

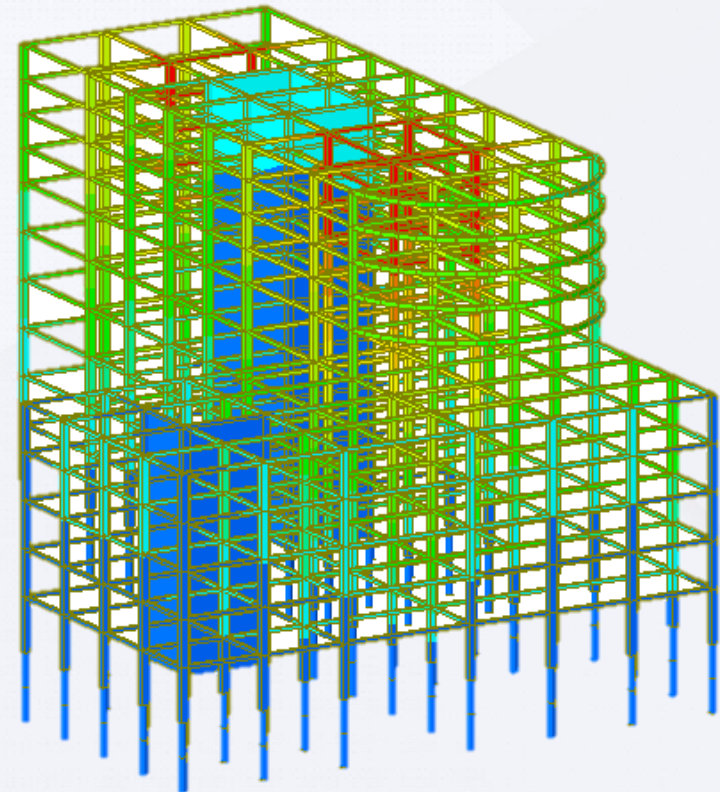
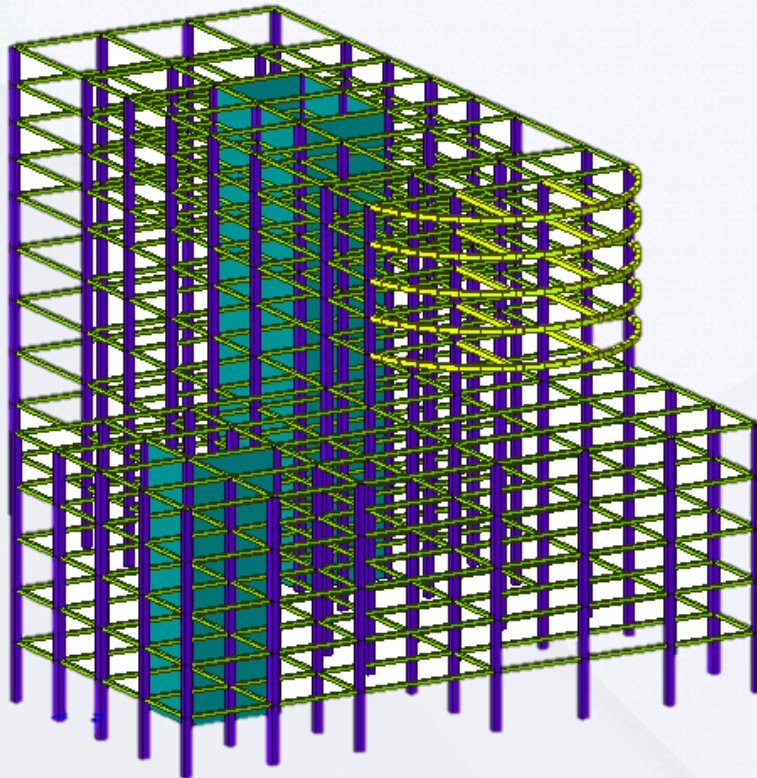


midas Gen

midas Gen Training Series

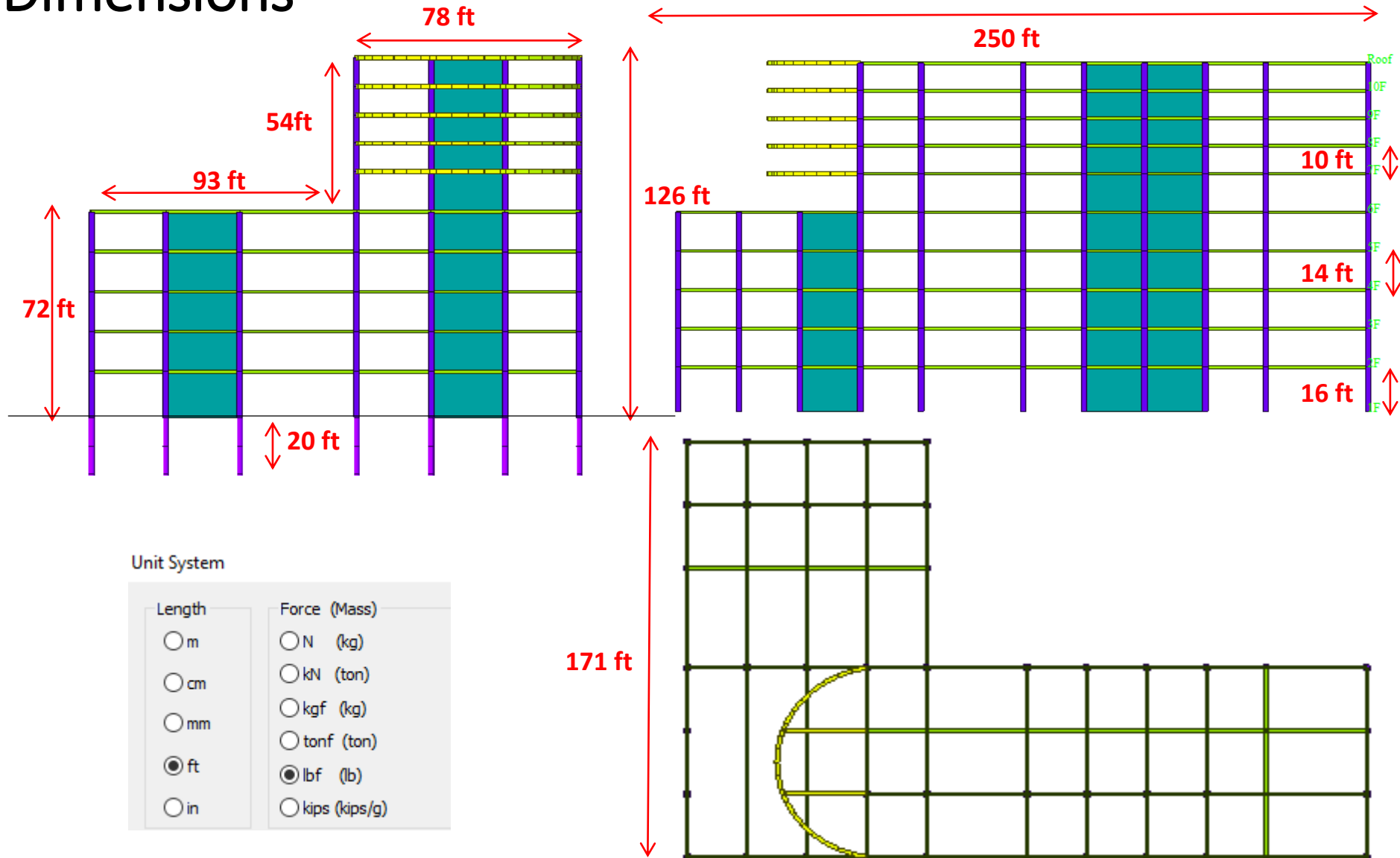
Building Analysis and Design

RC Building Analysis and Design



Angel Francisco Martinez
Civil Engineer
MIDASoft

Dimensions



Materials and Sections

- Define Material
-Concrete ASTM C7000
- Define 4 Sections as shown

	H	B
Column	2 ft	2 ft
Beam	1 ft	1 ft
Balcony Beam	1.5 ft	1 ft
Pile	D = 2 ft	

Properties

Material	Section	Thickness	
ID	Name	Type	Shape
1	Edge Column 11-15	User	SB
2	pile	User	SR
3	Beam	User	SB
4	Balcony Beams	User	SB

Material Data

General
Material ID: 1 Name: Grade C7000

Elasticity Data
Type of Design: Concrete
Type of Material: Isotropic Orthotropic

Steel
Standard: DB
Concrete
Standard: ASTM(RC)
Code:
DB: Grade C7000

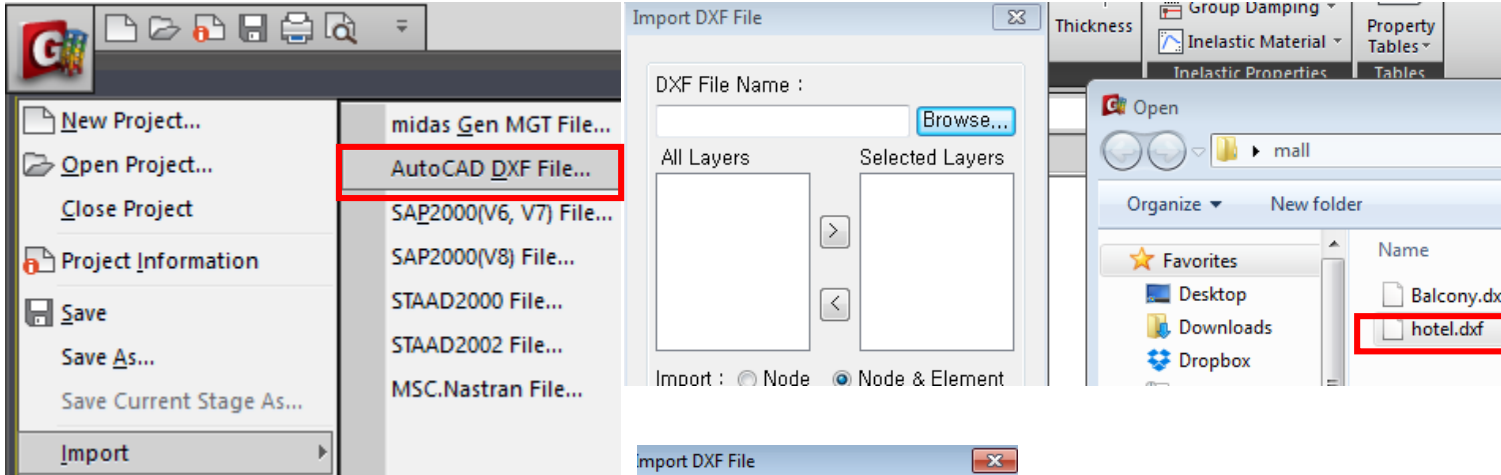
Steel
Modulus of Elasticity: 0.0000e+000 kips/ft^2
Poisson's Ratio: 0
Thermal Coefficient: 0.0000e+000 1/[F]
Weight Density: 0 kips/ft^3
 Use Mass Density: 0 kips/ft^3/g

Concrete
Modulus of Elasticity: 6.9419e+005 kips/ft^2
Poisson's Ratio: 0.2
Thermal Coefficient: 5.0000e-006 1/[F]
Weight Density: 0.15 kips/ft^3
 Use Mass Density: 0.004662 kips/ft^3/g

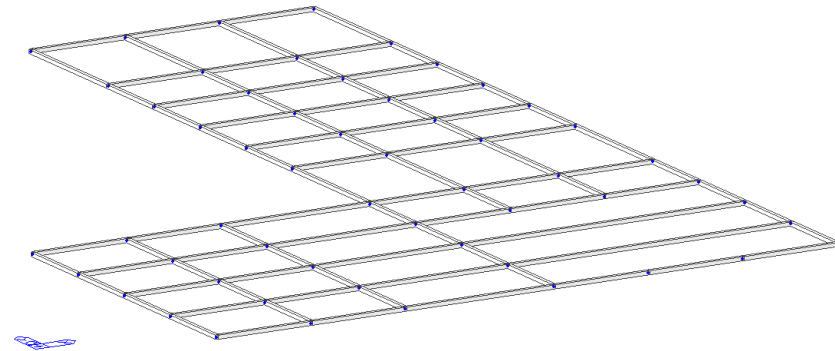
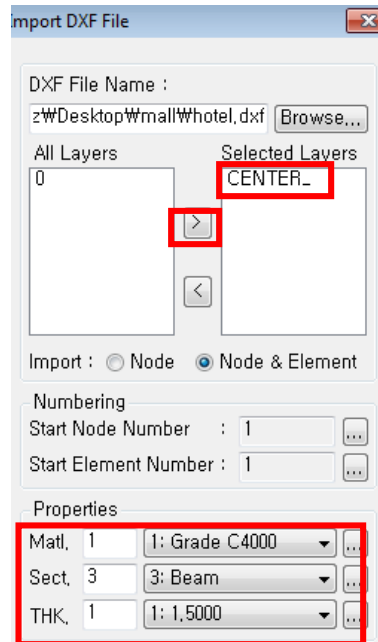
Properties

Material	Section	Thickness
ID	Type	Thickness(ft)
1	Value	1.500000

Import DXF CAD



- Import Hotel DXF
- Select CENTER Layers
- Section Beam



Create Columns

The screenshot shows the midas Gen software interface. The 'Node/Element' menu is active, and the 'Extrude Elements' dialog box is open. The dialog box contains the following settings:

- Extrude Elements:** A dropdown menu with a list icon.
- Start Number:**
 - Node Number: 56
 - Element Number: 91
- Extrude Type:**
 - Node -> Line Element (selected)
 - Source: Remove Move
 - Reverse I-J
- Element Attribute:**
 - Element Type: Beam
 - Material: 1 | 1: Grade C4000
 - Section: 1 | 1: Edge Column
 - Beta Angle: 0 [Deg]
- Generation Type:**
 - Translate Rotate Project
- Translation:**
 - Equal Distance Unequal Distance
- dx,dy,dz:** 0, 0, -16 ft
- Number of Times:** 1

