MIDAS

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Building Analysis and Design

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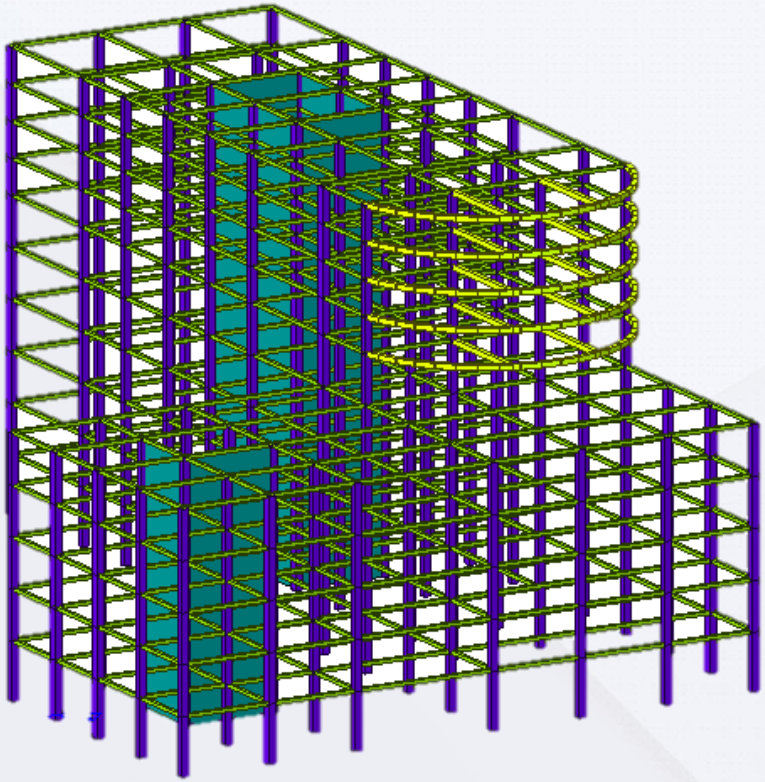
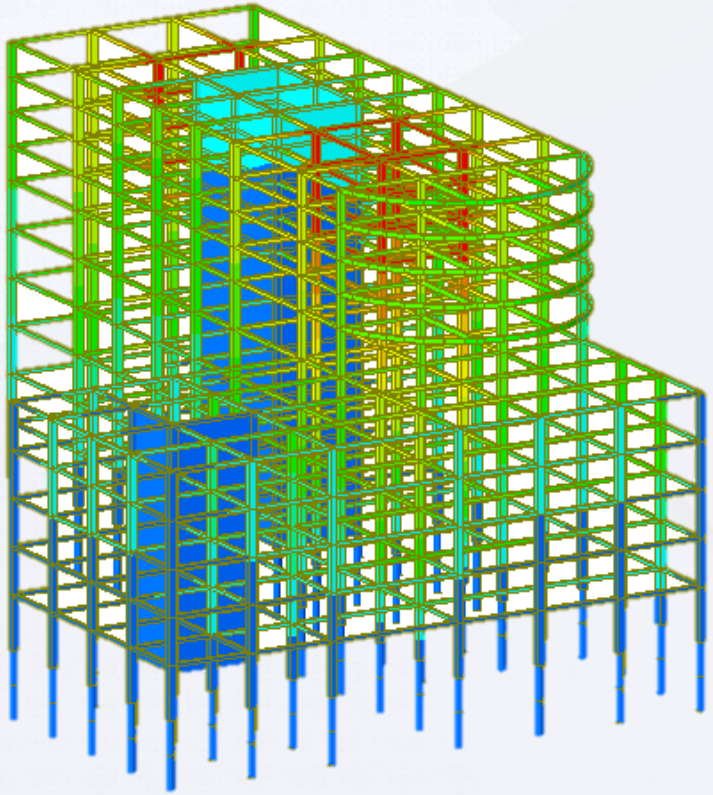
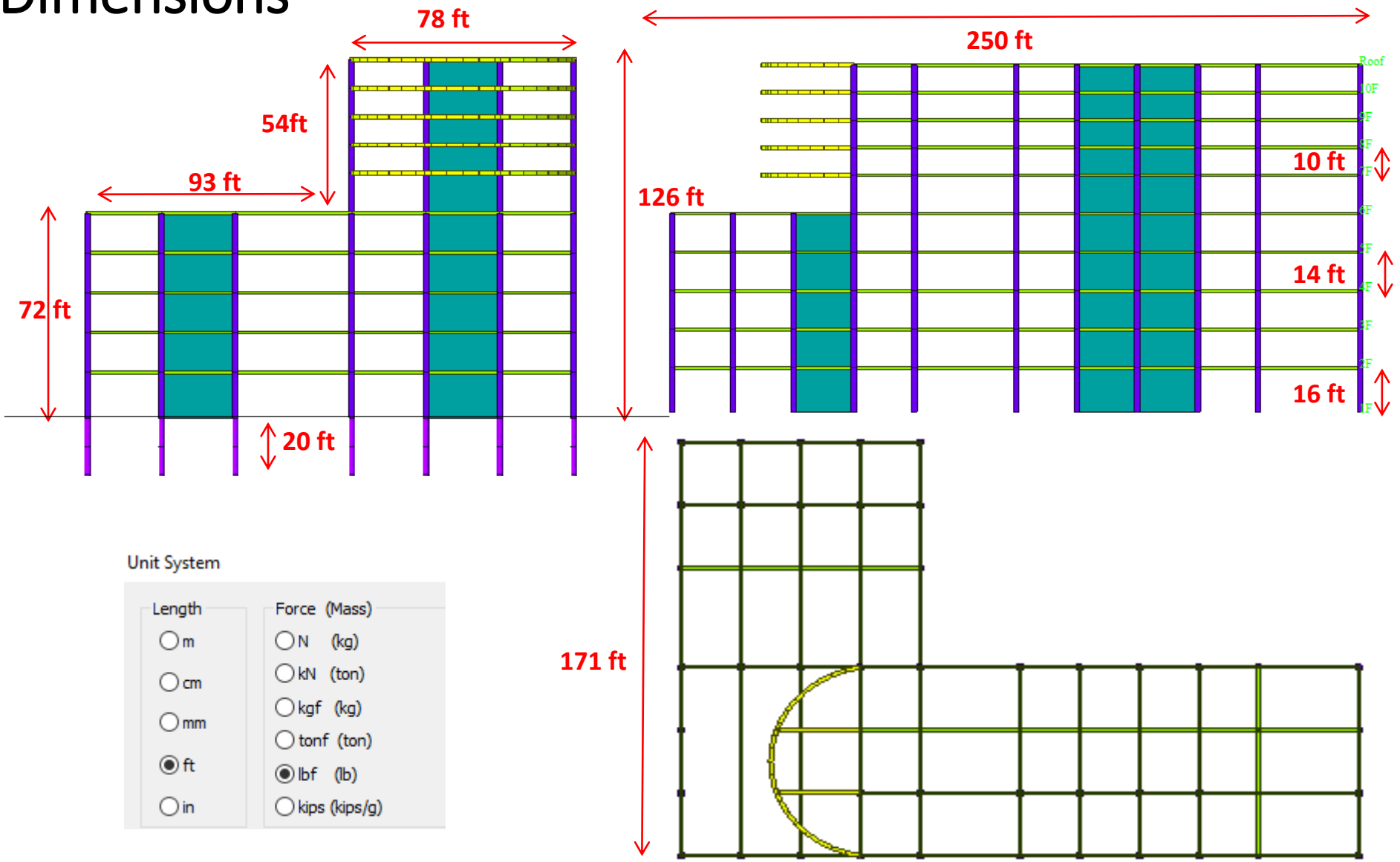
RC Building Analysis and Design





Angel Francisco Martinez
Civil Engineer
MIDASoft

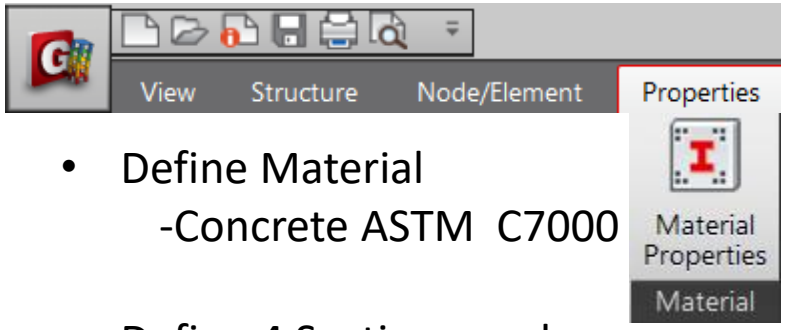
Dimensions



Unit System

Length	Force (Mass)
○ m	○ N (kg)
○ cm	○ kN (ton)
○ mm	○ kgf (kg)
◉ ft	○ tonf (ton)
○ in	◉ lbf (lb)
	○ kips (kips/g)

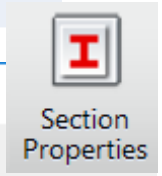
Materials and Sections

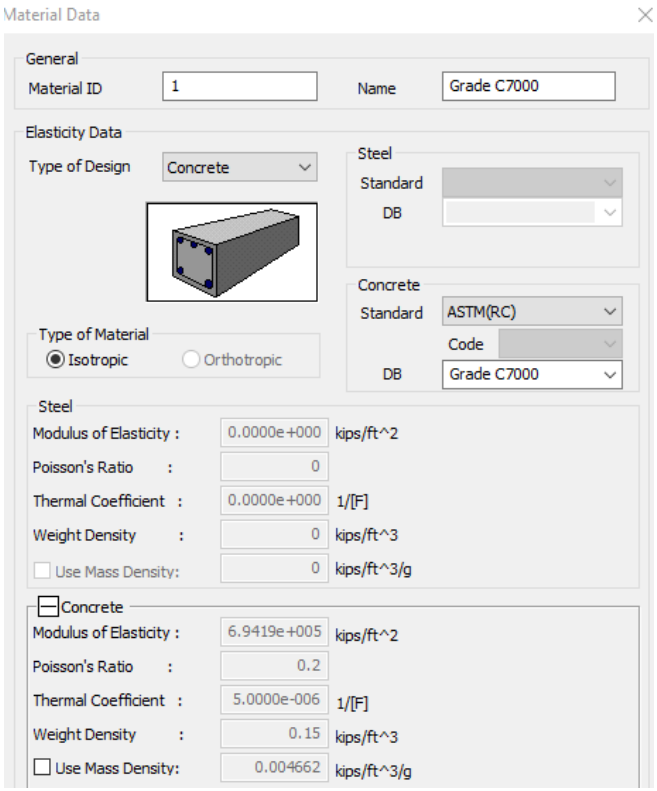


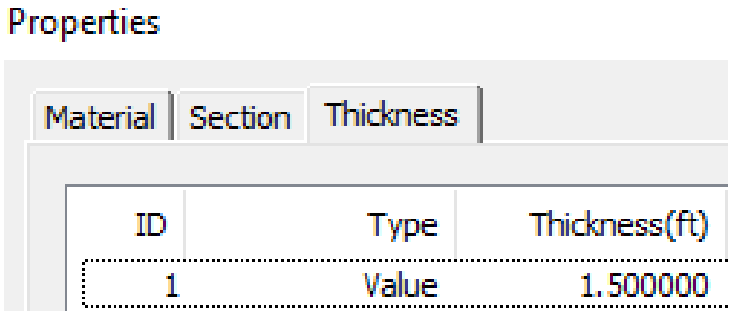
- Define Material
  -Concrete ASTM C7000

- Define 4 Sections as shown

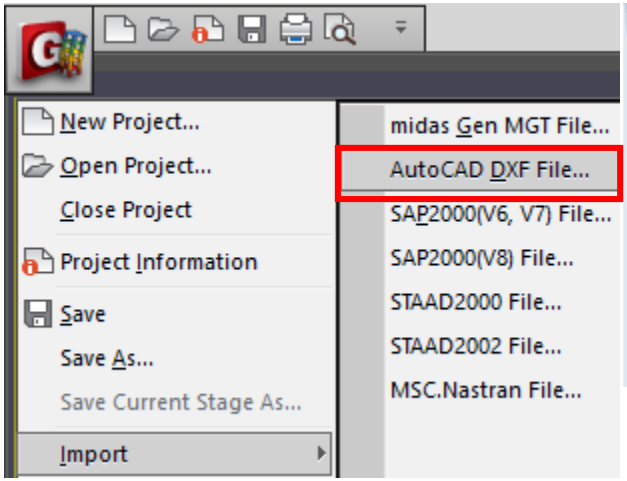
	H	B
Column	2 ft	2 ft
Beam	1 ft	1 ft
Balcony Beam	1.5 ft	1 ft
Pile	D = 2 ft	

