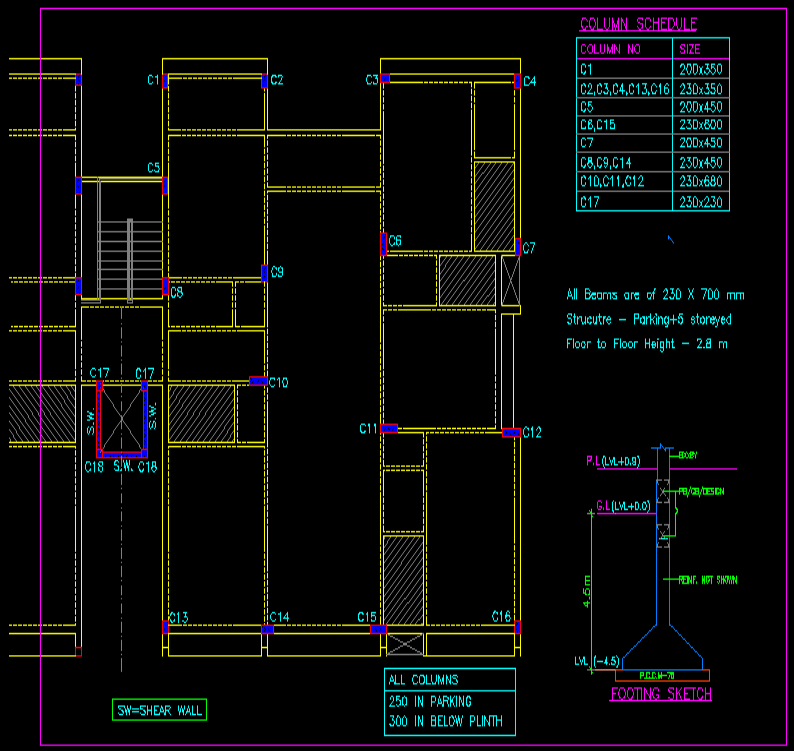
- Analysis and design tool
- GUI based modeling
- Input file/Output file
- Results as per Indian & other standards
- Report generation

AutoCAD 2006 - [I:\civil sem.-8\project\IDP PLAN.dwg]

Video: Farewell for North Korea's 'dear leader'

File Edit View Insert Format Tools Draw Dimension Modify Window Help

8FTGTEXT | ByLayer | ByLayer | ByLayer | ByColor



COLUMN SCHEDULE

COLUMN NO	SIZE
C1	200x350
C2,C3,C4,C13,C16	230x350
C5	200x450
C8,C15	230x600
C7	200x450
C8,C9,C14	230x450
C10,C11,C12	230x680
C17	230x230

All Beams are of 230 X 700 mm
Strucutre – Parking+5 storeyed
Floor to Floor Height – 2.8 m

FOOTING SKETCH

ALL COLUMNS
250 IN PARKING
300 IN BELOW PLINTH

Model Layout1 Layout2

Command: _options
Command:

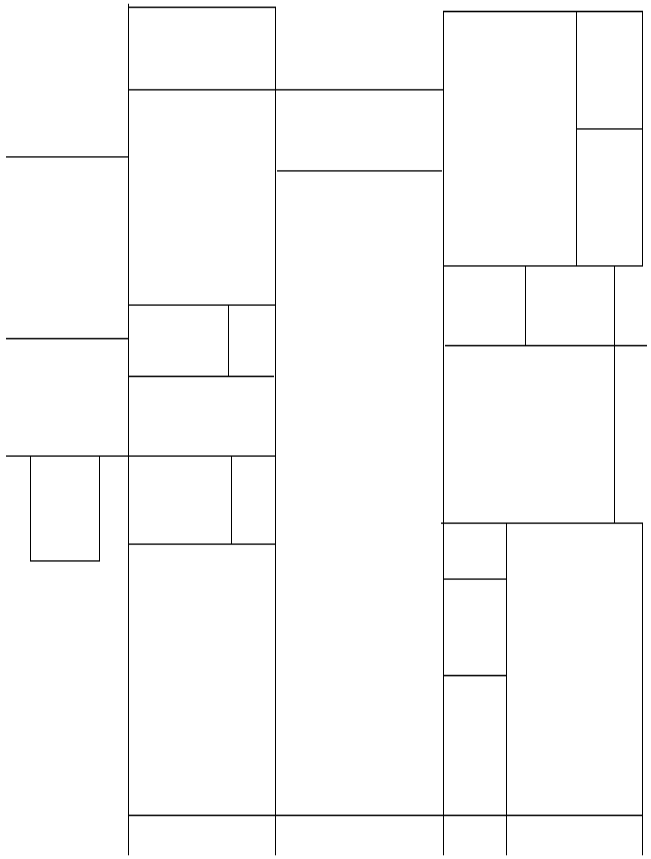
Command:

399.601, -114.954, 0.000 SNAP GRID ORTHO POLAR OSNAP OTRACK DYN LWT MODEL

AutoCAD 2006 - [I:\civil sem.-8\project\line plan.dxf]

Video: Gingrich sliding in Iowa polls

File Edit View Insert Format Tools Draw Dimension Modify Window Help



Model Layout1 Layout2

Command: _options
Command:

Command:

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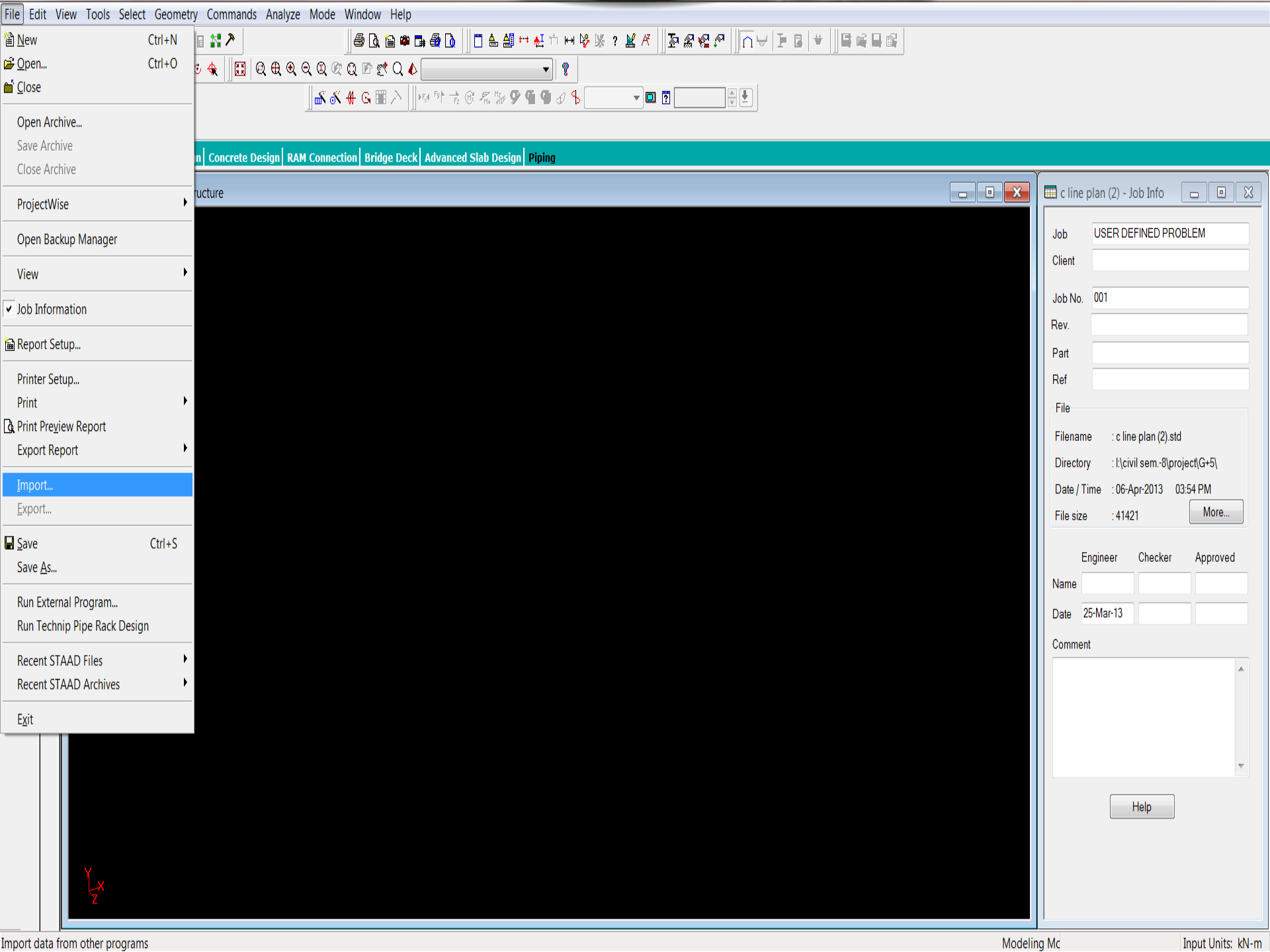
File Edit View Tools Select Geometry Commands Analyze Mode Window Help
New Ctrl+N
Open... Ctrl+O
Close
Open Archive...
Save Archive
Close Archive
ProjectWise
Open Backup Manager
View
Job Information
Report Setup...
Printer Setup...
Print
Print Preview Report
Export Report
Import...
Export...
Save Ctrl+S
Save As...
Run External Program...
Run Technip Pipe Rack Design
Recent STAAD Files
Recent STAAD Archives
Exit
Concrete Design
RAM Connection
Bridge Deck
Advanced Slab Design
Piping
c line plan (2) - Job Info
Job USER DEFINED PROBLEM
Client
Job No. 001
Rev.
Part
Ref
File
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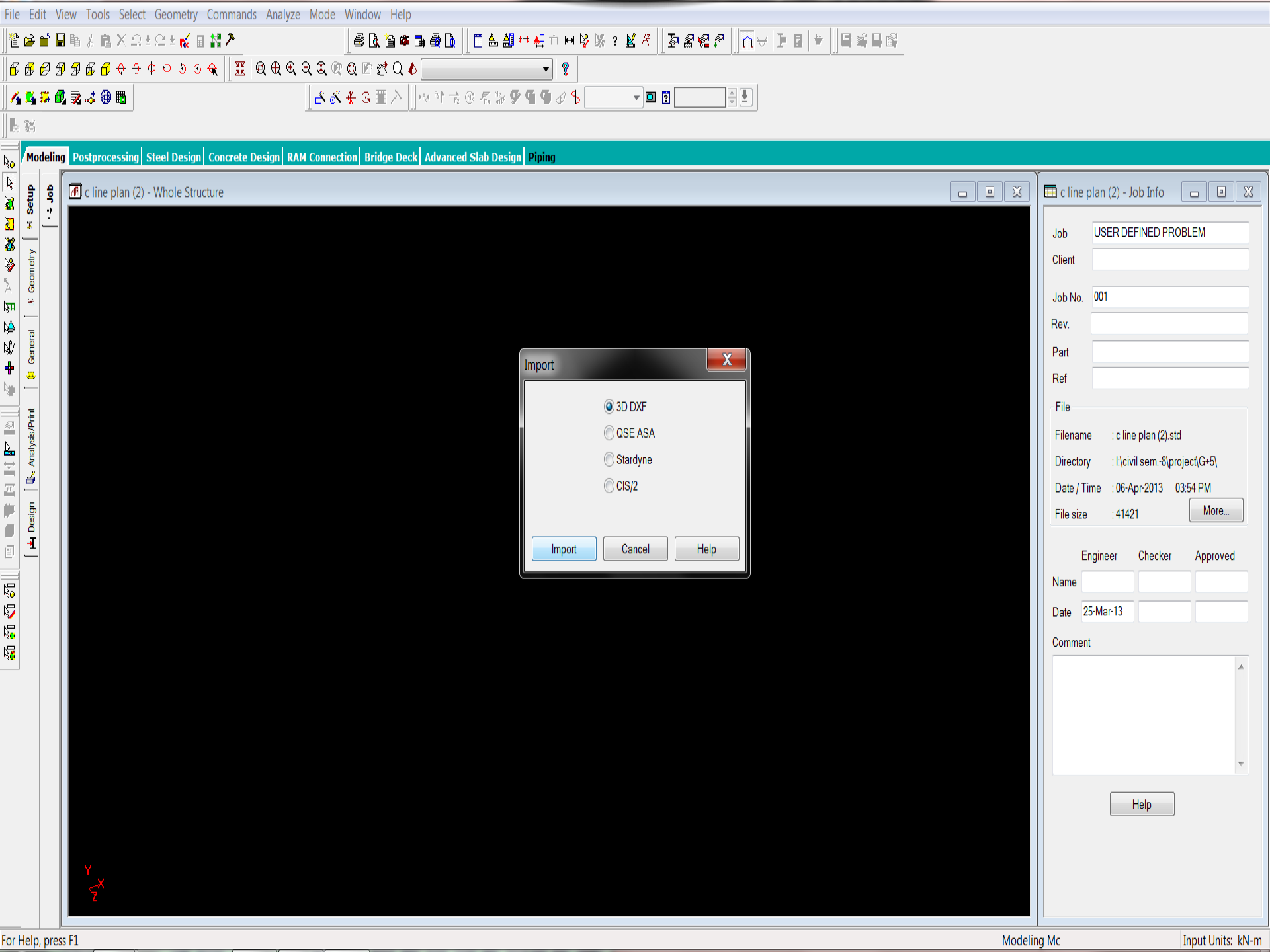
Date / Time : 06-Apr-2013 03:54 PM
File size : 41421
More...
Engineer
Checker
Approved
Name
Date 25-Mar-13
Comment
Help
Import data from other programs
Modeling Mc
Input Units: kN-m