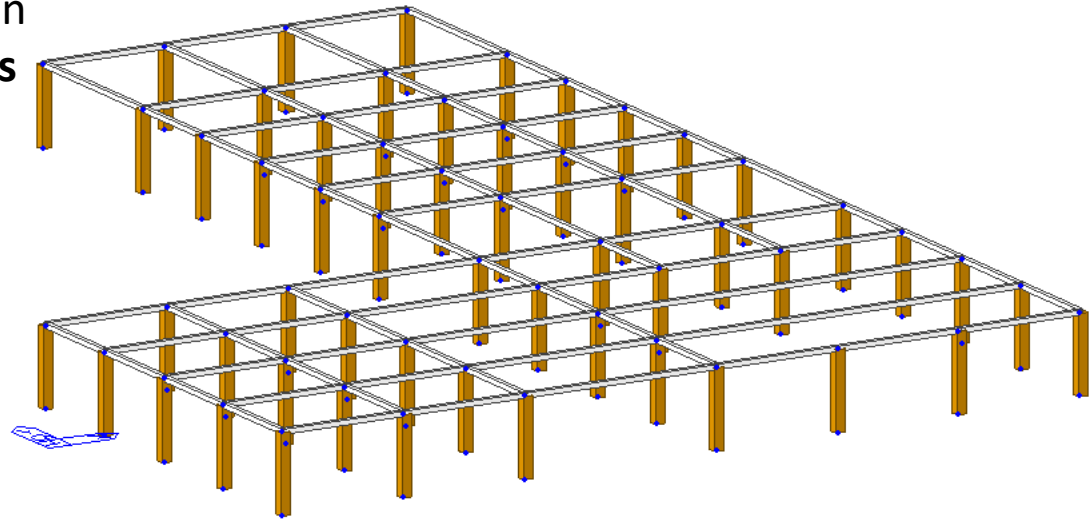
Extrude columns

Assign Element Type: General beam

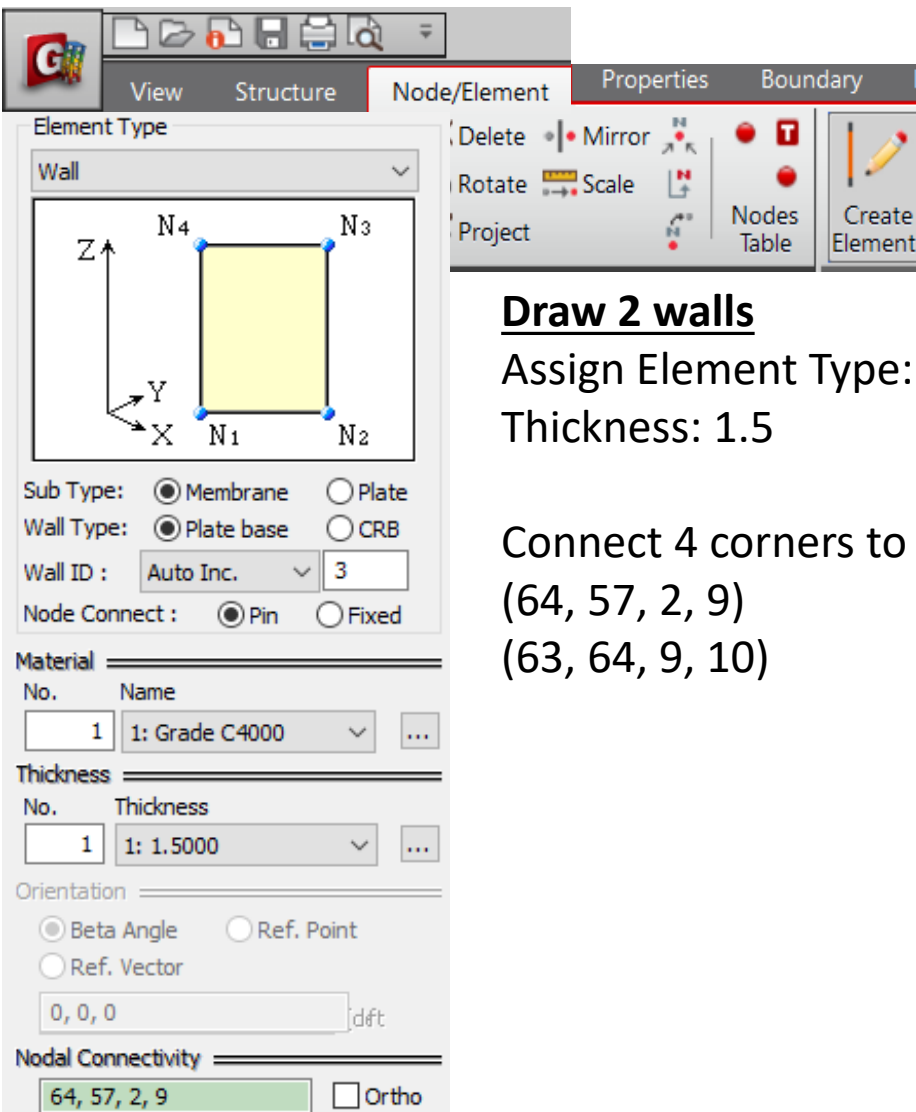
Section: Column

Select all nodes

Extrude: -16ft



Create Walls



Draw 2 walls

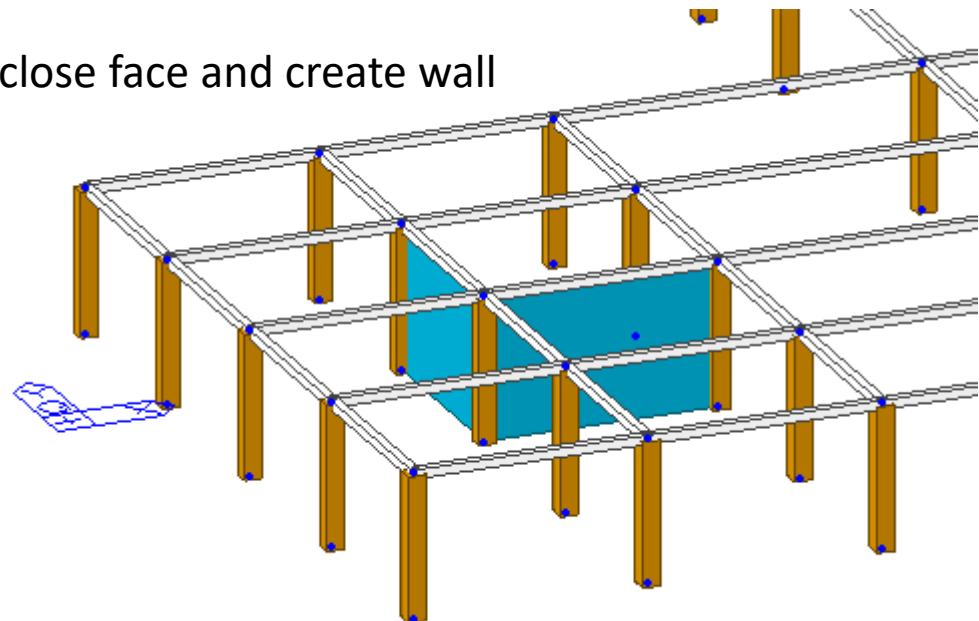
Assign Element Type: Wall

Thickness: 1.5

Connect 4 corners to close face and create wall

(64, 57, 2, 9)

(63, 64, 9, 10)



Create Walls

View Structure Node/Element Properties Boundary

Delete Mirror Rotate Scale Project Nodes Table Create Element

Element Type
Wall

Z
N4 N3
Y
N1 N2
X

Sub Type: Membrane Plate
Wall Type: Plate base CRB
Wall ID: Auto Inc. 5
Node Connect: Pin Fixed

Material
No. Name
1 1: Grade C4000

Thickness
No. Thickness
1 1: 1.5000

Orientation
 Beta Angle Ref. Point
 Ref. Vector
0, 0, 0 dft

Nodal Connectivity
101, 100, 45, 46 Ortho

Draw other 6 walls

Assign Element Type: Wall

Thickness: 1.5

Connect 4 corners to close face and create rest of walls

(101, 100, 45, 46)

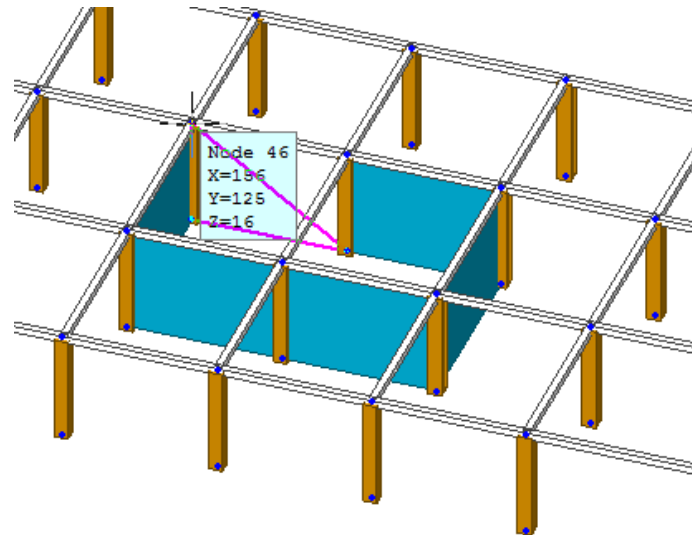
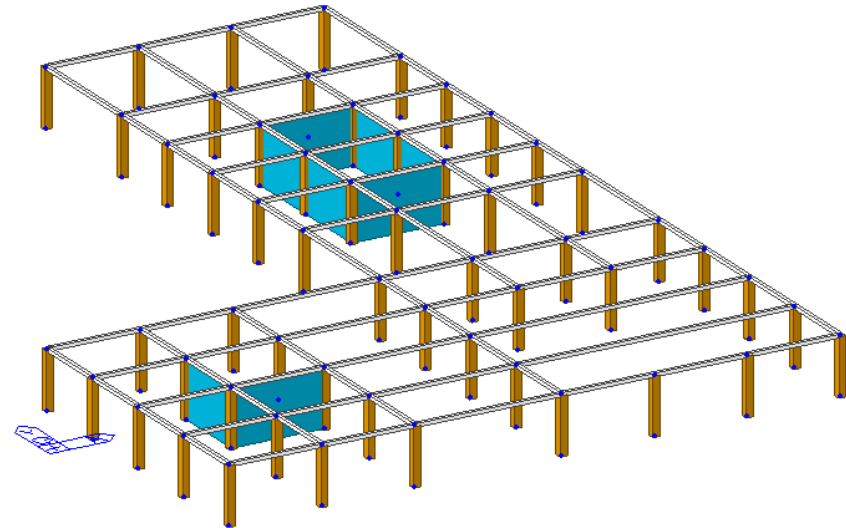
(104, 100, 45, 49)

(81, 104, 49, 26)

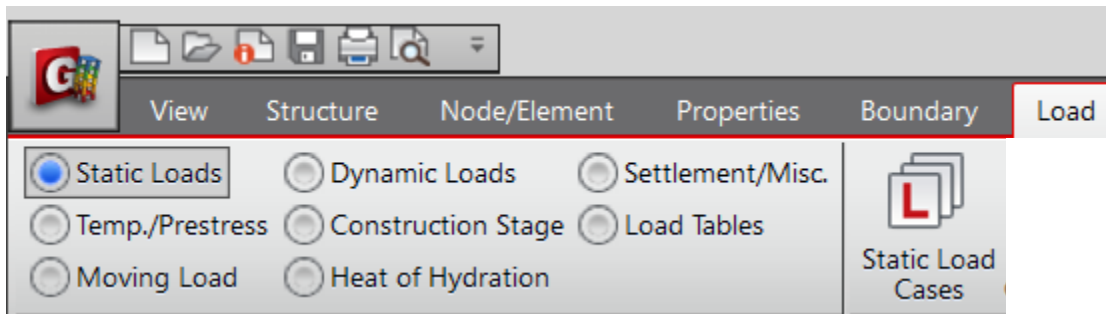
(82, 81, 26, 27)

(82, 105, 50, 27)

(105, 101, 46, 50)



Load Cases



Static Load Cases

Create 4 load cases

Assign Self Weight to dead load case

Static Load Cases

Name : earthquake y Add

Type : Earthquake (E) Modify

Description : Delete

Name	Type	Description
dead	Dead Load (D)	
live	Live Load (L)	
earthquake x	Earthquake (E)	
earthquake y	Earthquake (E)	

Node Element Boundary Mass Load

Self Weight

Load Case Name: dead

Load Group Name: Default

Self Weight Factor

X: 0

Y: 0

Z: 0

Load Case	X	Y	Z	Group
dead	0	0	-1	Default

Operation: Add Modify Delete

Define Floor Loads

Floor Load Type

Floor Load Type Name & Description

Name : hotel

Description :

Floor Load & Load Case

Load Case	Floor Load	Units	Sub Beam Weight
1. dead	-0.5	kips/ft ²	<input checked="" type="checkbox"/>
2. live	-0.2	kips/ft ²	<input type="checkbox"/>
3. NONE	0	kips/ft ²	<input type="checkbox"/>
4. NONE	0	kips/ft ²	<input type="checkbox"/>
5. NONE	0	kips/ft ²	<input type="checkbox"/>
6. NONE	0	kips/ft ²	<input type="checkbox"/>
7. NONE	0	kips/ft ²	<input type="checkbox"/>
8. NONE	0	kips/ft ²	<input type="checkbox"/>

Define Load Case...

Name	Description
▶ hotel	
*	

Add

Modify

Delete

Assign Floor Loads

Define Floor Load Type

Assign Floor Loads

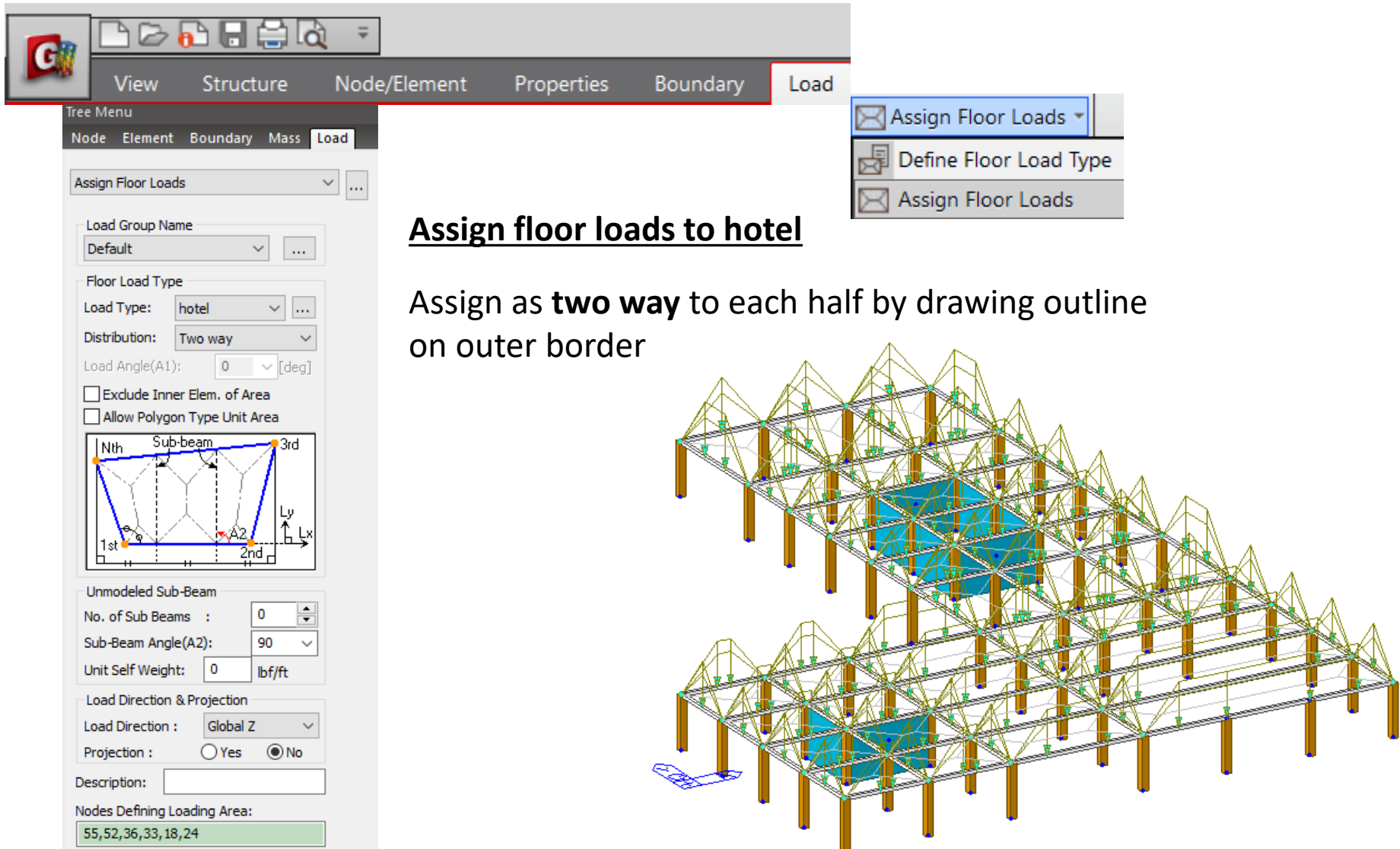
Assign floor loads to hotel

Define Floor loads >> Add

Dead = -0.5 kips/ft²

Live = -0.2 kips/ft²

Assign Floor Loads



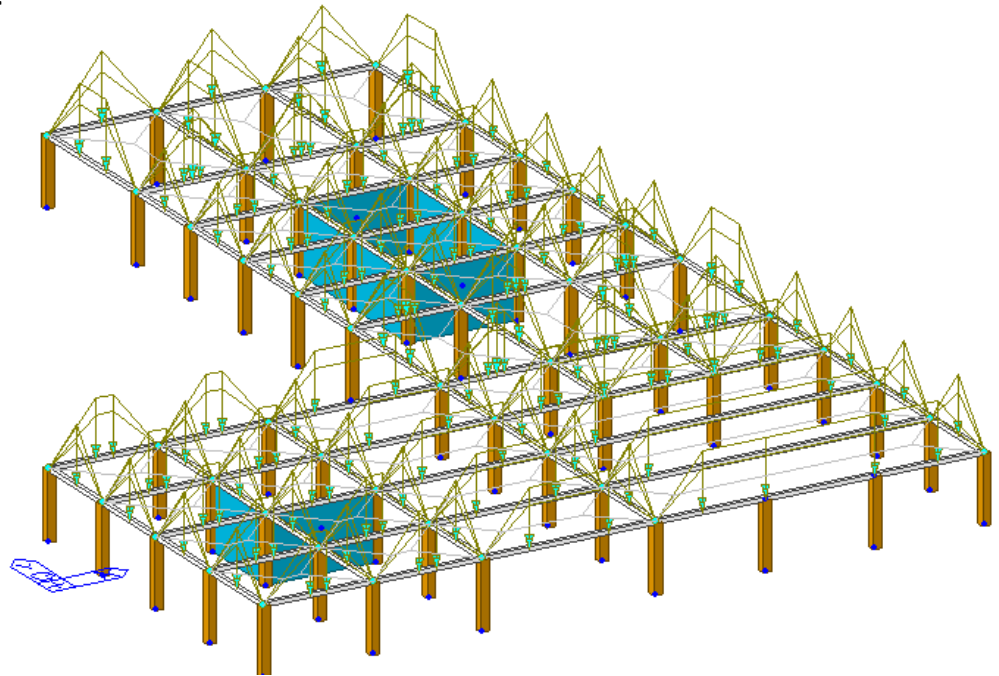
The screenshot displays the Midas Gen software interface. The 'Load' menu is open, showing the 'Assign Floor Loads' option. The 'Assign Floor Loads' dialog box is visible, showing the following settings:

- Load Group Name: Default
- Floor Load Type: hotel
- Load Type: hotel
- Distribution: Two way
- Load Angle(A1): 0 [deg]
- Exclude Inner Elem. of Area
- Allow Polygon Type Unit Area
- Unmodeled Sub-Beam:
 - No. of Sub Beams: 0
 - Sub-Beam Angle(A2): 90
 - Unit Self Weight: 0 lbf/ft
- Load Direction & Projection:
 - Load Direction: Global Z
 - Projection: Yes No
- Description: [Empty field]
- Nodes Defining Loading Area: 55,52,36,33,18,24

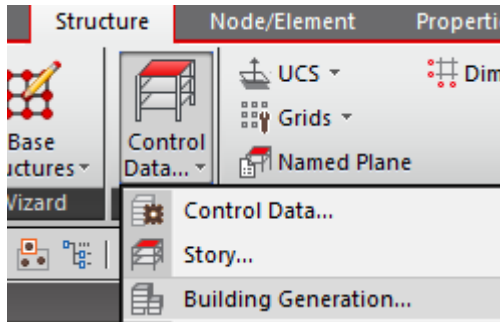
The 3D model on the right shows a building frame with a blue shaded area on the floor, indicating the assigned load area. The load is applied to the outer border of the floor.