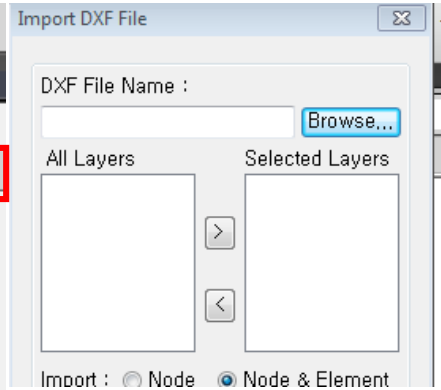


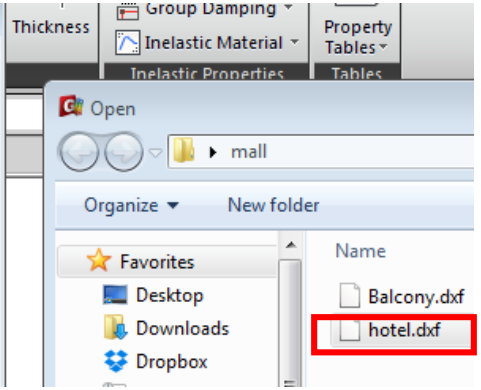


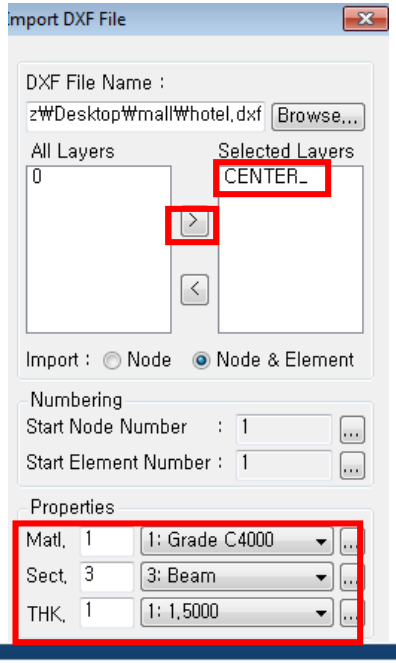


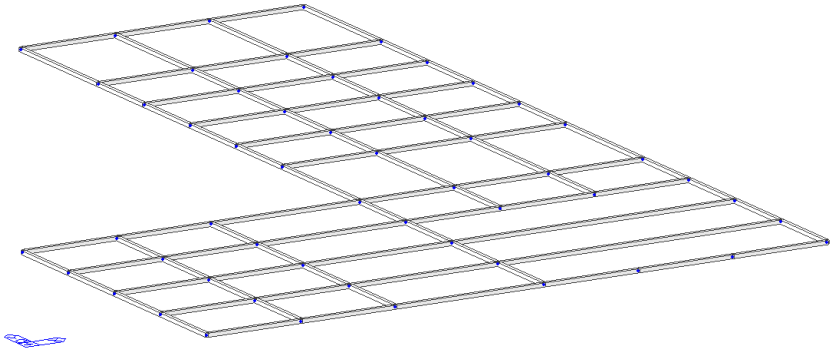
Import DXF CAD





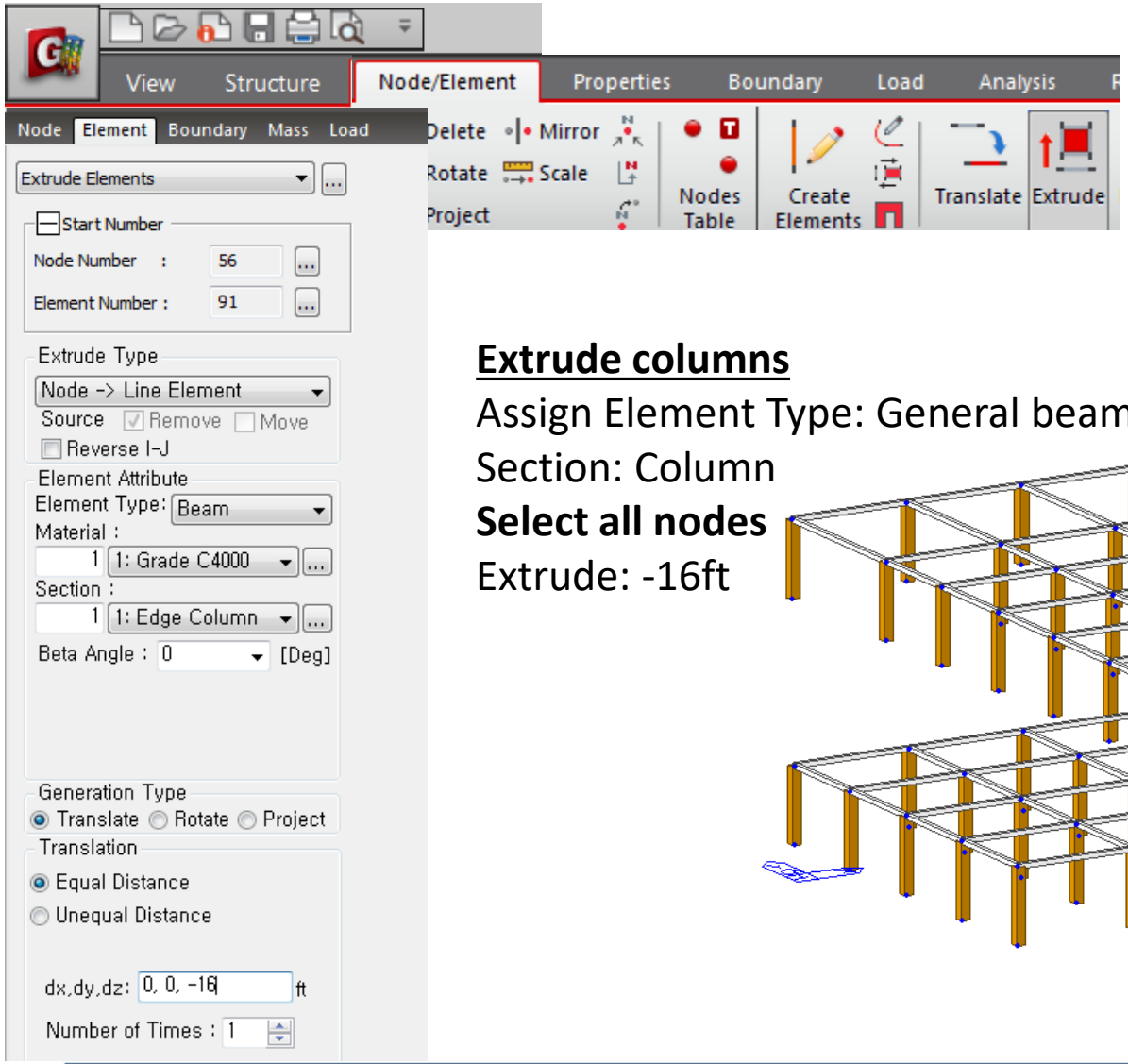






- Import Hotel DXF
- Select CENTER Layers
- Section Beam

Create Columns



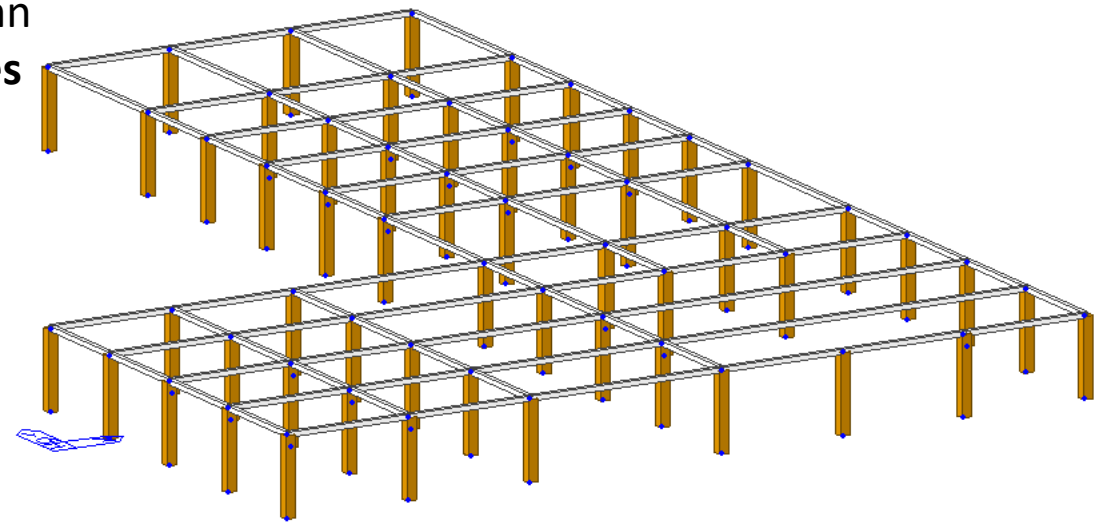
Extrude columns

Assign Element Type: General beam

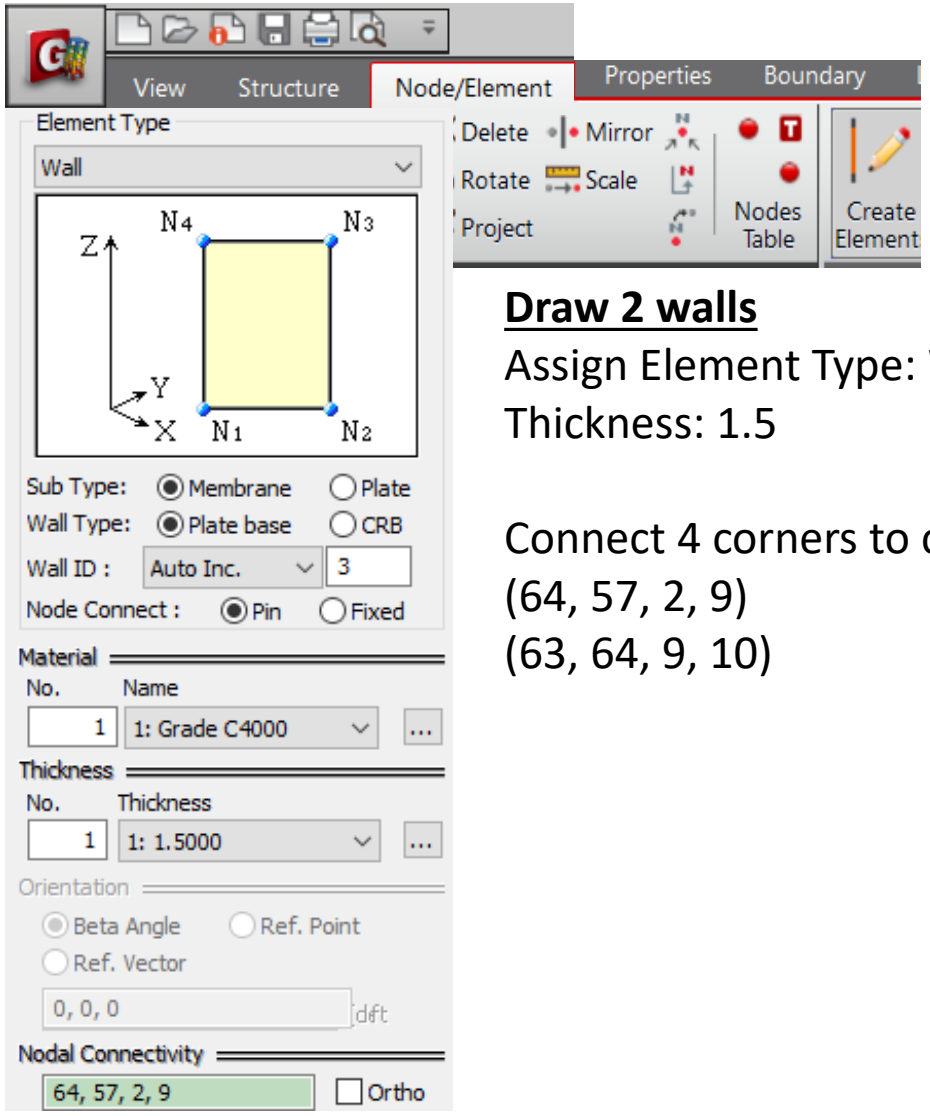
Section: Column

Select all nodes

Extrude: -16ft



Create Walls



Draw 2 walls

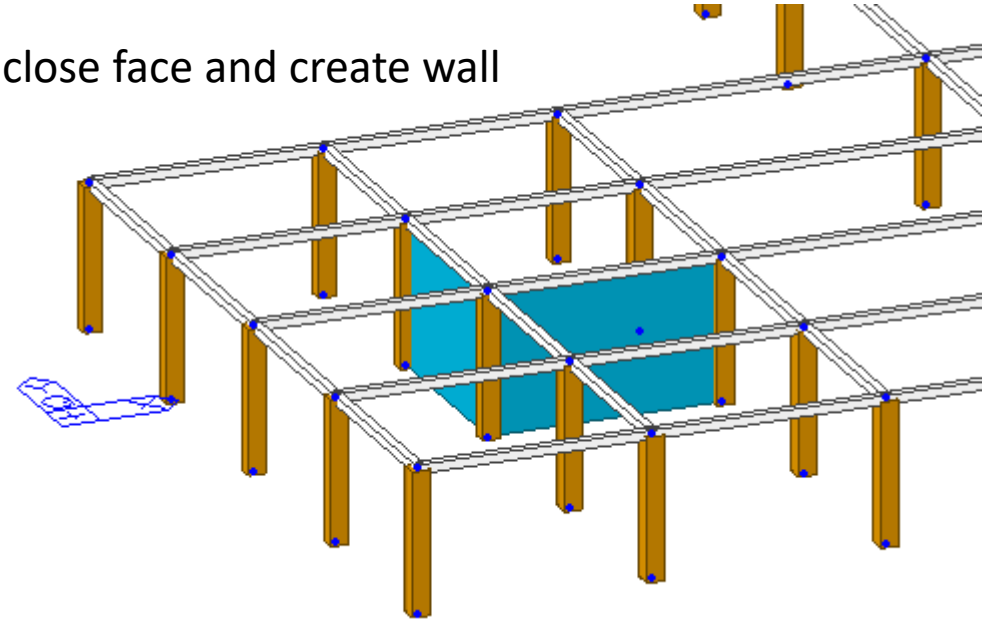
Assign Element Type: Wall

Thickness: 1.5

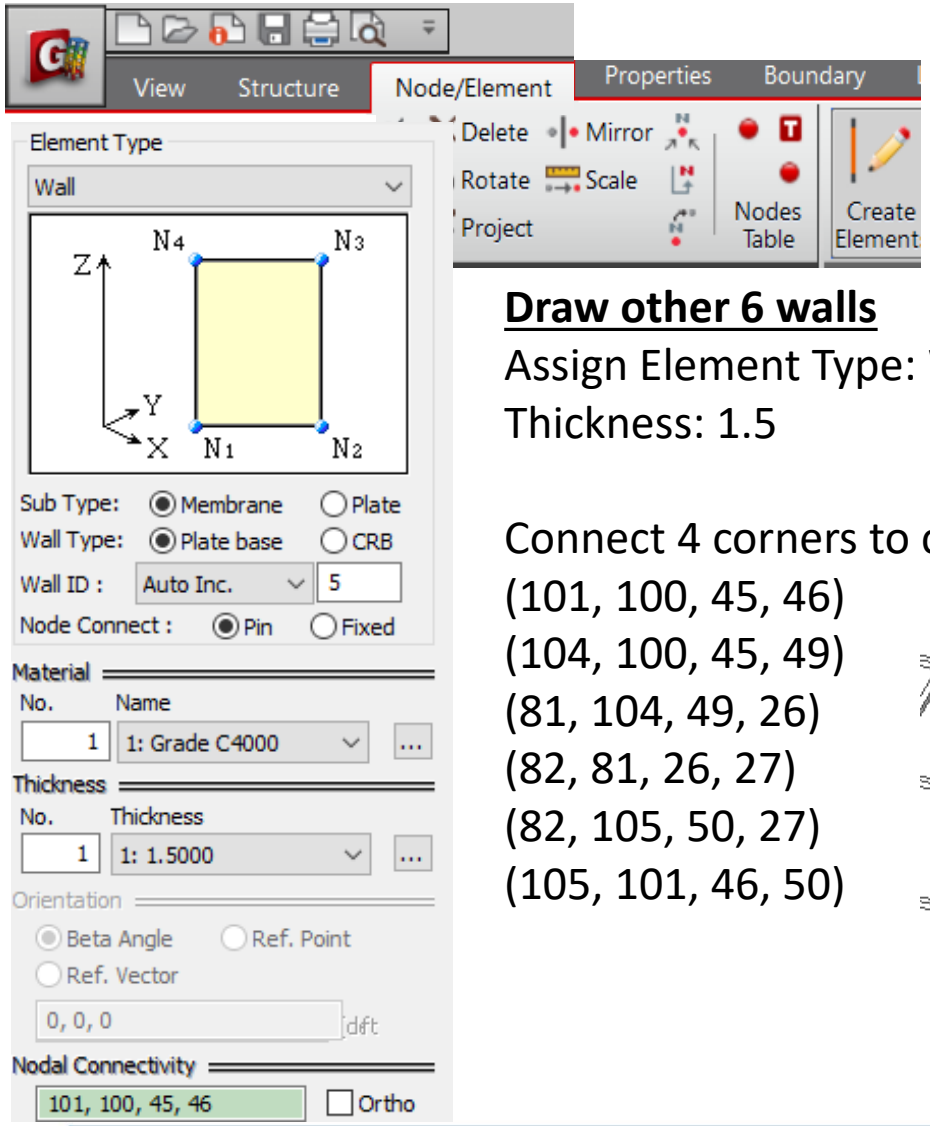
Connect 4 corners to close face and create wall

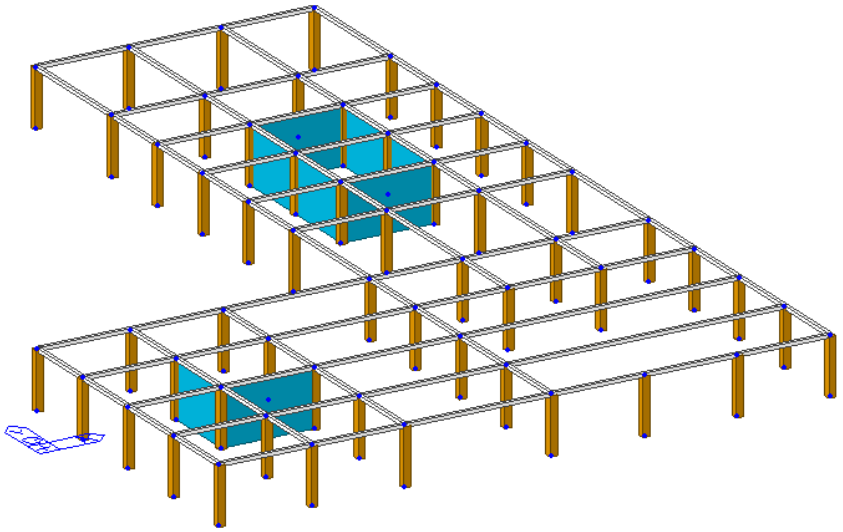
(64, 57, 2, 9)

(63, 64, 9, 10)



Create Walls





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)

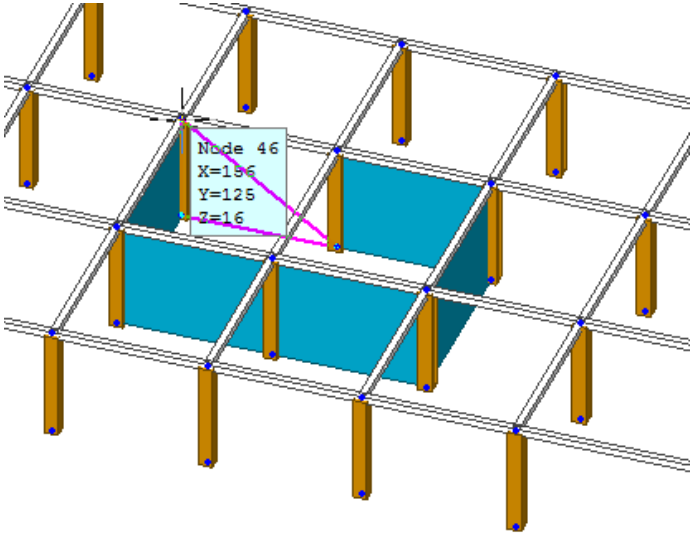
(104, 100, 45, 49)

(81, 104, 49, 26)

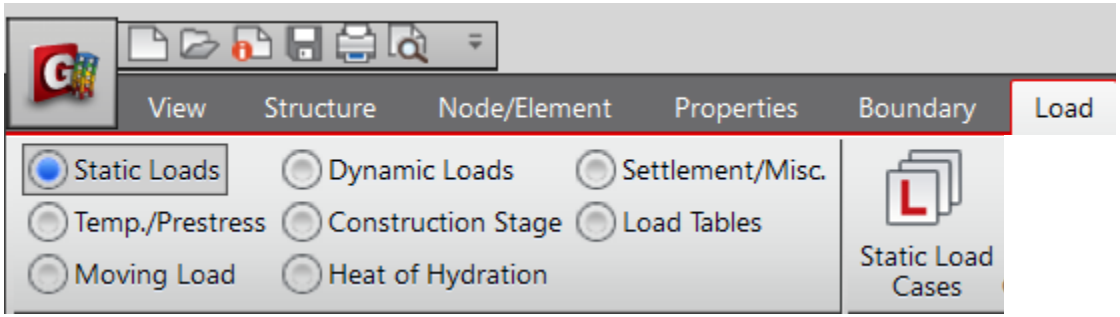
(82, 81, 26, 27)

(82, 105, 50, 27)

(105, 101, 46, 50)

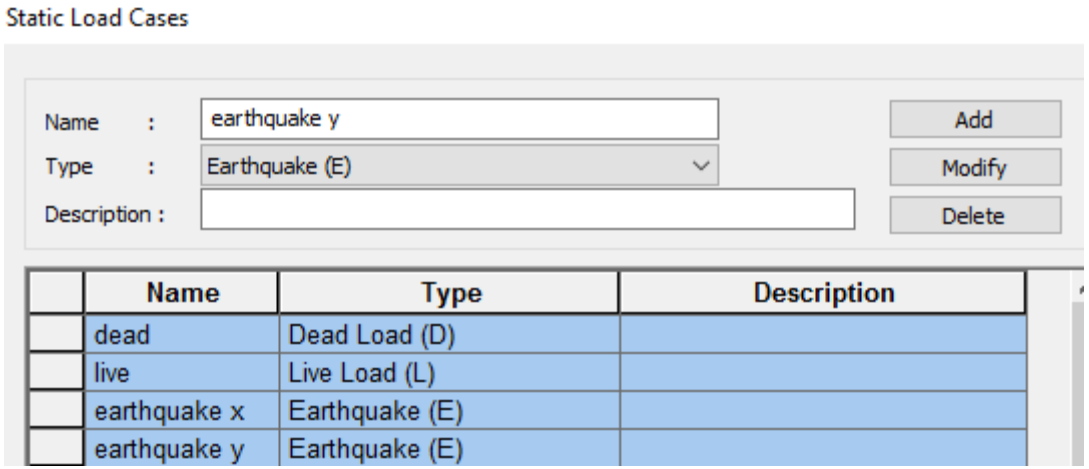


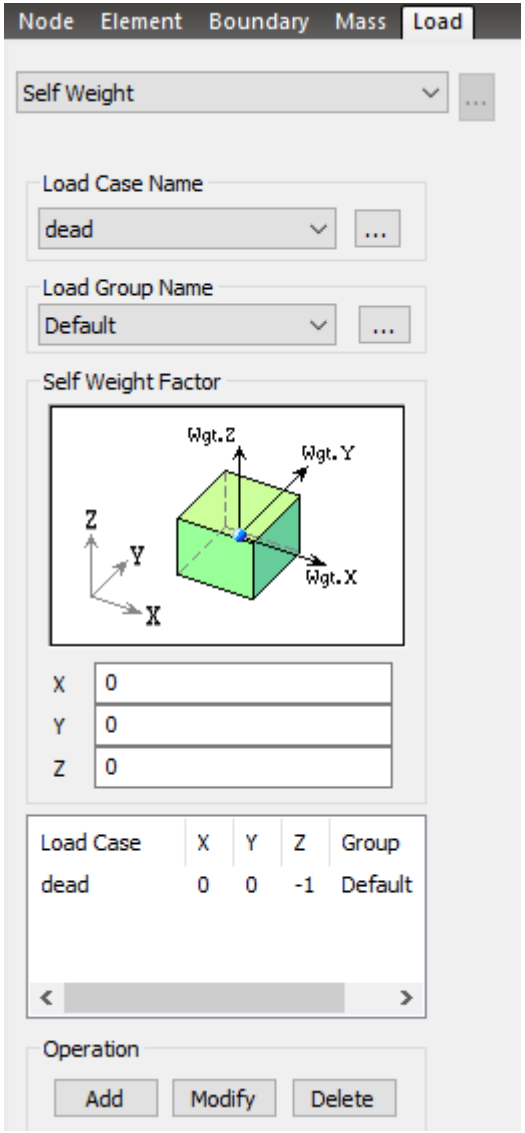
Load Cases



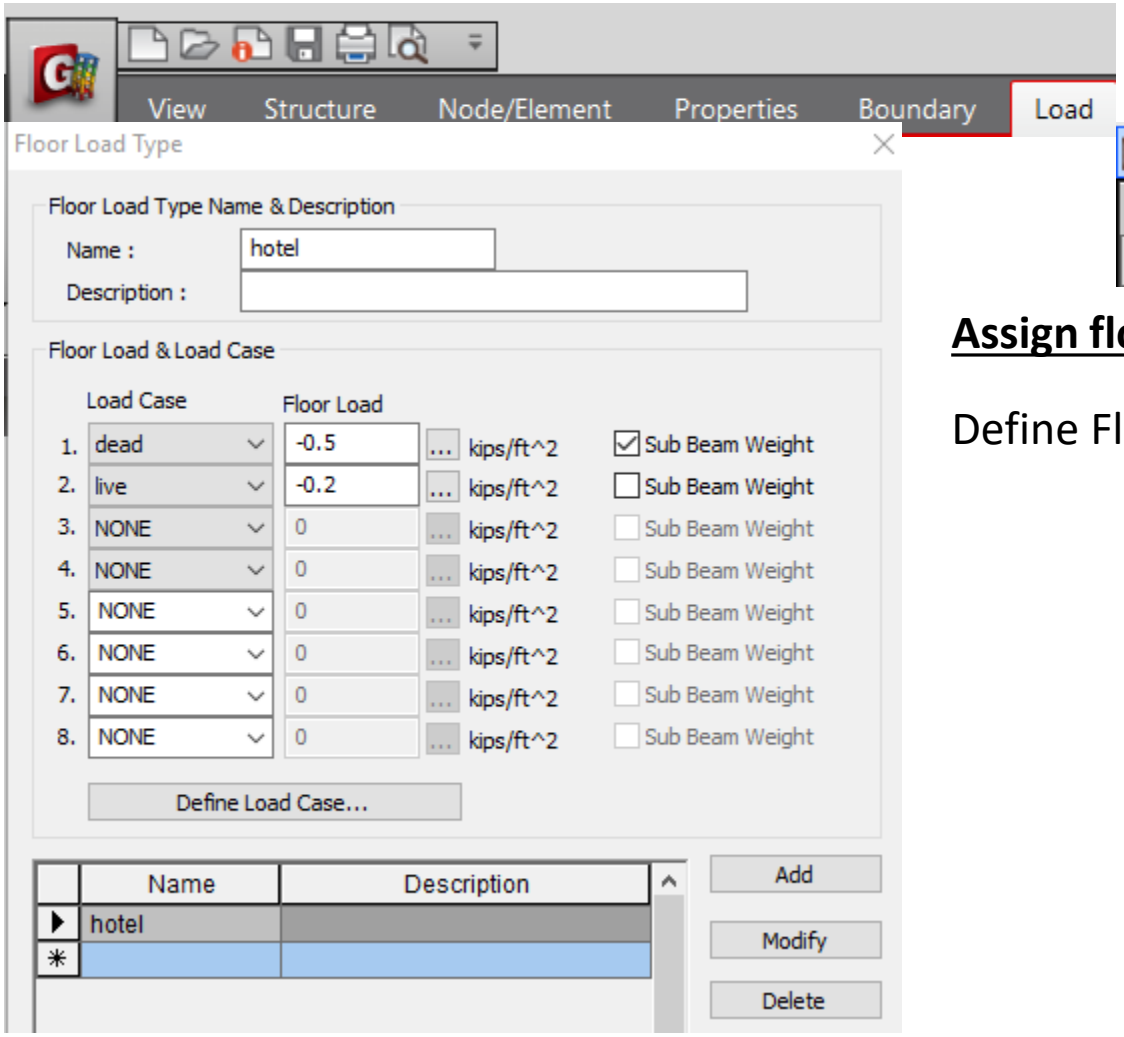
Static Load Cases

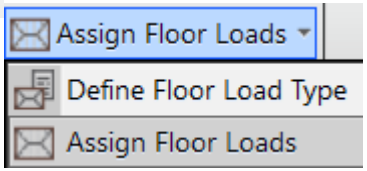
Create 4 load cases
Assign Self Weight to dead load case