File Edit View Tools Select Geometry Commands Analyze Mode Window Help
Modeling Postprocessing Steel Design Concrete Design RAM Connection Bridge Deck Advanced Slab Design Piping
c line plan (2) - Whole Structure
Import
3D DXF
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Help
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For Help, press F1
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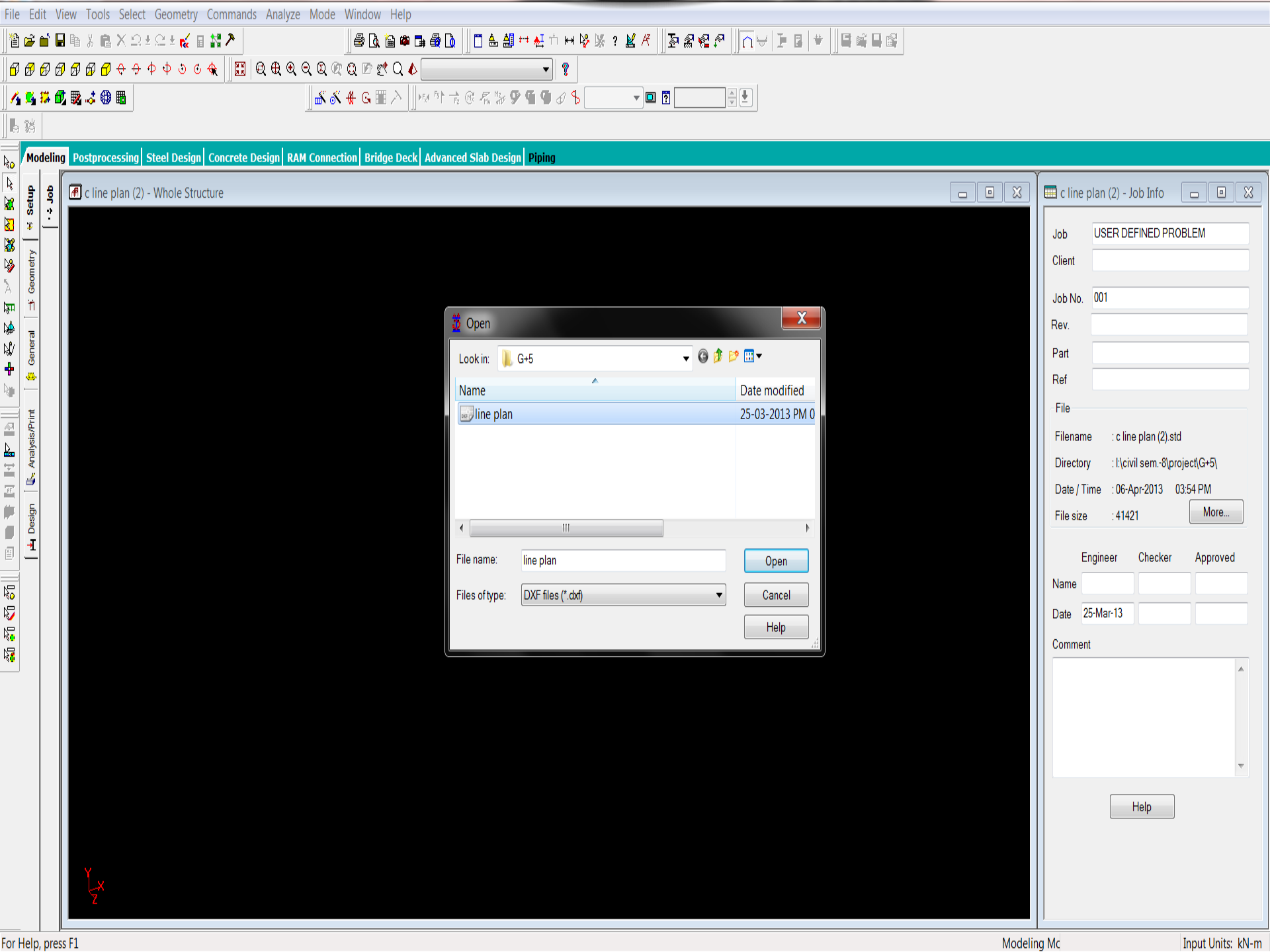
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c line plan (2) - Whole Structure
Open
Look in: G+5
Name
Date modified
line plan
25-03-2013 PM 0
File name: line plan
Files of type: DXF files (*.dxf)
Open
Cancel
Help
c line plan (2) - Job Info
Job USER DEFINED PROBLEM
Client
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File
Filename : c line plan (2).std
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Date / Time : 06-Apr-2013 03:54 PM
File size : 41421
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Engineer Checker Approved
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Date 25-Mar-13
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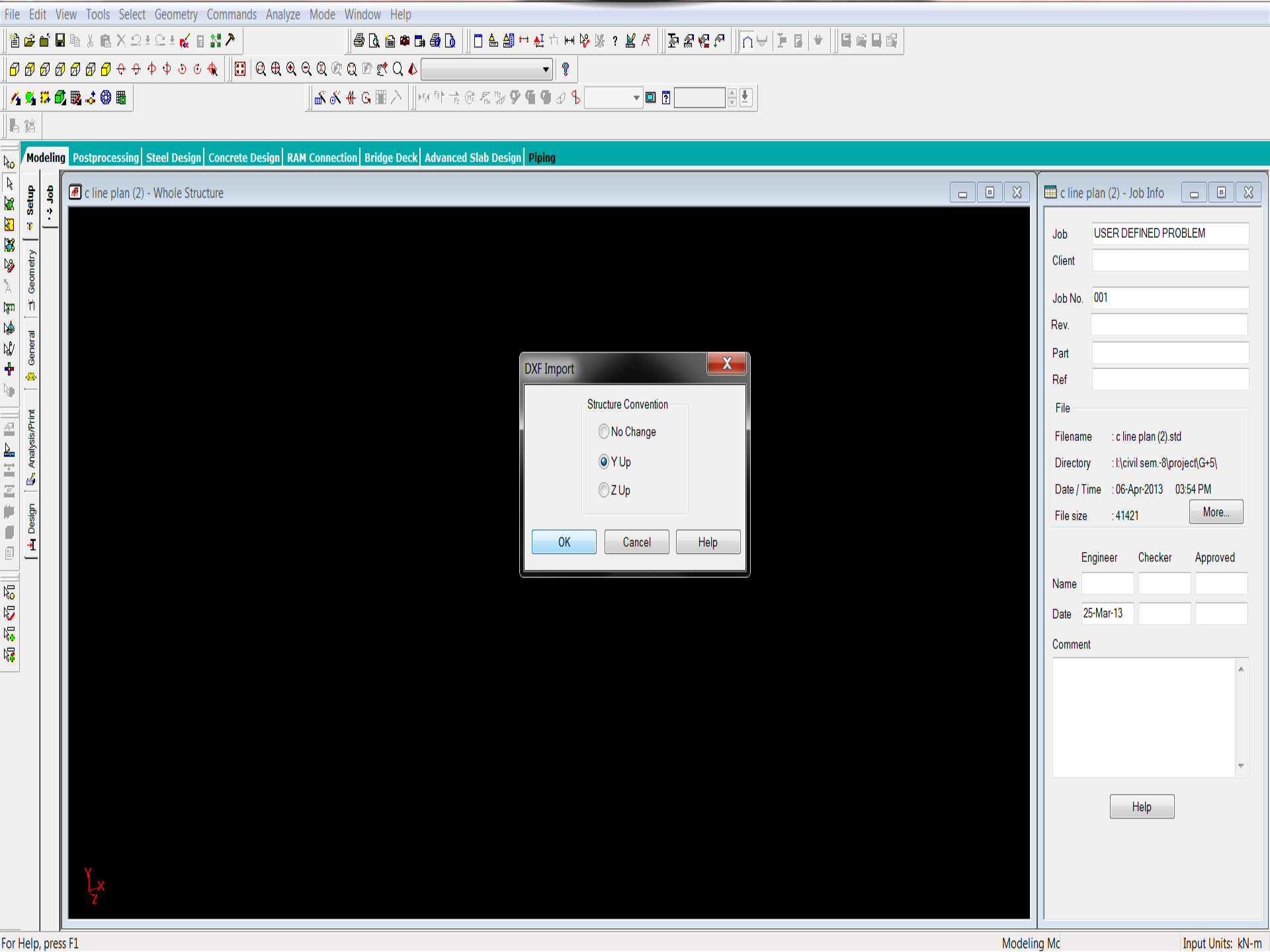
Help
For Help, press F1
Modeling Mc
Input Units: kN-m