Assign floor loads to hotel

Assign as **two way** to each half by drawing outline on outer border



Building Generation



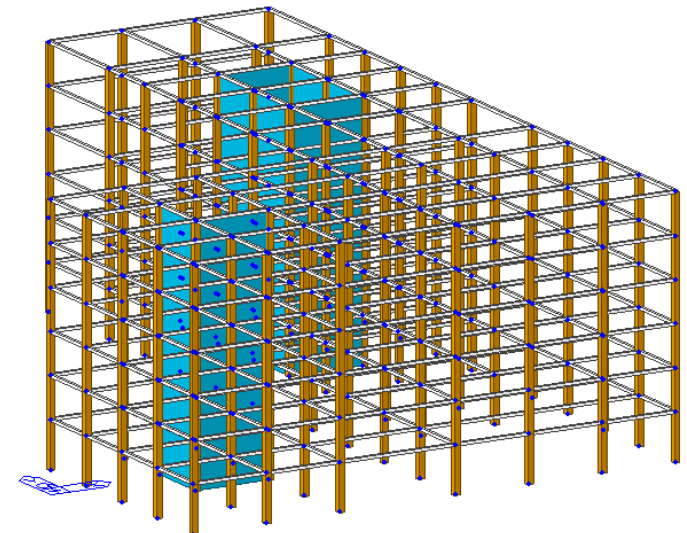
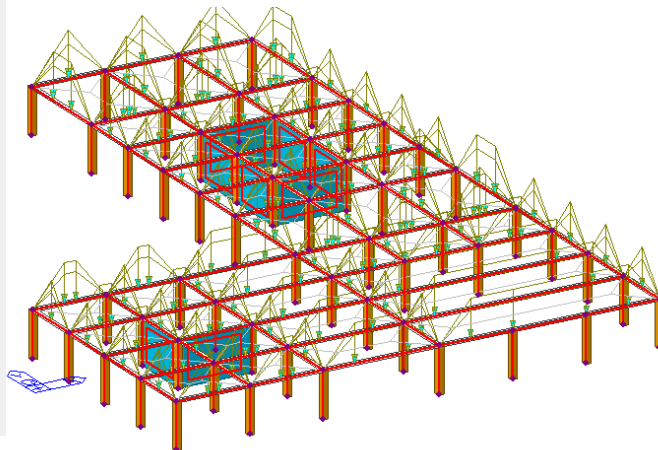
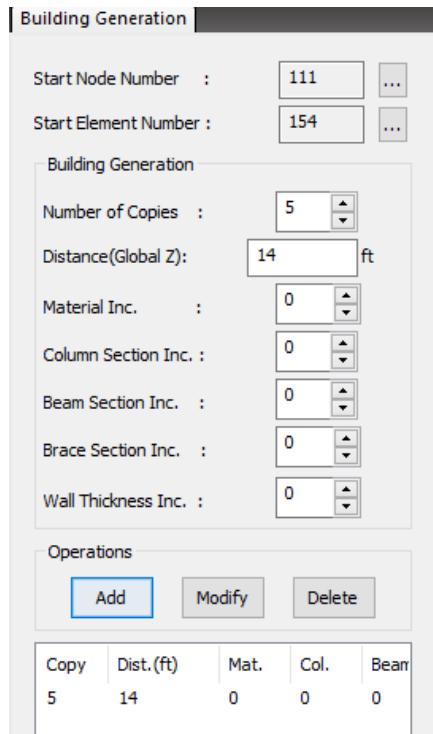
Make copies of the first floor

Select All

Copy 5 times at 14ft

Click Add

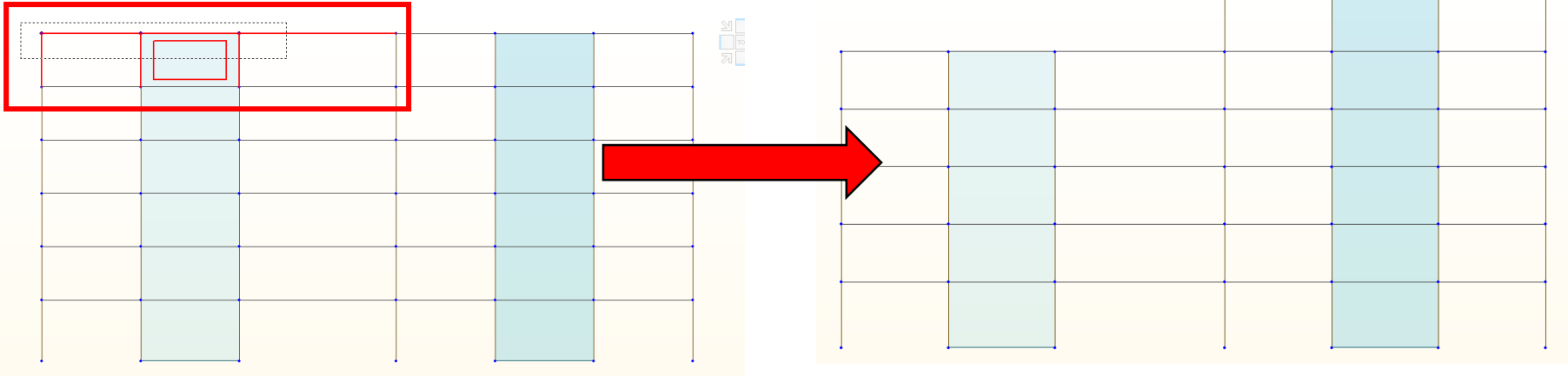
Click Apply



Delete Sections

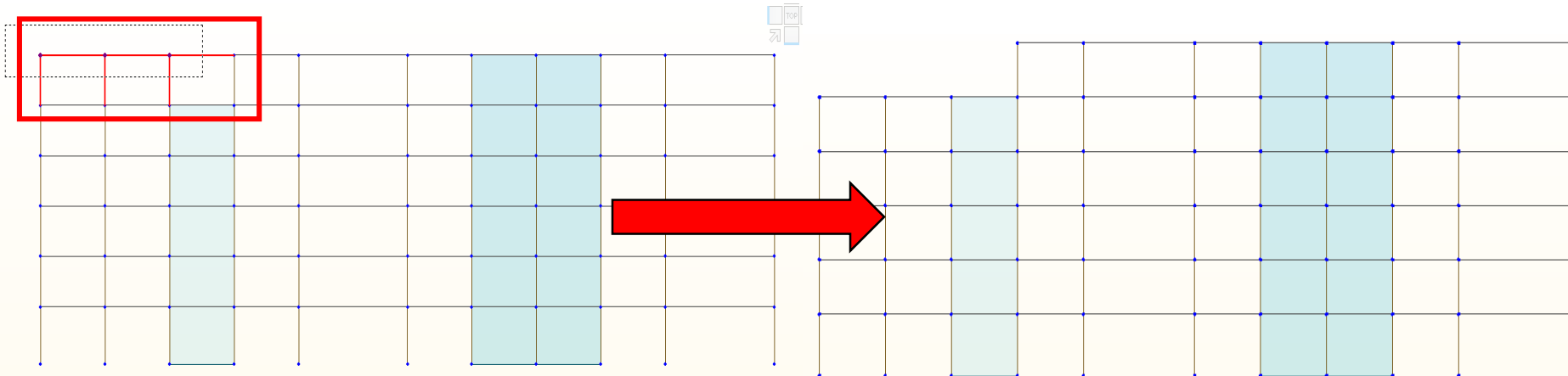
Change view to Front View

Select top left row as shown and delete

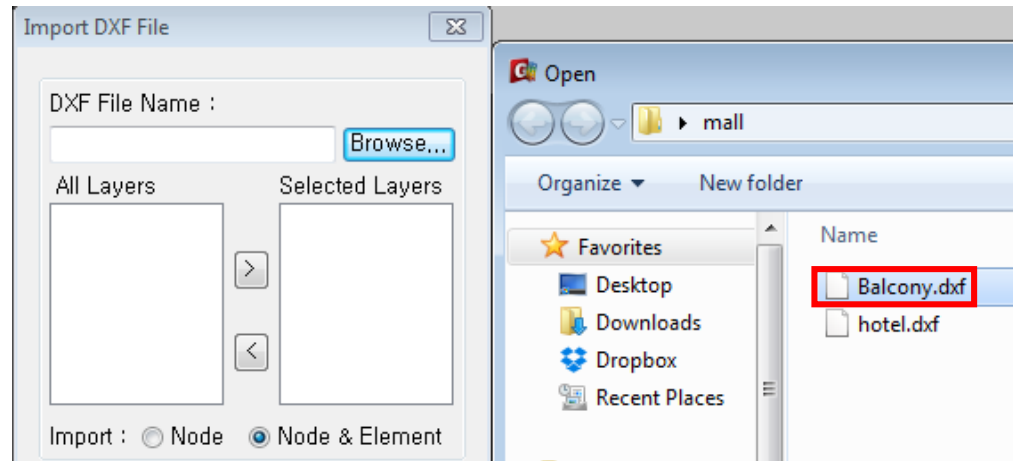
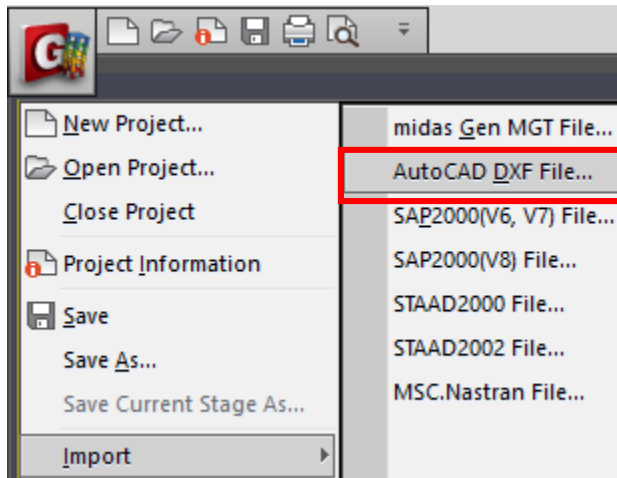


Change view to Right View

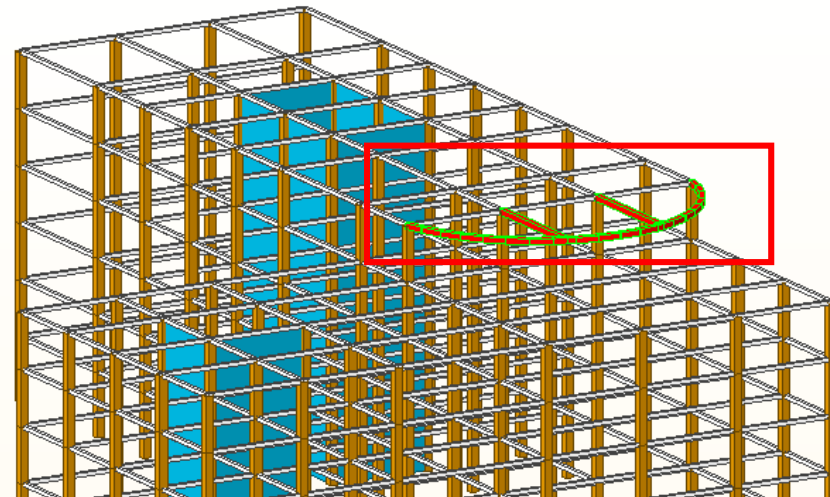
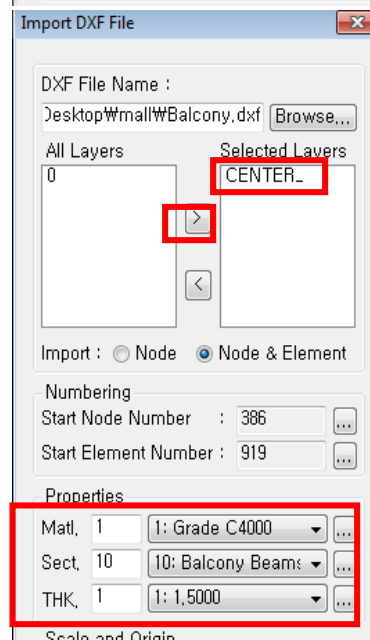
Select top left row as shown and delete



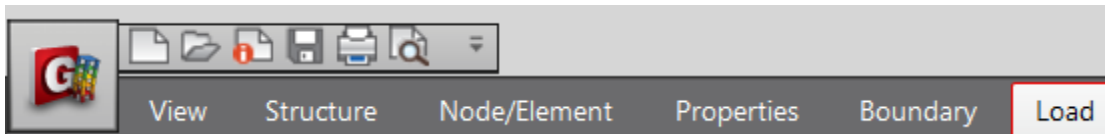
Import DXF CAD for Balcony



- Import Balcony DXF
- Select CENTER Layers
- Section Balcony Beam



Assign Upper Floor Loads



Tree Menu

Node Element Boundary Mass **Load**

Assign Floor Loads

Load Group Name: Default

Floor Load Type

Load Type: hotel

Distribution: Two way

Load Angle(A1): 0 [deg]

Exclude Inner Elem. of Area

Allow Polygon Type Unit Area

Unmodeled Sub-Beam

No. of Sub Beams : 0

Sub-Beam Angle(A2): 90

Unit Self Weight: 0 lbf/ft

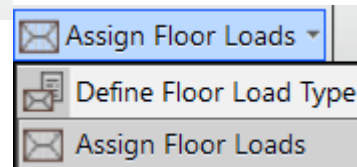
Load Direction & Projection

Load Direction : Global Z

Projection : Yes No

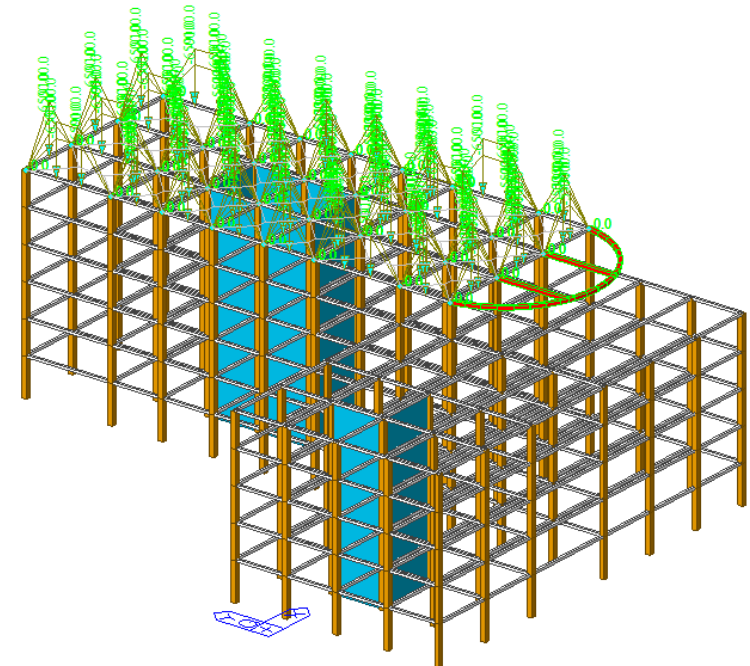
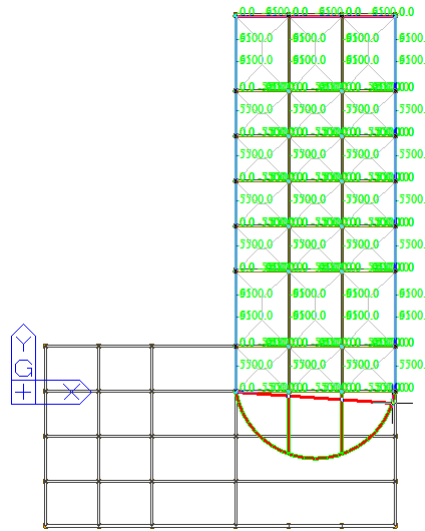
Description:

Nodes Defining Loading Area: 227,275,382,334

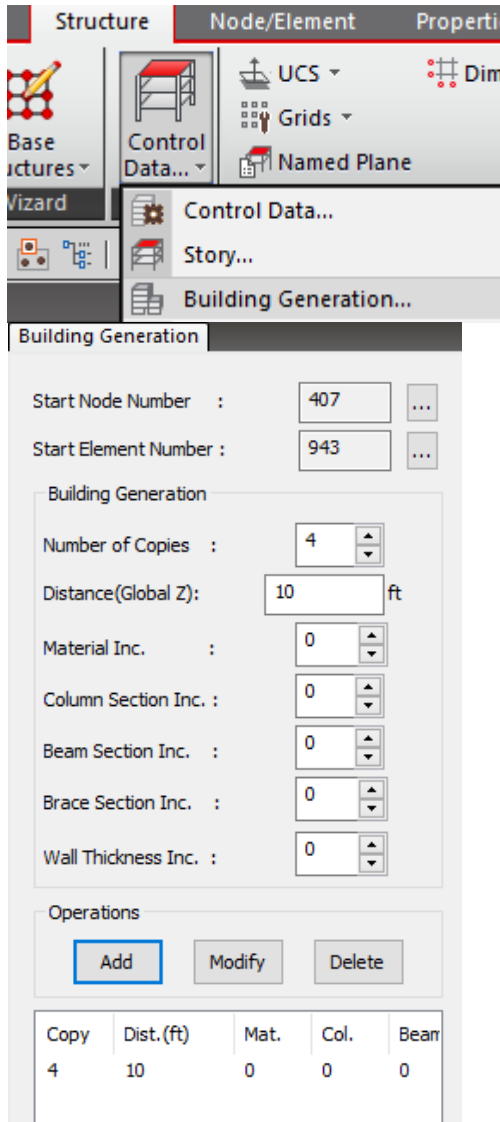


Assign floor loads to hotel

Assign as **two way** to each half by drawing outline on outer border (exclude balcony)