Define Floor Loads





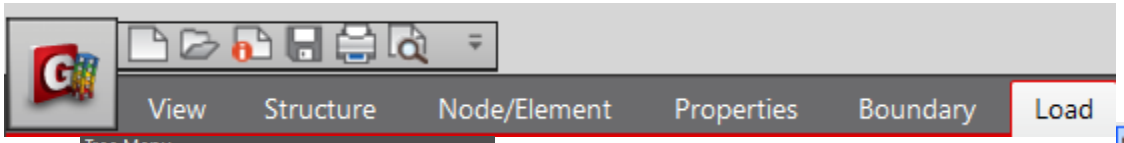
Assign floor loads to hotel

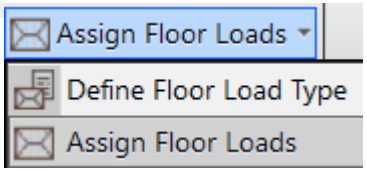
Define Floor loads >> Add

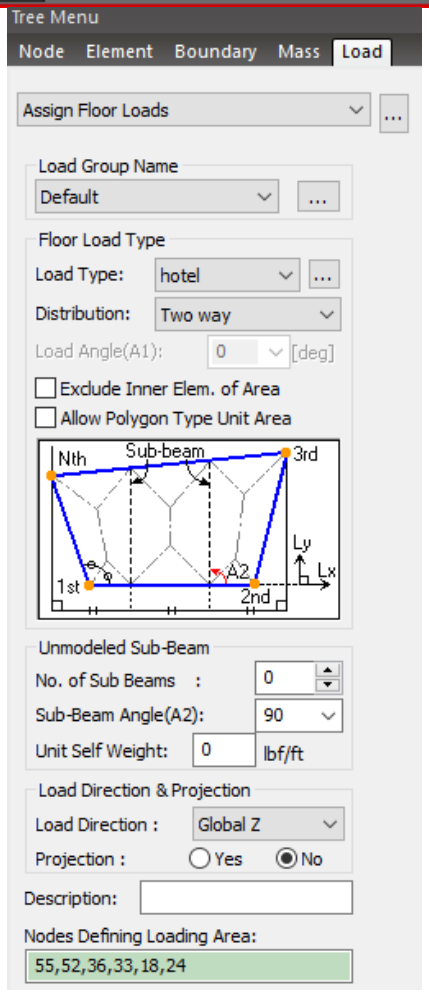
Dead = -0.5 kips/ft^2

Live = -0.2 kips/ft^2

Assign Floor Loads

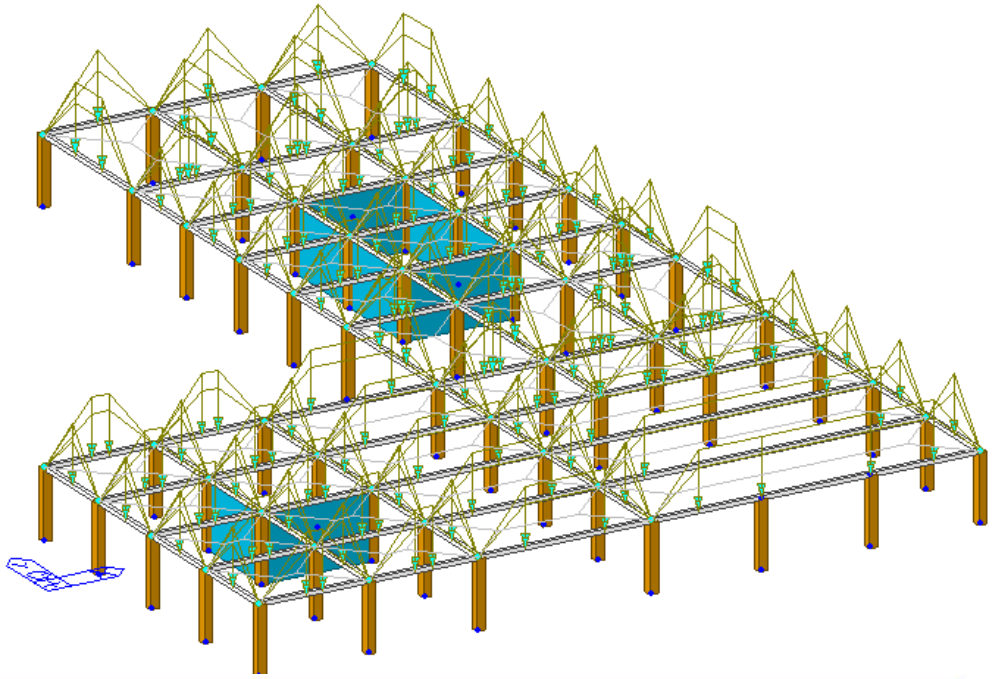




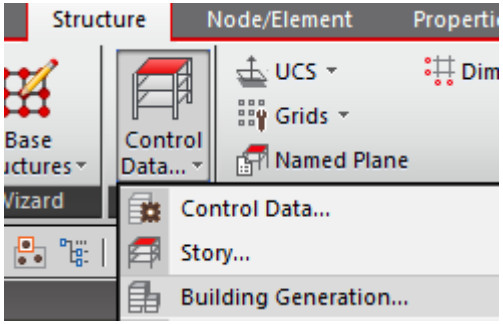


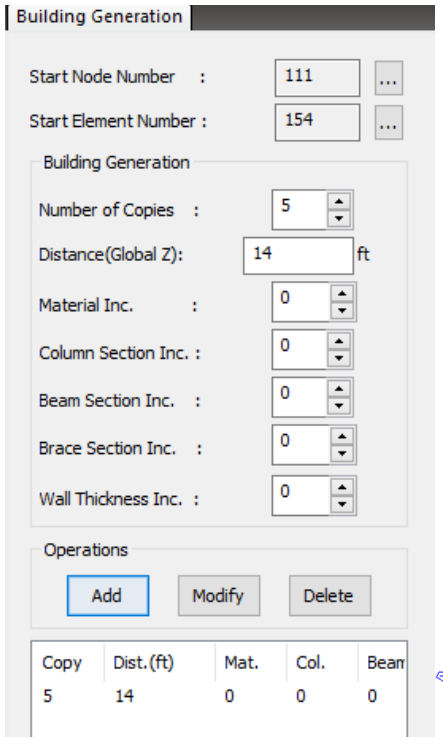
Assign floor loads to hotel

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



Building Generation





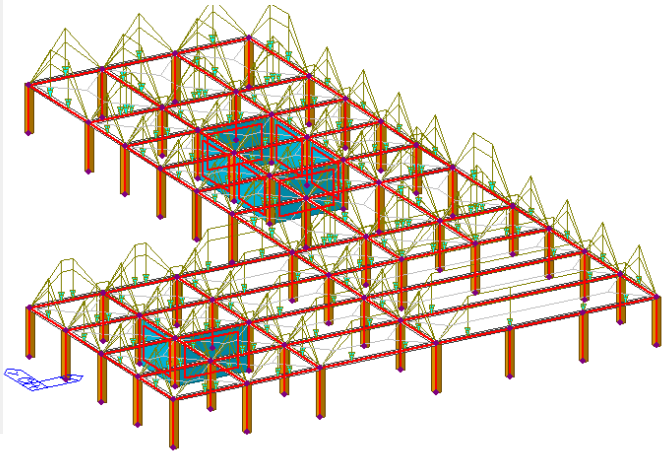
Make copies of the first floor

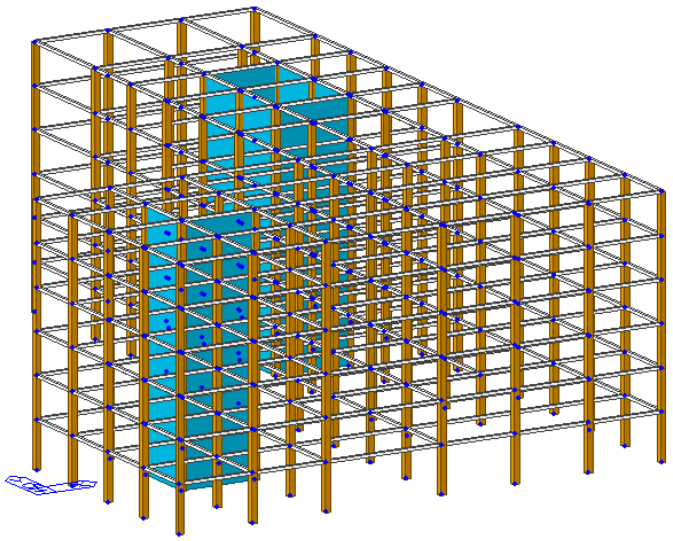
Select All

Copy 5 times at 14ft

Click Add

Click Apply

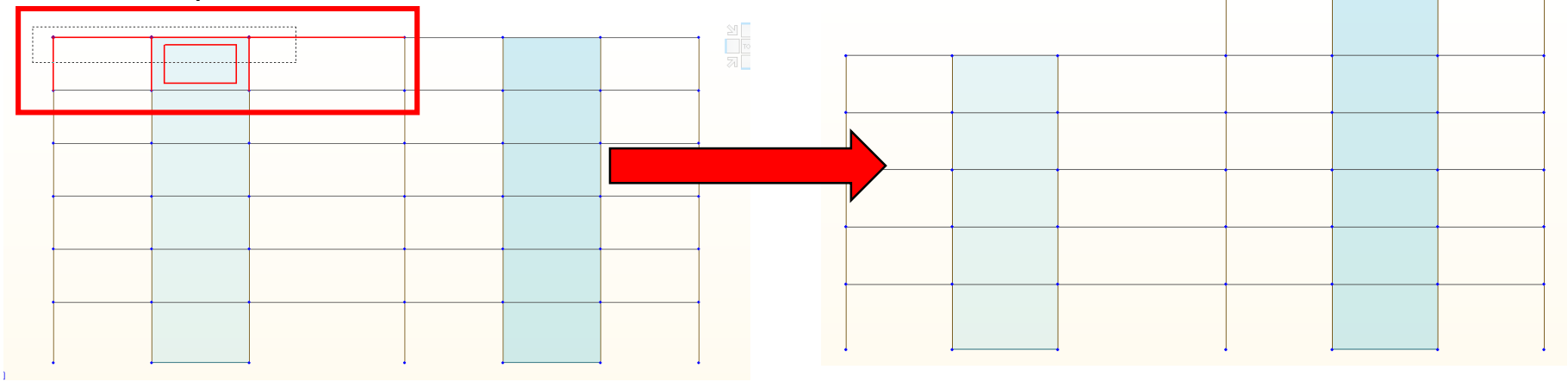




Delete Sections

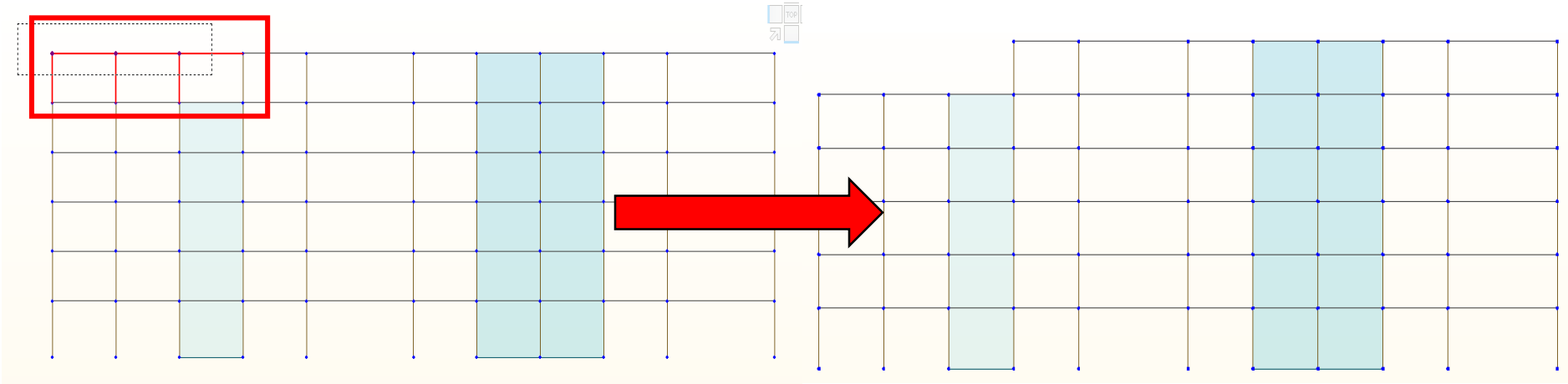
Change view to Front View

Select top left row as shown and delete

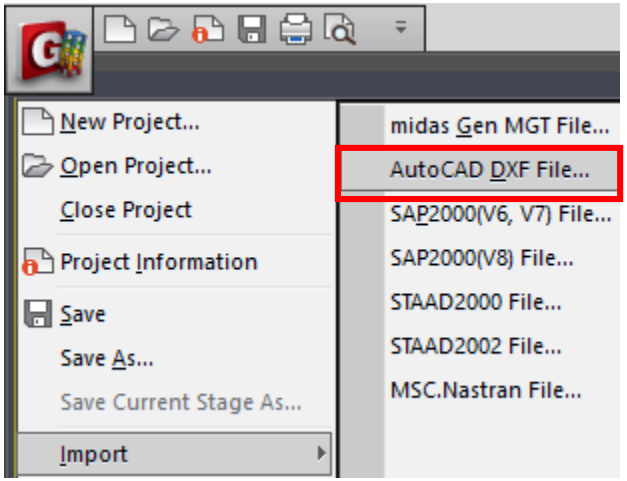


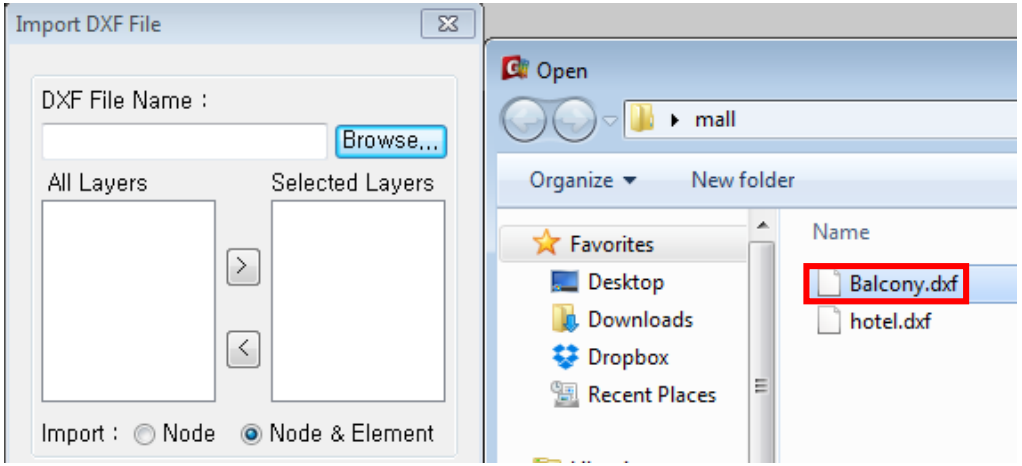
Change view to Right View

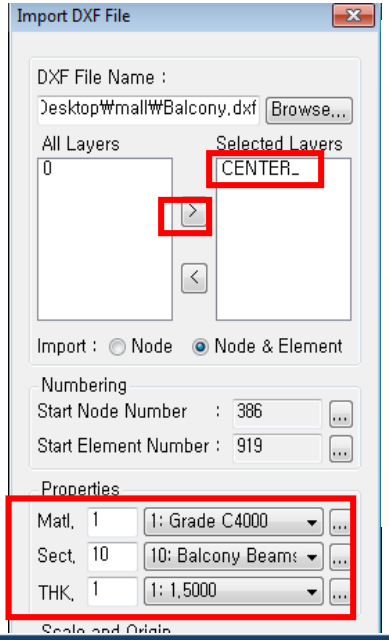
Select top left row as shown and delete

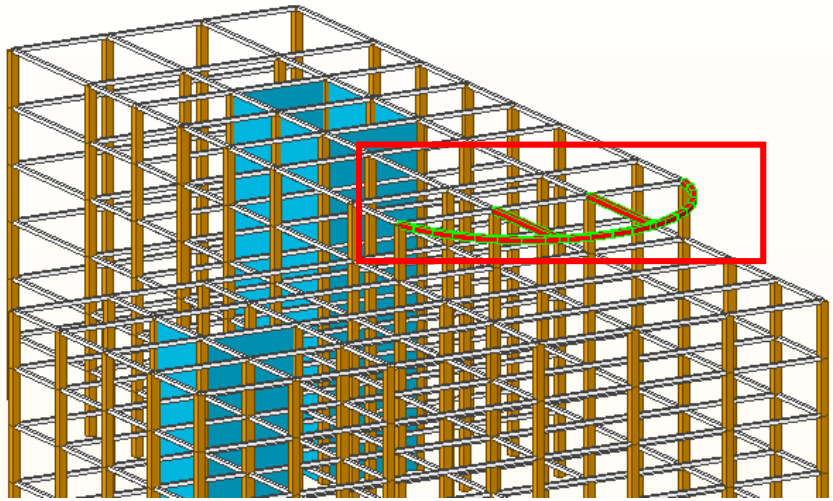


Import DXF CAD for Balcony



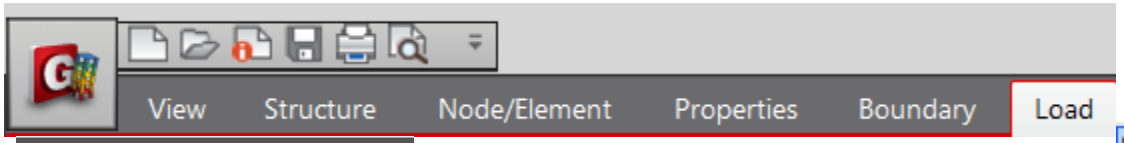


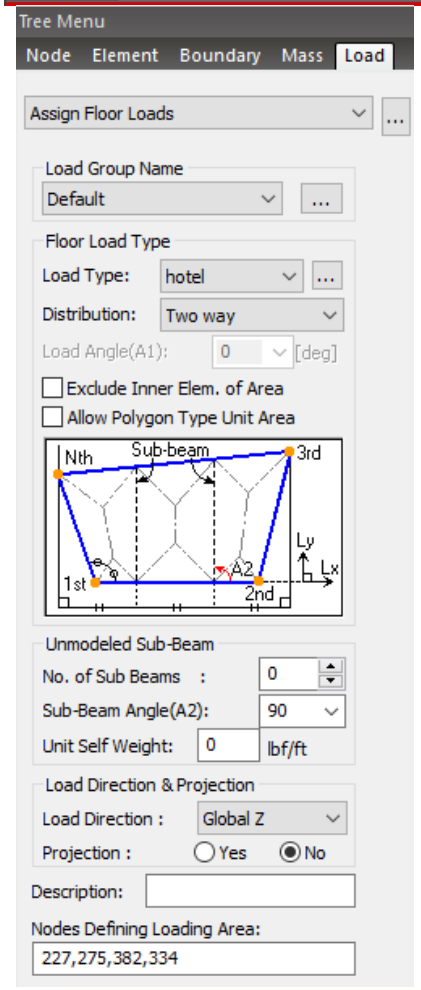


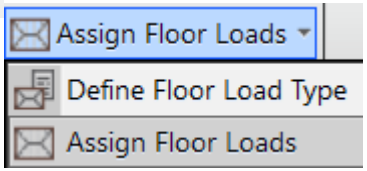


- Import Balcony DXF
- Select CENTER Layers