File Edit View Tools Select Geometry Commands Analyze Mode Window Help
Modeling Postprocessing Steel Design Concrete Design RAM Connection Bridge Deck Advanced Slab Design Piping
Setup Geometry General Analysis/Print Design Job
c line plan (2) - Whole Structure
DXF Import
Structure Convention
No Change
Y Up
Z Up
OK Cancel Help
c line plan (2) - Job Info
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Rev.
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Modeling Mc
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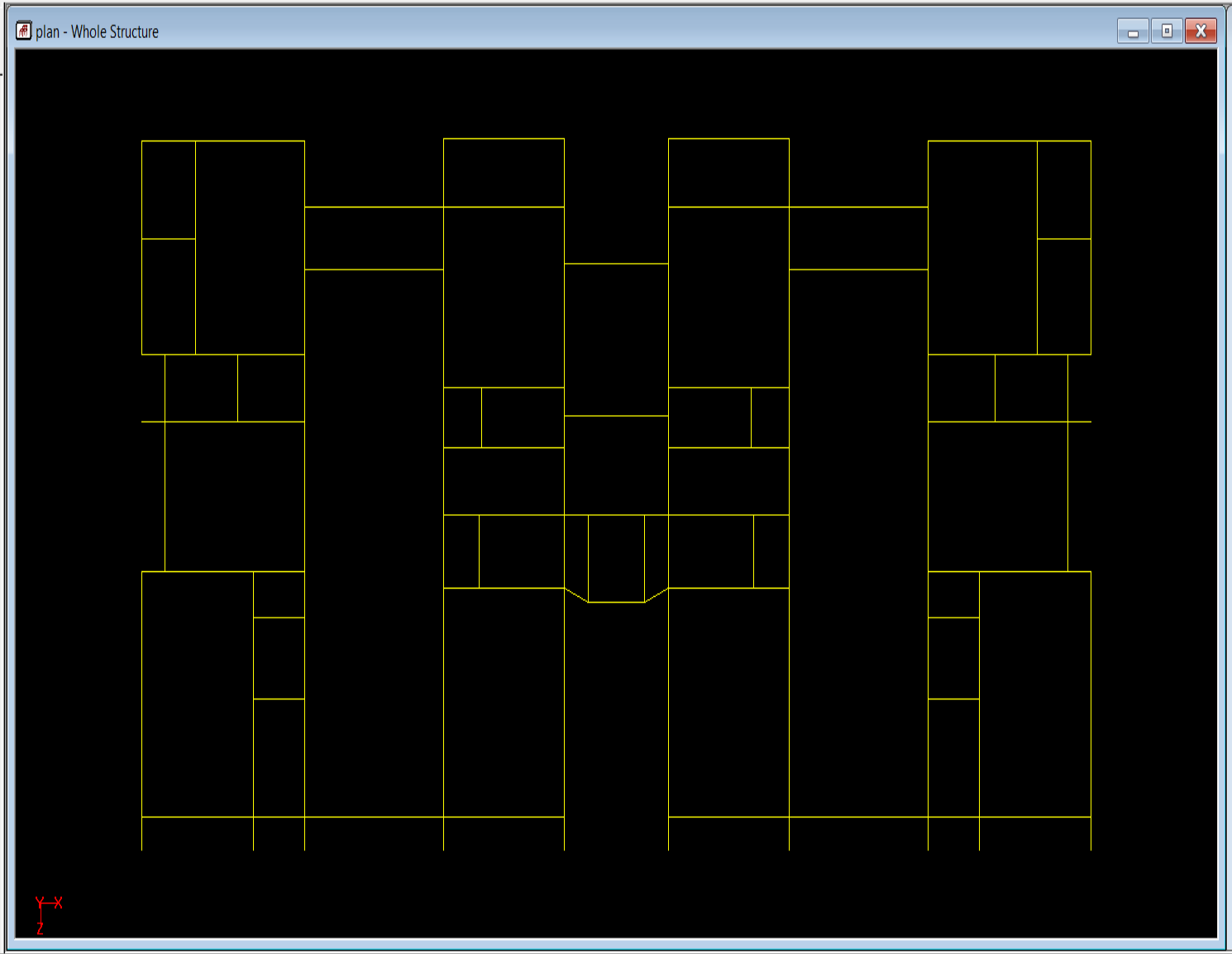
File Edit View Tools Select Geometry Commands Analyze Mode Window Help

Modeling | Postprocessing | Steel Design | Concrete Design | RAM Connection | Bridge Deck | Advanced Slab Design | Piping

Setup | Geometry | General | Analysis/Print | Design | Job

plan - Whole Structure



plan - Job Info

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Client	Aagam Lily
Job No.	003
Rev.	
Part	
Ref	

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File size	: 28975

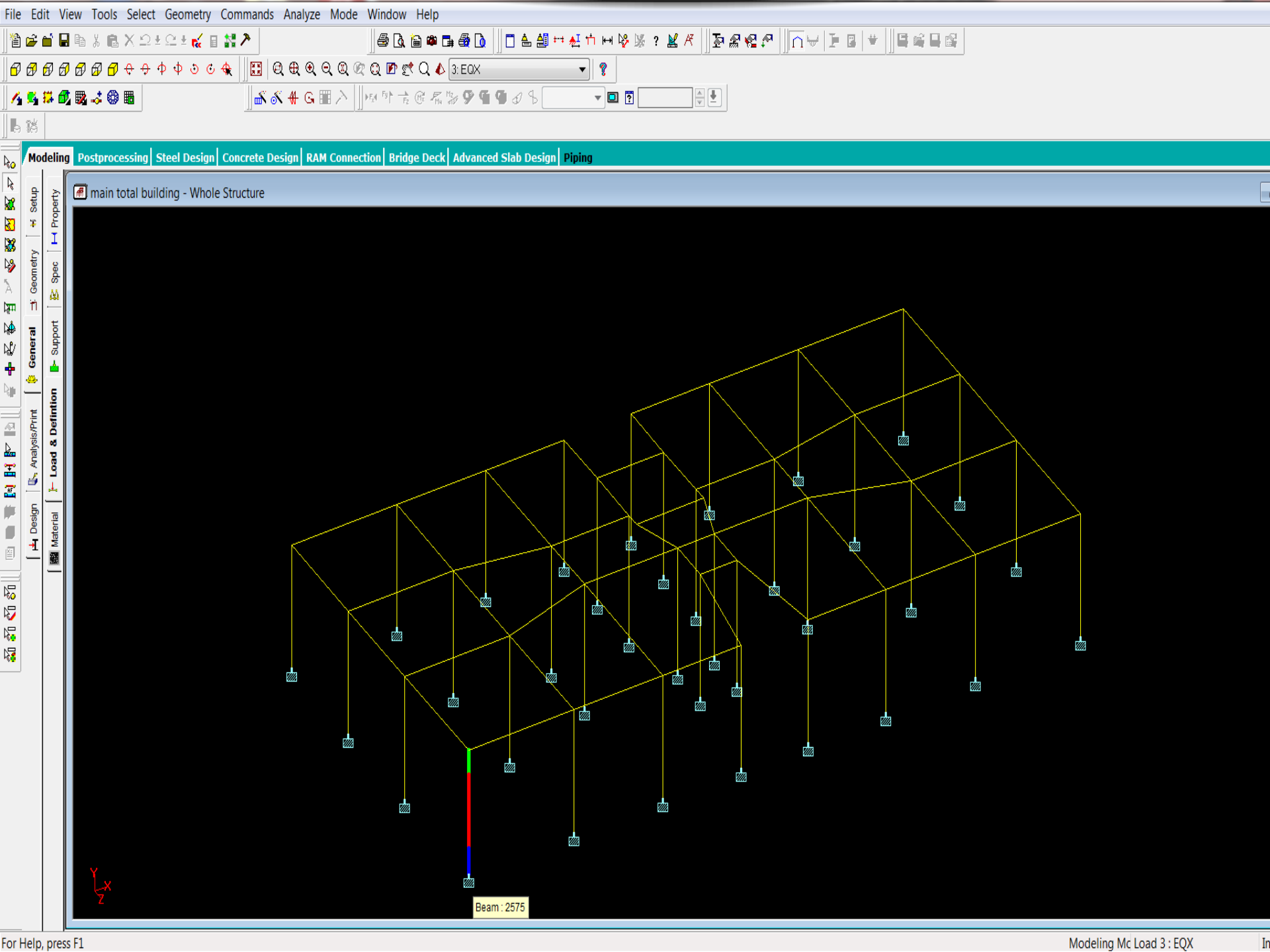
More...

	Engineer	Checker	Approved
Name	ZRCHHAYA	VSSHAH SII	
Date	21-Nov-12		

Comment

Help

For Help, press F1 | Modeling Mc | Input Units: kN-m

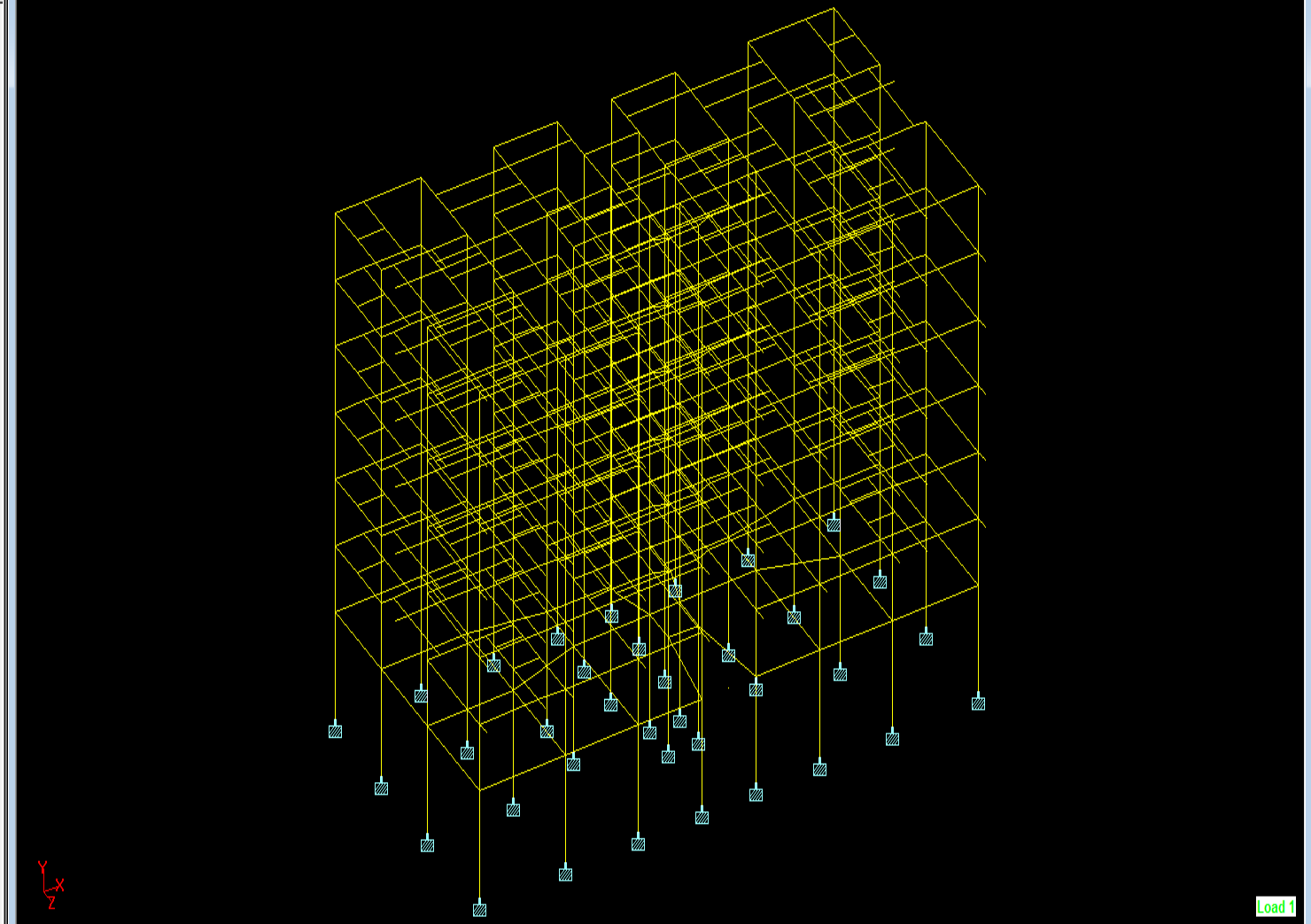

File Edit View Tools Select Geometry Commands Analyze Mode Window Help
3:EQX
Modeling Postprocessing Steel Design Concrete Design RAM Connection Bridge Deck Advanced Slab Design Piping
main total building - Whole Structure
Setup Geometry General Analysis/Print Design
Property Spec Support Load & Definition Material
Beam : 2575
For Help, press F1
Modeling Mc Load 3 : EQX

