

Overview

▪ 3-D Linear Static Analysis

▪ Model

- Unit : N, m
- Isotropic Elastic Material
- Plate and Beam Elements

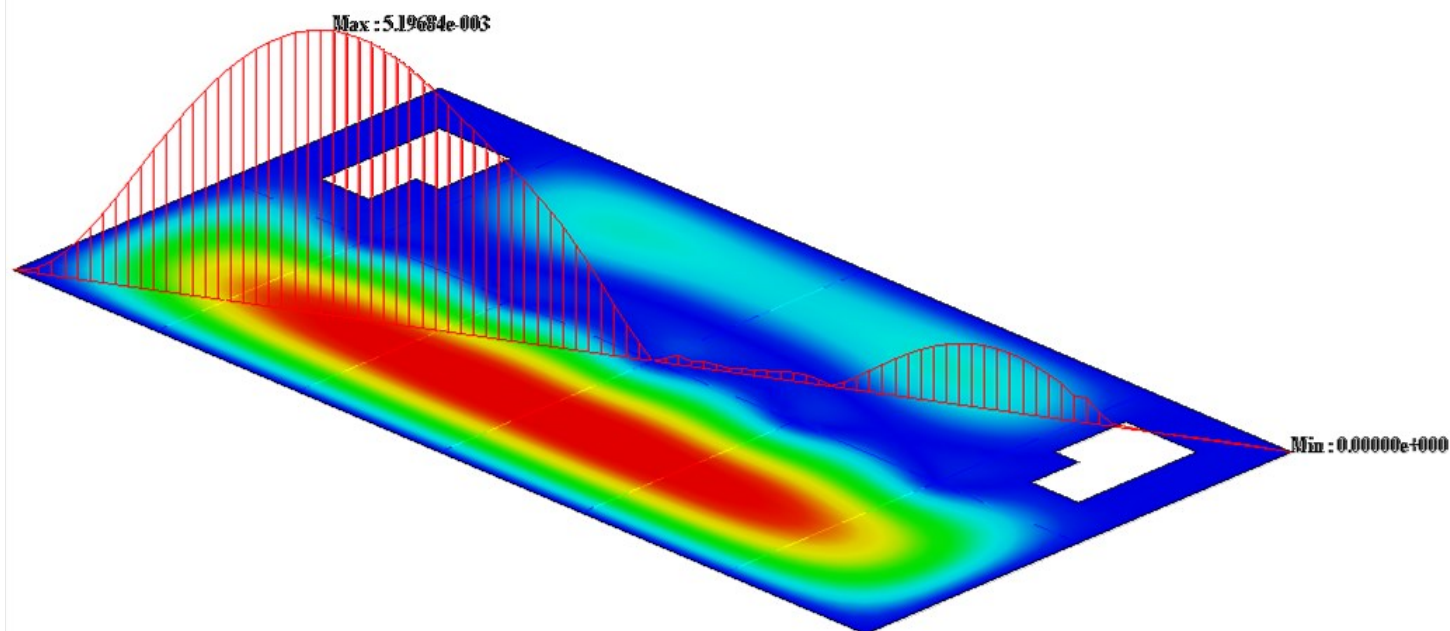
▪ Load & Boundary Condition

- Body Force
- Pressure
- Constraint

▪ Result Evaluation

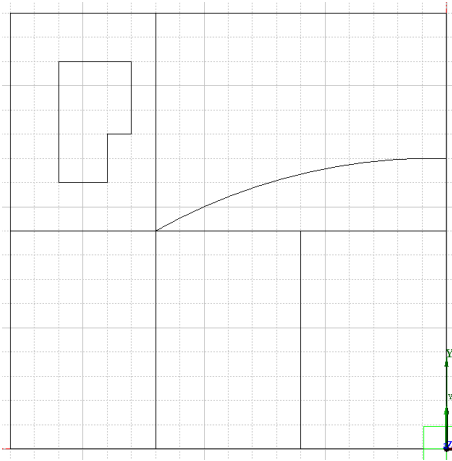
- Deformation
- On-Curve Diagram
- Beam Diagram

Concrete Floor

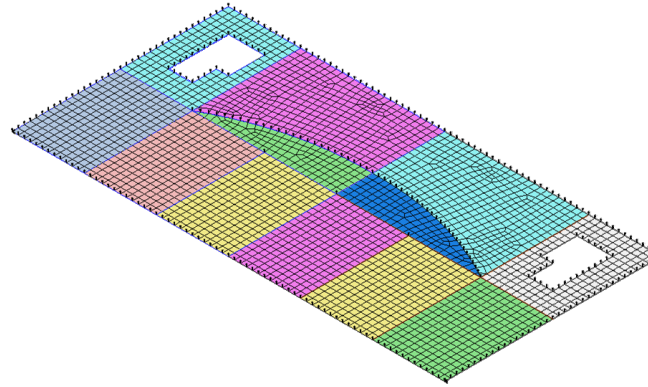


Modeling & Analysis Point

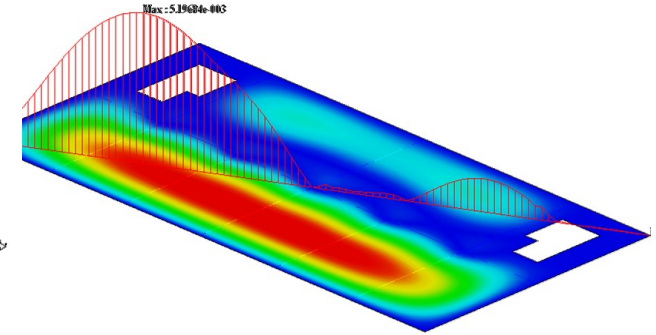
Geometry Modeling



Constraint & Load



Result Plot



About this Training...