- Section Balcony Beam

Assign Upper Floor Loads

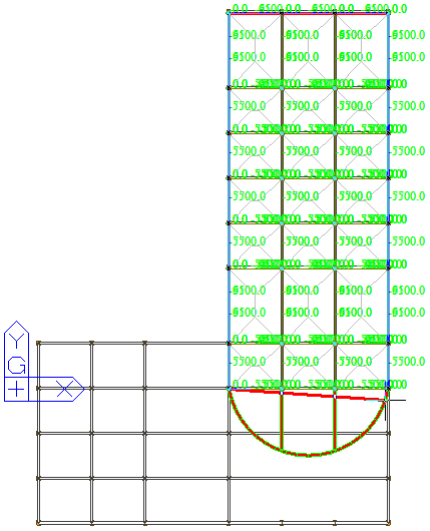


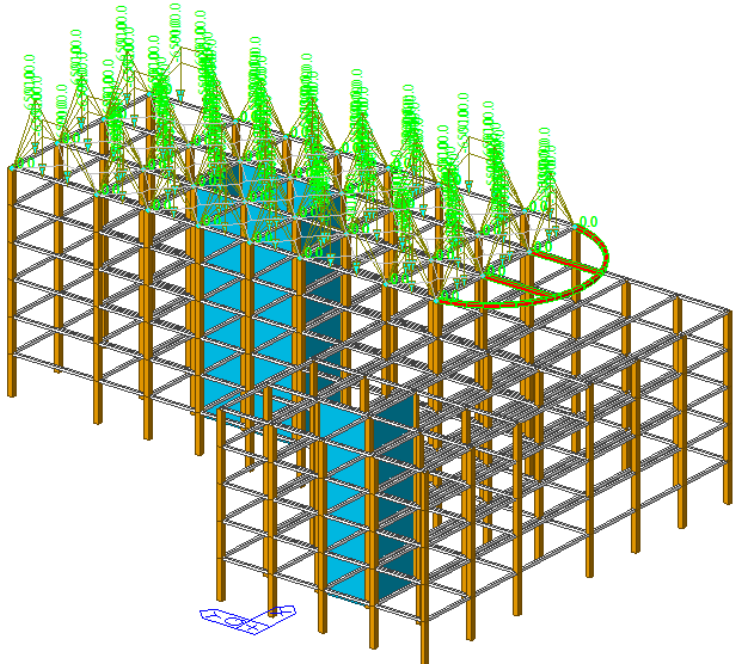




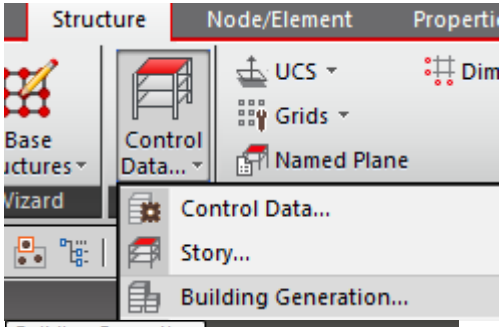
Assign floor loads to hotel

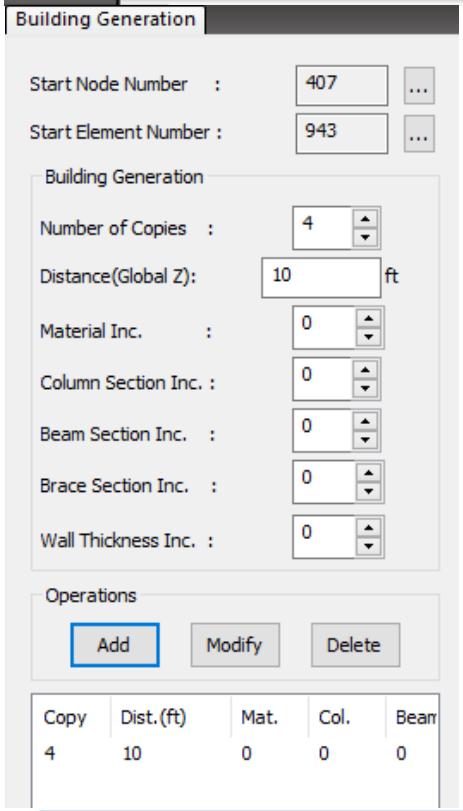
Assign as **two way** to each half by drawing outline on outer border (exclude balcony)





Building Generation





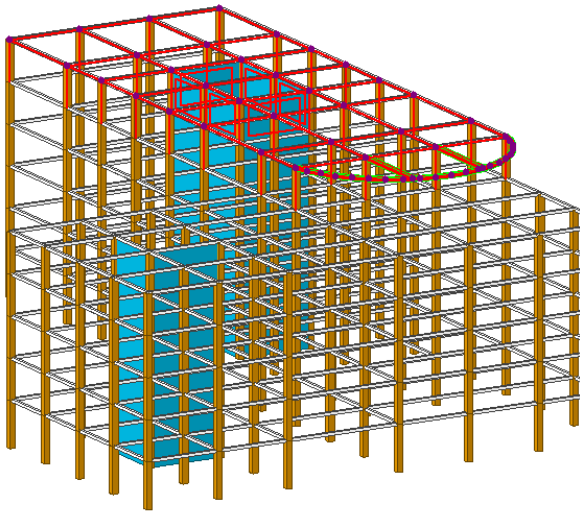
Make copies of the top floor only

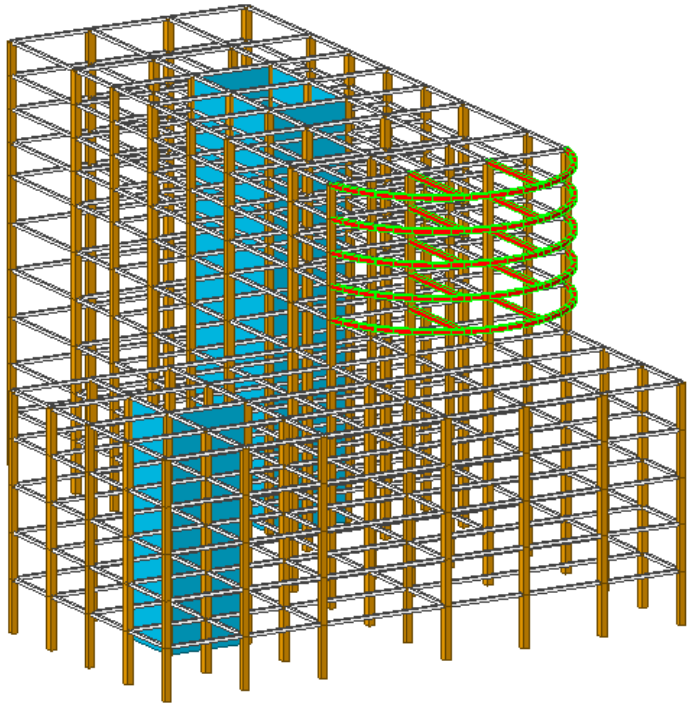
Select top floor

Copy 4 times at 10 ft

Click Add

Click Apply





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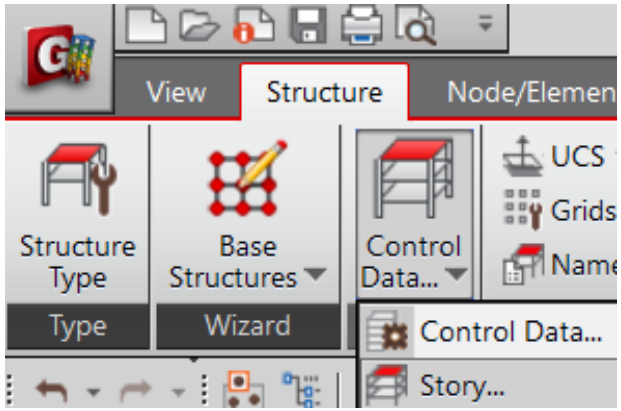
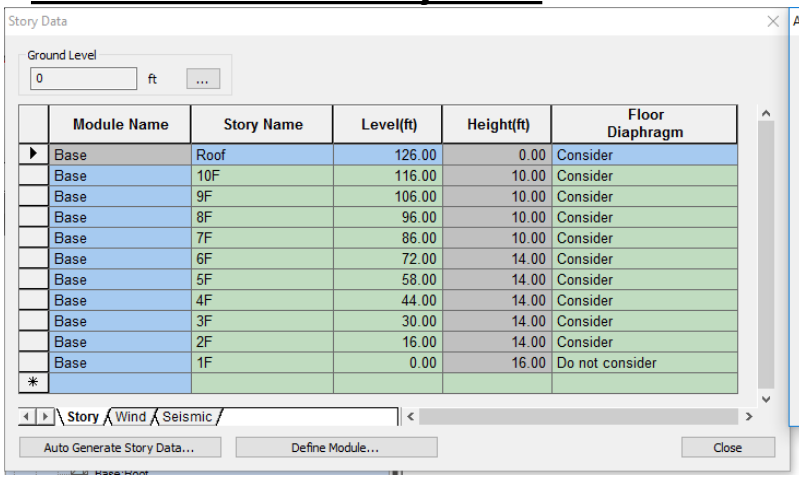
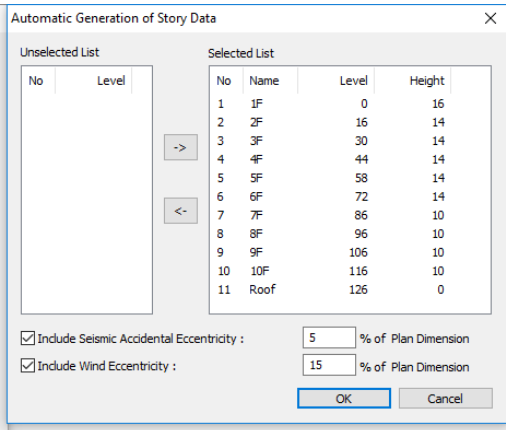
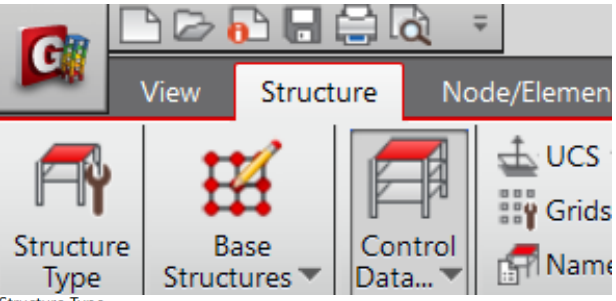
Generate story data

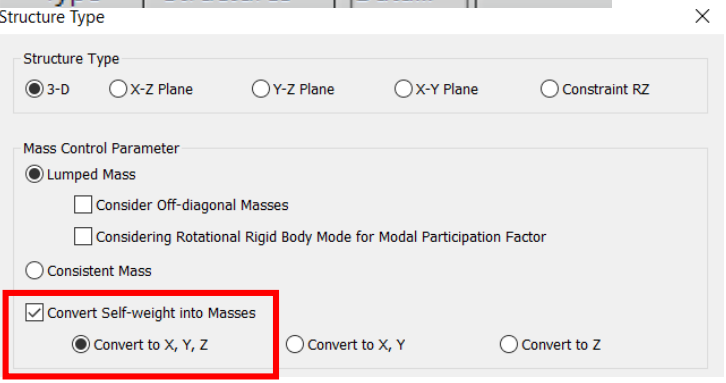


Auto Generate Story Data



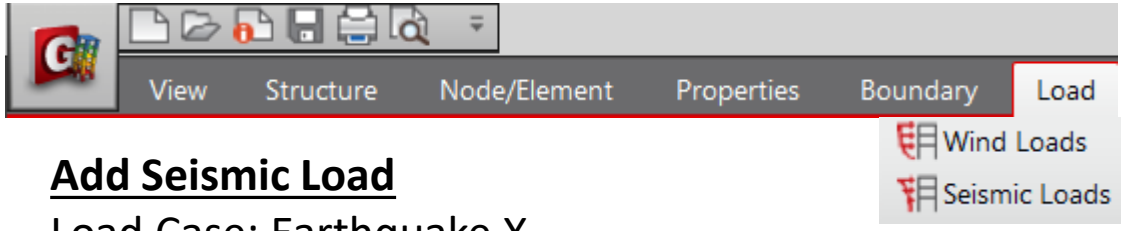






Convert Self weight into Masses

Seismic Load X



Add Seismic Load

Load Case: Earthquake X

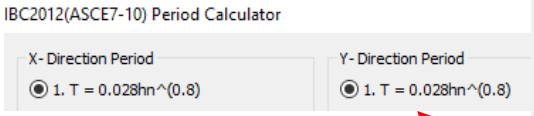
Wind Load Code: IBC 2012

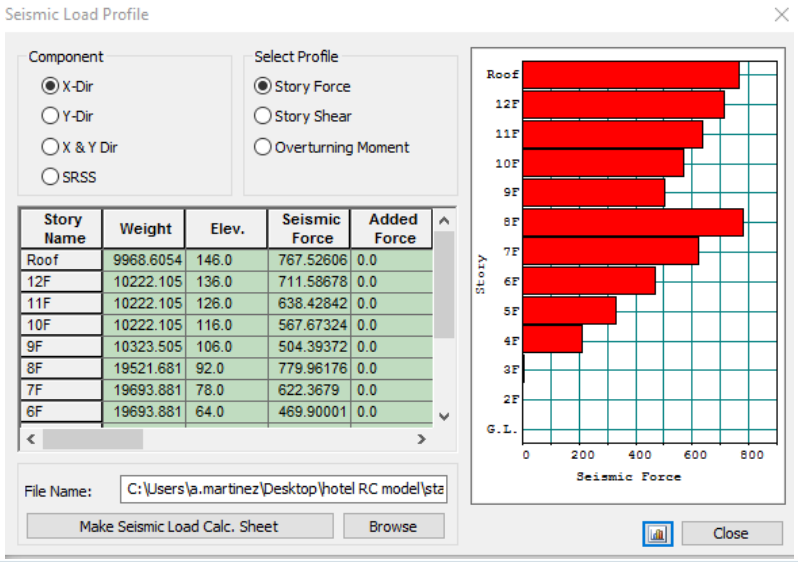
Exposure: B

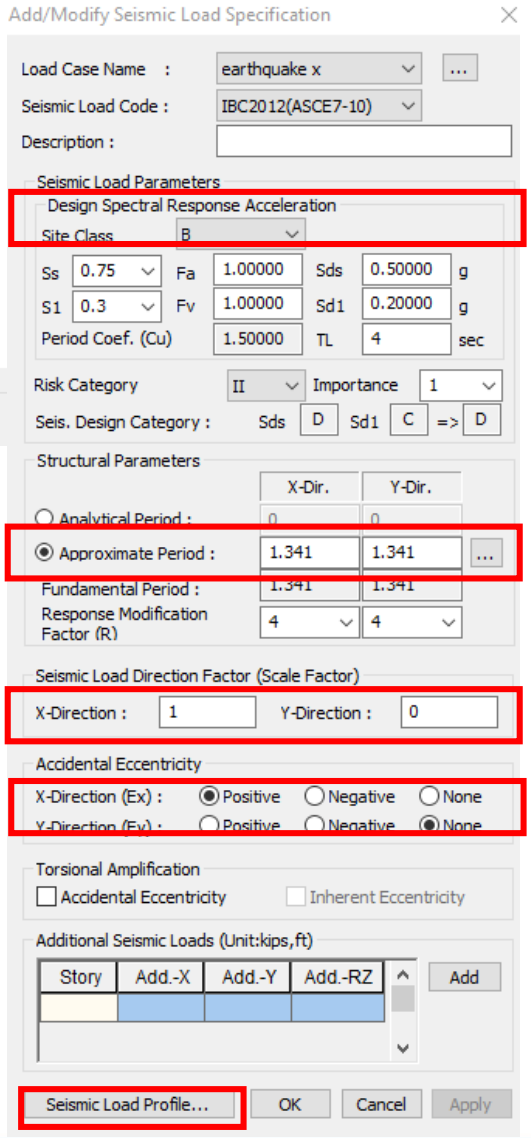
Period 1

X Direction 1 Scale Factor

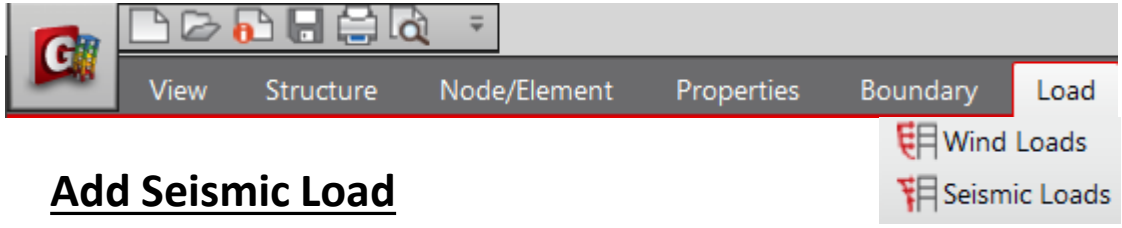
Accidental Eccentricity X Direction Positive