File Edit View Tools Select Geometry Commands Analyze Mode Window Help

Modeling | Postprocessing | Steel Design | Concrete Design | RAM Connection | Bridge Deck | Advanced Slab Design | Piping

Setup | Geometry | General | Analysis/Print | Design | Job

c line plan (2) - Whole Structure



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Client	
Job No.	001
Rev.	
Part	
Ref	

File

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More...

	Engineer	Checker	Approved
Name			
Date	25-Mar-13		

Comment

Help

For Help, press F1

Modeling Mc Load 1 : DL

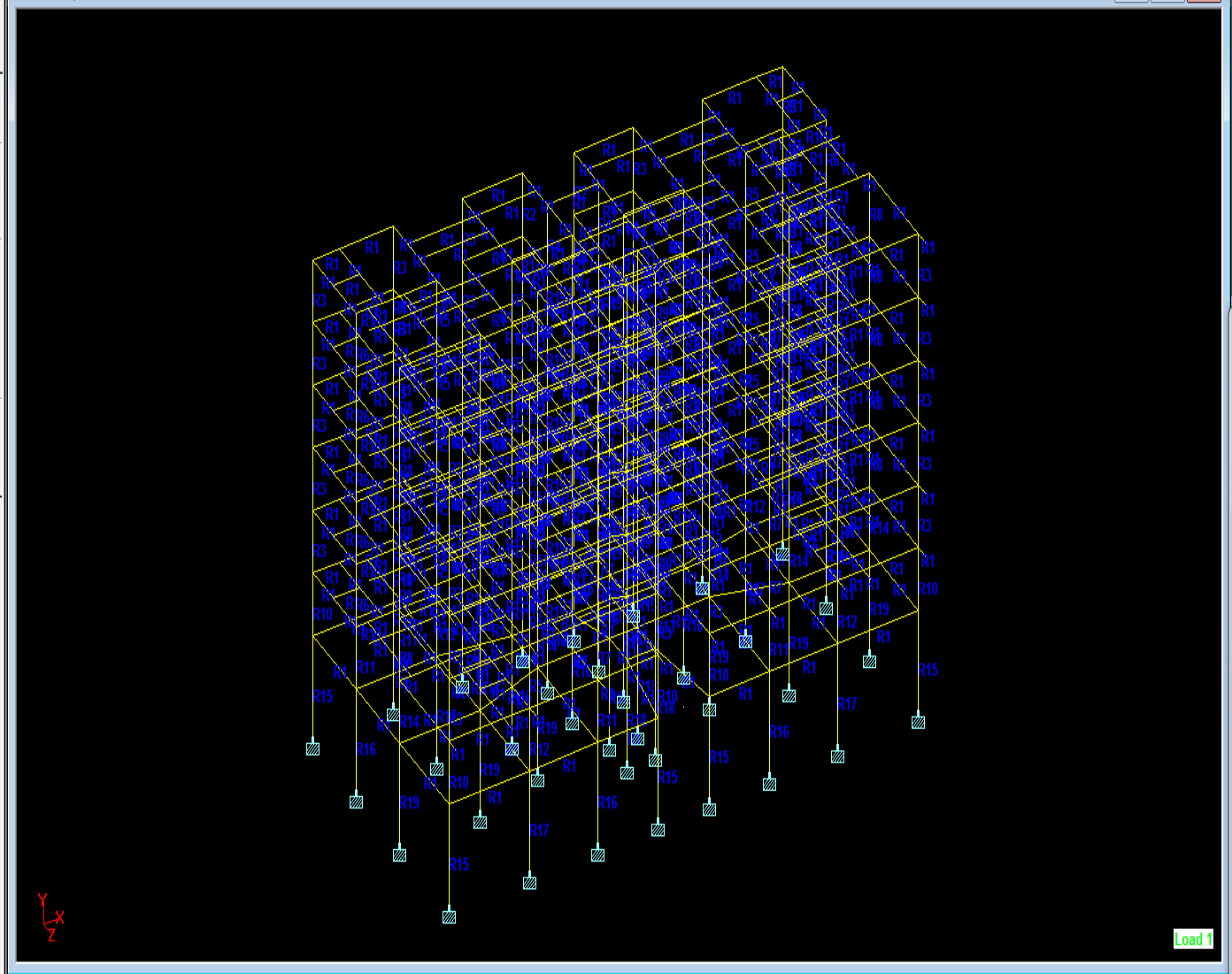
Input Units: kN-m

File Edit View Tools Select Geometry Commands Analyze Mode Window Help

Modeling | Postprocessing | Steel Design | Concrete Design | RAM Connection | Bridge Deck | Advanced Slab Design | Piping

Setup | Geometry | General | Analysis/Print | Design | Property | Spec | Support | Load & Definition | Material

c line plan (2) - Whole Structure



c line plan (2) - Beams

Beam	Node A	Node B	Property Refn.	Material	Beta
30	52	53	1	CONCRETE	0.
60	78	67	1	CONCRETE	0.
61	79	66	1	CONCRETE	0.
62	80	79	1	CONCRETE	0.
80	95	97	1	CONCRETE	0.
81	97	98	1	CONCRETE	0.
82	94	95	1	CONCRETE	0.
83	98	94	1	CONCRETE	0.
91	14	6	1	CONCRETE	0.
106	59	105	1	CONCRETE	0.

Properties - Whole Structure

Section | Beta Angle

Ref	Section	Material
1	Rect 0.70x0.23	CONCRETE
2	Rect 0.35x0.20	CONCRETE
3	Rect 0.35x0.23	CONCRETE
4	Rect 0.45x0.20	CONCRETE
5	Rect 0.60x0.23	CONCRETE
6	Rect 0.45x0.20	CONCRETE
7	Rect 0.45x0.23	CONCRETE
8	Rect 0.68x0.23	CONCRETE

Highlight Assigned Geometry

Edit... | Delete...

Values... | Section Database | Define...

Materials... | Thickness... | User Table...

Assignment Method

Assign To Selected Beams | Use Cursor To Assign

Assign To Edit List | Assign To View

Assign | Close | Help

For Help, press F1

File Edit View Tools Select Geometry Commands Analyze Mode Window Help

Modeling | Postprocessing | Steel Design | Concrete Design | RAM Connection | Bridge Deck | Advanced Slab Design | Piping

Setup | Geometry | General | Analysis/Print | Design | Property | Spec | Support | Load & Definition | Material

main total building - Whole Structure

Load 3

Load & Definition

- Definitions
  - Vehicle Definitions
  - Time History Definitions
  - Wind Definitions
  - Snow Definition
  - Reference Load Definitions
  - Seismic Definition (IS 1893 - 2002)
    - ZONE 0.16 RF 5 I 1 SS 2 ST 1 DM 5 PX 0.622 PZ 0.622
      - SELFWEIGHT 1
      - JOINT WEIGHT
      - MEMBER WEIGHT
      - FLOOR WEIGHT
  - Pushover Definitions
  - Direct Analysis Definition
- Load Cases Details
  - 3 : EQX
  - 4 : EQZ
  - 1 : DL
  - 2 : LIVE LOAD
  - 5 : DL+LL
  - 6 : GENERATED INDIAN CODE GENRAL_STRUCTUR
  - 7 : GENERATED INDIAN CODE GENRAL_STRUCTUR
  - 8 : GENERATED INDIAN CODE GENRAL_STRUCTUR
  - 9 : GENERATED INDIAN CODE GENRAL_STRUCTUR
  - 10 : GENERATED INDIAN CODE GENRAL_STRUCTUF
  - 11 : GENERATED INDIAN CODE GENRAL_STRUCTUF
  - 12 : GENERATED INDIAN CODE GENRAL_STRUCTUF
  - 13 : GENERATED INDIAN CODE GENRAL_STRUCTUF
  - 14 : GENERATED INDIAN CODE GENRAL_STRUCTURES 9
  - 15 : GENERATED INDIAN CODE GENRAL_STRUCTUF

New... | Add... | Edit... | Delete...