Building Generation



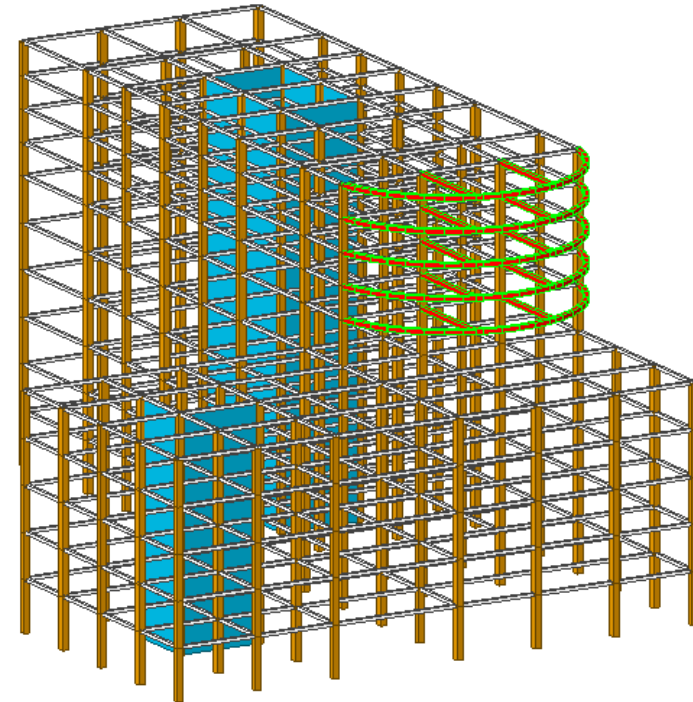
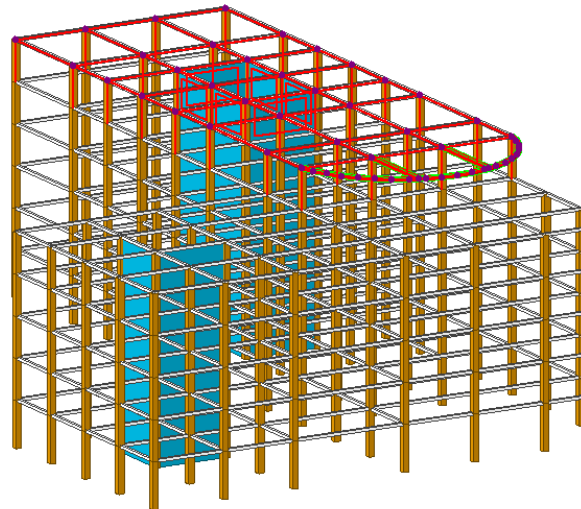
Make copies of the top floor only

Select top floor

Copy 4 times at 10 ft

Click Add

Click Apply



Generate story data

Auto Generate Story Data

Story Data

Ground Level: 0 ft

Module Name	Story Name	Level(ft)	Height(ft)	Floor Diaphragm
Base	Roof	126.00	0.00	Consider
Base	10F	116.00	10.00	Consider
Base	9F	106.00	10.00	Consider
Base	8F	96.00	10.00	Consider
Base	7F	86.00	10.00	Consider
Base	6F	72.00	14.00	Consider
Base	5F	58.00	14.00	Consider
Base	4F	44.00	14.00	Consider
Base	3F	30.00	14.00	Consider
Base	2F	16.00	14.00	Consider
Base	1F	0.00	16.00	Do not consider
*				

Automatic Generation of Story Data

Unselected List

Selected List

No	Level	No	Name	Level	Height
1	1F	0		0	16
2	2F	16		16	14
3	3F	30		30	14
4	4F	44		44	14
5	5F	58		58	14
6	6F	72		72	14
7	7F	86		86	10
8	8F	96		96	10
9	9F	106		106	10
10	10F	116		116	10
11	Roof	126		126	0

Include Seismic Accidental Eccentricity : 5 % of Plan Dimension

Include Wind Eccentricity : 15 % of Plan Dimension

OK Cancel

Structure Type

3-D X-Z Plane Y-Z Plane X-Y Plane Constraint RZ

Mass Control Parameter

Lumped Mass

Consider Off-diagonal Masses

Considering Rotational Rigid Body Mode for Modal Participation Factor

Consistent Mass

Convert Self-weight into Masses

Convert to X, Y, Z Convert to X, Y Convert to Z

Convert Self weight into Masses

Seismic Load X

Add Seismic Load

Load Case: Earthquake X

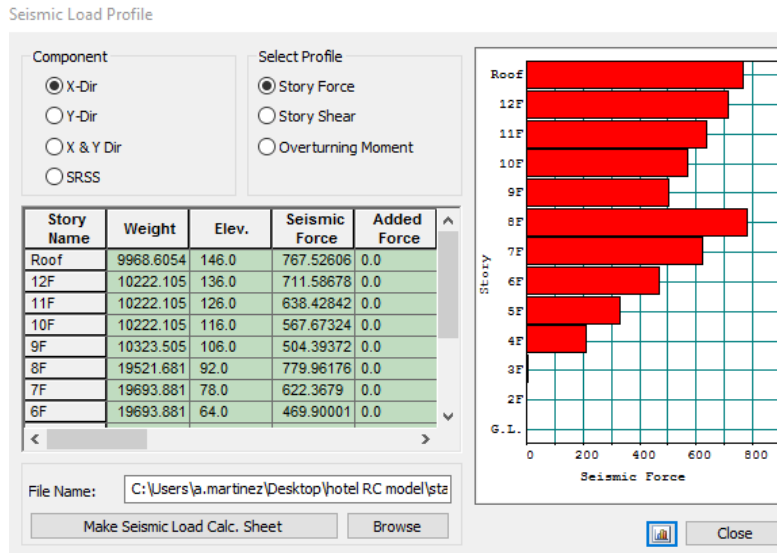
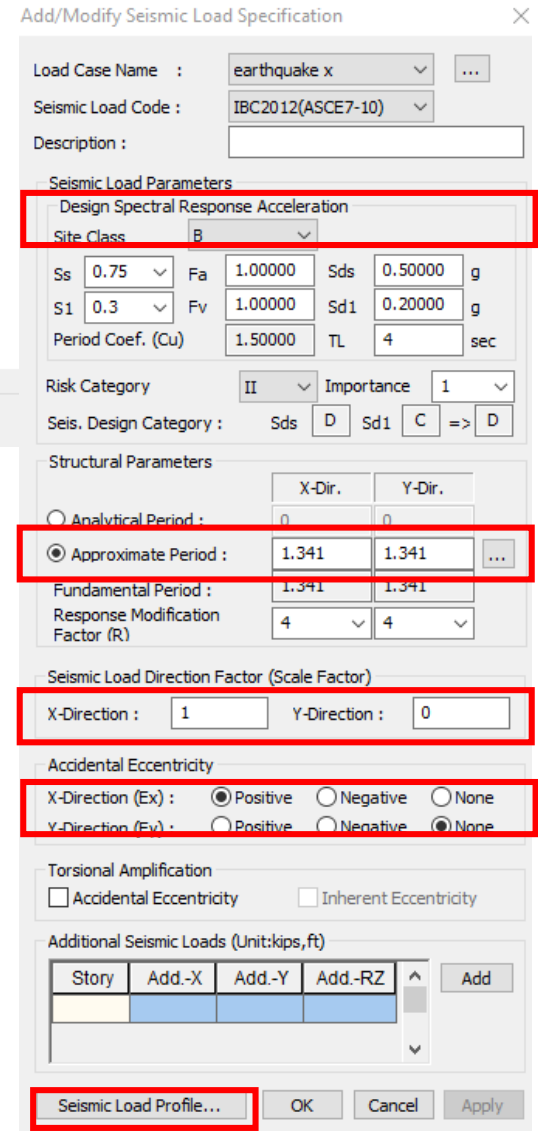
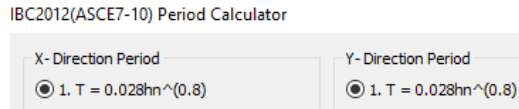
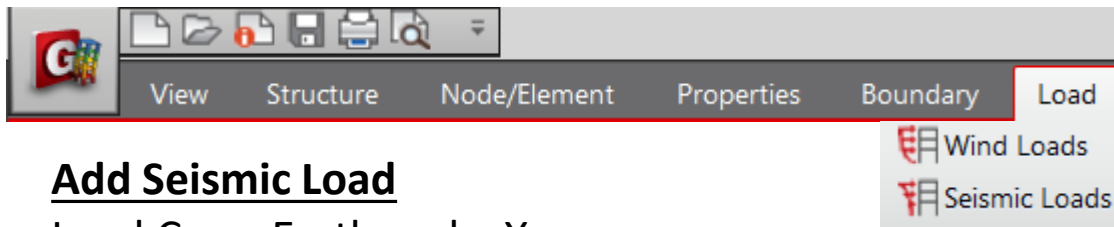
Wind Load Code: IBC 2012

Exposure: B

Period 1

X Direction 1 Scale Factor

Accidental Eccentricity X Direction Positive



Seismic Load Y

Add Seismic Load

Load Case: Earthquake Y

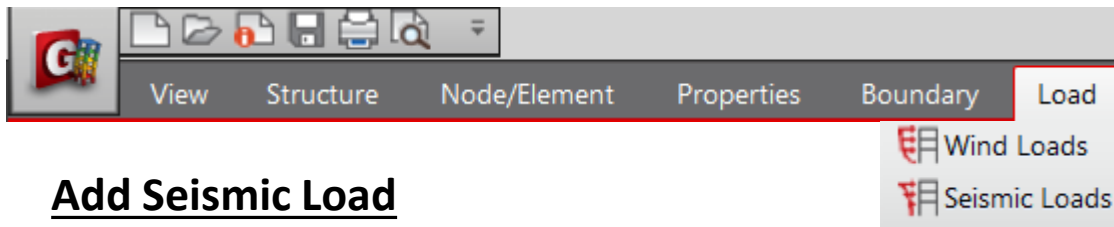
Wind Load Code: IBC 2012

Exposure: B

Period 1

Y Direction 1 Scale Factor

Accidental Eccentricity Y Positive



IBC2012(ASCE7-10) Period Calculator

X-Direction Period: 1. $T = 0.028hn^{0.8}$

Y-Direction Period: 1. $T = 0.028hn^{0.8}$

Seismic Load Profile

Component: X-Dir, Y-Dir, X & Y Dir, SRSS

Select Profile: Story Force, Story Shear, Overturning Moment

Story Name	Weight	Elev.	Seismic Force	Added Force
Roof	9968.6054	146.0	767.52606	0.0
12F	10222.105	136.0	711.58678	0.0
11F	10222.105	126.0	638.42842	0.0
10F	10222.105	116.0	567.67324	0.0
9F	10323.505	106.0	504.39372	0.0
8F	19521.681	92.0	779.96176	0.0
7F	19693.881	78.0	622.3679	0.0
6F	19693.881	64.0	469.90001	0.0

File Name: C:\Users\j.martinez\Desktop\hotel RC model\sta

Buttons: Make Seismic Load Calc. Sheet, Browse, Close

Add/Modify Seismic Load Specification

Load Case Name: earthquake y

Seismic Load Code: IBC2012(ASCE7-10)

Description:

Seismic Load Parameters

Design Spectral Response Acceleration

Site Class: B

Ss: 0.75, Fa: 1.00000, Sds: 0.50000 g

S1: 0.3, Fv: 1.00000, Sd1: 0.20000 g

Period Coef. (Cu): 1.50000, TL: 4 sec

Risk Category: II, Importance: 1

Seis. Design Category: Sds: D, Sd1: C => D

Structural Parameters

Analytical Period: X-Dir: 0, Y-Dir: 0

Approximate Period: X-Dir: 1.341, Y-Dir: 1.341

Fundamental Period: X-Dir: 1.341, Y-Dir: 1.341

Response Modification Factor (R): X-Dir: 4, Y-Dir: 4

Seismic Load Direction Factor (Scale Factor)

X-Direction: 0, Y-Direction: 1

Accidental Eccentricity

X-Direction (Ex): Positive, Negative, None

Y-Direction (Ey): Positive, Negative, None

Torsional Amplification

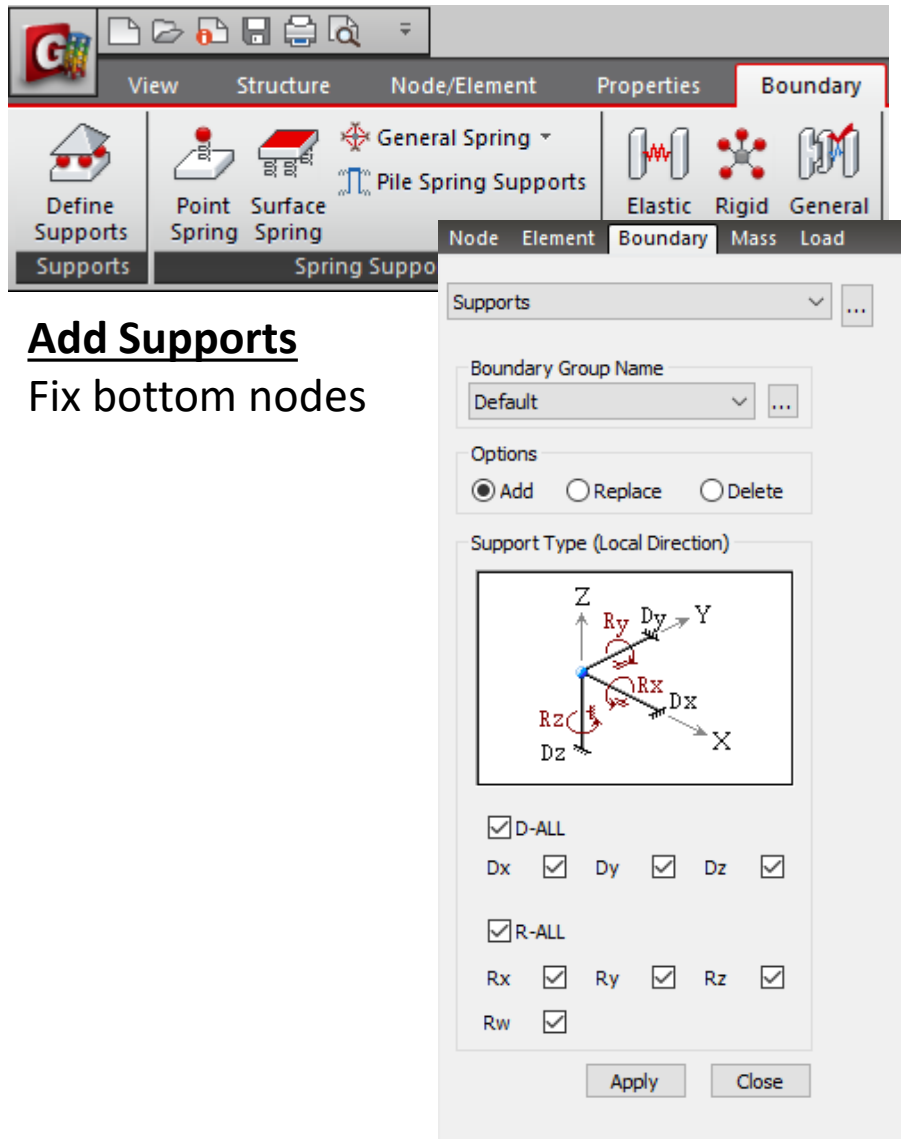
Accidental Eccentricity: Inherent Eccentricity:

Additional Seismic Loads (Unit:kips,ft)

Story	Add-X	Add-Y	Add-RZ

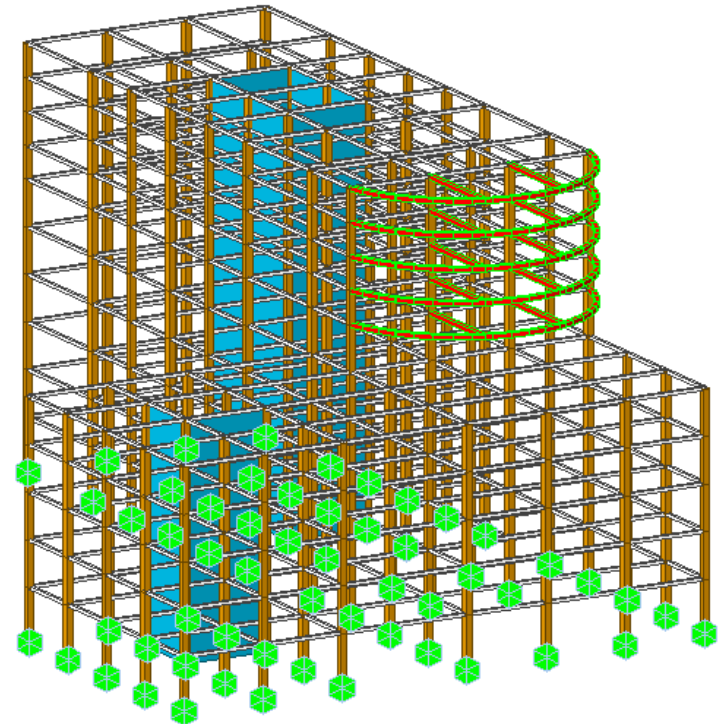
Buttons: Seismic Load Profile..., OK, Cancel, Apply