Seismic Load Y



Add Seismic Load

Load Case: Earthquake Y

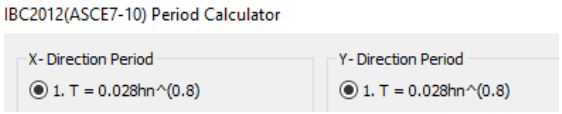
Wind Load Code: IBC 2012

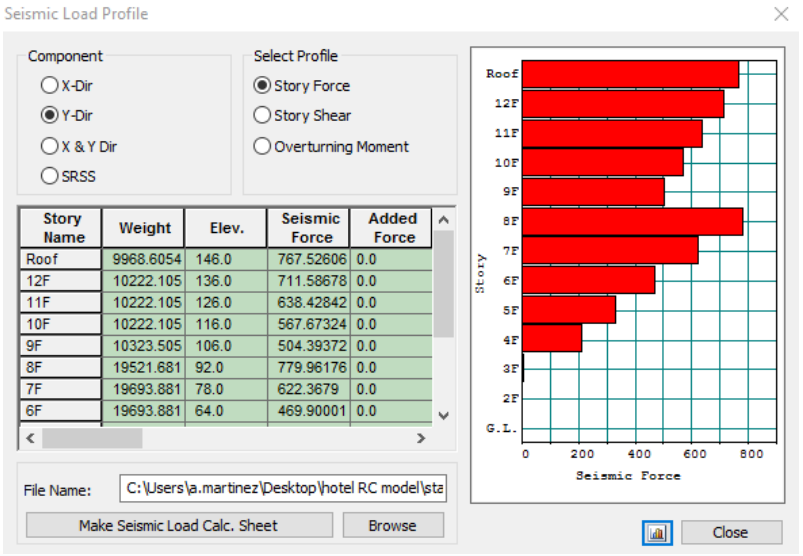
Exposure: B

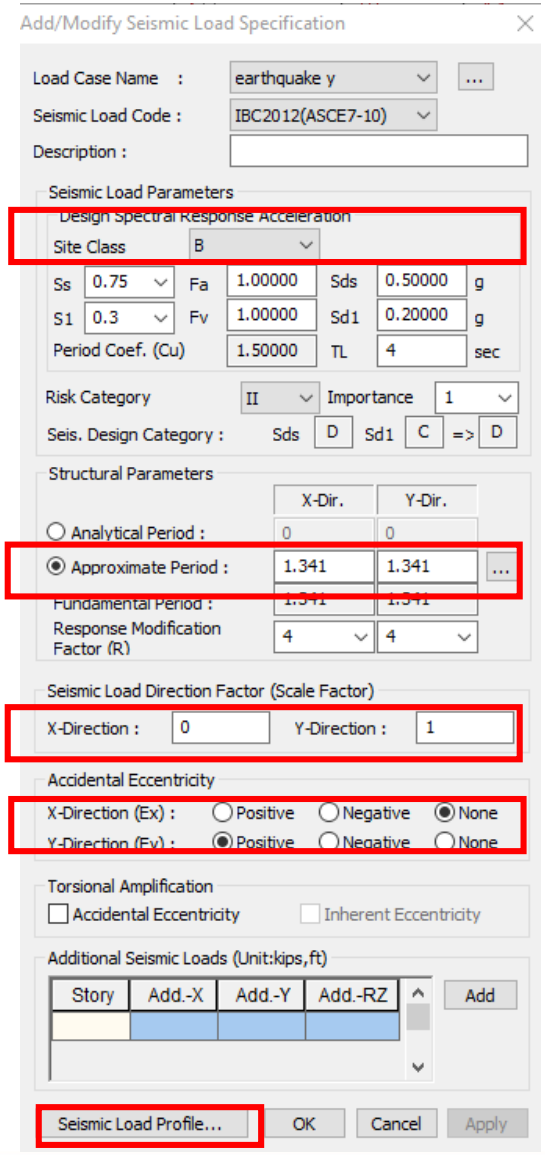
Period 1

Y Direction 1 Scale Factor

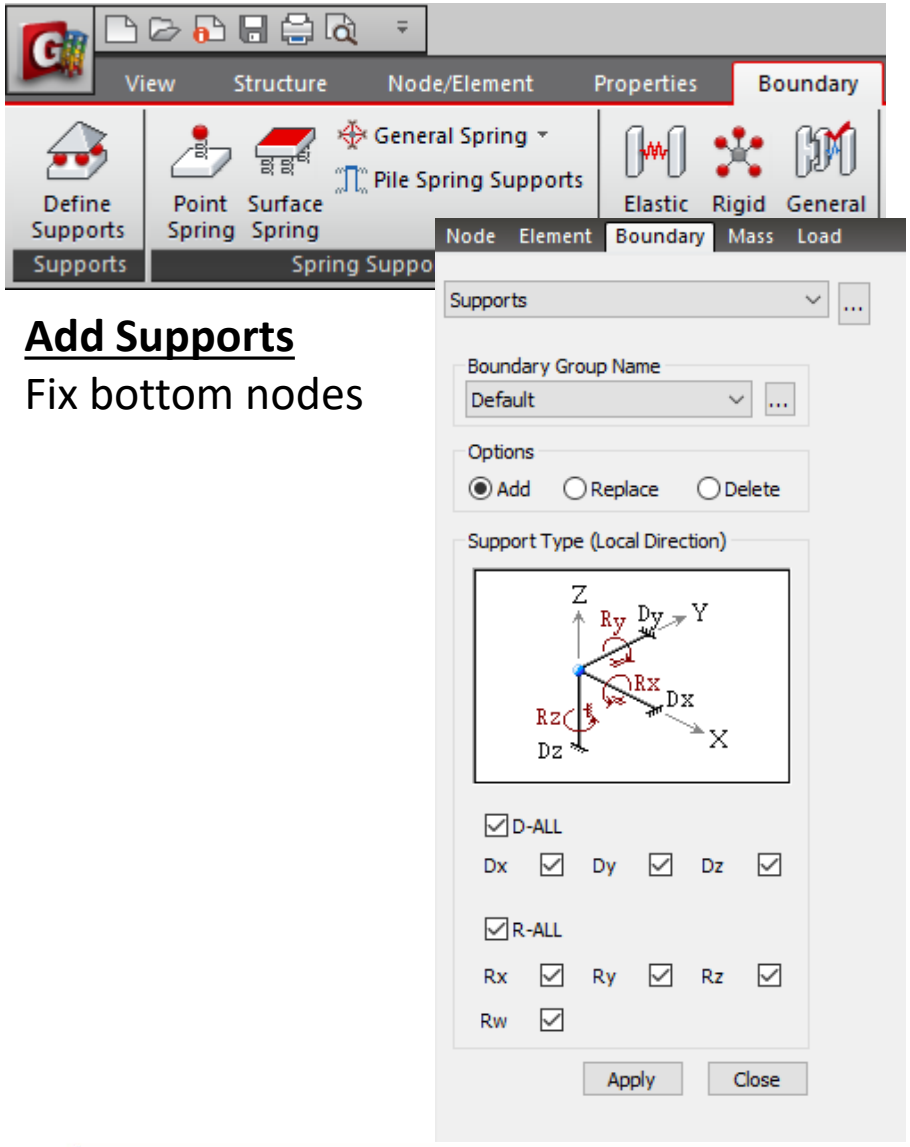
Accidental Eccentricity Y Positive





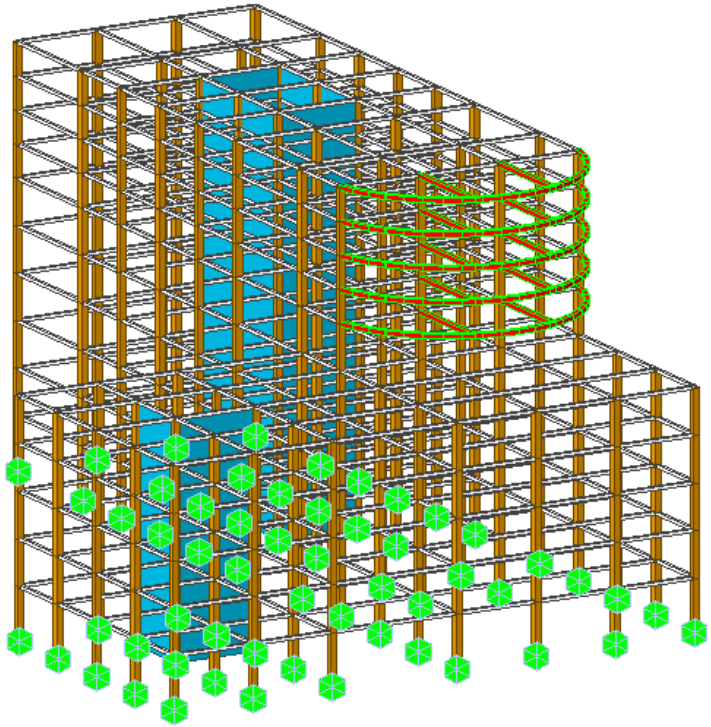


Boundary Condition

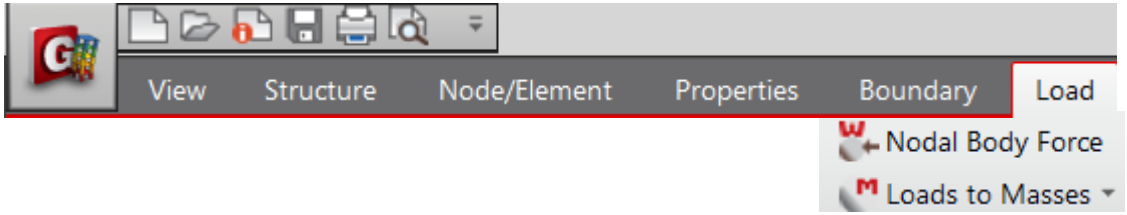


Add Supports

Fix bottom nodes



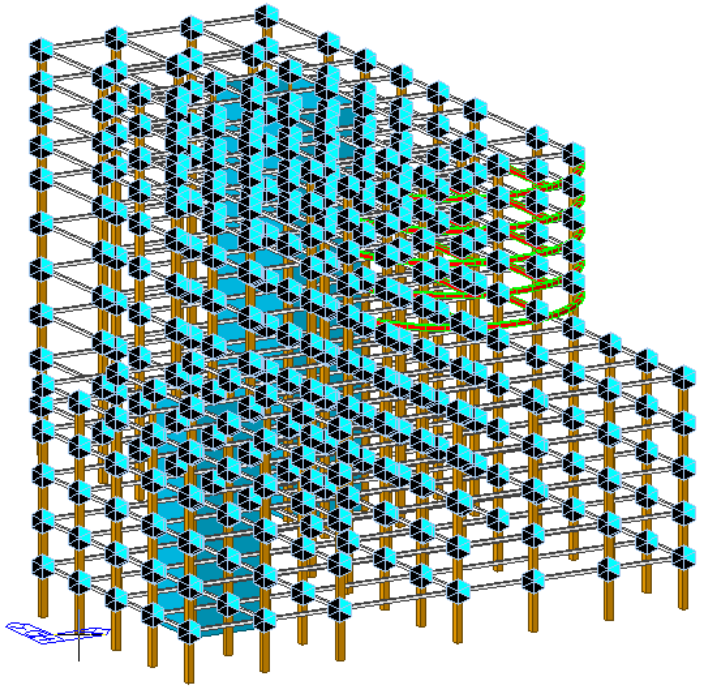
Load to masses

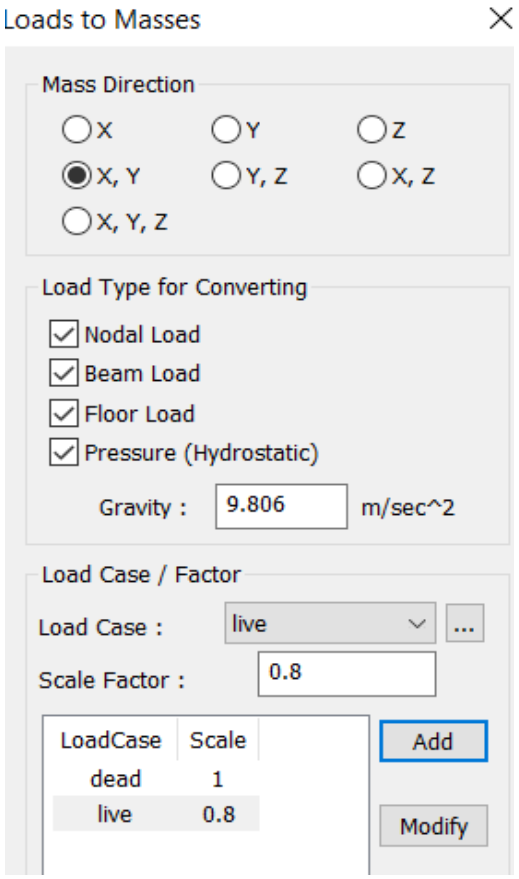


Create Load to Masses

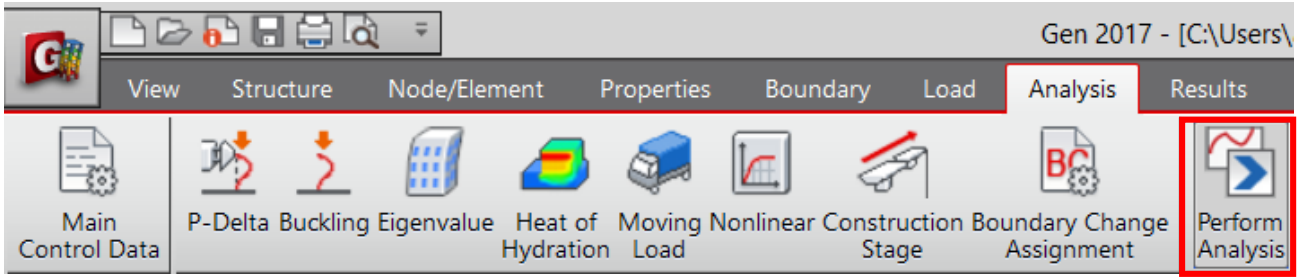
Dead Scale Factor: 1

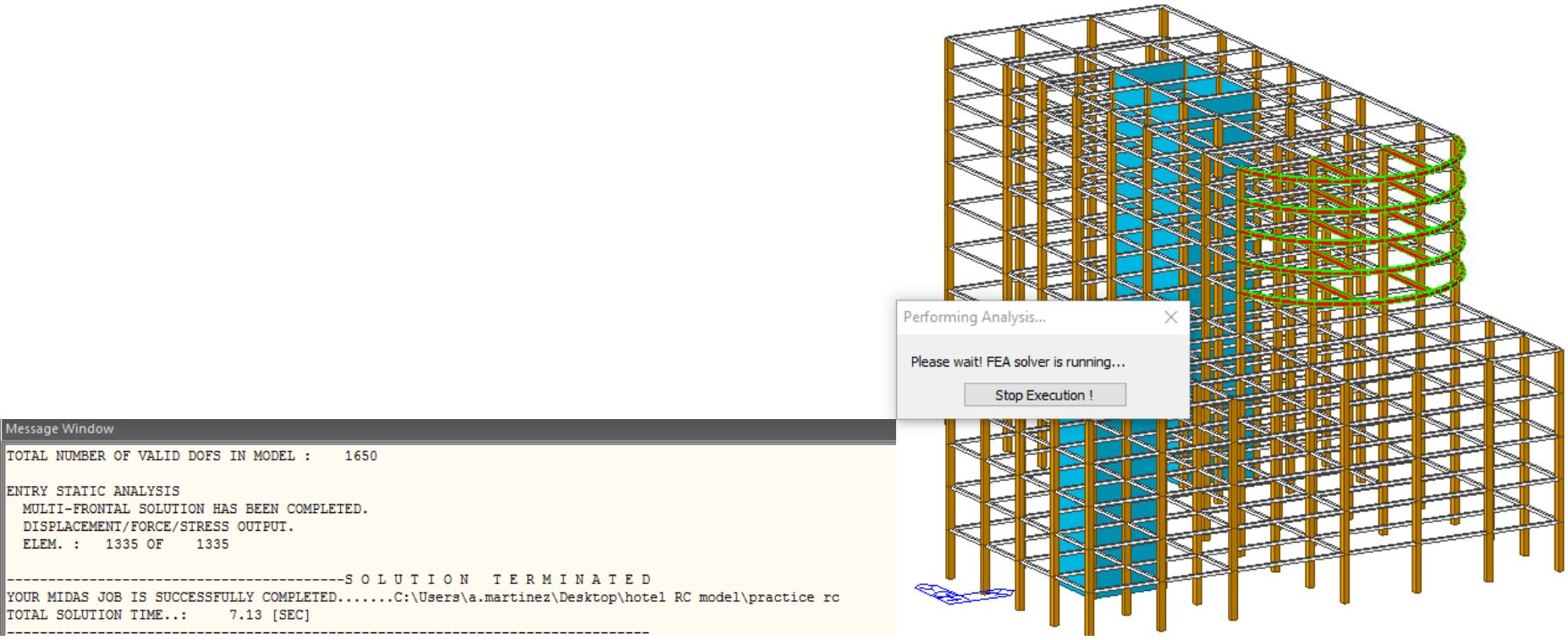
Live Scale Factor: 0.8





Perform Analysis





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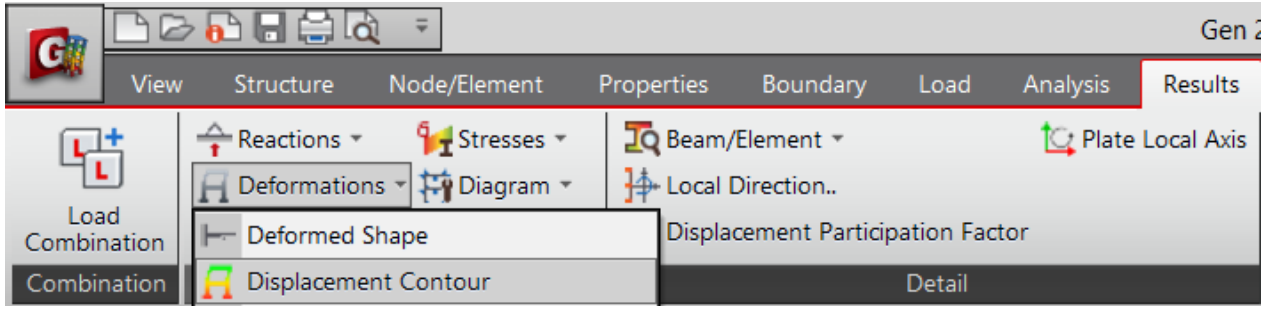
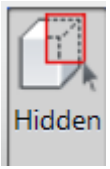
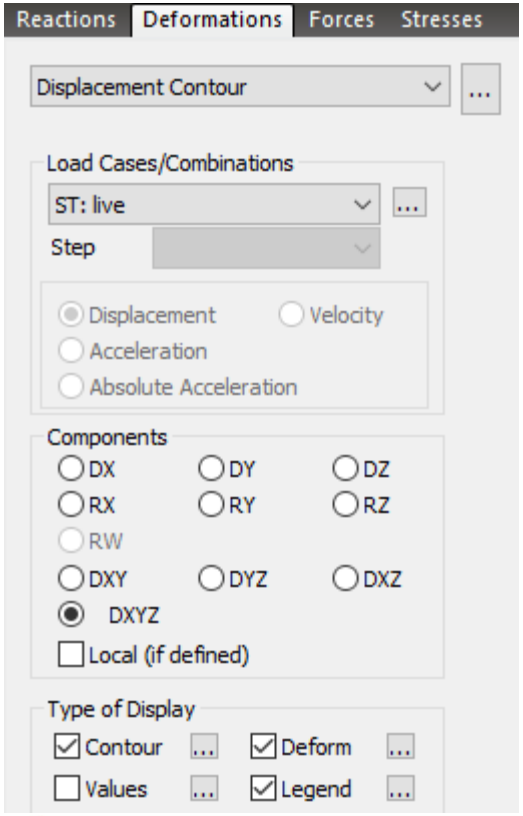
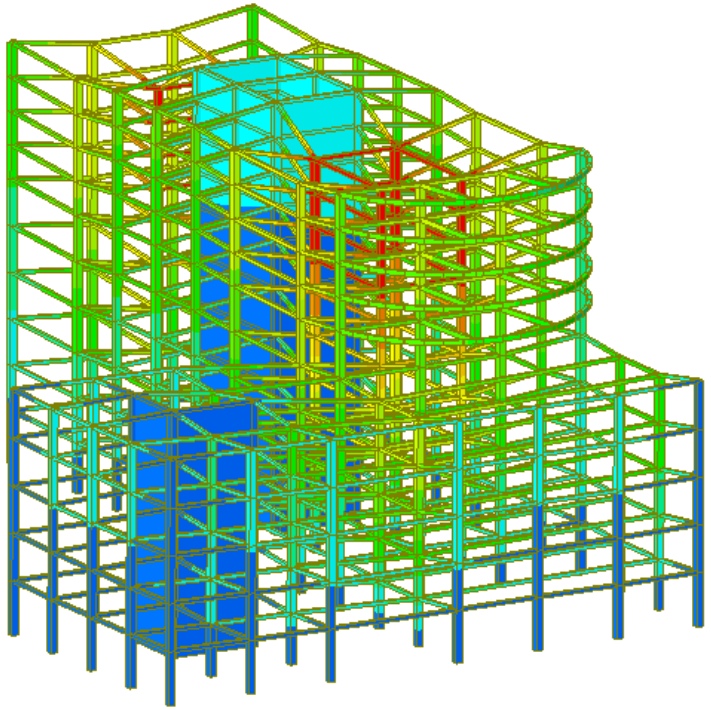
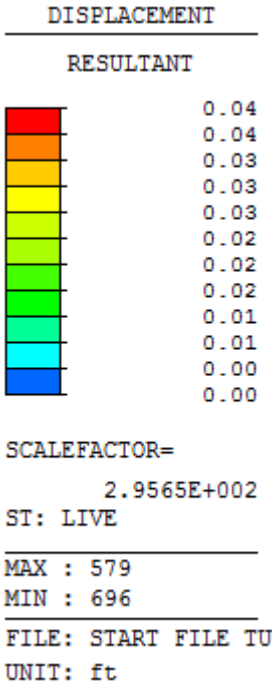
Results: Deformations