Toggle Load

Assignment Method

Assign To Selected Entities | Use Cursor To Assign

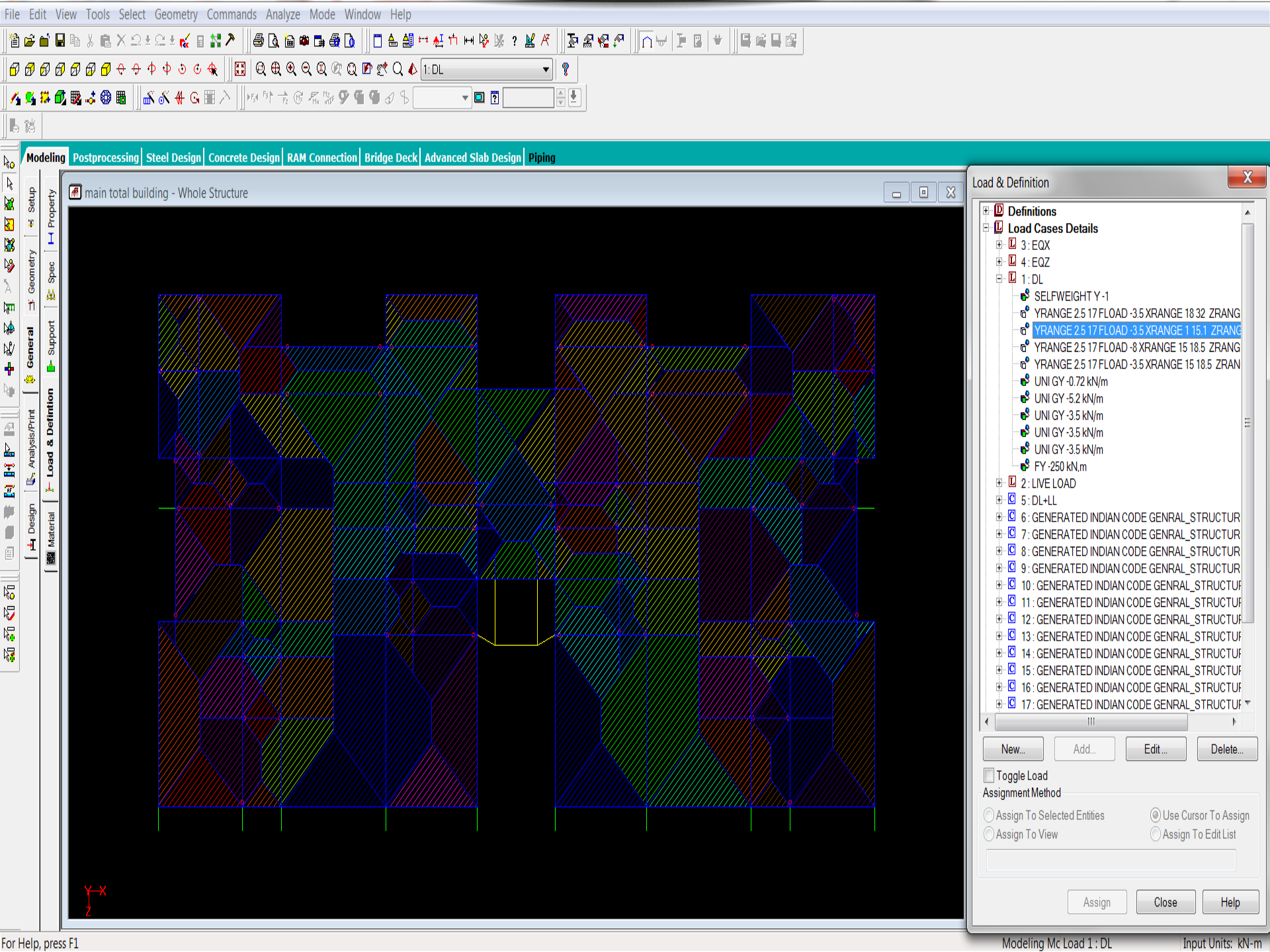
Assign To View | Assign To Edit List

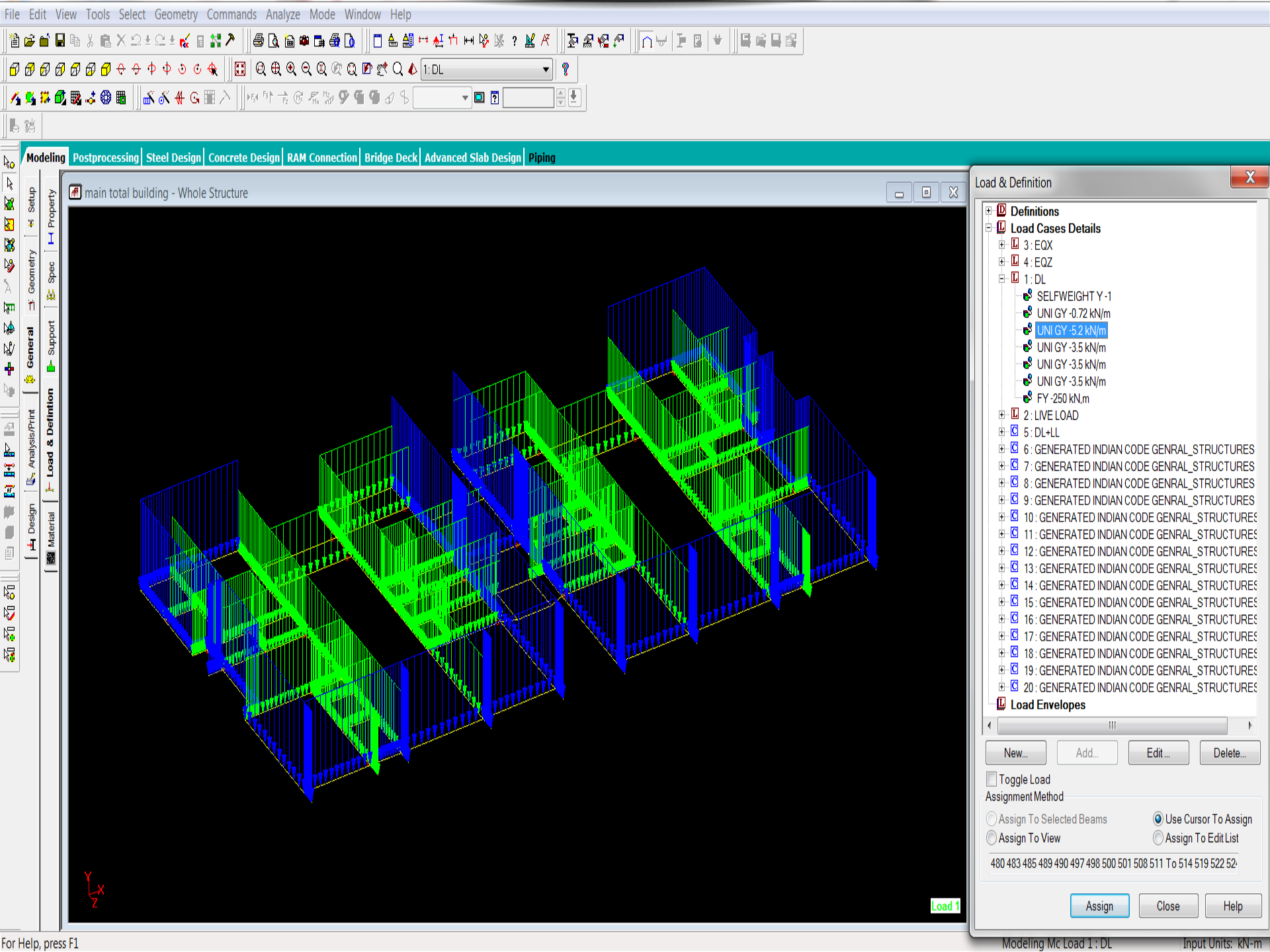
Assign | Close | Help

For Help, press F1

Modeling Mc Load 3 : EQX

Input Units: kN-m


File Edit View Tools Select Geometry Commands Analyze Mode Window Help
1:DL
Modeling Postprocessing Steel Design Concrete Design RAM Connection Bridge Deck Advanced Slab Design Piping
main total building - Whole Structure
Load & Definition
Definitions
Load Cases Details
3 : EQX
4 : EQZ
1 : DL
SELFWEIGHT Y -1
YRANGE 2.5 17 FLOAD -3.5 XRANGE 18 32 ZRANG
YRANGE 2.5 17 FLOAD -3.5 XRANGE 1 15.1 ZRANG
YRANGE 2.5 17 FLOAD -8 XRANGE 15 18.5 ZRANG
YRANGE 2.5 17 FLOAD -3.5 XRANGE 15 18.5 ZRAN
UNI GY -0.72 kN/m
UNI GY -5.2 kN/m
UNI GY -3.5 kN/m
UNI GY -3.5 kN/m
UNI GY -3.5 kN/m
FY -250 kN,m
2 : LIVE LOAD
5 : DL+LL
6 : GENERATED INDIAN CODE GENRAL_STRUCTUR
7 : GENERATED INDIAN CODE GENRAL_STRUCTUR
8 : GENERATED INDIAN CODE GENRAL_STRUCTUR
9 : GENERATED INDIAN CODE GENRAL_STRUCTUR
10 : GENERATED INDIAN CODE GENRAL_STRUCTUF
11 : GENERATED INDIAN CODE GENRAL_STRUCTUF
12 : GENERATED INDIAN CODE GENRAL_STRUCTUF
13 : GENERATED INDIAN CODE GENRAL_STRUCTUF
14 : GENERATED INDIAN CODE GENRAL_STRUCTUF
15 : GENERATED INDIAN CODE GENRAL_STRUCTUF
16 : GENERATED INDIAN CODE GENRAL_STRUCTUF
17 : GENERATED INDIAN CODE GENRAL_STRUCTUF
New... Add... Edit... Delete...
Toggle Load
Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
Assign Close Help
For Help, press F1
Modeling Mc Load 1 : DL
Input Units: kN-m