Boundary Condition

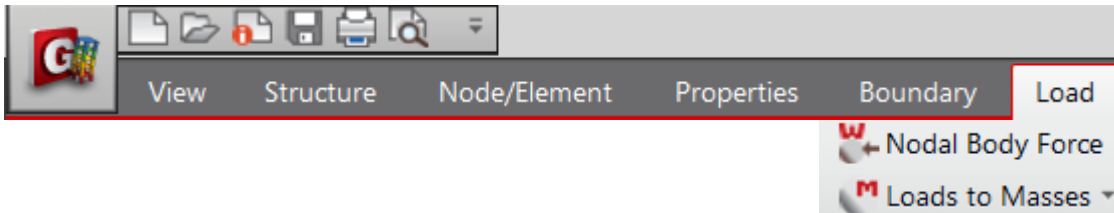


Add Supports

Fix bottom nodes



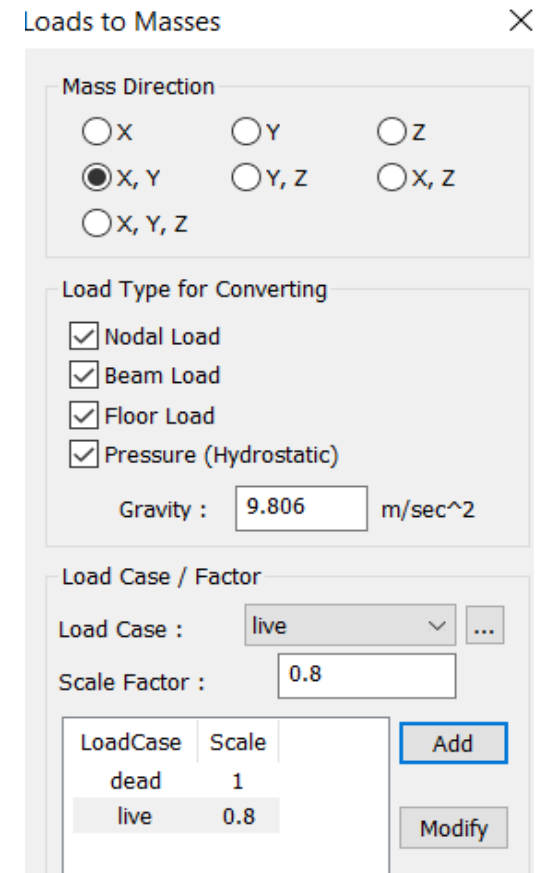
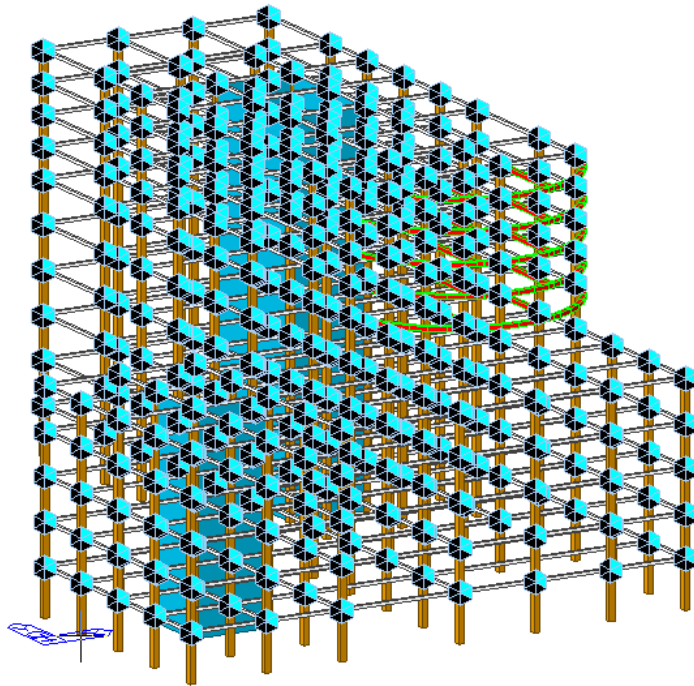
Load to masses



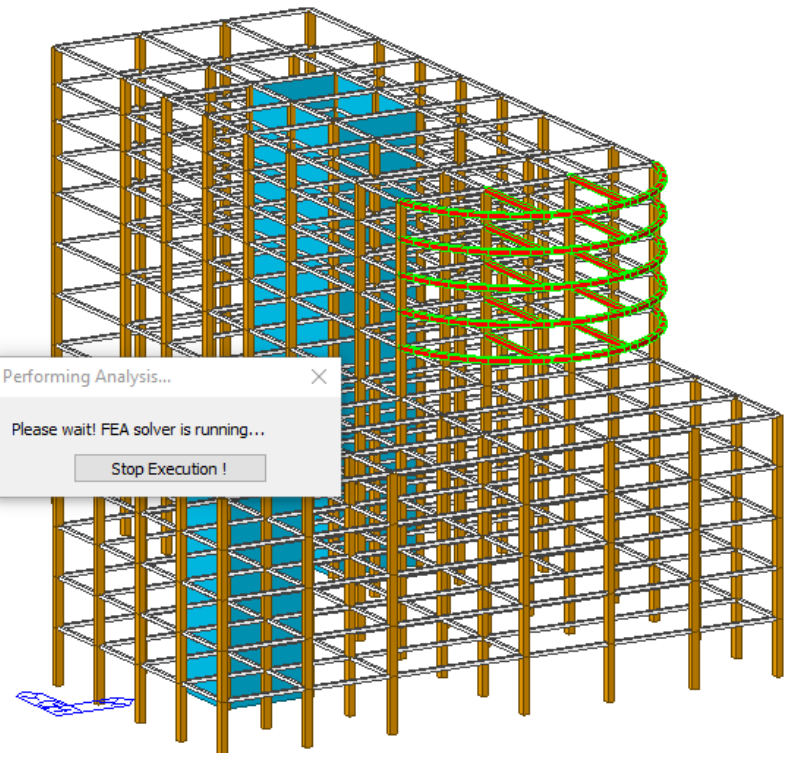
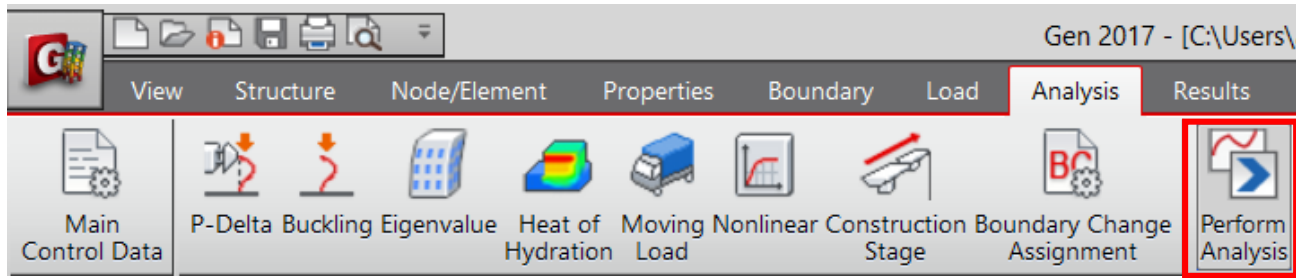
Create Load to Masses

Dead Scale Factor: 1

Live Scale Factor: 0.8



Perform Analysis



Message Window

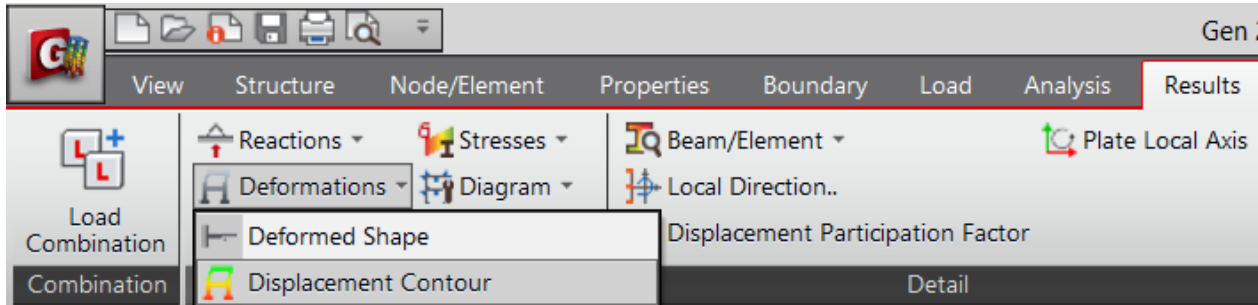
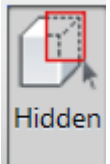
```

TOTAL NUMBER OF VALID DOFS IN MODEL :    1650

ENTRY STATIC ANALYSIS
MULTI-FRONTAL SOLUTION HAS BEEN COMPLETED.
DISPLACEMENT/FORCE/STRESS OUTPUT.
ELEM. :    1335 OF    1335

-----SOLUTION TERMINATED-----
YOUR MIDAS JOB IS SUCCESSFULLY COMPLETED.....C:\Users\a.martinez\Desktop\hotel RC model\practice rc
TOTAL SOLUTION TIME..:    7.13 [SEC]
    
```

Results: Deformations



Reactions | **Deformations** | Forces | Stresses

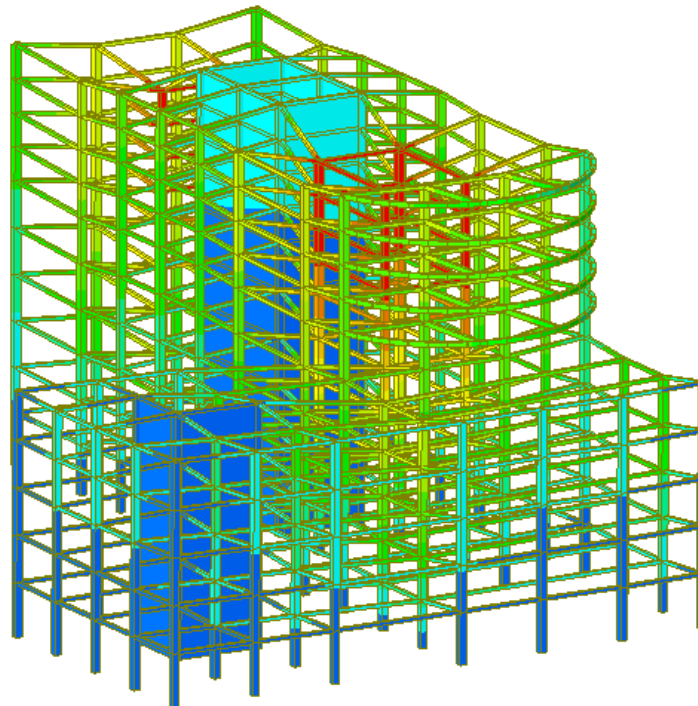
Displacement Contour

Load Cases/Combinations
 ST: live
 Step

Displacement Velocity
 Acceleration
 Absolute Acceleration

Components
 DX DY DZ
 RX RY RZ
 RW
 DXY DYZ DXZ
 DXYZ
 Local (if defined)

Type of Display
 Contour Deform
 Values Legend



DISPLACEMENT	
RESULTANT	
0.04	0.04
0.04	0.04
0.03	0.03
0.03	0.03
0.03	0.02
0.02	0.02
0.02	0.02
0.02	0.01
0.01	0.01
0.01	0.00
0.00	0.00

SCALEFACTOR=
 2.9565E+002
 ST: LIVE

MAX : 579
 MIN : 696

FILE: START FILE TU
 UNIT: ft

Results: Axial Forces

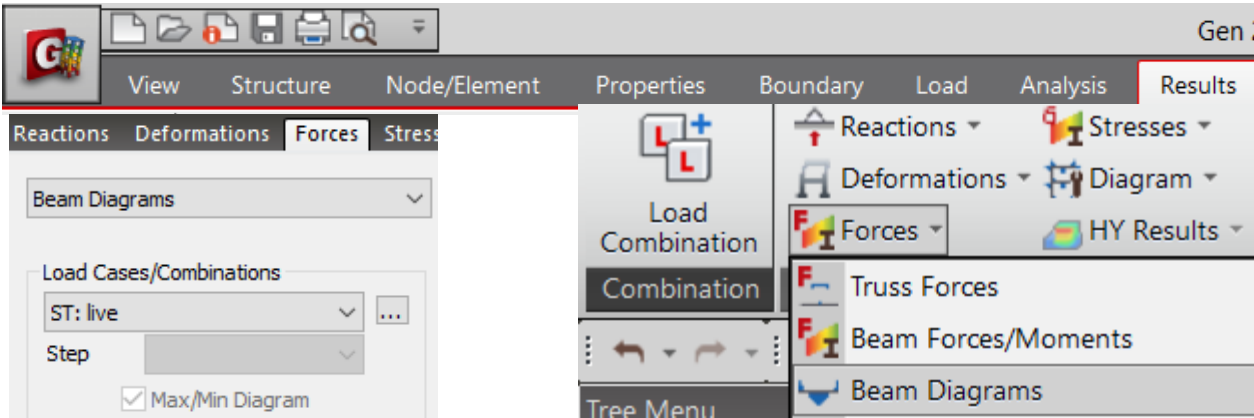
The screenshot displays the Midas Gen software interface. The 'Results' menu is open, showing options for 'Reactions', 'Deformations', 'Forces', and 'Stresses'. Under 'Forces', 'Beam Forces/Moments' is selected. The left sidebar shows the 'Forces' tab active, with 'Beam Diagrams' selected. The 'Load Cases/Combinations' section shows 'ST: live' and 'Step' selected. The 'Components' section shows 'Fx' selected. The 'Display Options' section shows '5 Points' and 'Solid Fill' selected. The 'Type of Display' section shows 'Contour' and 'Legend' selected.

The 3D model shows a truss structure with axial force diagrams. The legend on the right is titled 'AXIAL' and shows a color scale from 0.00 (blue) to -1524.27 (red). The legend values are:

Color	Value
Blue	0.00
Cyan	-138.57
Light Green	-277.14
Green	-415.71
Light Yellow	-554.28
Yellow	-692.85
Orange	-831.42
Dark Orange	-969.99
Red-Orange	-1108.56
Red	-1247.13
Dark Red	-1385.70
Red	-1524.27

ST: LIVE
 MAX : 1
 MIN : 127
 FILE: START FILE TU
 UNIT: kips

Results: Moments Y



Reactions Deformations **Forces** Stress

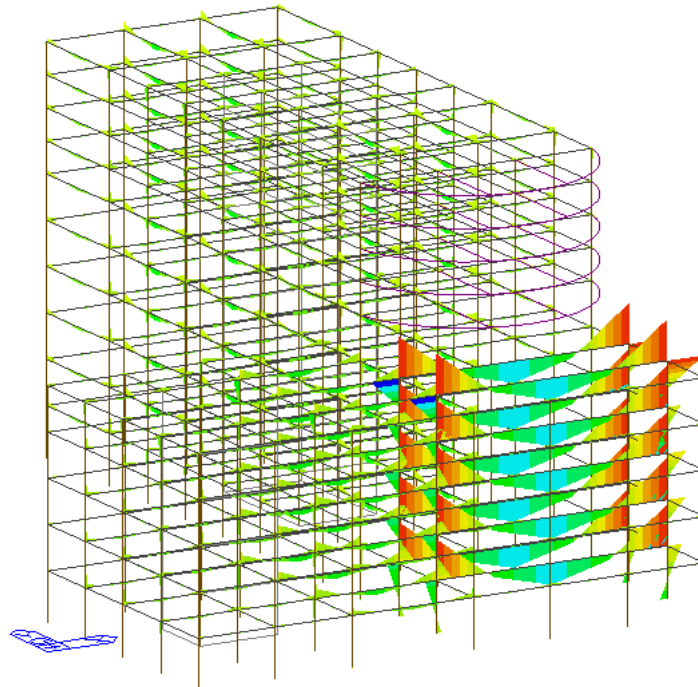
Beam Diagrams

Load Cases/Combinations
 ST: live
 Step
 Max/Min Diagram

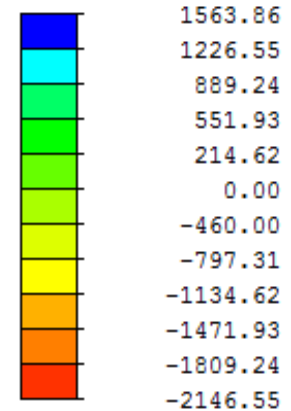
Components
 Part Total
 Fx Mx
 Fy Fz Fyz
 My Mz Myz
 Mb Mt Mw
 Show Truss Forces
 Only Truss Forces

Display Options
 Exact No Fill
 5 Points Line Fill
 Scale: 1.00000 Solid Fill

Type of Display
 Contour Deform
 Values Legend
 Animate Undeformed
 Mirrored Quick View