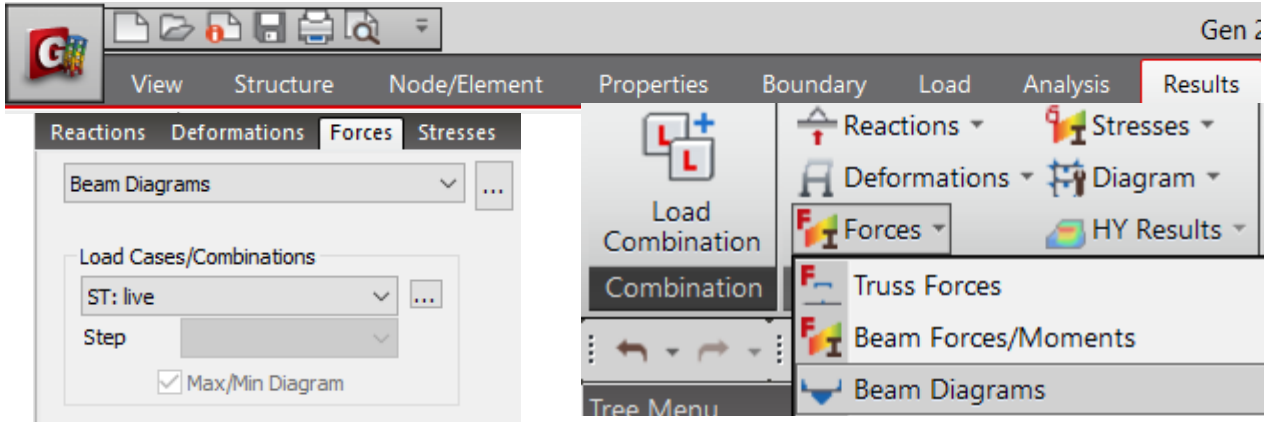


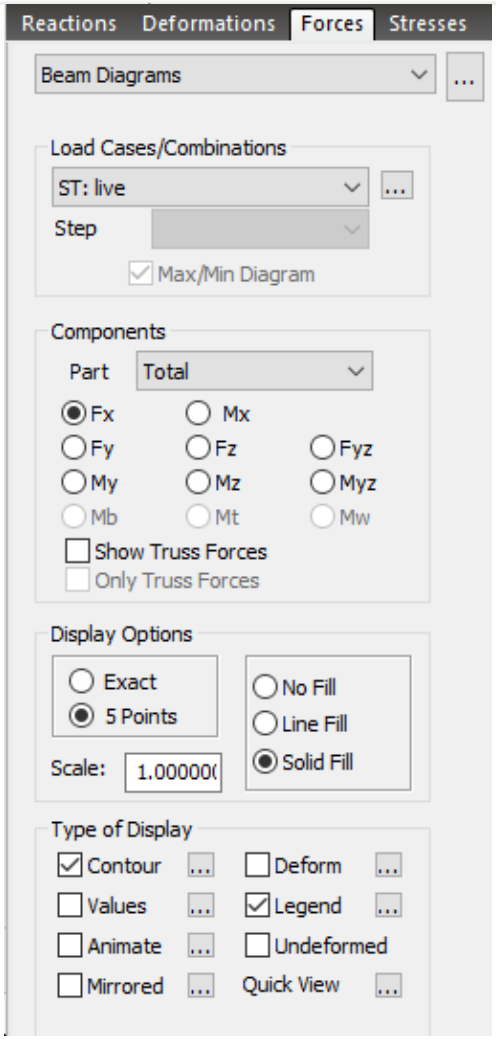


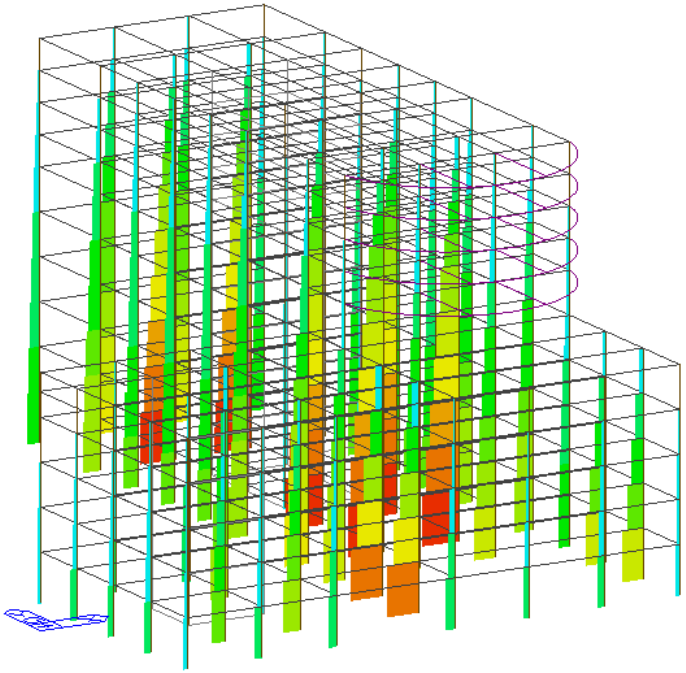


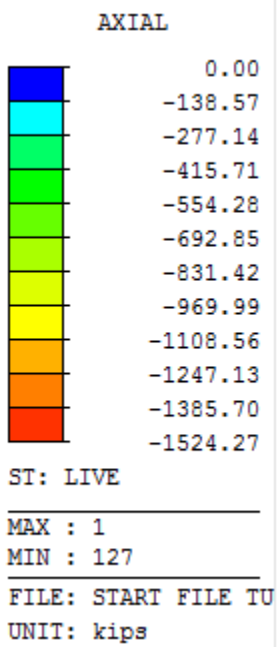


Results: Axial Forces



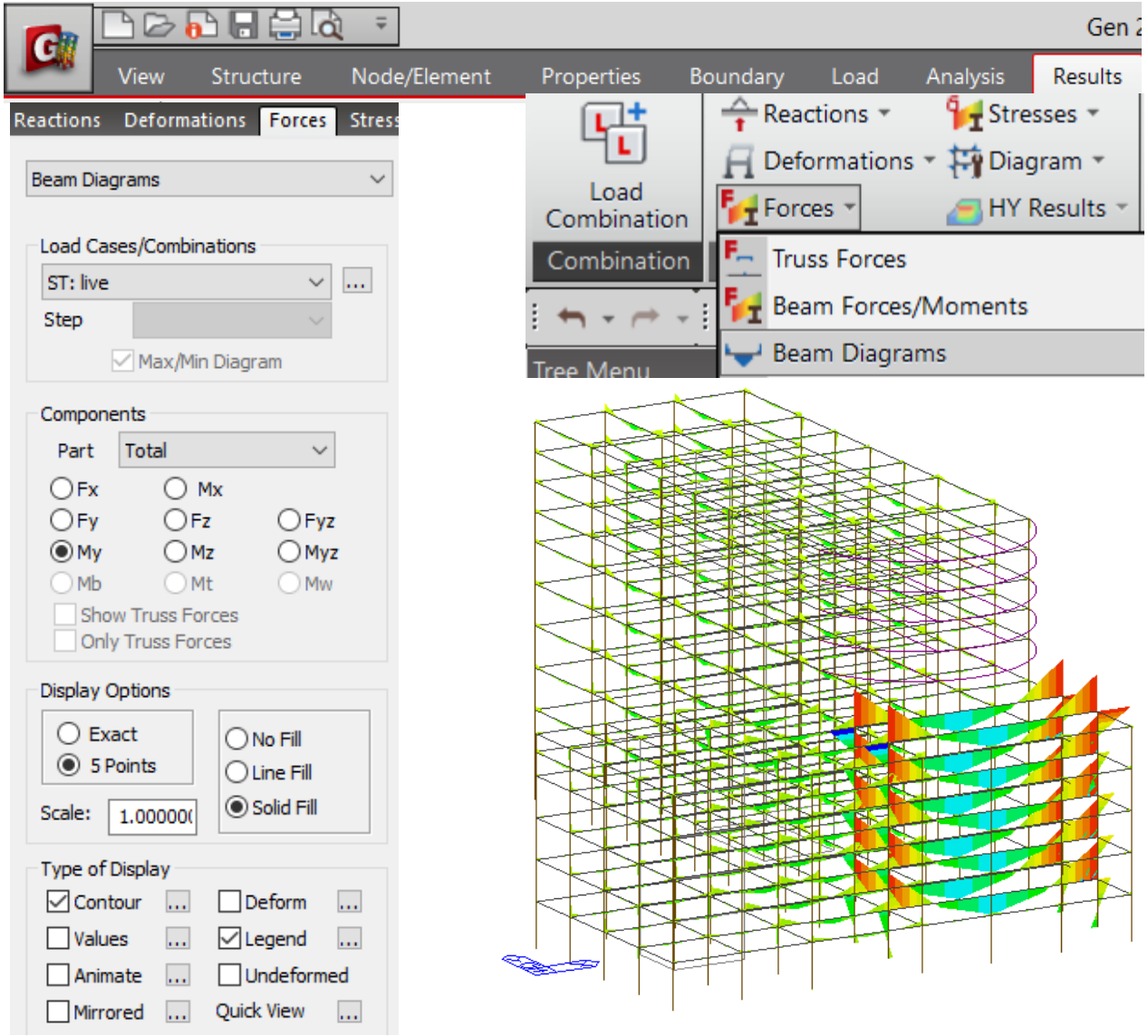


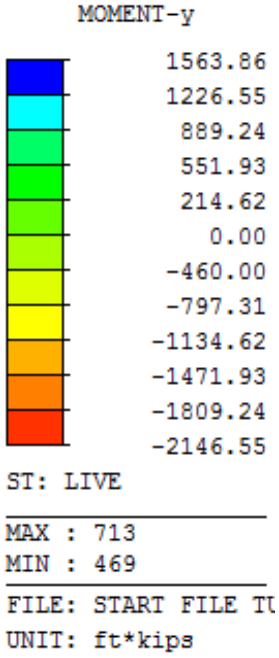




midas Gen

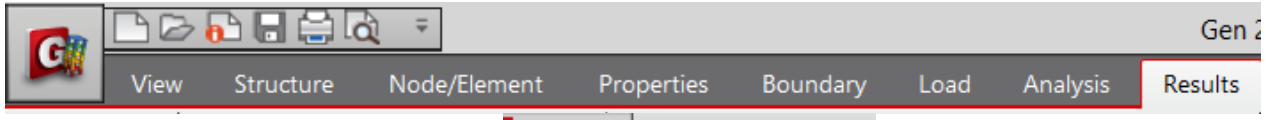
Results: Moments Y

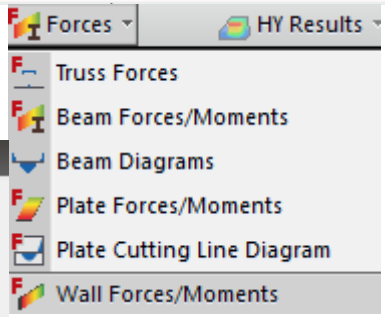


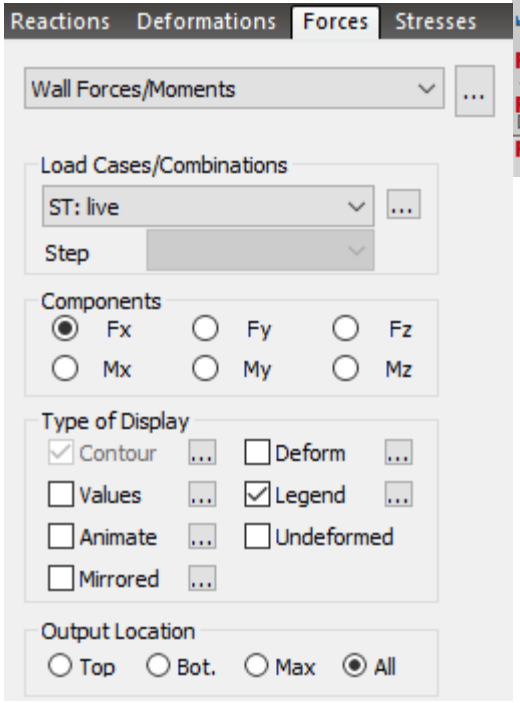


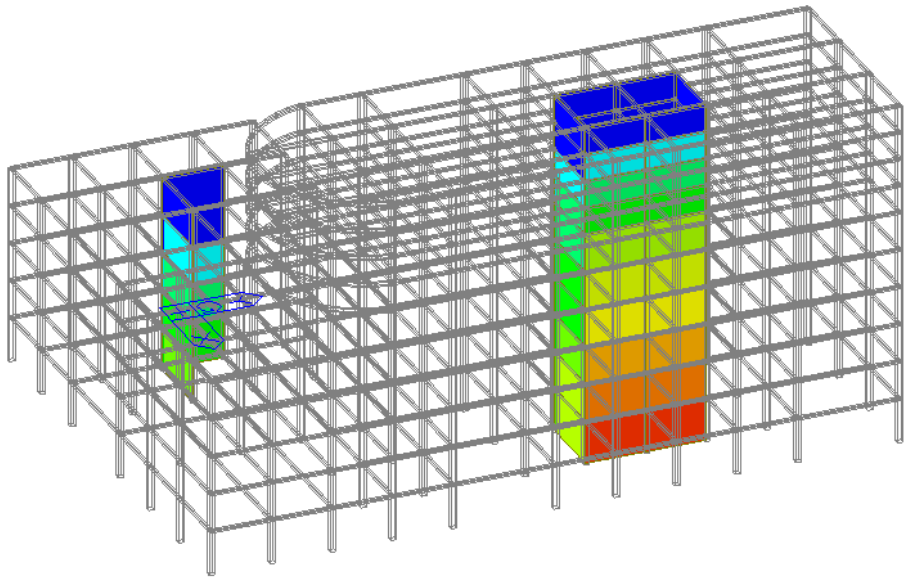
midas Gen

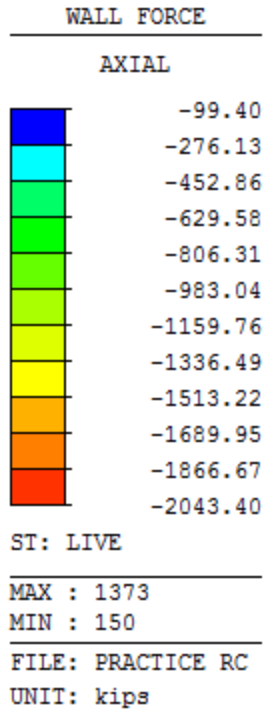
Results: Wall Forces





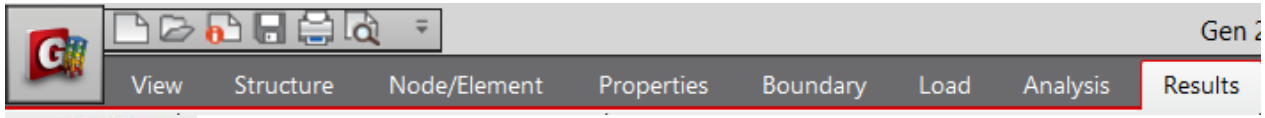






midas Gen

Load combination

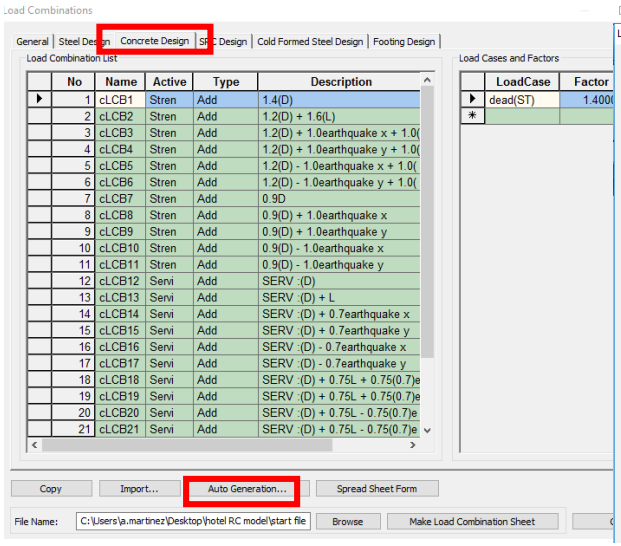


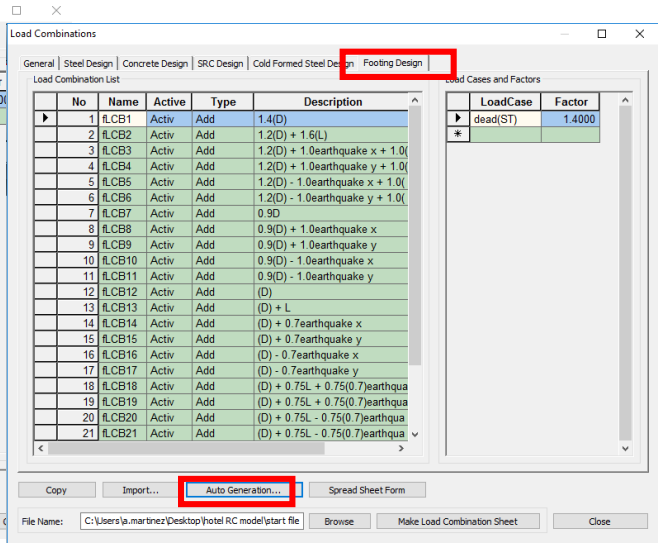
Generate Load Combo

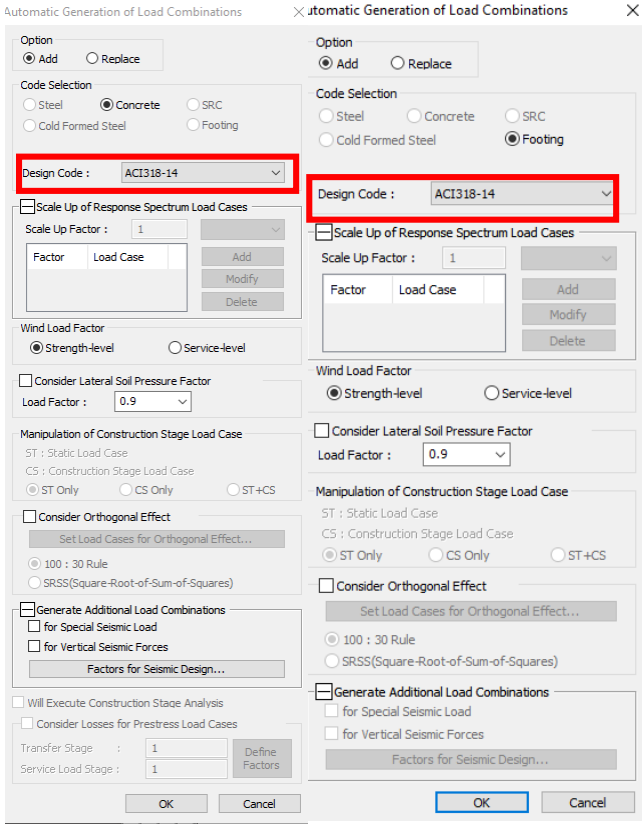
Select Concrete and Footing Design

Auto Generation

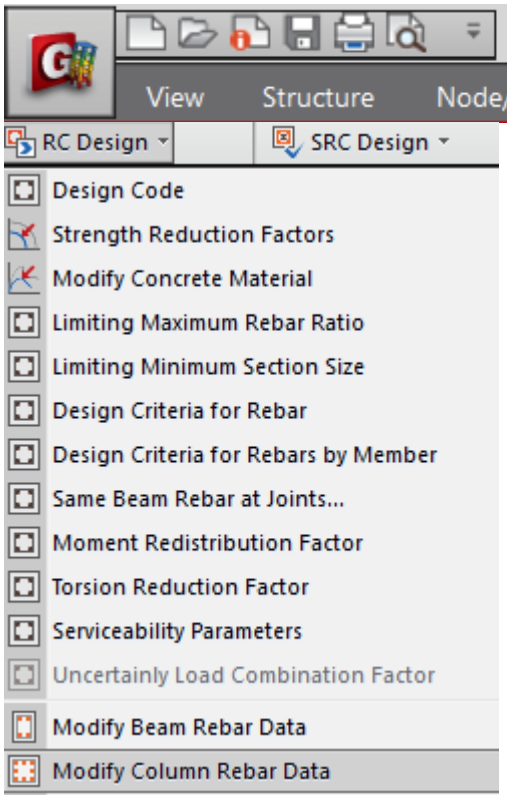
Design Code: ACI318-14

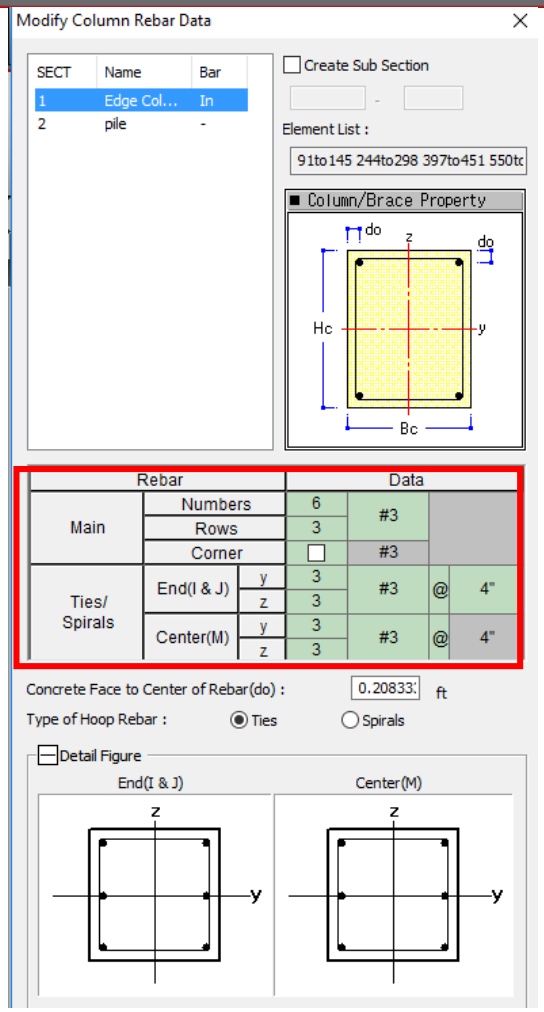






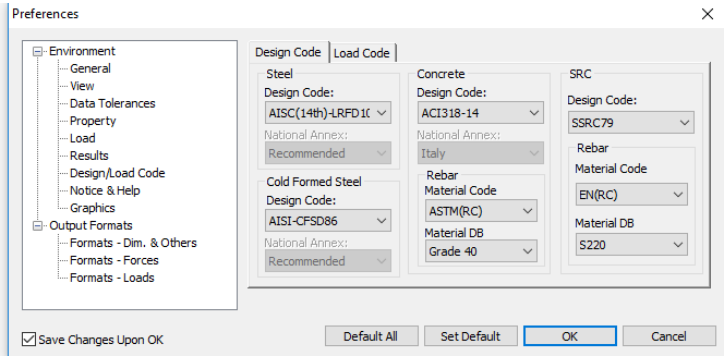
Define Column Rebar Data





Add Column Rebar Data

Specify rebar #3 as shown



Column Code Check

Gen 2017 - [C:\Users\a.martin

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

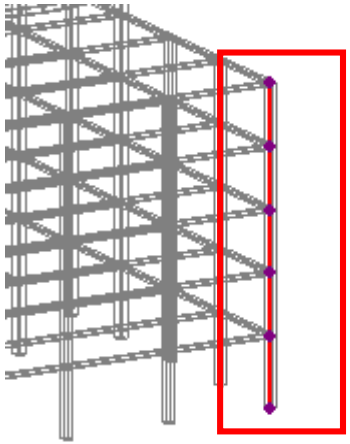
RC Design | SRC Design

- 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 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