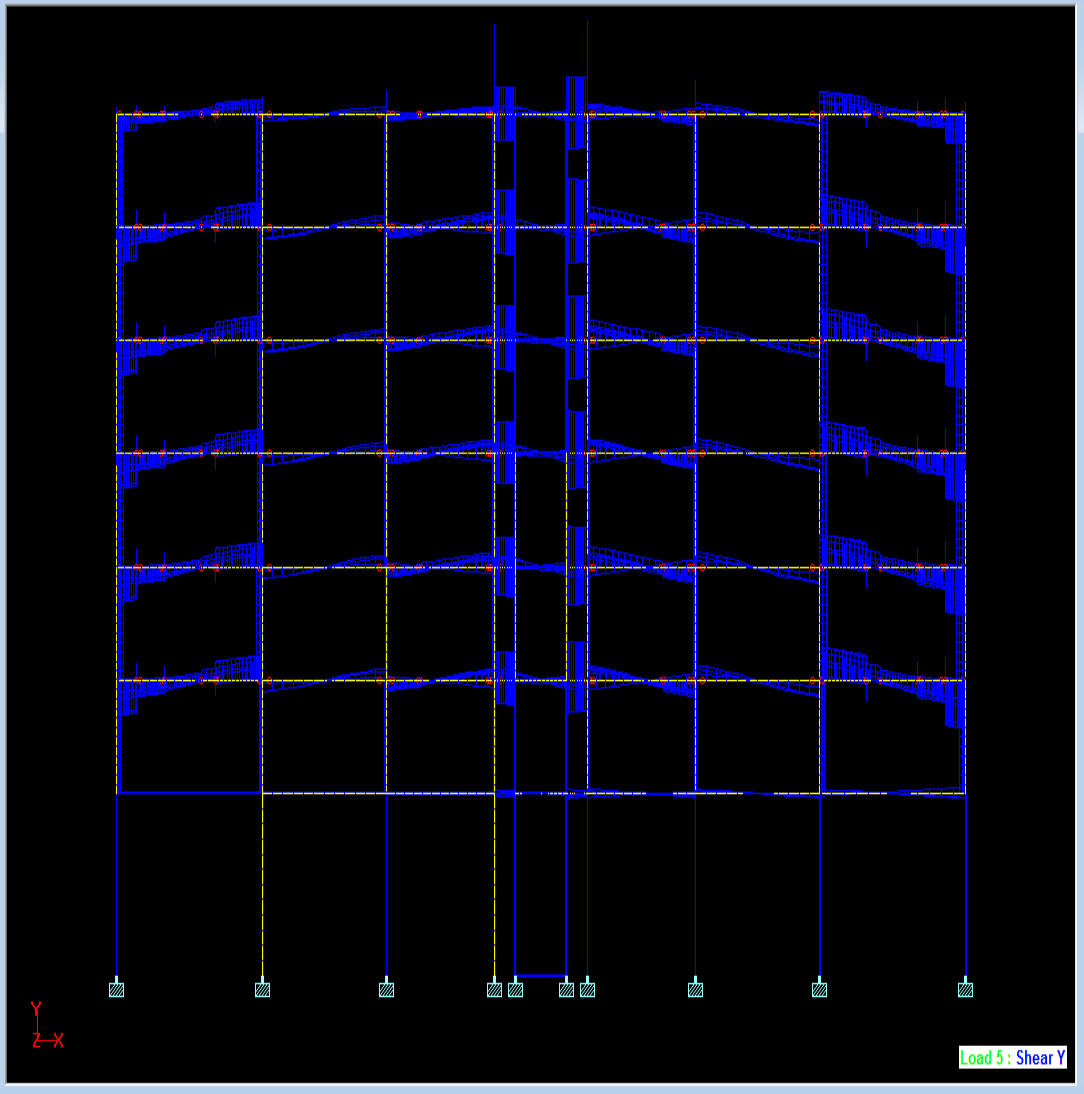

File Edit View Tools Select Geometry Commands Analyze Mode Window Help
1:DL
Modeling Postprocessing Steel Design Concrete Design RAM Connection Bridge Deck Advanced Slab Design Piping
main total building - Whole Structure
Load & Definition
Definitions
Load Cases Details
3 : EQX
4 : EQZ
1 : DL
SELFWEIGHT Y -1
UNI GY -0.72 kN/m
UNI GY -5.2 kN/m
UNI GY -3.5 kN/m
UNI GY -3.5 kN/m
UNI GY -3.5 kN/m
FY -250 kN.m
2 : LIVE LOAD
5 : DL+LL
6 : GENERATED INDIAN CODE GENRAL_STRUCTURES
7 : GENERATED INDIAN CODE GENRAL_STRUCTURES
8 : GENERATED INDIAN CODE GENRAL_STRUCTURES
9 : GENERATED INDIAN CODE GENRAL_STRUCTURES
10 : GENERATED INDIAN CODE GENRAL_STRUCTURES
11 : GENERATED INDIAN CODE GENRAL_STRUCTURES
12 : GENERATED INDIAN CODE GENRAL_STRUCTURES
13 : GENERATED INDIAN CODE GENRAL_STRUCTURES
14 : GENERATED INDIAN CODE GENRAL_STRUCTURES
15 : GENERATED INDIAN CODE GENRAL_STRUCTURES
16 : GENERATED INDIAN CODE GENRAL_STRUCTURES
17 : GENERATED INDIAN CODE GENRAL_STRUCTURES
18 : GENERATED INDIAN CODE GENRAL_STRUCTURES
19 : GENERATED INDIAN CODE GENRAL_STRUCTURES
20 : GENERATED INDIAN CODE GENRAL_STRUCTURES
Load Envelopes
New... Add... Edit... Delete...
Toggle Load
Assignment Method
Assign To Selected Beams
Use Cursor To Assign
Assign To View
Assign To Edit List
480 483 485 489 490 497 498 500 501 508 511 To 514 519 522 52
Assign Close Help
Load 1
For Help, press F1
Modeling Mc Load 1 : DL
Input Units: kN-m

File Edit View Tools Select Results Report Mode Window Help

Modeling | Postprocessing | Steel Design | Concrete Design | RAM Connection | Bridge Deck | Advanced Slab Design | Piping

Node | Beam | Surface | Animation | Reports | Displacement | Reactions

main total building - Whole Structure



main total building - Node Displacements:

All | Summary

Node	L/C	Horizontal X mm	Vertical Y mm	Horizontal Z mm	Resultant mm	Rotational rX rad	rY rad	rZ rad
1	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	5 DL+LL	-0.053	-0.808	-0.163	0.826	0.000	0.000	-0.000
7	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14	5 DL+LL	-0.051	-1.239	-0.310	1.278	0.000	0.000	-0.000
15	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18	5 DL+LL	0.039	-1.440	-0.298	1.471	-0.000	0.000	-0.000

main total building - Beam Relative Displacement Detail:

All Relative Displacement | Max Relative Displacements

Beam	L/C	Dist m	x mm	y mm	z mm	Resultant mm
30	5 DL+LL	0.000	0.000	0.000	0.000	0.000
		1.358	0.033	0.027	-0.000	0.042
		2.716	0.003	-0.027	0.000	0.027
		4.074	-0.026	-0.044	0.000	0.052
		5.432	0.000	0.000	0.000	0.000
60	5 DL+LL	0.000	0.000	0.000	0.000	0.000
		0.820	0.001	-0.002	0.011	0.011
		1.640	-0.000	-0.006	0.017	0.018
		2.460	0.001	-0.004	0.014	0.015
		3.280	0.000	0.000	0.000	0.000
61	5 DL+LL	0.000	0.000	0.000	0.000	0.000
		0.686	-0.001	-0.029	-0.000	0.029
		1.371	-0.007	-0.047	-0.000	0.047
		2.057	-0.010	-0.040	-0.000	0.042
		2.742	0.000	0.000	0.000	0.000
62	5 DL+LL	0.000	0.000	0.000	0.000	0.000
		0.820	-0.000	-0.007	0.005	0.009
		1.640	0.001	-0.015	0.005	0.016
		2.460	0.000	-0.013	0.003	0.014

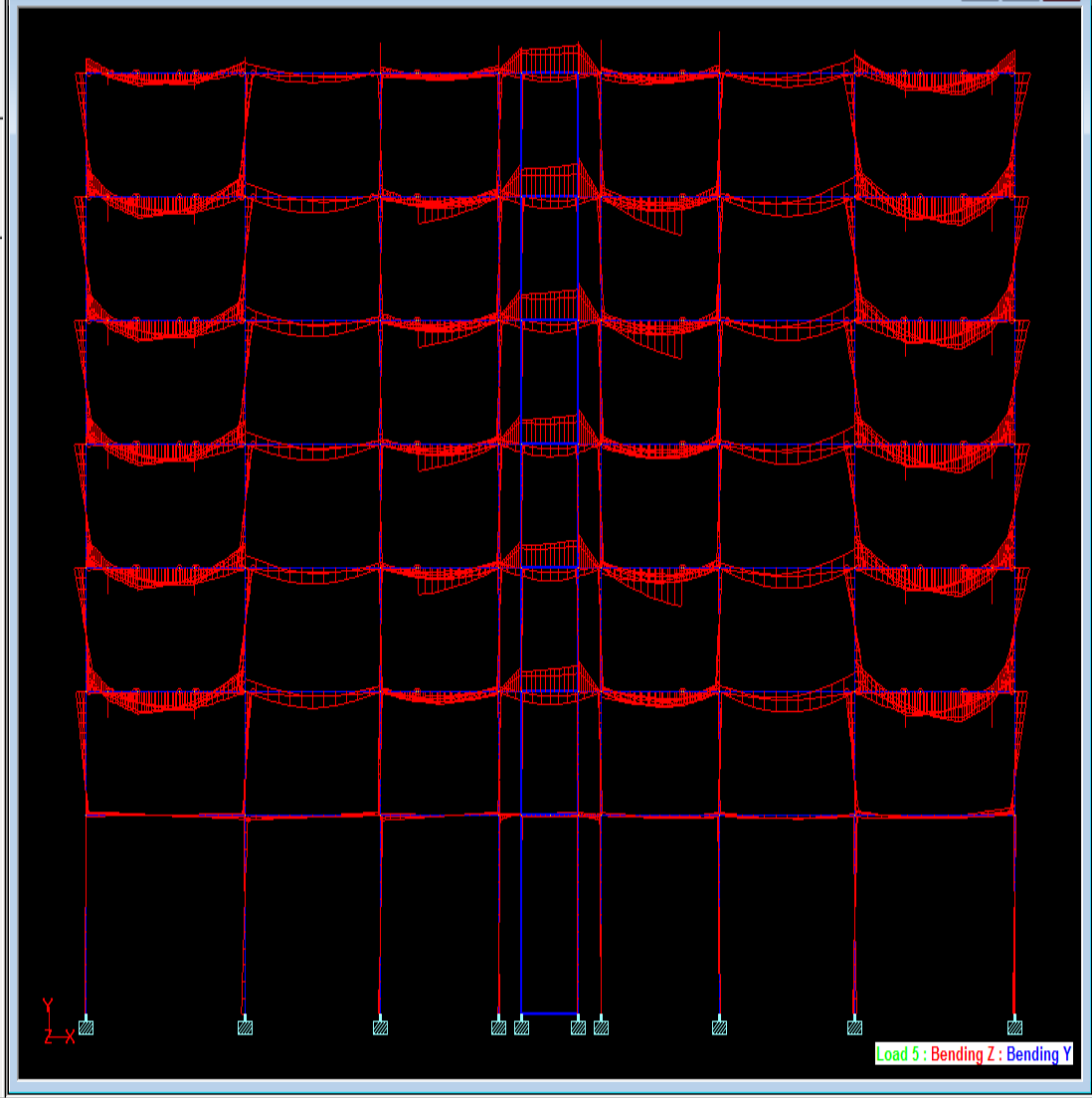
File Edit View Tools Select Results Report Mode Window Help

5: DL+LL

Modeling | Postprocessing | Steel Design | Concrete Design | RAM Connection | Bridge Deck | Advanced Slab Design | Piping

Node | Beam | Surface | Animation | Reports | Displacement | Reactions

main total building - Whole Structure



main total building - Node Displacements:

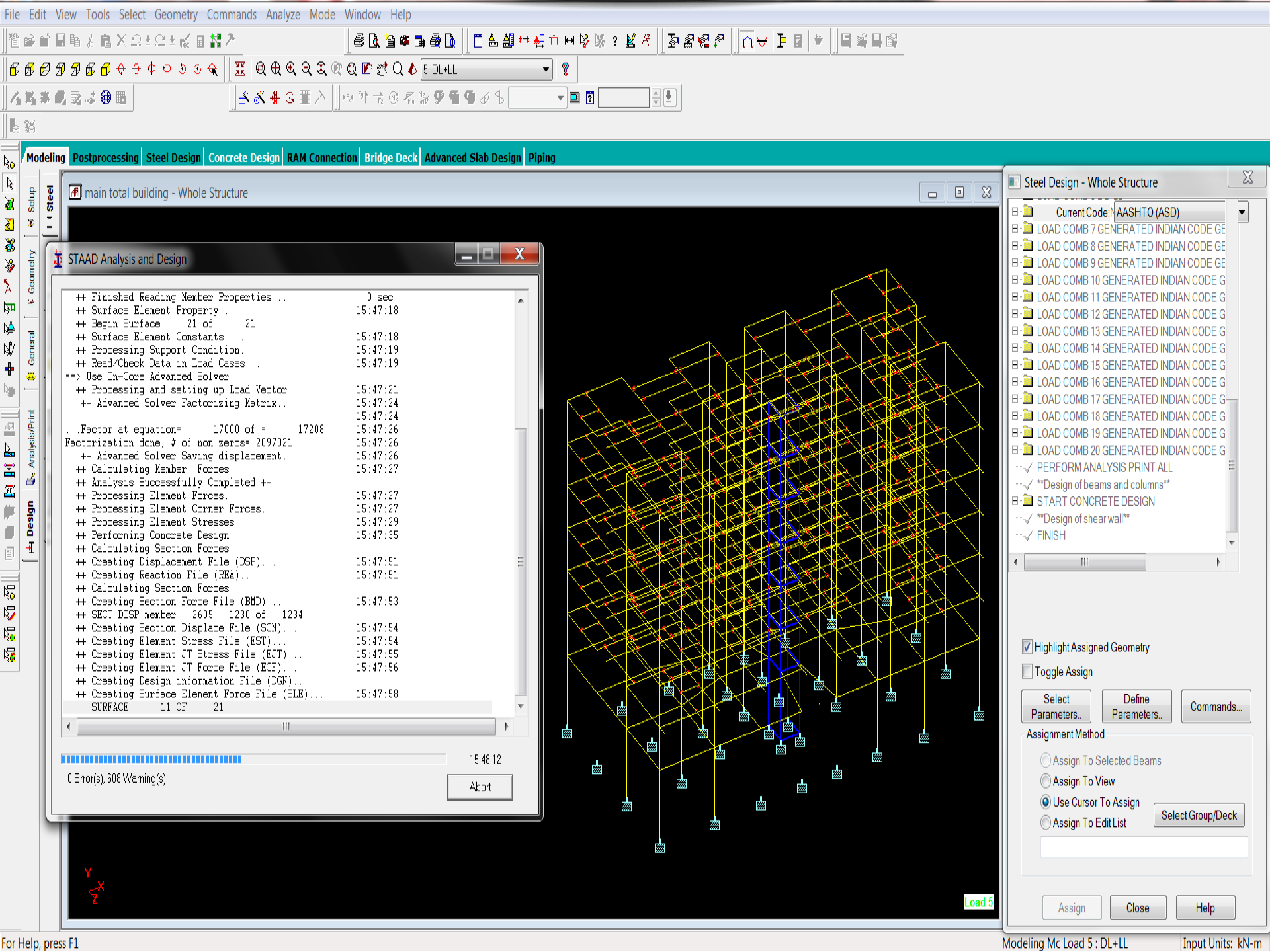
All | Summary

Node	L/C	Horizontal X mm	Vertical Y mm	Horizontal Z mm	Resultant mm	Rotational rX rad	rY rad	rZ rad
1	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	5 DL+LL	-0.053	-0.808	-0.163	0.826	0.000	0.000	-0.000
7	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14	5 DL+LL	-0.051	-1.239	-0.310	1.278	0.000	0.000	-0.000
15	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17	5 DL+LL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18	5 DL+LL	0.039	-1.440	-0.298	1.471	-0.000	0.000	-0.000

main total building - Beam Relative Displacement Detail:

All Relative Displacement | Max Relative Displacements

Beam	L/C	Dist m	x mm	y mm	z mm	Resultant mm
30	5 DL+LL	0.000	0.000	0.000	0.000	0.000
		1.358	0.033	0.027	-0.000	0.042
		2.716	0.003	-0.027	0.000	0.027
		4.074	-0.026	-0.044	0.000	0.052
		5.432	0.000	0.000	0.000	0.000
60	5 DL+LL	0.000	0.000	0.000	0.000	0.000
		0.820	0.001	-0.002	0.011	0.011
		1.640	-0.000	-0.006	0.017	0.018
		2.460	0.001	-0.004	0.014	0.015
		3.280	0.000	0.000	0.000	0.000
61	5 DL+LL	0.000	0.000	0.000	0.000	0.000
		0.686	-0.001	-0.029	-0.000	0.029
		1.371	-0.007	-0.047	-0.000	0.047
		2.057	-0.010	-0.040	-0.000	0.042
		2.742	0.000	0.000	0.000	0.000
62	5 DL+LL	0.000	0.000	0.000	0.000	0.000
		0.820	-0.000	-0.007	0.005	0.009
		1.640	0.001	-0.015	0.005	0.016
		2.460	0.000	-0.013	0.003	0.014


File Edit View Tools Select Geometry Commands Analyze Mode Window Help
5: DL+LL
Modeling Postprocessing Steel Design Concrete Design RAM Connection Bridge Deck Advanced Slab Design Piping
main total building - Whole Structure
STAAD Analysis and Design
++ Finished Reading Member Properties ... 0 sec
++ Surface Element Property ... 15:47:18
++ Begin Surface 21 of 21
++ Surface Element Constants ... 15:47:18
++ Processing Support Condition. 15:47:19
++ Read/Check Data in Load Cases .. 15:47:19
==> Use In-Core Advanced Solver
++ Processing and setting up Load Vector. 15:47:21
++ Advanced Solver Factorizing Matrix.. 15:47:24
15:47:24
...Factor at equation= 17000 of = 17208 15:47:26
Factorization done, # of non zeros= 2097021 15:47:26
++ Advanced Solver Saving displacement.. 15:47:26
++ Calculating Member Forces. 15:47:27
++ Analysis Successfully Completed ++
++ Processing Element Forces. 15:47:27
++ Processing Element Corner Forces. 15:47:27
++ Processing Element Stresses. 15:47:29
++ Performing Concrete Design 15:47:35
++ Calculating Section Forces
++ Creating Displacement File (DSP)... 15:47:51
++ Creating Reaction File (REA)... 15:47:51
++ Calculating Section Forces
++ Creating Section Force File (BMD)... 15:47:53
++ SECT DISP member 2605 1230 of 1234
++ Creating Section Displace File (SCN)... 15:47:54
++ Creating Element Stress File (EST)... 15:47:54
++ Creating Element JT Stress File (EJT)... 15:47:55
++ Creating Element JT Force File (ECF)... 15:47:56
++ Creating Design information File (DGN)...
++ Creating Surface Element Force File (SLE)... 15:47:58
SURFACE 11 OF 21
15:48:12
0 Error(s), 608 Warning(s)
Abort
Steel Design - Whole Structure
Current Code: AASHTO (ASD)
LOAD COMB 7 GENERATED INDIAN CODE GE
LOAD COMB 8 GENERATED INDIAN CODE GE
LOAD COMB 9 GENERATED INDIAN CODE GE
LOAD COMB 10 GENERATED INDIAN CODE G
LOAD COMB 11 GENERATED INDIAN CODE G
LOAD COMB 12 GENERATED INDIAN CODE G
LOAD COMB 13 GENERATED INDIAN CODE G
LOAD COMB 14 GENERATED INDIAN CODE G
LOAD COMB 15 GENERATED INDIAN CODE G
LOAD COMB 16 GENERATED INDIAN CODE G
LOAD COMB 17 GENERATED INDIAN CODE G
LOAD COMB 18 GENERATED INDIAN CODE G
LOAD COMB 19 GENERATED INDIAN CODE G
LOAD COMB 20 GENERATED INDIAN CODE G
PERFORM ANALYSIS PRINT ALL
Design of beams and columns
START CONCRETE DESIGN
Design of shear wall
FINISH
Highlight Assigned Geometry
Toggle Assign
Select Parameters..
Define Parameters..
Commands...
Assignment Method
Assign To Selected Beams
Assign To View
Use Cursor To Assign
Assign To Edit List
Select Group/Deck
Assign
Close
Help
Load 5
For Help, press F1
Modeling Mc Load 5 : DL+LL
Input Units: kN-m

Out put file of beam

Out put file of column

File Edit View Help

WARNING

**WARNING- JOINT NO. 1(
**WARNING- THIS STRUCTU
WARNING about Floor/(
*WARNING- NO MEMBERS
**WARNING: IF THIS UBC/IB
**WARNING - THERE WERE
***WARNING - INSTABILITY

RESULTS

792. 2050 TO 2121 2138 TO 2210 2227 TO 2299 2316 TO 2388 2405 TO 2477 2494 TO 2566 -
793. 2583 TO 2609

----------< PAGE 771 Ends Here >----------

DXF IMPORT OF LINE PLAN.DXF -- PAGE NO. 772

==========

B E A M N O. 30 D E S I G N R E S U L T S

M25 Fe415 (Main) Fe415 (Sec.)

LENGTH: 5432.5 mm SIZE: 230.0 mm X 700.0 mm COVER: 40.0 mm

SUMMARY OF REINF. AREA (Sq.mm)

SECTION	0.0 mm	1358.1 mm	2716.3 mm	4074.4 mm	5432.5 mm
TOP REINF.	308.56 (Sq. mm)	308.56 (Sq. mm)	308.56 (Sq. mm)	308.56 (Sq. mm)	308.56 (Sq. mm)
BOTTOM REINF.	308.56 (Sq. mm)	308.56 (Sq. mm)	308.56 (Sq. mm)	308.56 (Sq. mm)	308.56 (Sq. mm)

SUMMARY OF PROVIDED REINF. AREA

SECTION	0.0 mm	1358.1 mm	2716.3 mm	4074.4 mm	5432.5 mm
TOP REINF.	4-10í 1 layer(s)	4-10í 1 layer(s)	4-10í 1 layer(s)	4-10í 1 layer(s)	4-10í 1 layer(s)
BOTTOM REINF.	4-10í 1 layer(s)	4-10í 1 layer(s)	4-10í 1 layer(s)	4-10í 1 layer(s)	4-10í 1 layer(s)
SHEAR REINF.	2 legged 8í @ 140 mm c/c	2 legged 8í @ 140 mm c/c	2 legged 8í @ 140 mm c/c	2 legged 8í @ 140 mm c/c	2 legged 8í @ 140 mm c/c

----------< PAGE 772 Ends Here >----------

DXF IMPORT OF LINE PLAN.DXF -- PAGE NO. 773

OUTPUT FOR BAR COMBINATION

File Edit View Help

WARNING

**WARNING- JOINT NO. 1(
**WARNING- THIS STRUCTU
WARNING about Floor/(
*WARNING- NO MEMBERS
**WARNING: IF THIS UBC/IB
**WARNING - THERE WERE
***WARNING - INSTABILITY

RESULTS

----------< PAGE 2133 Ends Here >----------

DXF IMPORT OF LINE PLAN.DXF -- PAGE NO. 2134

REQD. STEEL AREA : 700.00 Sq.mm.
REQD. CONCRETE AREA: 86800.00 Sq.mm.
MAIN REINFORCEMENT : Provide 4 - 16 dia. (0.92%, 804.25 Sq.mm.)
(Equally distributed)
TIE REINFORCEMENT : Provide 8 mm dia. rectangular ties @ 250 mm c/c

SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)

Puz : 1194.38 Muz1 : 31.71 Muy1 : 21.56

INTERACTION RATIO: 0.37 (as per Cl. 39.6, IS456:2000)

SECTION CAPACITY BASED ON REINFORCEMENT PROVIDED (KNS-MET)

WORST LOAD CASE: 16
END JOINT: 224 Puz : 1225.65 Muz : 52.58 Muy : 35.18 IR: 0.67

==========

C O L U M N N O. 388 D E S I G N R E S U L T S

M25 Fe415 (Main) Fe415 (Sec.)