MOMENT-y



ST: LIVE

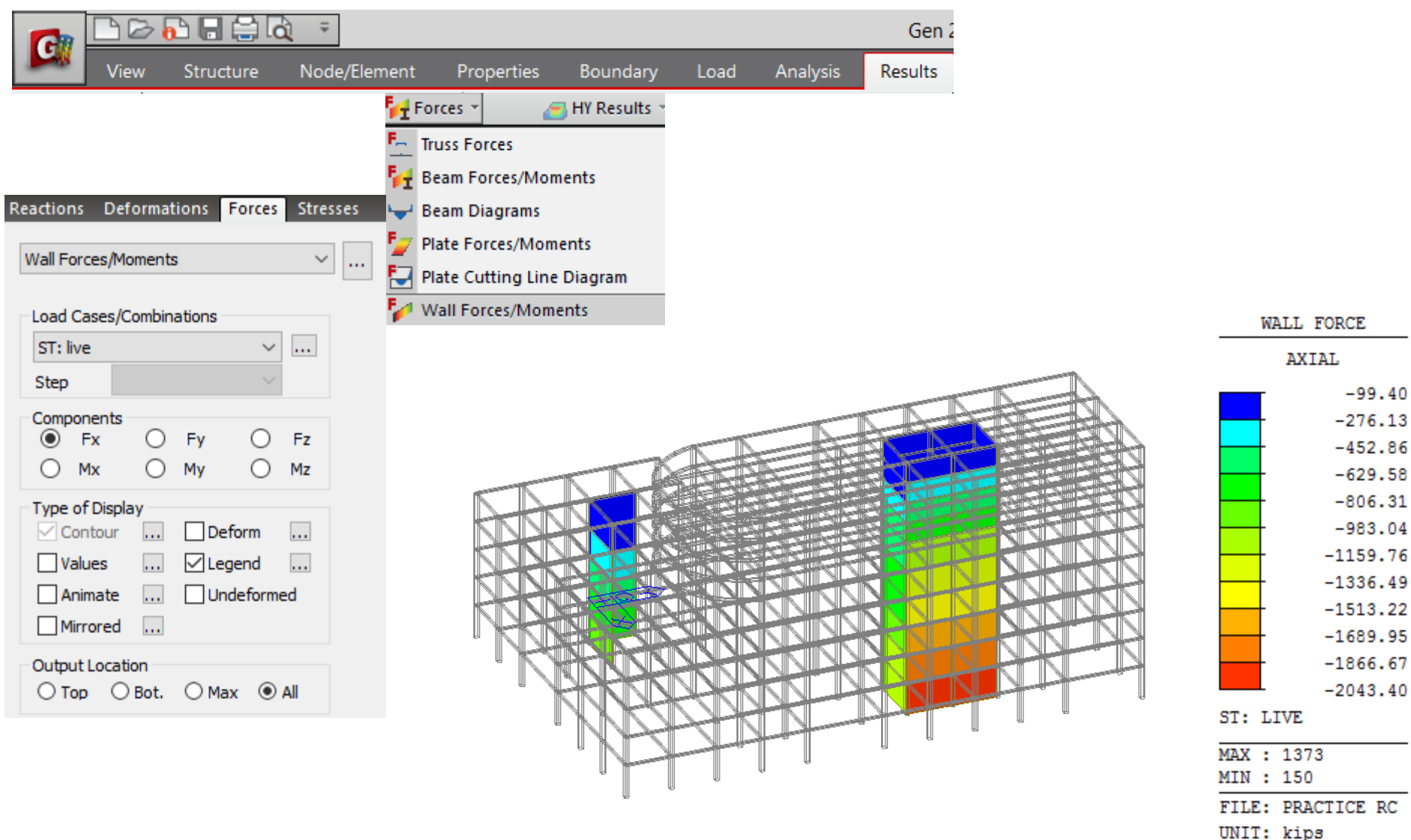
MAX : 713

MIN : 469

FILE: START FILE TU

UNIT: ft*kips

Results: Wall Forces



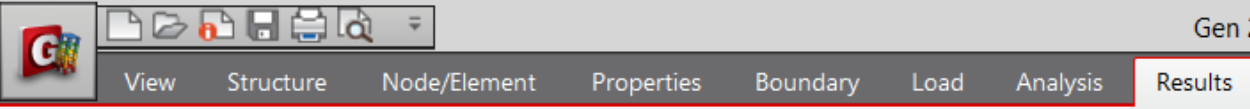
Load combination

Generate Load Combo

Select Concrete and Footing Design

Auto Generation

Design Code: ACI318-14



Load Combinations

General | Steel Design | Concrete Design | SRC Design | Cold Formed Steel Design | Footing Design

No	Name	Active	Type	Description	LoadCase	Factor
1	cLCB1	Stren	Add	1.4(D)		
2	cLCB2	Stren	Add	1.2(D) + 1.6(L)		
3	cLCB3	Stren	Add	1.2(D) + 1.0earthquake x + 1.0(
4	cLCB4	Stren	Add	1.2(D) + 1.0earthquake y + 1.0(
5	cLCB5	Stren	Add	1.2(D) - 1.0earthquake x + 1.0(
6	cLCB6	Stren	Add	1.2(D) - 1.0earthquake y + 1.0(
7	cLCB7	Stren	Add	0.9D		
8	cLCB8	Stren	Add	0.9(D) + 1.0earthquake x		
9	cLCB9	Stren	Add	0.9(D) + 1.0earthquake y		
10	cLCB10	Stren	Add	0.9(D) - 1.0earthquake x		
11	cLCB11	Stren	Add	0.9(D) - 1.0earthquake y		
12	cLCB12	Servi	Add	SERV (D)		
13	cLCB13	Servi	Add	SERV (D) + L		
14	cLCB14	Servi	Add	SERV (D) + 0.7earthquake x		
15	cLCB15	Servi	Add	SERV (D) + 0.7earthquake y		
16	cLCB16	Servi	Add	SERV (D) - 0.7earthquake x		
17	cLCB17	Servi	Add	SERV (D) - 0.7earthquake y		
18	cLCB18	Servi	Add	SERV (D) + 0.75L + 0.75(0.7)e		
19	cLCB19	Servi	Add	SERV (D) + 0.75L + 0.75(0.7)e		
20	cLCB20	Servi	Add	SERV (D) + 0.75L - 0.75(0.7)e		
21	cLCB21	Servi	Add	SERV (D) + 0.75L - 0.75(0.7)e		

Auto Generation...

Load Combinations

General | Steel Design | Concrete Design | SRC Design | Cold Formed Steel Design | Footing Design

No	Name	Active	Type	Description	LoadCase	Factor
1	fLCB1	Activ	Add	1.4(D)		
2	fLCB2	Activ	Add	1.2(D) + 1.6(L)		
3	fLCB3	Activ	Add	1.2(D) + 1.0earthquake x + 1.0(
4	fLCB4	Activ	Add	1.2(D) + 1.0earthquake y + 1.0(
5	fLCB5	Activ	Add	1.2(D) - 1.0earthquake x + 1.0(
6	fLCB6	Activ	Add	1.2(D) - 1.0earthquake y + 1.0(
7	fLCB7	Activ	Add	0.9D		
8	fLCB8	Activ	Add	0.9(D) + 1.0earthquake x		
9	fLCB9	Activ	Add	0.9(D) + 1.0earthquake y		
10	fLCB10	Activ	Add	0.9(D) - 1.0earthquake x		
11	fLCB11	Activ	Add	0.9(D) - 1.0earthquake y		
12	fLCB12	Activ	Add	(D)		
13	fLCB13	Activ	Add	(D) + L		
14	fLCB14	Activ	Add	(D) + 0.7earthquake x		
15	fLCB15	Activ	Add	(D) + 0.7earthquake y		
16	fLCB16	Activ	Add	(D) - 0.7earthquake x		
17	fLCB17	Activ	Add	(D) - 0.7earthquake y		
18	fLCB18	Activ	Add	(D) + 0.75L + 0.75(0.7)earthqua		
19	fLCB19	Activ	Add	(D) + 0.75L + 0.75(0.7)earthqua		
20	fLCB20	Activ	Add	(D) + 0.75L - 0.75(0.7)earthqua		
21	fLCB21	Activ	Add	(D) + 0.75L - 0.75(0.7)earthqua		

Auto Generation...

Automatic Generation of Load Combinations

Option: Add Replace

Code Selection: Steel Concrete SRC Cold Formed Steel Footing

Design Code: ACI318-14

Scale Up of Response Spectrum Load Cases: Scale Up Factor: 1

Wind Load Factor: Strength-level Service-level

Consider Lateral Soil Pressure Factor: Load Factor: 0.9

Manipulation of Construction Stage Load Case: ST: Static Load Case CS: Construction Stage Load Case ST Only CS Only ST+CS

Consider Orthogonal Effect: 100 : 30 Rule SRSS(Square-Root-of-Sum-of-Squares)

Generate Additional Load Combinations: for Special Seismic Load for Vertical Seismic Forces

Will Execute Construction Stage Analysis: Consider Losses for Prestress Load Cases

Transfer Stage: 1 Service Load Stage: 1

OK Cancel

Define Column Rebar Data

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View Structure Node/Element Properties Boundary Load Analysis Results Pushover Design

RC Design SRC Design

- Design Code
- Strength Reduction Factors
- Modify Concrete Material
- Limiting Maximum Rebar Ratio
- Limiting Minimum Section Size
- Design Criteria for Rebar
- Design Criteria for Rebars by Member
- Same Beam Rebar at Joints...
- Moment Redistribution Factor
- Torsion Reduction Factor
- Serviceability Parameters
- Uncertainly Load Combination Factor
- Modify Beam Rebar Data
- Modify Column Rebar Data

Modify Column Rebar Data

SECT	Name	Bar
1	Edge Col...	In
2	pile	-

Create Sub Section

Element List : 91to145 244to298 397to451 550tc

Rebar		Data			
Main	Numbers	6	#3		
	Rows	3			
	Corner	<input type="checkbox"/>	#3		
Ties/ Spirals	End(I & J)	y	3	#3	@ 4"
		z	3		
	Center(M)	y	3	#3	@ 4"
		z	3		

Concrete Face to Center of Rebar(do) : 0.20833 ft

Type of Hoop Rebar : Ties Spirals

Detail Figure

End(I & J)

Center(M)

Add Column Rebar Data

Specify rebar #3 as shown

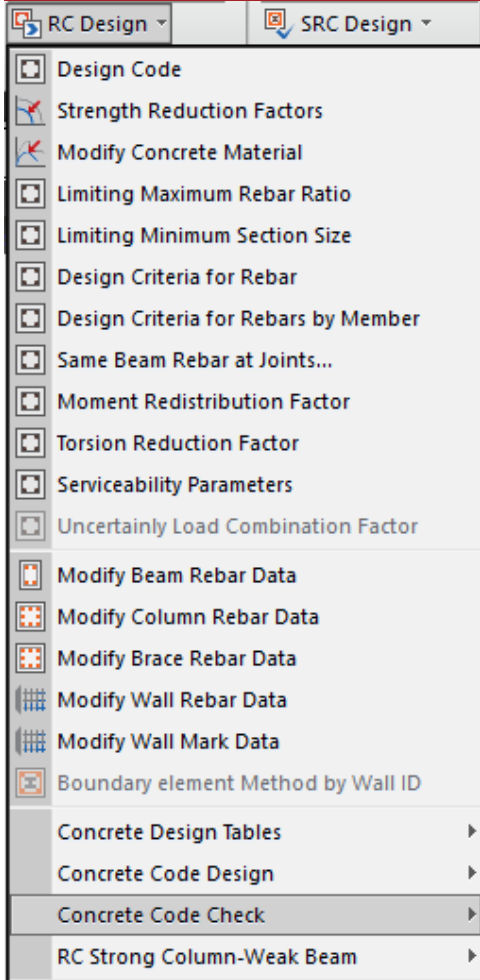
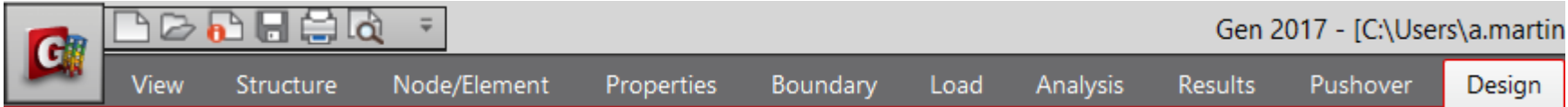
Preferences

Design Code	Load Code	Concrete	SRC
Steel			
Design Code: AISC(14th)-LRFD1C		Design Code: ACI318-14	Design Code: SSRC79
National Annex: Recommended		National Annex: Italy	Rebar Material Code: EN(RC)
Cold Formed Steel		Rebar Material Code: ASTM(RC)	Material DB: S220
Design Code: AISI-CFSD86		Material DB: Grade 40	
National Annex: Recommended			

Save Changes Upon OK

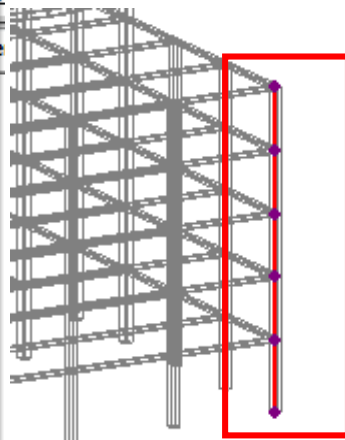
Default All Set Default OK Cancel

Column Code Check



Run Code Check

Select corner columns as shown



ACI318-11 RC-Column Checking Result Dialog

Code: ACI318-11 Unit: kips, ft Primary Sorting Option: SECT

Sorted by: Member Property

MEMB	SE	Section	fc	fy	CHK	LC	V-Rebar	phiPn-max	Pu	D_nsy	Mcy	Mcz	LC	Vu.end	Rat-V.end
SECT	L	Bc Hc	Height	fys	PK	B			Rat-P	D_nsz	Rat-My	Rat-Mz	B	Vu.mid	Rat-V.mid
0		Edge Column	1008.00	5760.00	PM*	2	6-3-#3	1793.83	142.261	1.000	503.189	288.266	2	57.4653	0.456
1	<input checked="" type="checkbox"/>	2.000 2.000	14.000	5760.00					15.451	1.000	15.599	15.647	2	57.4653	0.455

No: 1 Print Print All Close Save

1. Design Condition

Design Code : ACI318-11 UNIT SYSTEM : kips, ft
 Member Number : 726 (PM), 726 (Shear)
 Material Data : fc = 1008, fy = 5760, fys = 5760 ksf
 Column Height : 14 ft
 Section Property : Edge Column 11-15 (No : 1)
 Rebar Pattern : 6 - 3 - #3 Ast = 0.00458333 ft² (Rhostr = 0.001 < Rhostrn = 0.010f)

2. Applied Loads

Load Combination : 2 AT (I) Point
 Pu = 142.261 kips My = 503.189 ft-kips Mz = 288.266 ft-kips
 Mc = SQRT(My² + Mz²) = 579.911 ft-kips

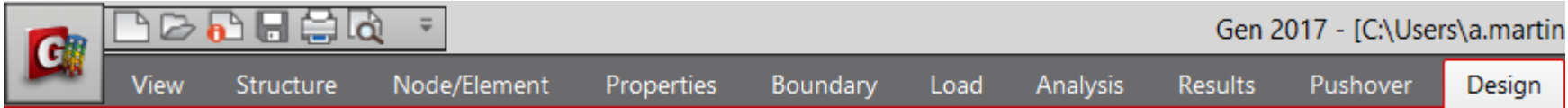
3. Axial Forces and Moments Capacity Check

Concentric Max. Axial Load	phiPn-max = 1793.83 kips	
Axial Load Ratio	Pu/phiPn = 142.261 / 9.20707	= 15.451 > 1.000 N.G
Moment Ratio	Mp/phiMn = 579.911 / 37.1473	= 15.611 > 1.000 N.G
	My/phiMny = 503.189 / 32.2571	= 15.599 > 1.000 N.G
	Mz/phiMnz = 288.266 / 18.4227	= 15.647 > 1.000 N.G

4. P-M Interaction Diagram

P(kips)	phiPn(kips)	phiMn(ft-kips)
2242.29		0.00
1978.19		235.07
1688.31		418.50
1432.06		518.86
1214.15		558.89
1044.98		561.93
951.98		553.40
848.52		520.62
797.03		536.01
725.71		546.02
550.04		469.63
244.24		245.17
-23.76		0.00

Column Design



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- RC Design ▾
- SRC Design ▾
- Design Code
- Strength Reduction Factors
- Modify Concrete Material
- Limiting Maximum Rebar Ratio
- Limiting Minimum Section Size
- Design Criteria for Rebar**
- Design Criteria for Rebars by Member
- Same Beam Rebar at Joints...
- Moment Redistribution Factor
- Torsion Reduction Factor
- Serviceability Parameters
- Uncertainly Load Combination Factor
- Modify Beam Rebar Data
- Modify Column Rebar Data
- Modify Brace Rebar Data
- Modify Wall Rebar Data
- Modify Wall Mark Data
- Boundary element Method by Wall ID
- Concrete Design Tables
- Concrete Code Design
- Concrete Code Check

Run Design Specify Design Criteria for Rebar

For Column Design

Main Rebar: Rebar...