Beam Checking
Column Checking

Run Code Check

Select corner columns as shown



ACI318-11 RC-Column Checking Result Dialog

Code : ACI318-11 Unit : kips , ft

Sorted by: Member / Property

Primary Sorting Option: SECT / MEMB

MEMB / SECT	SEL	Section Bc	Section Hc	fc Height	fy fys	CHK	LCB	V-Rebar	phiPn-max	Pu Rat-P	D_nsy D_nsz	Mcy Rat-My	Mcz Rat-Mz	LCB	Vu.end Vu.mid	Rat-V.end 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		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 ft^2 (Rhost = 0.001 < Rhomin = 0.010)

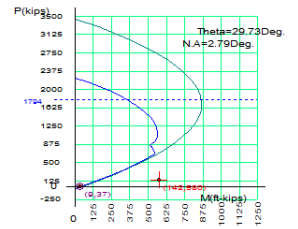
2. Applied Loads

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

3. Axial Forces and Moments Capacity Check

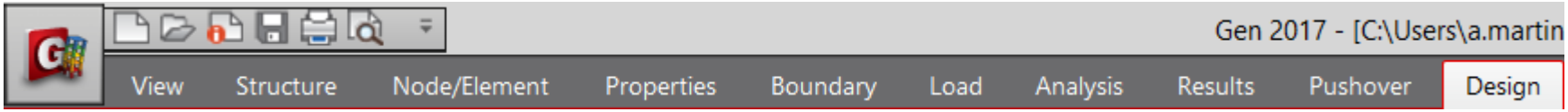
Concentric Max. Axial Load	phiPn-max	= 1793.83 kips	
Axial Load Ratio	Pu/phiPn	= 142.261 / 9.20707	= 15.451 > 1.000 ..... N.G
Moment Ratio	Mc/phiMn	= 579.911 / 37.1473	= 15.611 > 1.000 ..... N.G
	My/phiMny	= 503.189 / 32.2571	= 15.599 > 1.000 ..... N.G
	Mz/phiMnz	= 288.266 / 18.4227	= 15.647 > 1.000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

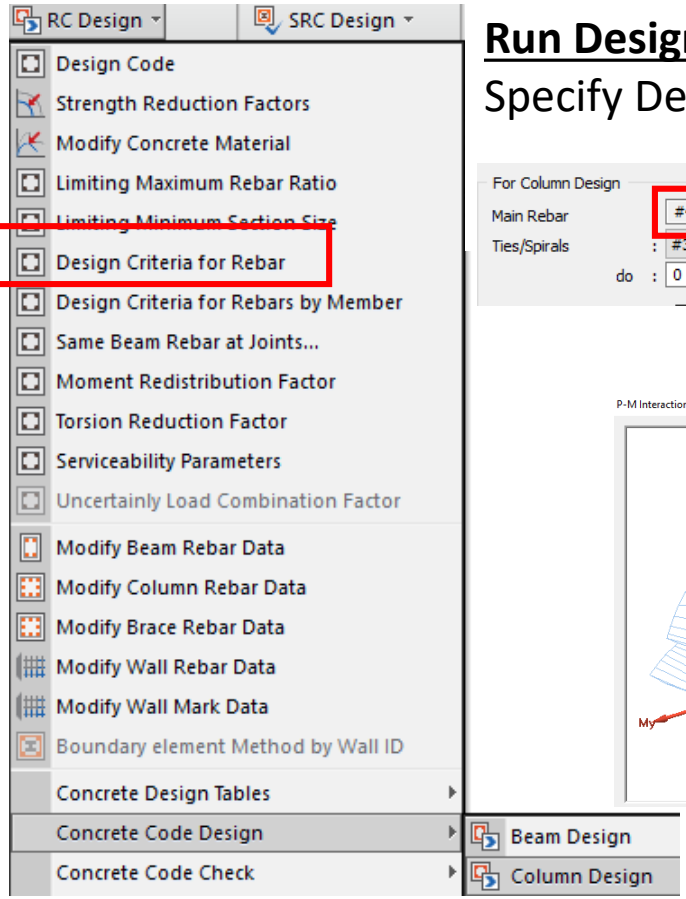
4. P-M Interaction Diagram



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

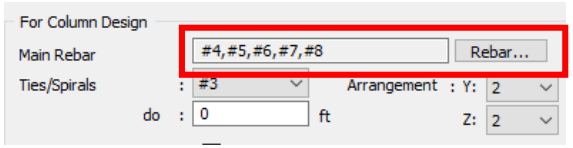
Column Design

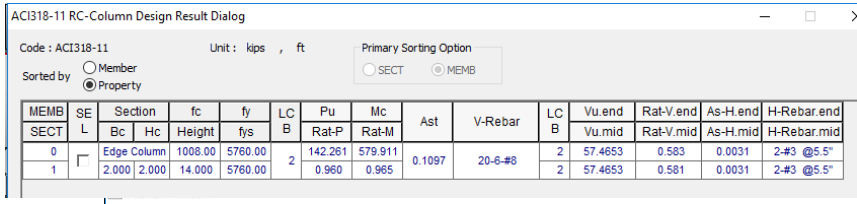




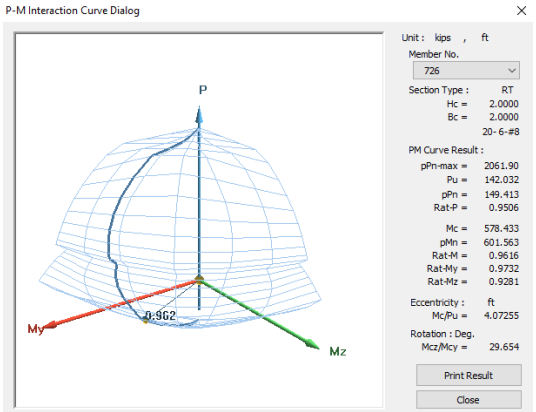
Run Design

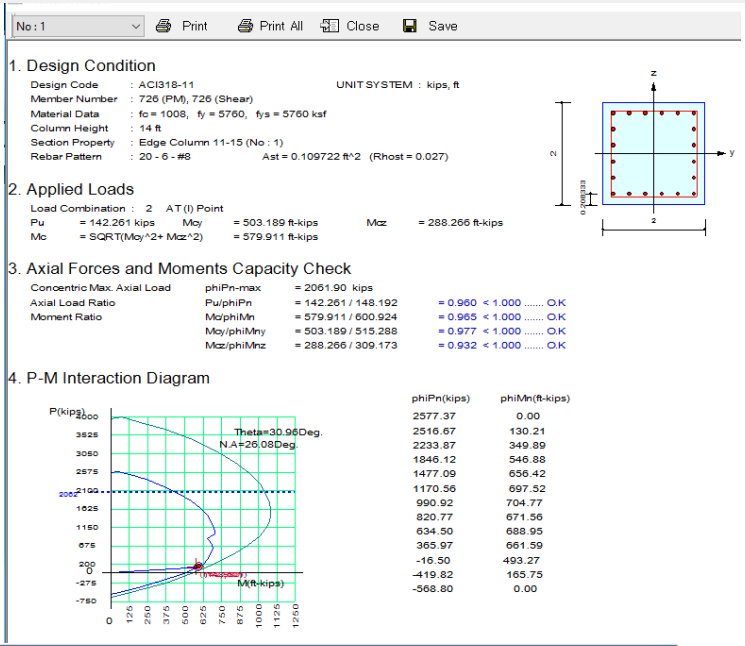
Specify Design Criteria for Rebar



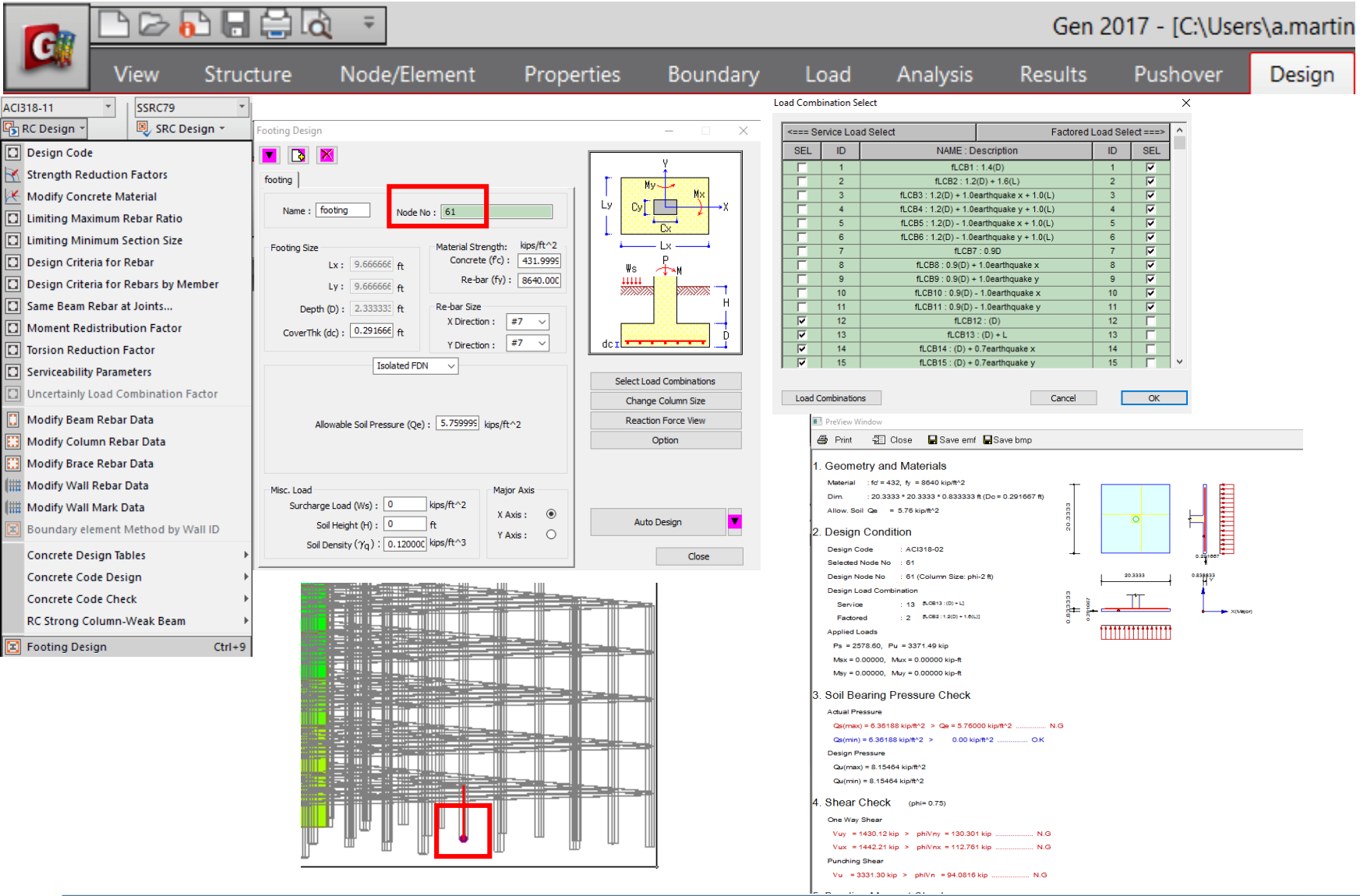


MEMB / SECT	SE L	Section Bc	Hc	Height	fc / fys	fy / fys	LC B	Pu / Rat-P	Mc / Rat-M	Ast	V-Rebar	LC B	Vu.end / Vu.mid	Rat-V.end / Rat-V.mid	As-H.end / As-H.mid	H-Rebar.end / H-Rebar.mid
0		Edge Column		1008.00	5760.00		2	142.261	579.911	0.1097	20-6-#8	2	57.4653	0.583	0.0031	2-#3 @5.5"
1		2.000	2.000	14.000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

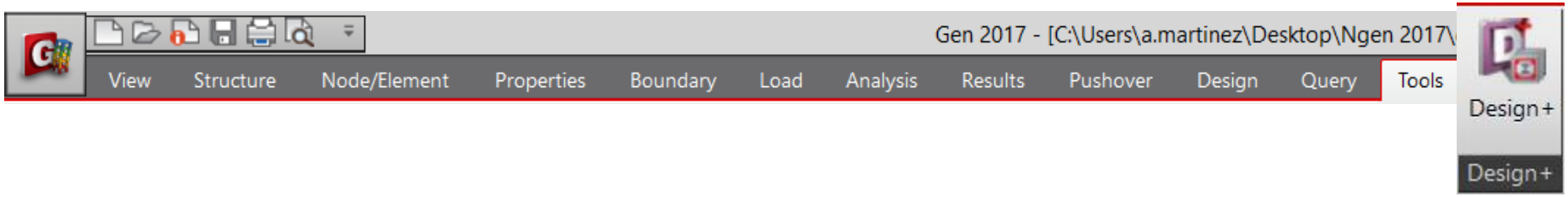


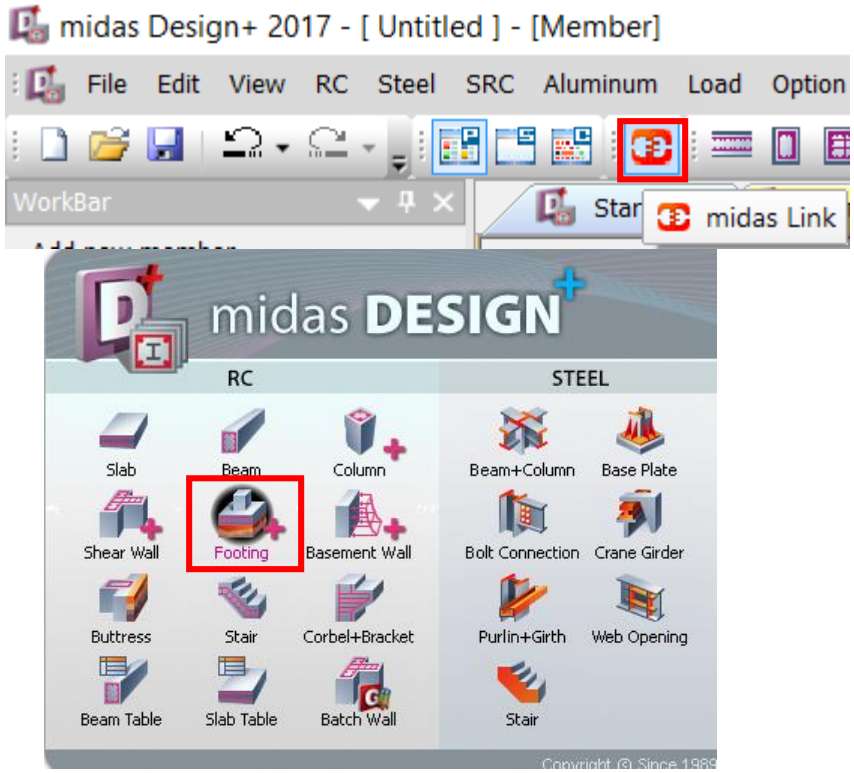


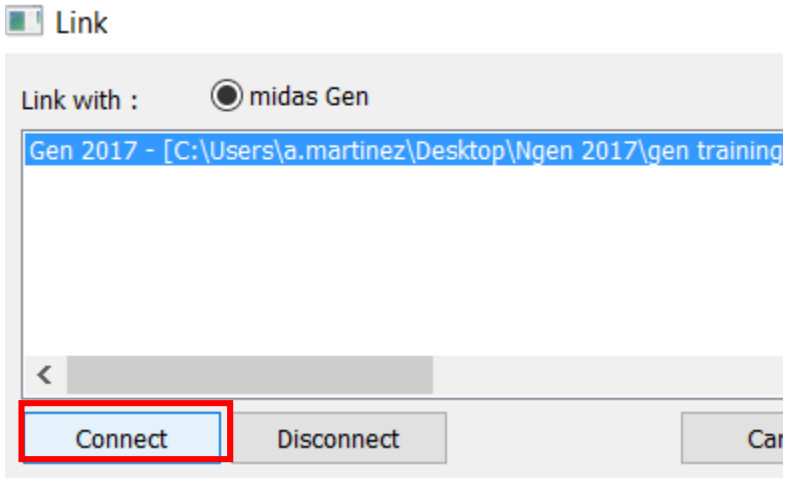
Footing Design



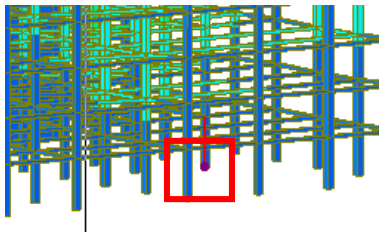
Design Plus Import







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

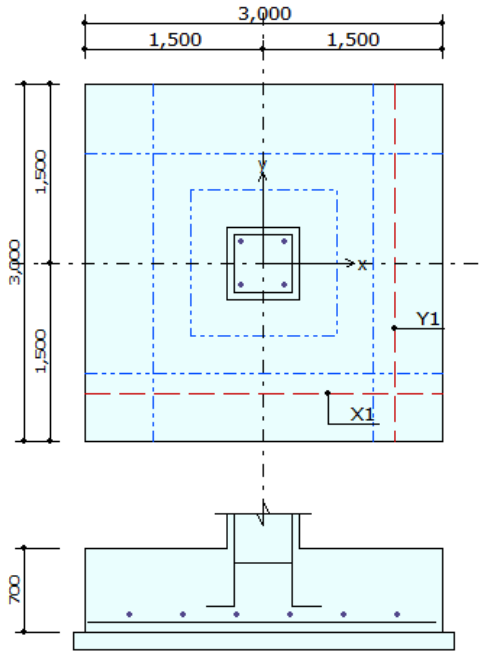
Rectangle | Circle

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 (mm²)	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

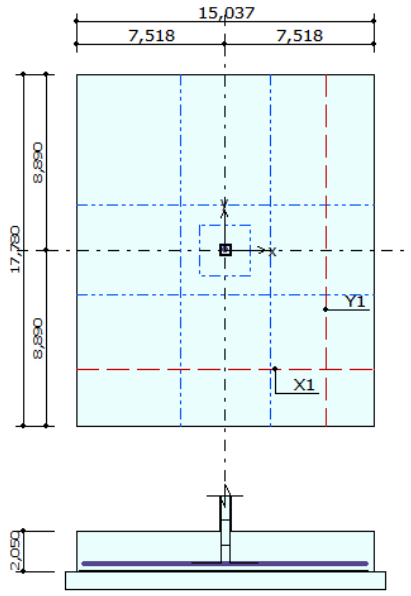
Material
- Concrete 24 MPa
- Main Bar 400 MPa
- Light Weight Concrete
- Factor 1