LENGTH: 2800.0 mm CROSS SECTION: 250.0 mm X 350.0 mm COVER: 40.0 mm

** GUIDING LOAD CASE: 4 END JOINT: 42 SHORT COLUMN

REQD. STEEL AREA : 700.00 Sq.mm.
REQD. CONCRETE AREA: 86800.00 Sq.mm.
MAIN REINFORCEMENT : Provide 4 - 16 dia. (0.92%, 804.25 Sq.mm.)
(Equally distributed)
TIE REINFORCEMENT : Provide 8 mm dia. rectangular ties @ 250 mm c/c

SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)

Puz : 1194.38 Muz1 : 32.07 Muy1 : 21.80

INTERACTION RATIO: 0.38 (as per Cl. 39.6, IS456:2000)

Out put file of shear wall

File Edit View Help

WARNING

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WARNING : THE LOAD CON

RESULTS

----------< PAGE 4804 Ends Here >----------

DXF IMPORT OF LINE PLAN.DXF -- PAGE NO. 4805

==========

SHEARWALL NO. : 1 DESIGN CODE : IS 456-2000

WIDTH : 1.80 M FC : 30.00 MPA
HEIGHT : 2.80 M FY : 415.00 MPA
THICKNESS : 150.00 MM CONC. COVER : 25.000 MM

EDGE ELEMENTS : MIN. REINFORCING RATIO :
WIDTH : 360.00 MM HORIZONTAL : 0.00200
THICKNESS : 150.00 MM VERTICAL : 0.00120

REINFORCING SUMMARY (REBAR SPACING/AREA UNITS: MM/MM^2)

==========

LEVEL (M)	GOV.LOAD NO. FOR HOR./ VERT./ EDGE/ LINK	HORIZONTAL/ (RATIO)/ HOR. LINK	VERTICAL/ (RATIO)/ VER. LINK	EDGE/ (AREA/RATIO)
-0.84	3/ 14/ 3/	8 DIA @ 167.00/ (0.00201) NOT REQUIRED	10 DIA @ 33.75/ (0.01601) NOT REQUIRED	3 NOS. 8 DIA/ (150.855/ 0.00070)
-0.56	3/ 14/ 3/	8 DIA @ 167.00/ (0.00201) NOT REQUIRED	16 DIA @ 77.14/ (0.01862) NOT REQUIRED	3 NOS. 8 DIA/ (150.855/ 0.00070)
-0.28	3/ 14/ 3/	8 DIA @ 167.00/ (0.00201) NOT REQUIRED	10 DIA @ 25.12/ (0.02134) NOT REQUIRED	3 NOS. 8 DIA/ (150.855/ 0.00070)

NOTE :
ALL HEIGHTS ARE IN LOCAL COORDINATE SYSTEM OF THE SURFACE.
NUMBER OF REINFORCING LAYERS IN EACH DIRECTION : 1

Total Page : 4847 NUM

Column design as per IS : 456:2000

File Edit View Help

WARNING

RESULTS

TOTAL APPLIED LOAD 3
TOTAL REACTION LOAD 3
TOTAL APPLIED LOAD 4
TOTAL REACTION LOAD 4
TOTAL APPLIED LOAD 1
TOTAL REACTION LOAD 1
TOTAL APPLIED LOAD 2
TOTAL REACTION LOAD 2
CONCRETE DESIGN
ANALYSIS RESULTS
MEMBER FORCES ALL
SUPPORT REACTION ALL
STORY DRIFT
SHEARWALL DESIGN

```
 SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)
 ----------------------------------------------------------
 Puz :   1850.91   Muz1 :     74.54   Muy1 :     47.65

 INTERACTION RATIO: 0.94 (as per Cl. 39.6, IS456:2000)

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--------------------------------< PAGE 2208 Ends Here >--------------------------
  DXF IMPORT OF LINE PLAN.DXF                                -- PAGE NO. 2209


 ================================================================================

         C O L U M N   N O.   1978  D E S I G N   R E S U L T S

       M25                   Fe415 (Main)              Fe415 (Sec.)

 LENGTH:  4500.0 mm   CROSS SECTION:  300.0 mm X  680.0 mm  COVER: 40.0 mm

 ** GUIDING LOAD CASE:    4  SHORT(Z)        /BRACED LONG(Y)


 REQD. STEEL AREA   :     1632.00 Sq.mm.
 REQD. CONCRETE AREA:   202368.00 Sq.mm.
 MAIN REINFORCEMENT : Provide  16 - 12 dia. (0.89%,   1809.56 Sq.mm.)
                      (Equally distributed)
 TIE REINFORCEMENT  : Provide  8 mm dia. rectangular ties @ 190 mm c/c

 SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)
 ----------------------------------------------------------
 Puz :   2784.60   Muz1 :    165.72   Muy1 :     65.57

 INTERACTION RATIO: 0.44 (as per Cl. 39.6, IS456:2000)

 ================================================================================


 ================================================================================

         C O L U M N   N O.   1979  D E S I G N   R E S U L T S

       M25                   Fe415 (Main)              Fe415 (Sec.)

 LENGTH:  4500.0 mm   CROSS SECTION:  300.0 mm X  350.0 mm  COVER: 40.0 mm
```

Total Page : 4847 NUM

Column design as per IS : 13920

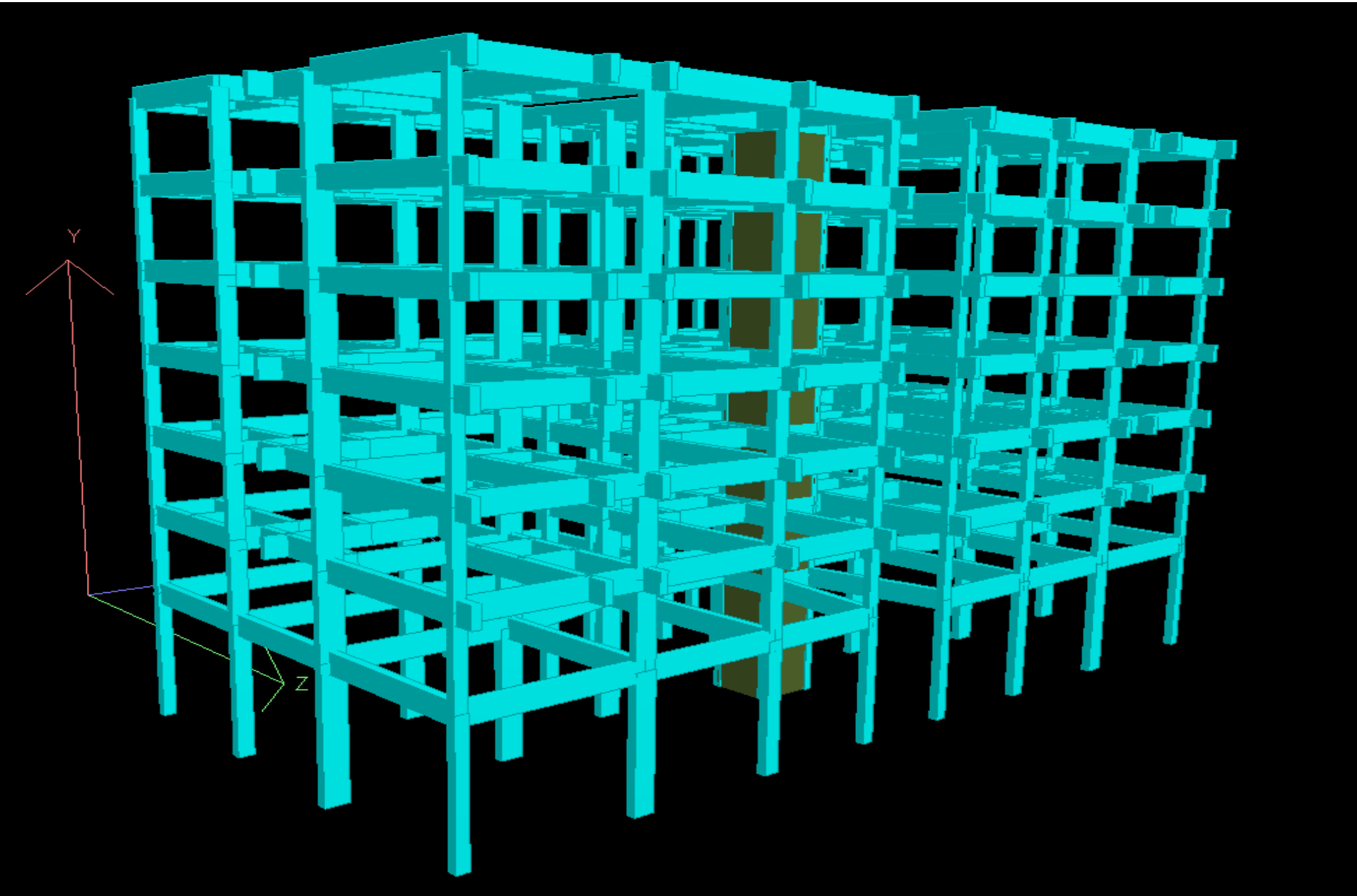
File Edit View Help

WARNING
RESULTS
TOTAL APPLIED LOAD 3
TOTAL REACTION LOAD 3
TOTAL APPLIED LOAD 4
TOTAL REACTION LOAD 4
TOTAL APPLIED LOAD 1
TOTAL REACTION LOAD 1
TOTAL APPLIED LOAD 2
TOTAL REACTION LOAD 2
ANALYSIS RESULTS
MEMBER FORCES ALL
SUPPORT REACTION ALL
STORY DRIFT
SHEARWALL DESIGN
CONCRETE DESIGN

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


***NOTE: SOME OF THE BEAMS CONNECTED TO THE COLUMN NO.   1978
         ARE NOT DESIGNED. HENCE ONLY SHEAR FORCE FROM ANALYSIS
         WILL BE CONSIDERED FOR SHEAR DESIGN.

================================================================================

         C O L U M N   N O.   1978  D E S I G N   R E S U L T S

      M25                  Fe415 (Main)              Fe415 (Sec.)

LENGTH:  4500.0 mm   CROSS SECTION:  300.0 mm X  680.0 mm  COVER: 40.0 mm

** GUIDING LOAD CASE:    4  SHORT(Z)        /BRACED LONG(Y)


REQD. STEEL AREA   :     1632.00 Sq.mm.
REQD. CONCRETE AREA:   202368.00 Sq.mm.
MAIN REINFORCEMENT : Provide  16 - 12 dia. (0.89%,   1809.56 Sq.mm.)
                     (Equally distributed)
CONFINING REINFORCEMENT  : Provide 10 mm dia. rectangular ties @  75 mm c/c
                           over a length   750.0 mm from each joint face towards
                           midspan as per Cl. 7.4.6 of IS-13920.
                            4 number overlapping hoop along with crossties
                           are provided along Y direction.
                           (Clause 7.3.2 of IS-13920)
TIE REINFORCEMENT        : Provide  8 mm dia. rectangular ties @ 150 mm c/c

SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)
---------------------------------------------------------
Puz :   2784.60   Muz1 :    165.72   Muy1 :     65.57

INTERACTION RATIO: 0.44 (as per Cl. 39.6, IS456:2000)

------------------------------< PAGE 4869 Ends Here >--------------------------
 DXF IMPORT OF LINE PLAN.DXF                              -- PAGE NO. 4870

================================================================================


================================================================================

         C O L U M N   N O.   1979  D E S I G N   R E S U L T S
```

Total Page : 4870 NUM

3D view




Thank
You