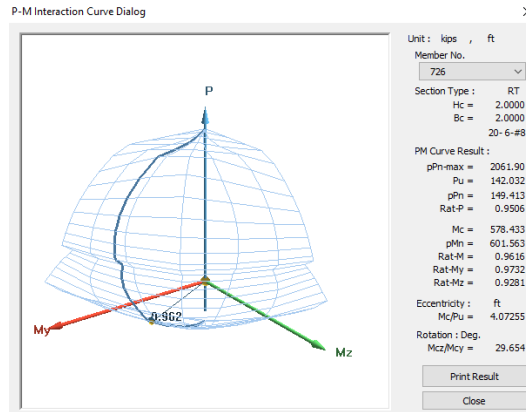
Ties/Spirals: #3 Arrangement: Y: 2

do: 0 ft Z: 2

ACI318-11 RC-Column Design Result Dialog

Code: ACI318-11 Unit: kips, ft Primary Sorting Option: SECT

MEMB	SE	Section	fc	fy	LC	Pu	Mc	Ast	V-Rebar	LC	Vu.end	Rat-V.end	As-H.end	H-Rebar.end
SECT	L	Bc Hc	Height	fys	B	Rat-P	Rat-M			B	Vu.mid	Rat-V.mid	As-H.mid	H-Rebar.mid
0		Edge Column	1008.00	5760.00	2	142.261	579.911	0.1097	20-6-#8	2	57.4653	0.583	0.0031	2-#3 @5.5"
1		2.000 2.000	14.000	5760.00		0.960	0.965			2	57.4653	0.581	0.0031	2-#3 @5.5"



No: 1

1. Design Condition

Design Code: ACI318-11 UNIT SYSTEM: kips, ft
Member Number: 726 (PM), 726 (Shear)
Material Data: fc = 1008, fy = 5760, fys = 5760 ksf
Column Height: 14 ft
Section Property: Edge Column 11-15 (No: 1)
Rebar Pattern: 20-6-#8 Ast = 0.109722 ft² (Rho = 0.027)

2. Applied Loads

Load Combination: 2 AT (I) Point
Pu = 142.261 kips My = 503.189 ft-kips Mz = 288.266 ft-kips
Mc = SQRT(My² + Mz²) = 579.911 ft-kips

3. Axial Forces and Moments Capacity Check

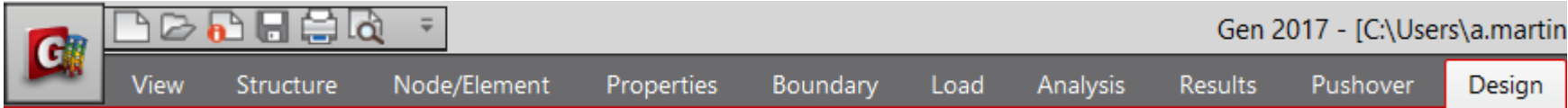
Concentric Max. Axial Load phiPn-max = 2061.90 kips
Axial Load Ratio Pu/phiPn = 142.261 / 148.192 = 0.960 < 1.000 OK
Moment Ratio Mo/phiMn = 579.911 / 600.924 = 0.965 < 1.000 OK
Mo/phiMny = 503.189 / 515.288 = 0.977 < 1.000 OK
Mz/phiMnz = 288.266 / 309.173 = 0.932 < 1.000 OK

4. P-M Interaction Diagram

phiPn(kips) phiMn(ft-kips)

2577.37	0.00
2516.67	130.21
2233.87	349.89
1846.12	546.88
1477.09	656.42
1170.56	697.52
990.92	704.77
820.77	671.56
634.50	688.95
365.97	661.59
-16.50	-493.27
-19.82	165.75
-568.80	0.00

Footing Design



ACI318-11 | SRC79 | RC Design | SRC Design

- Design Code
- Strength Reduction Factors
- Modify Concrete Material
- Limiting Maximum Rebar Ratio
- Limiting Minimum Section Size
- Design Criteria for Rebar
- Design Criteria for Rebars by Member
- Same Beam Rebar at Joints...
- Moment Redistribution Factor
- Torsion Reduction Factor
- Serviceability Parameters
- Uncertainly Load Combination Factor
- Modify Beam Rebar Data
- Modify Column Rebar Data
- Modify Brace Rebar Data
- Modify Wall Rebar Data
- Modify Wall Mark Data
- Boundary element Method by Wall ID
- Concrete Design Tables
- Concrete Code Design
- Concrete Code Check
- RC Strong Column-Weak Beam
- Footing Design Ctrl+9

Footing Design

Name: footing **Node No: 61**

Material Strength: kips/ft²
Concrete (f_c): 431.9995
Re-bar (f_y): 8640.000

Re-bar Size: #7
X Direction: #7
Y Direction: #7

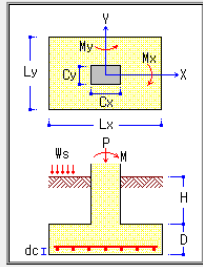
Isolated FDN

Allowable Soil Pressure (Q_e): 5.759995 kips/ft²

Misc. Load
Surcharge Load (W_s): 0 kips/ft²
Soil Height (h): 0 ft
Soil Density (γ_q): 0.120000 kips/ft³

Major Axis
X Axis:
Y Axis:

Auto Design



Load Combination Select

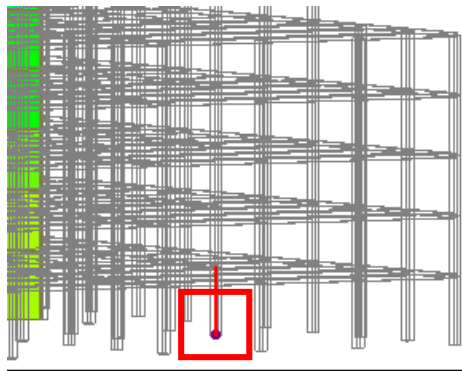
<=== Service Load Select				Factored Load Select >===	
SEL	ID	NAME : Description	ID	SEL	
<input type="checkbox"/>	1	fLCB1 : 1.4(D)	1	<input checked="" type="checkbox"/>	
<input type="checkbox"/>	2	fLCB2 : 1.2(D) + 1.6(L)	2	<input checked="" type="checkbox"/>	
<input type="checkbox"/>	3	fLCB3 : 1.2(D) + 1.0earthquake x + 1.0(L)	3	<input checked="" type="checkbox"/>	
<input type="checkbox"/>	4	fLCB4 : 1.2(D) + 1.0earthquake y + 1.0(L)	4	<input checked="" type="checkbox"/>	
<input type="checkbox"/>	5	fLCB5 : 1.2(D) - 1.0earthquake x + 1.0(L)	5	<input checked="" type="checkbox"/>	
<input type="checkbox"/>	6	fLCB6 : 1.2(D) - 1.0earthquake y + 1.0(L)	6	<input checked="" type="checkbox"/>	
<input type="checkbox"/>	7	fLCB7 : 0.9D	7	<input checked="" type="checkbox"/>	
<input type="checkbox"/>	8	fLCB8 : 0.9(D) + 1.0earthquake x	8	<input checked="" type="checkbox"/>	
<input type="checkbox"/>	9	fLCB9 : 0.9(D) + 1.0earthquake y	9	<input checked="" type="checkbox"/>	
<input type="checkbox"/>	10	fLCB10 : 0.9(D) - 1.0earthquake x	10	<input checked="" type="checkbox"/>	
<input type="checkbox"/>	11	fLCB11 : 0.9(D) - 1.0earthquake y	11	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	12	fLCB12 : (D)	12	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	13	fLCB13 : (D) + L	13	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	14	fLCB14 : (D) + 0.7earthquake x	14	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	15	fLCB15 : (D) + 0.7earthquake y	15	<input type="checkbox"/>	

Load Combinations Cancel OK

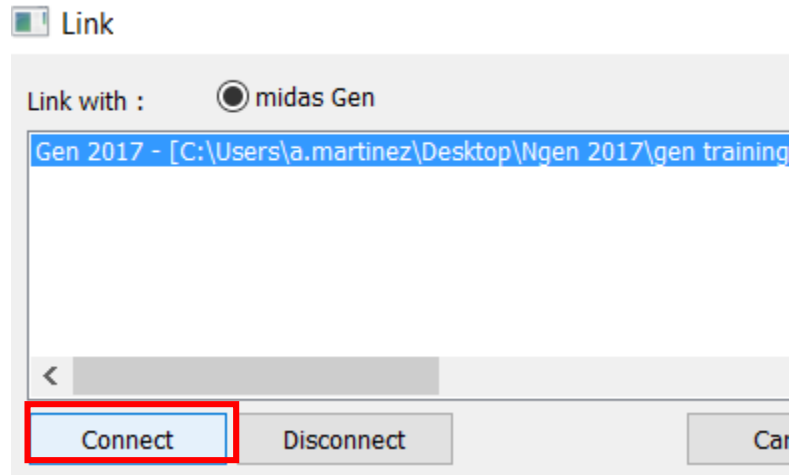
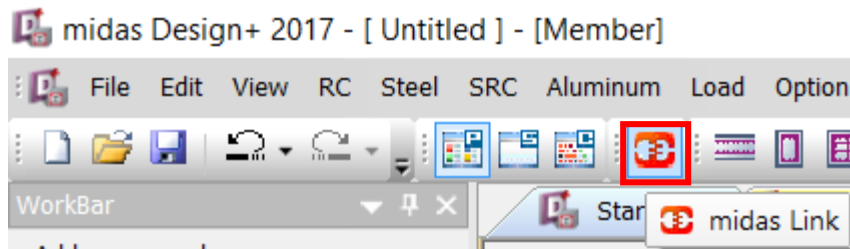
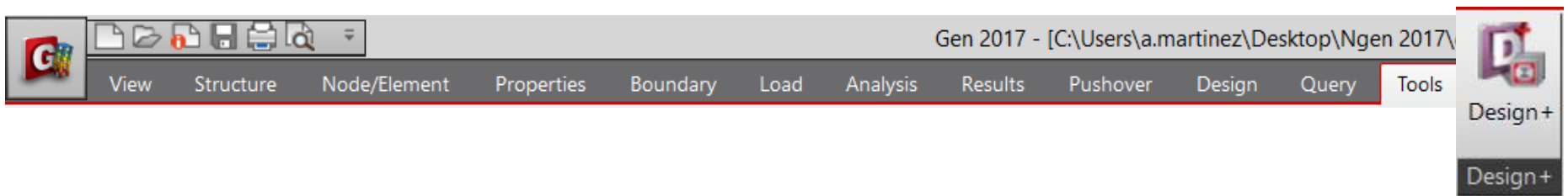
PreView Window

Print | Close | Save emf | Save bmp

- Geometry and Materials**
Material : fc = 432, fy = 8640 kip/ft²
Dim : 20.3333 * 20.3333 * 0.833333 ft (Dc = 0.291667 ft)
Allow. Soil Q_e = 5.76 kip/ft²
- Design Condition**
Design Code : ACI318-02
Selected Node No : 61
Design Node No : 61 (Column Size: phi-2 ft)
Design Load Combination
Service : 13, fLCB11 : (D) + L
Factored : 2, fLCB2 : 1.2(D) + 1.6(L)
Applied Loads
P_s = 2578.60, P_u = 3371.49 kip
M_{ax} = 0.00000, M_{ux} = 0.00000 kip-ft
M_y = 0.00000, M_{uy} = 0.00000 kip-ft
- Soil Bearing Pressure Check**
Actual Pressure
Q_e(max) = 6.36188 kip/ft² > Q_e = 5.76000 kip/ft² N.G
Q_e(min) = 6.36188 kip/ft² > 0.00 kip/ft² O.K
Design Pressure
Q_u(max) = 8.15464 kip/ft²
Q_u(min) = 8.15464 kip/ft²
- Shear Check** (phi= 0.75)
One Way Shear
V_{uy} = 1430.12 kip > phi/V_{ny} = 130.301 kip N.G
V_{ux} = 1442.21 kip > phi/V_{nx} = 112.781 kip N.G
Punching Shear
V_u = 3331.30 kip > phi/V_n = 94.0816 kip N.G



Design Plus Import



Run Check on section

Add new member

System: RC

Type: Footing

Node: **61**

Option... Import

Material

Concrete: 24 MPa

Main Bar: 400 MPa

Light Weight Concrete

Factor: 1

Design Load

Ps: 23794.17 kN

Msx: 12.21 kN.m

Msy: -169.06 kN.m

Load Combinations (6) ...

Pu: 32359.49 kN

Mux: 16.69 kN.m

Muy: -230.77 kN.m

Load Combinations (6) ...

Include Self-Weight Mx <-> My

Surcharge Load

Surface Load: 0.00 kN/m²

Weight Density: 18.00 kN/m³

Height: 0.00 m

Footing

Type: Isolated (Mat)

Depth: 700.00 mm

Cover: 80.00 mm

Column Section

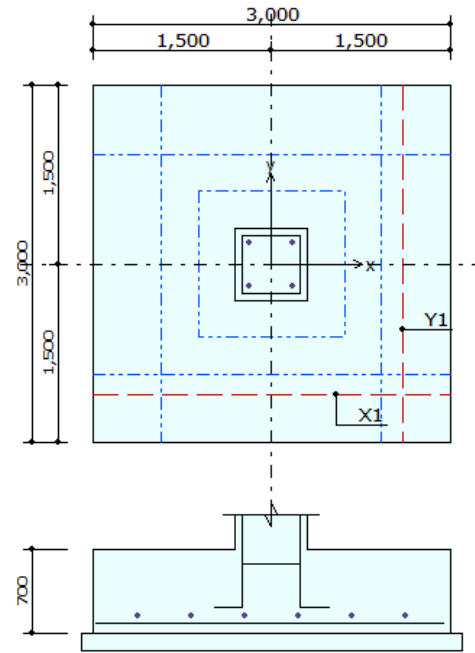
Rectangle Circle

Cx: 609.60 mm

Cy: 609.60 mm

Ex: 0.00 mm

Ey: 0.00 mm



Rebar

	Y-Direction (Mux)		X-Direction (Muy)	
Moment (kN.m)	783		791	
Layer 1 (mm)	#8	@ 450.00	#8	@ 450.00
Layer 2 (mm)	@		@	
Result	NG(11.04)		NG(10.67)	

Calculation Result

Check Items	Result
Soil Bearing (kPa)	2700 NG(27.00)
1Way Shear-X (kN)	6439 NG(5.792)
1Way Shear-Y (kN)	6647 NG(6.240)
2Way Shear (kN)	27035 NG(7.494)
Min. Bar Ratio (mm ²)	0.180% 384
Max. Bar Space (mm)	#8 @457

Footing Size

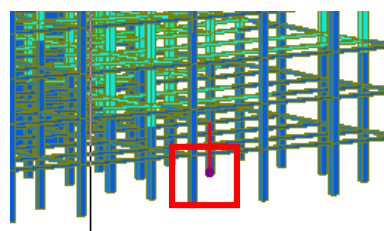
FOOTING SIZE		
Lx	3.00	m
Ly	3.00	m
SOIL BEARING		
Capacity(fe)	100.00	kPa

Design(F4)

Check(F5)

Report ...

Apply(F3)



Run Design on section

Preference

General | Design | Drawing | Word | System

Section RC(1) | RC(2) | RC(3) | Shear Wall | Steel | SRC

Slab Change Section by Design
 Max. Thick 1000.00 mm

Footing Change Section by Design
 Max. Thick 2000.00 mm

Material

Concrete 24 MPa
 Main Bar 400 MPa
 Light Weight Concrete
 Factor 1

Design Load

Ps 14157.22 kN
 Msx 7.12 kN.m
 Msy -99.27 kN.m
 Load Combinations (6) ...

Pu 18511.77 kN
 Mux 9.36 kN.m
 Muy -130.29 kN.m
 Load Combinations (6) ...

Include Self-Weight Mx <-> My

Surcharge Load

Surface Load 0.00 kN/m²
 Weight Density 18.00 kN/m³
 Height 0.00 m

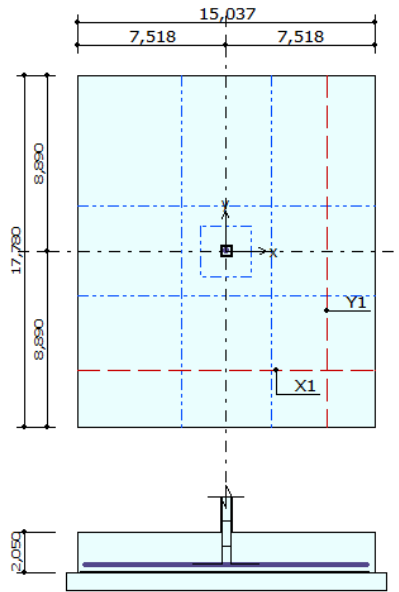
Footing

Type Isolated (Mat)
 Depth 2050.00 mm
 Cover 80.00 mm

Column Section

Rectangle Circle

Cx 609.60 mm
 Cy 609.60 mm
 Ex 0.00 mm
 Ey 0.00 mm



Calculation Result

Check Items	Result
Soil Bearing (kPa)	99.80 OK(0.998)
1Way Shear-X (kN)	11588 OK(0.545)
1Way Shear-Y (kN)	12373 OK(0.696)
2Way Shear (kN)	18055 OK(0.735)
Min. Bar Ratio (mm ²)	0.180% 1125
Max. Bar Space (mm)	#7 @457

Footing Size

FOOTING SIZE	
Lx	15.04 m
Ly	17.78 m
SOIL BEARING	
Capacity(fe)	100.00 kPa

Rebar

	Y-Direction (Mux)		X-Direction (Muy)	
	Moment (kN.m)	Rebar	Moment (kN.m)	Rebar
Layer 1 (mm)	561	#7 @ 100.00	550	#7 @ 100.00
Layer 2 (mm)		@		@
Result	OK(0.695)		OK(0.674)	

Start Page | Member | Member List | **Drawing**

MIDASIT <http://www.midasuser.com>

RC FOOTING LIST

NAME	TYP.	FOOTING		COLUMN		REBAR				SOIL CAPA	REMARK	
		THK.	Lx	Ly	Cx	Cy	X1	Y1	X2			Y2
F01	A	700	3000	3000	500	500	#8 @450	#8 @450			100.00	-
1Edge Column	1-1R(61)	2450	36271	36271	610	610	#8 @100	#8 @100			100.00	-

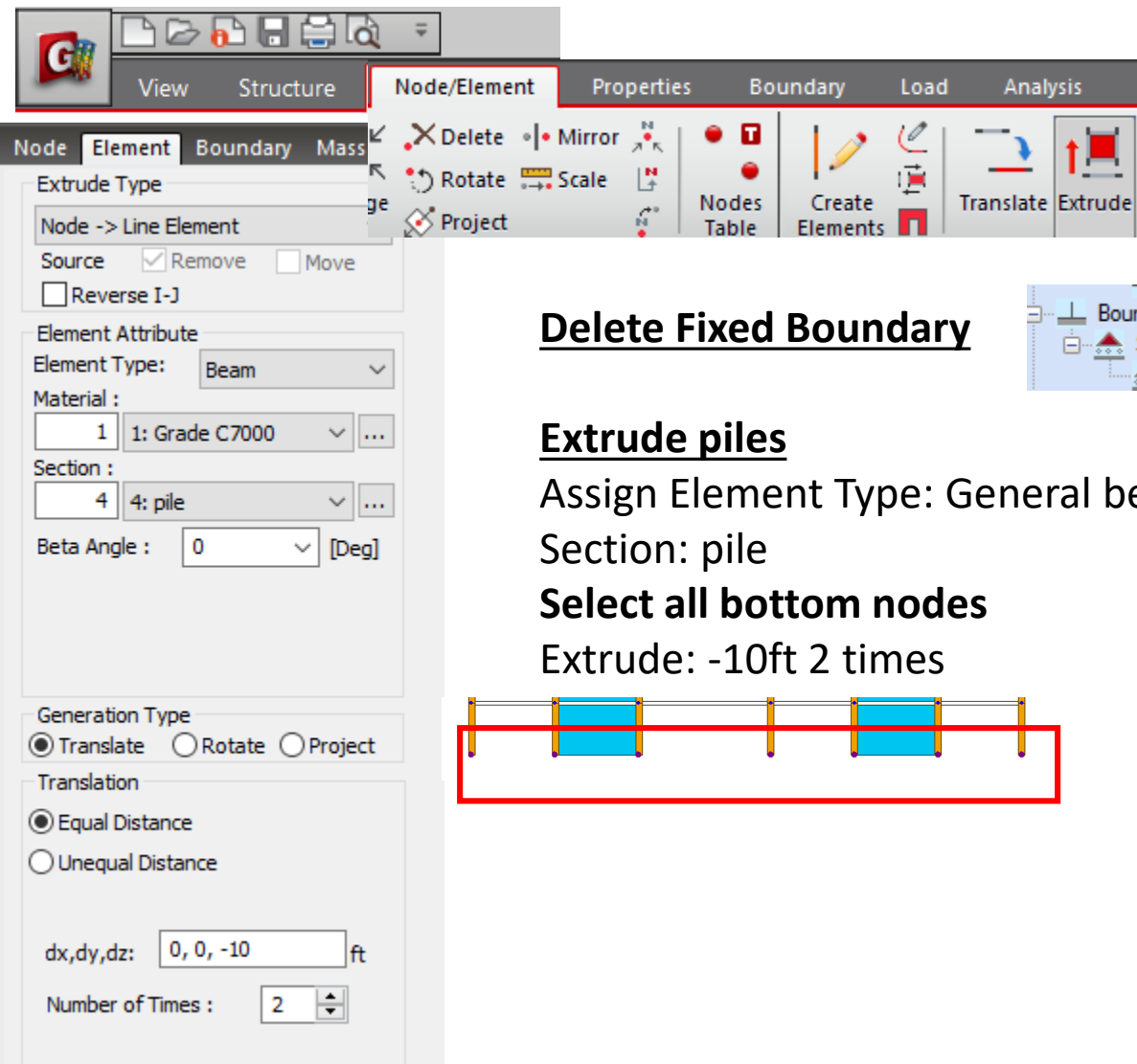
Design(F4)

Check(F5)

Report ...