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

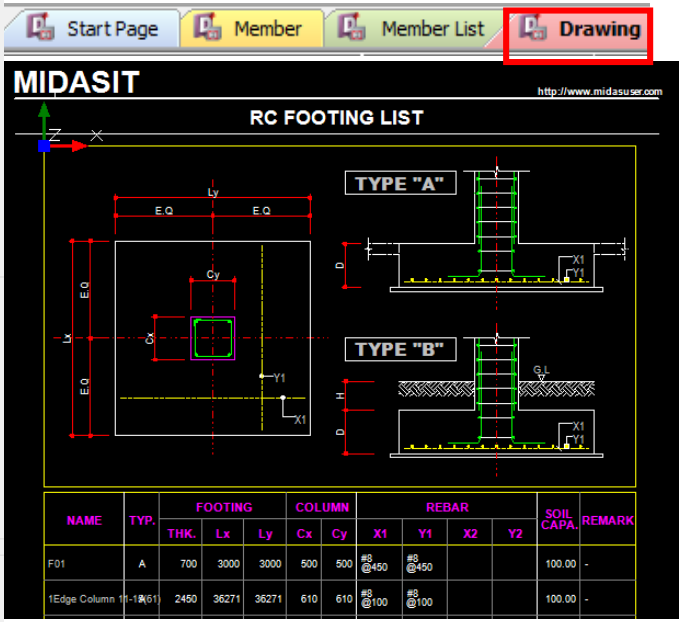
Check Items	Result	
Soil Bearing (KPa)	99.80	OK(0.998
1Way Shear-X (kN)	11588	OK(0.545
1Way Shear-Y (kN)	12373	OK(0.696
2Way Shear (kN)	18055	OK(0.735
Min. Bar Ratio (mm²)	0.180%	1125
Max. Bar Space (mm)	#7	@457

Footing Size

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

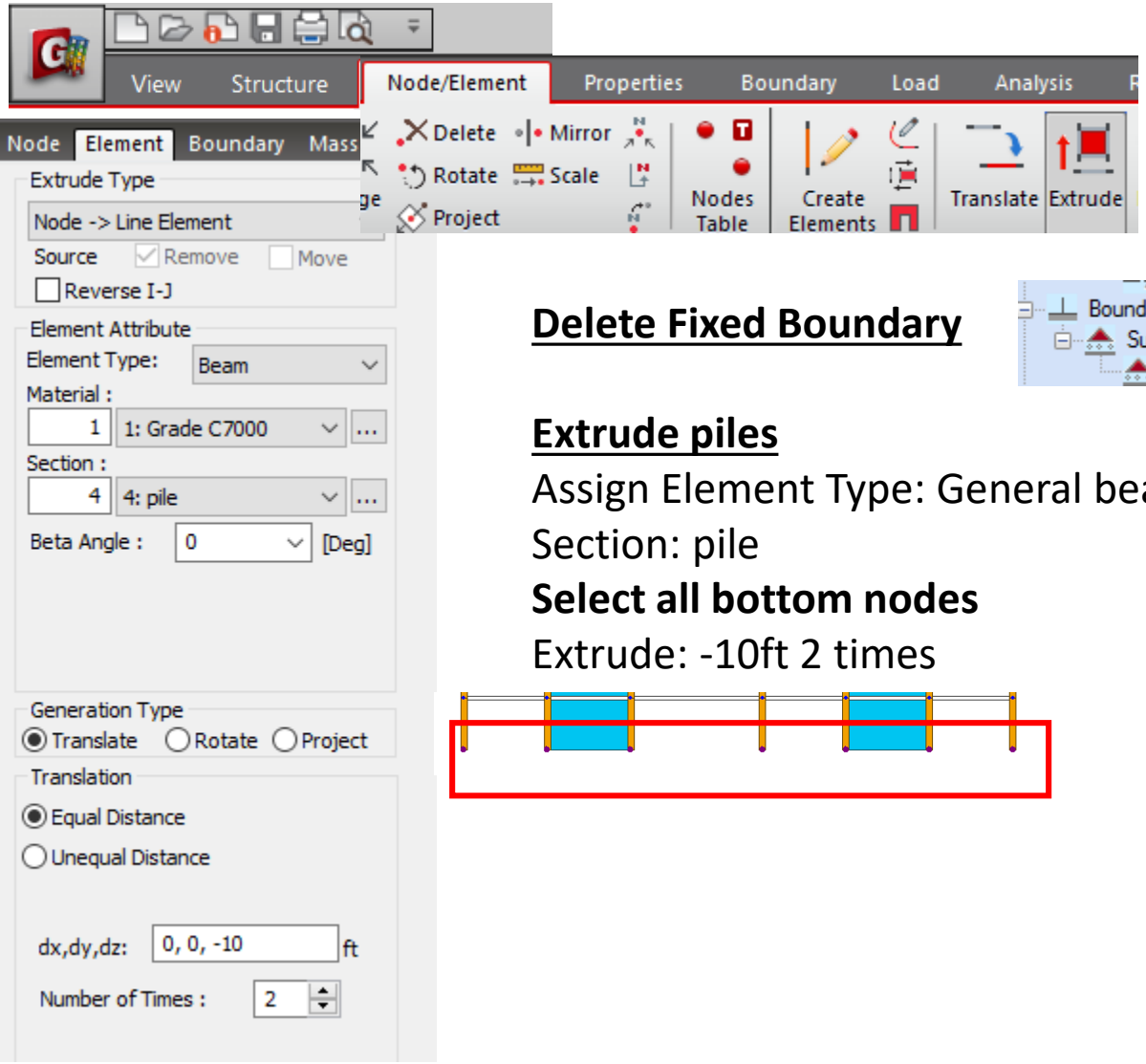
Rebar

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

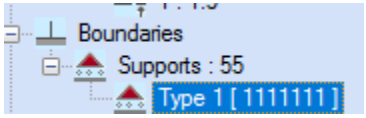


Design(F4) | Check(F5) | Report ... | Apply(F3)

Create Piles



Delete Fixed Boundary



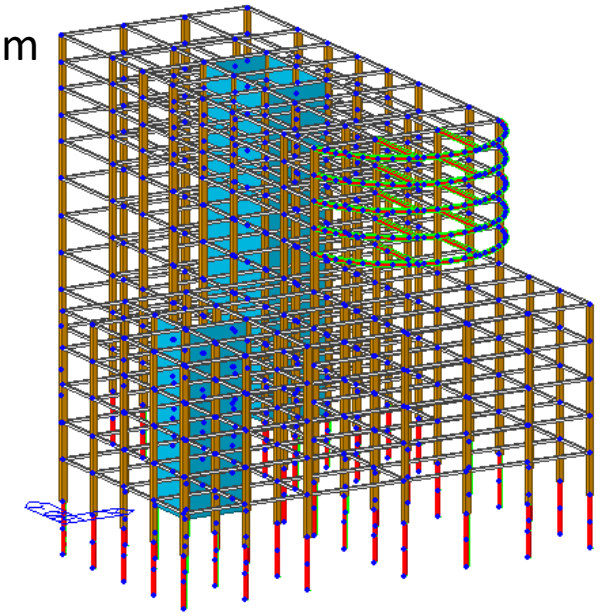
Extrude piles

Assign Element Type: General beam

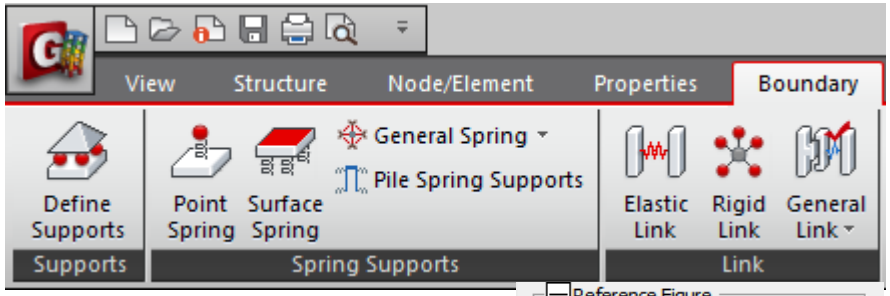
Section: pile

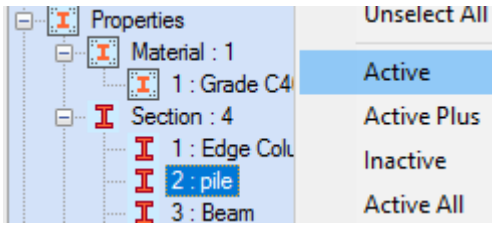
Select all bottom nodes

Extrude: -10ft 2 times



Pile Spring Support

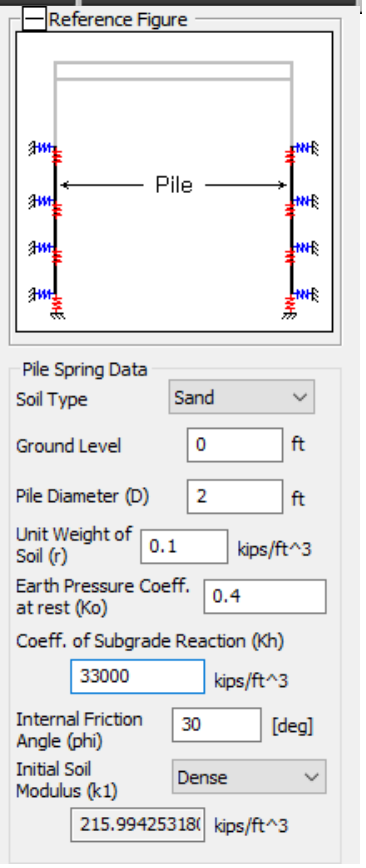


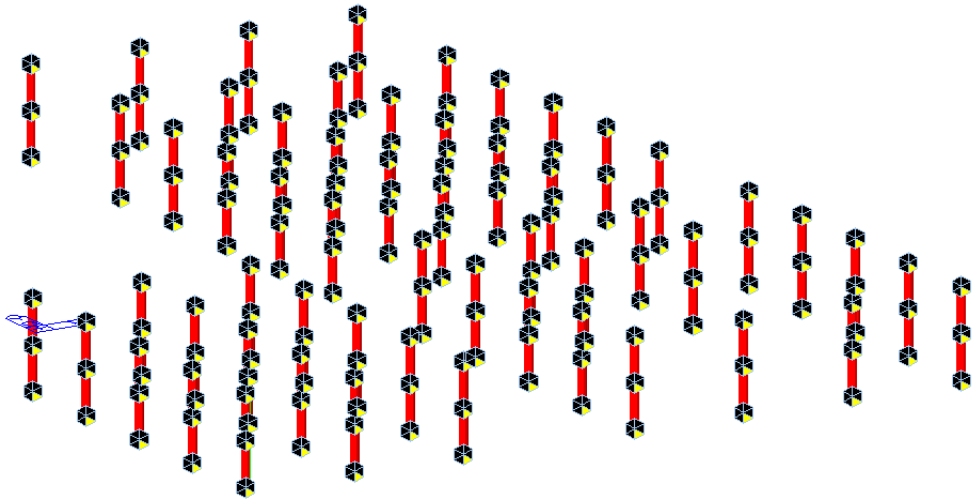


Add Pile Springs

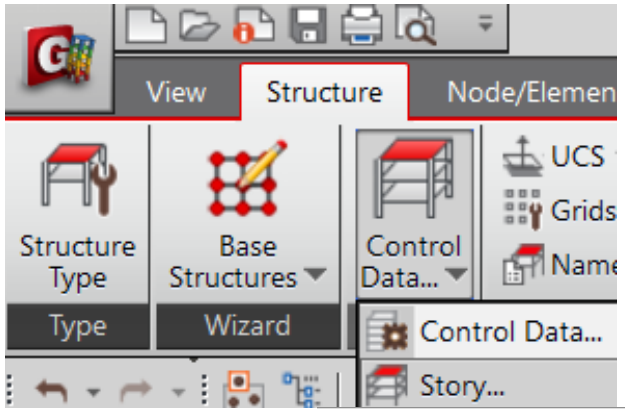
Activate Only Piles

Apply Spring as Shown





Update story data



Auto Generate 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
*					

Story | Wind | Seismic

Auto Generate Story Data... | Define Module... | Close

Automatic Generation of Story Data

Unselected List

No	Level

-> <-

Selected List

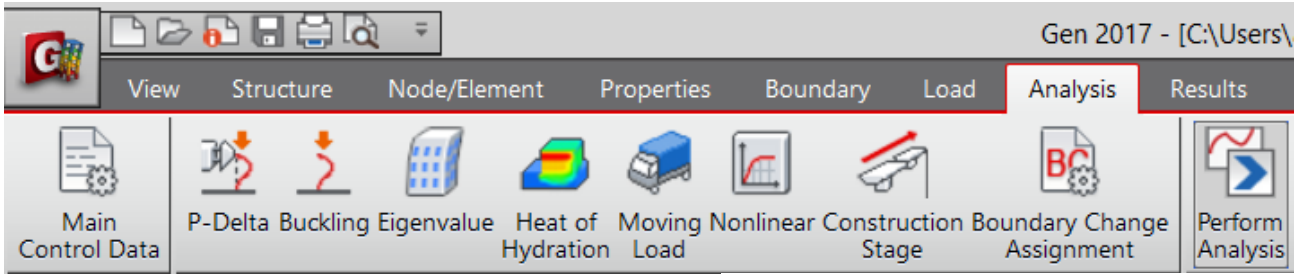
No	Name	Level	Height
1	1F	-20	10
2	2F	-10	10
3	3F	0	16
4	4F	16	14
5	5F	30	14
6	6F	44	14
7	7F	58	14
8	8F	72	14
9	9F	86	10
10	10F	96	10
11	11F	106	10
12	12F	116	10

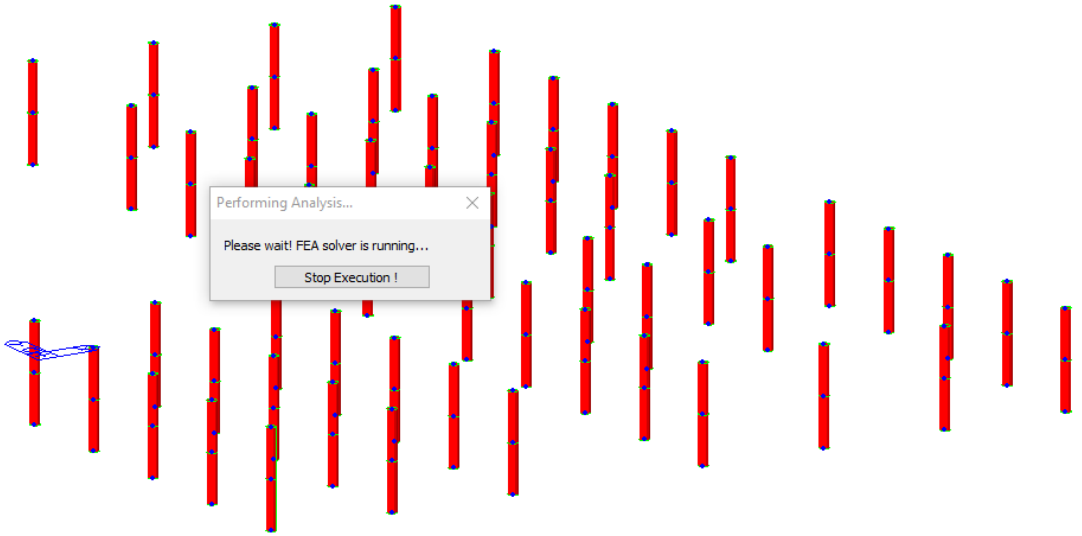
☑ Include Seismic Accidental Eccentricity : 5 % of Plan Dimension

☑ Include Wind Eccentricity : 15 % of Plan Dimension

OK | Cancel

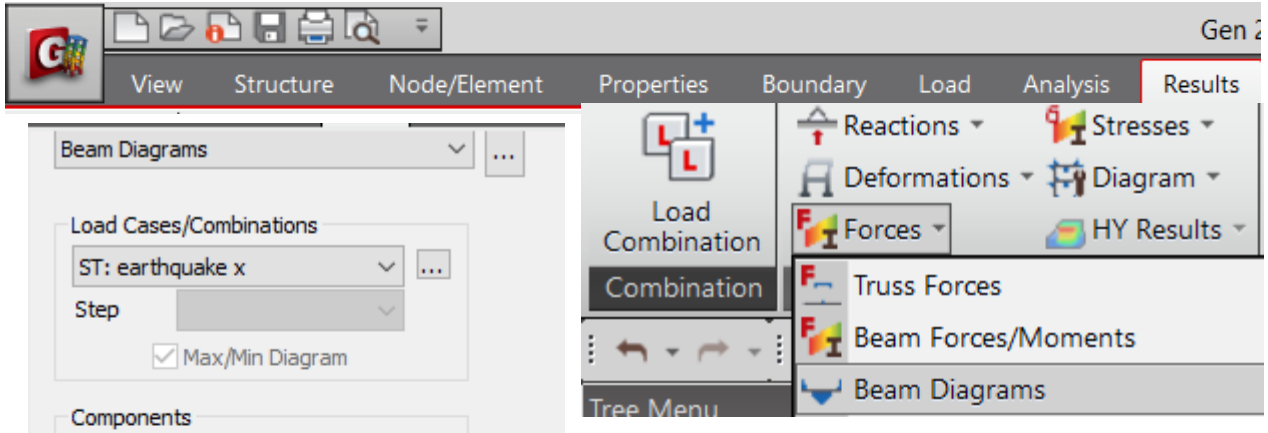
Re-Perform Analysis

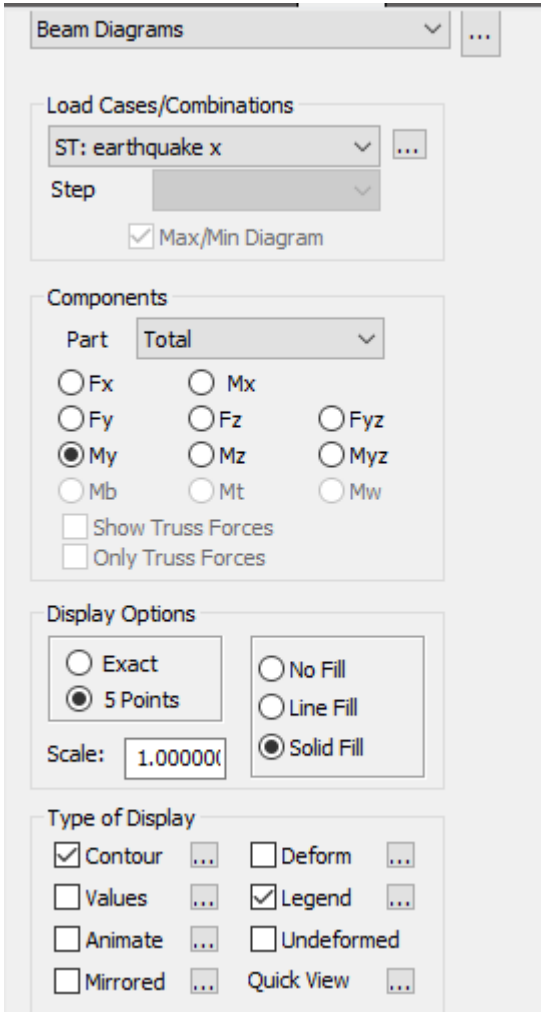


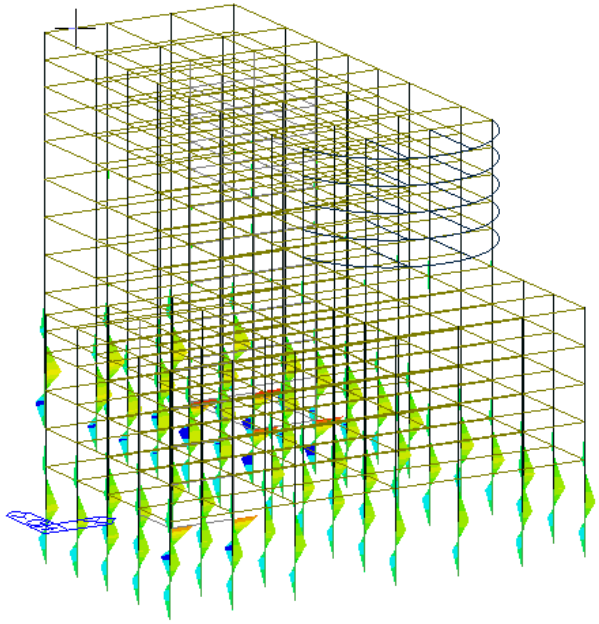


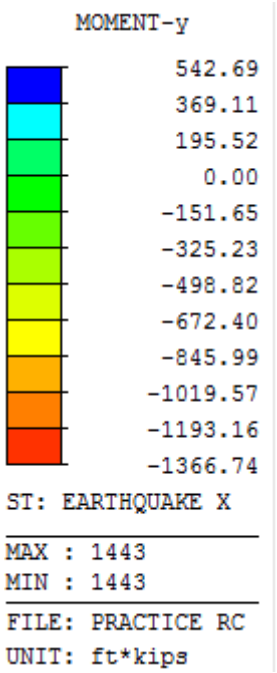

```
YOUR MIDAS JOB IS SUCCESSFULLY COMPLETED.......C:\Users\a.martinez\Desktop\hotel RC model\practice rc
TOTAL SOLUTION TIME..:    20.11 [SEC]
--------------------------------------------------------------------------------
```

Results: Moments









Thanks!