Apply(F3)

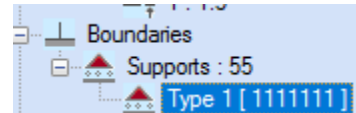
Create Piles



The screenshot shows the midas Gen software interface. The 'Node/Element' menu is open, and the 'Extrude' option is selected. The 'Extrude' dialog box is displayed with the following settings:

- Extrude Type: Node -> Line Element
- Source: Remove Move
- Reverse I-J
- Element Attribute:
 - Element Type: Beam
 - Material: 1: Grade C7000
 - Section: 4: pile
 - Beta Angle: 0 [Deg]
- Generation Type:
 - Translate Rotate Project
- Translation:
 - Equal Distance Unequal Distance
- dx,dy,dz: 0, 0, -10 ft
- Number of Times: 2

Delete Fixed Boundary



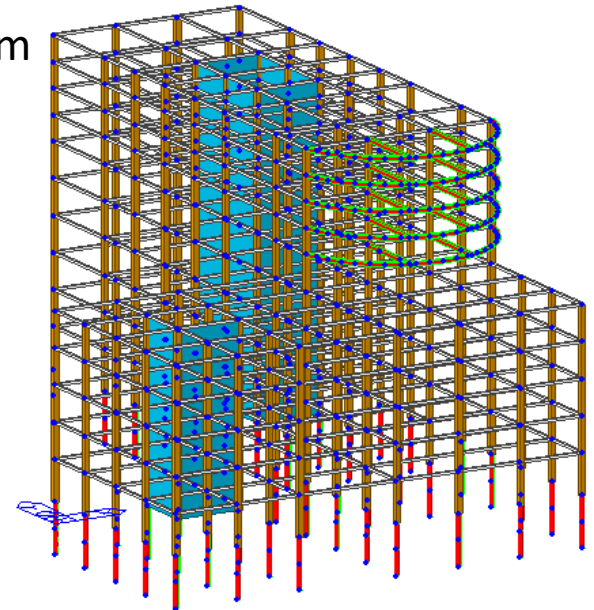
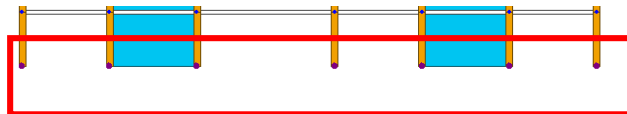
Extrude piles

Assign Element Type: General beam

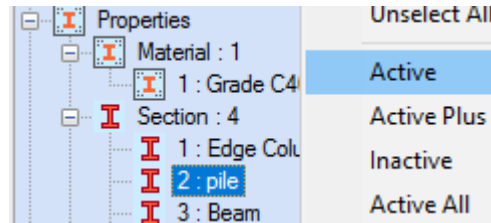
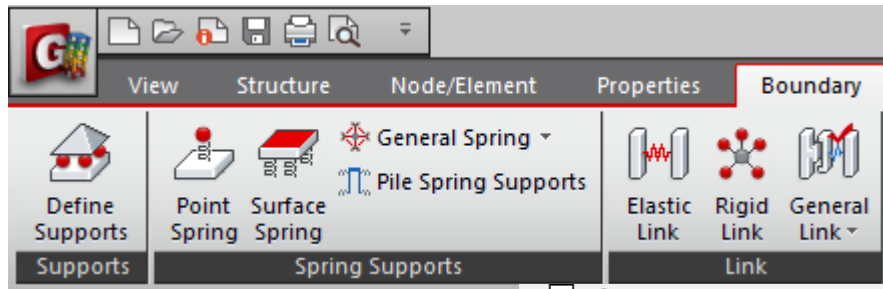
Section: pile

Select all bottom nodes

Extrude: -10ft 2 times



Pile Spring Support



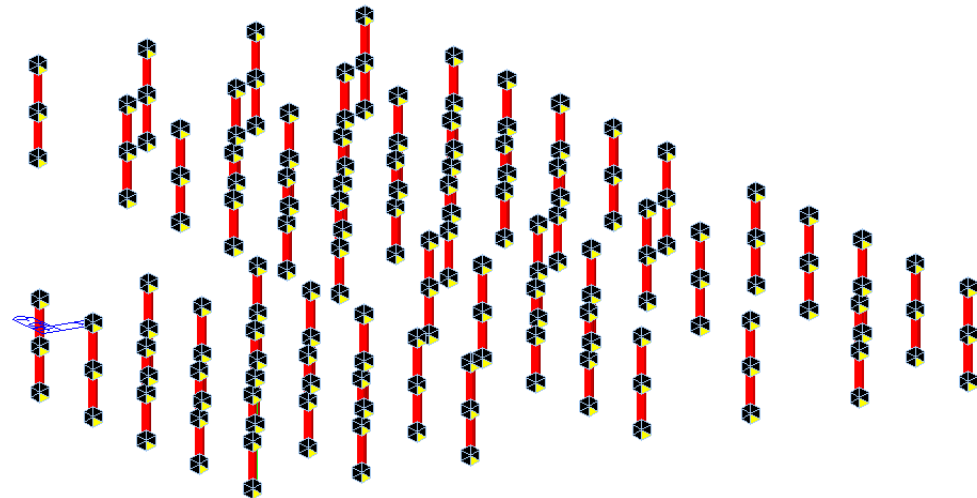
Add Pile Springs
 Activate Only Piles
 Apply Spring as Shown

Reference Figure

The reference figure shows a vertical pile with several horizontal spring supports along its length. A double-headed arrow labeled 'Pile' indicates the vertical extent of the pile.

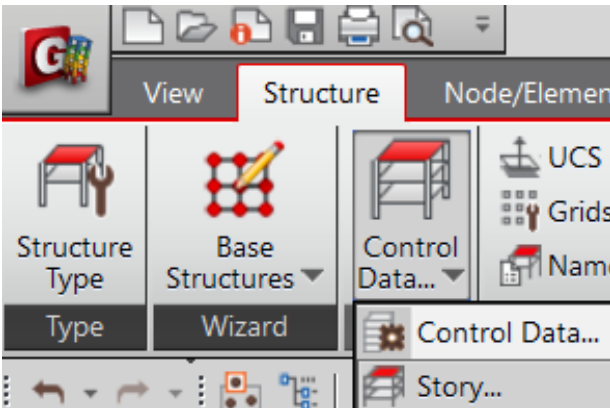
Pile Spring Data

- Soil Type: Sand
- Ground Level: 0 ft
- Pile Diameter (D): 2 ft
- Unit Weight of Soil (r): 0.1 kips/ft³
- Earth Pressure Coeff. at rest (K₀): 0.4
- Coeff. of Subgrade Reaction (k_h): 33000 kips/ft³
- Internal Friction Angle (phi): 30 [deg]
- Initial Soil Modulus (k₁): 215.99425318 kips/ft³



Update story data

Auto Generate Story Data



Automatic Generation of Story Data

Story Data

Ground Level: 0 ft

	Module Name	Story Name	Level(ft)	Height(ft)	Floor Diaphragm
	Base	11F	106.00	10.00	Consider
	Base	10F	96.00	10.00	Consider
	Base	9F	86.00	10.00	Consider
	Base	8F	72.00	14.00	Consider
	Base	7F	58.00	14.00	Consider
	Base	6F	44.00	14.00	Consider
	Base	5F	30.00	14.00	Consider
	Base	4F	16.00	14.00	Consider
	Base	3F	0.00	16.00	Consider
	Base	2F	-10.00	10.00	Consider
	Base	1F	-20.00	10.00	Do not consider
*					

Unselected List

No	Level

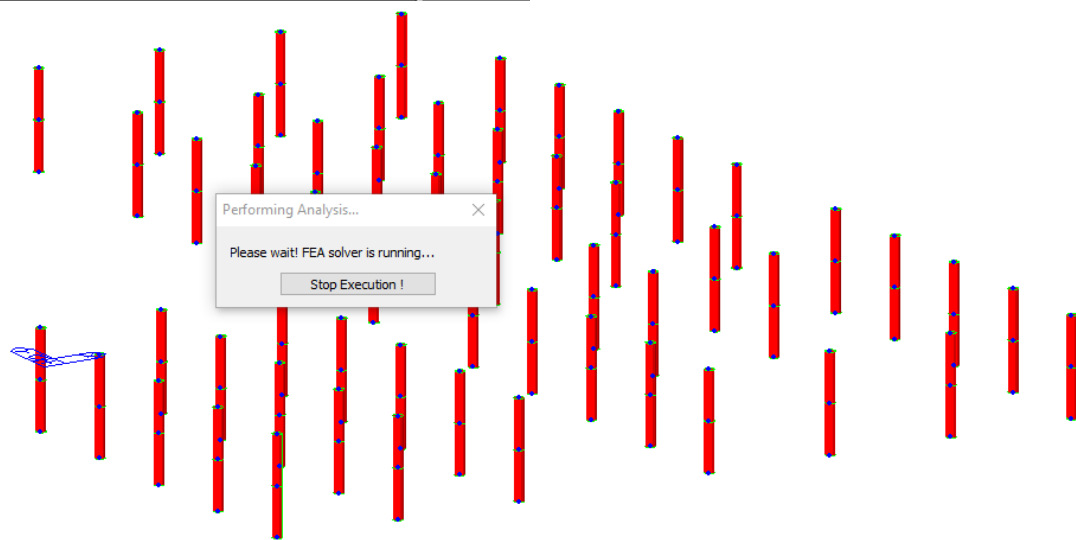
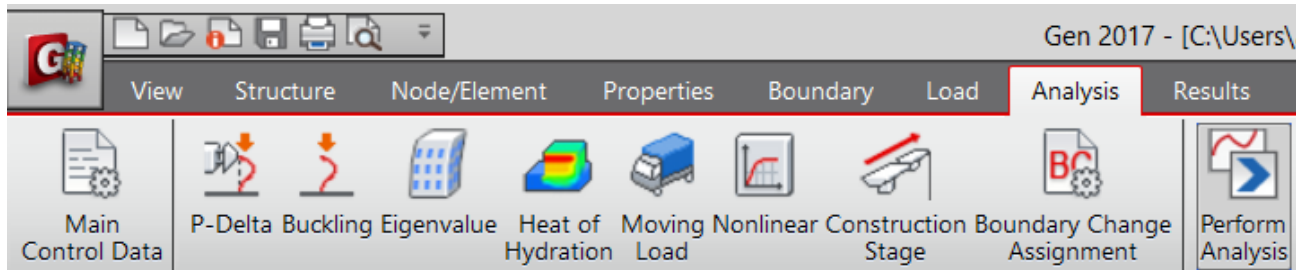
Selected List

No	Name	Level	Height
1	1F	-20	10
2	2F	-10	10
3	3F	0	16
4	4F	16	14
5	5F	30	14
6	6F	44	14
7	7F	58	14
8	8F	72	14
9	9F	86	10
10	10F	96	10
11	11F	106	10
12	12F	116	10

Include Seismic Accidental Eccentricity : 5 % of Plan Dimension
 Include Wind Eccentricity : 15 % of Plan Dimension

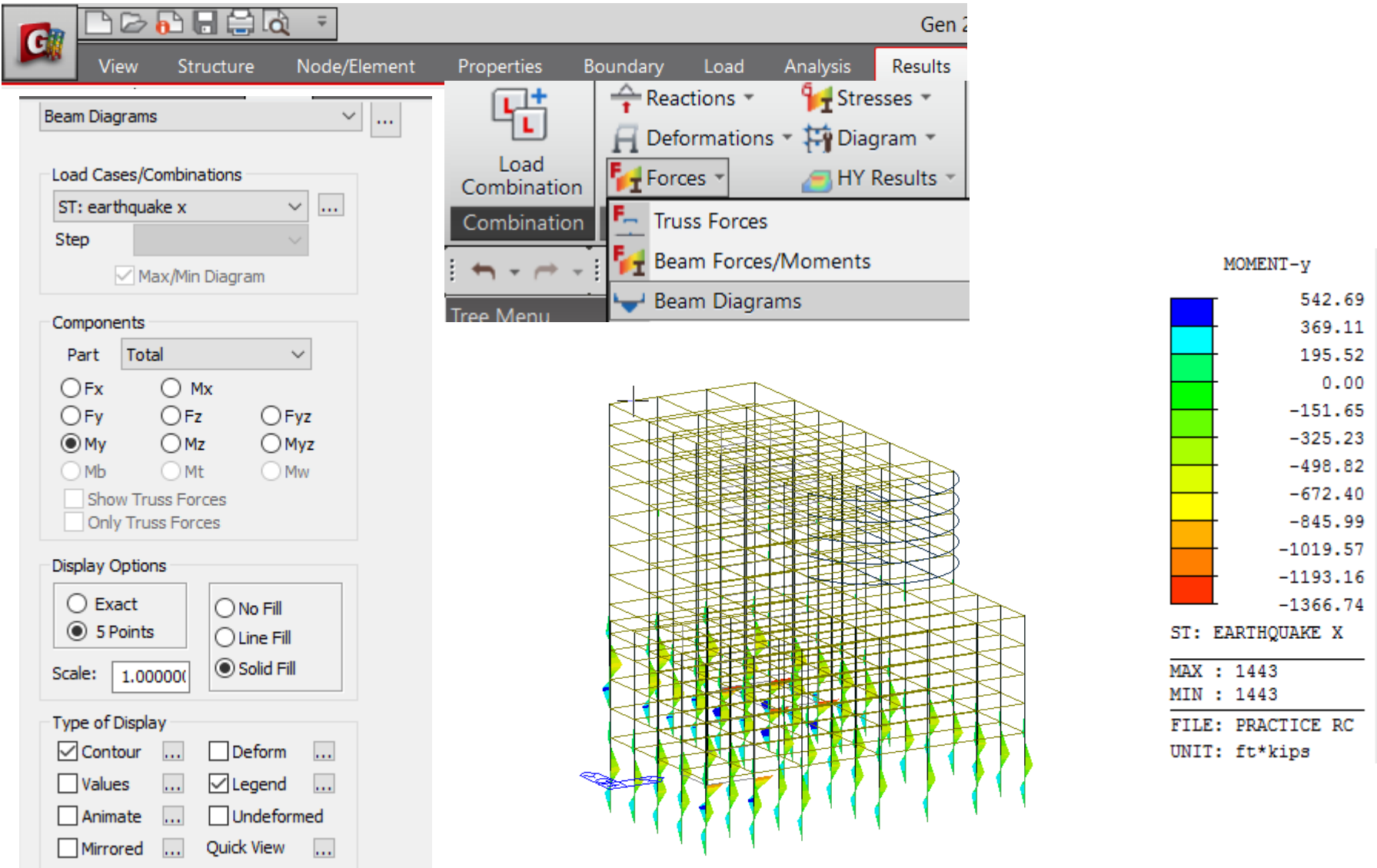
OK Cancel

Re-Perform Analysis



```
YOUR MIDAS JOB IS SUCCESSFULLY COMPLETED.....C:\Users\a.martinez\Desktop\hotel RC model\practice rc
TOTAL SOLUTION TIME.: 20.11 [SEC]
```

Results: Moments



Thanks!