This tutorial model is the concrete slab model using 1D beam element and 2D plate element.

The slab is 0.3m in thickness and the frame is defined as H-beam. The self weight and pressure load are defined.

After an analysis, check the displacement results with the *Probe Result* and *On Curve Diagram* function and save it as *Text Output*.

Learning Target

How to model with *Geometry*> *Rectangle*, *Polyline*, and *Arc* function

How to create 2D Mesh with Planar Area of *Auto-mesh* and 1D Mesh with *Extract Element*

How to check result with *Probe Result*, *On Curve Diagram* function

Procedure

- 1 Analysis Type : **[3D]**
- 2 Force : **[N]**, Length : **[m]**
- 3 Click **[OK]** Button
- 4 Click **“Normal View”**

Analysis Setting

Project Title Engineer

Desc.

Model Type

1 ☒ 3D

☐ 2D

☐ Axisymmetric

Gravity Direction

☒ Y

☐ Z

2 Unit System

N m J sec

Initial Parameters Water Parameters

Gravity Acceleration(g) 9.80665 m/sec²



Initial Temperature 0 [T]


Plane Strain Thickness 0.01 m

3 OK Cancel

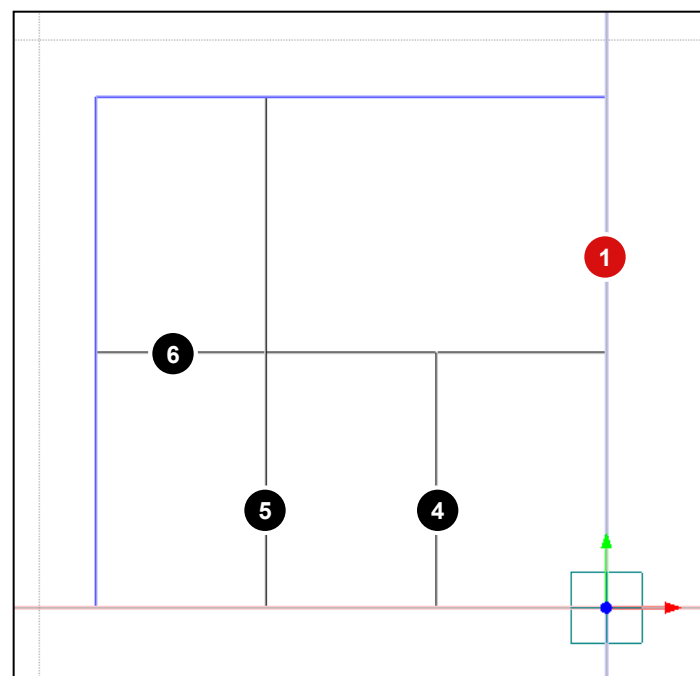
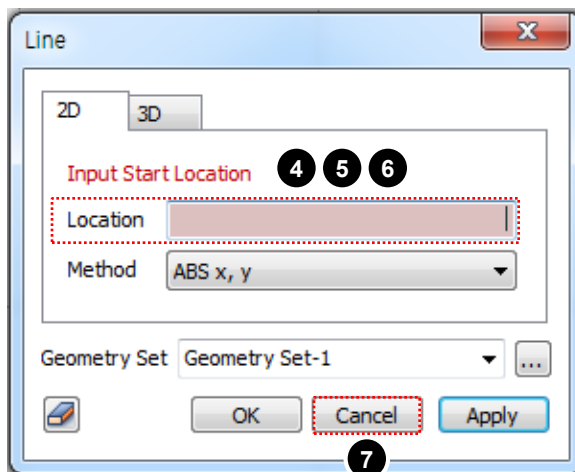
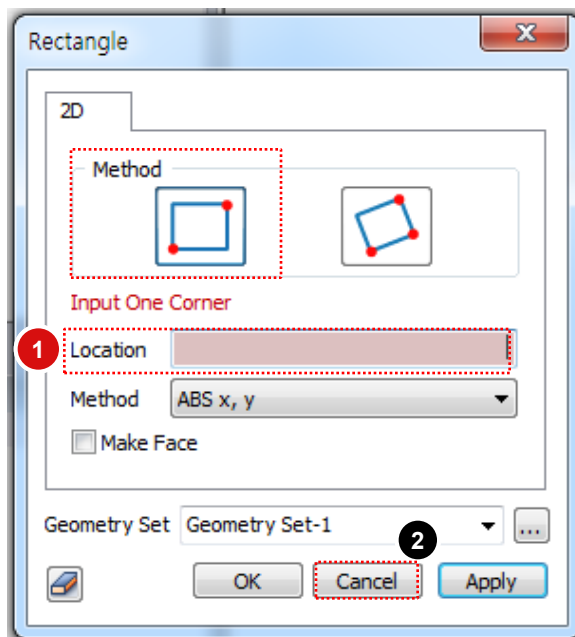


Procedure

- 1 Location : (0) , <-18, 18> 
- 2 Click **[Cancel]** Button 
- 3 Geometry > Point & Curve > **Line...**
- 4 L1 : SL (-6), EL : <0, 9>
- 5 L2 : SL : (-12), EL : <0, 18>
- 6 L3 : SL : (0, 9), EL : <-18>
- 7 Click **[Cancel]** Button

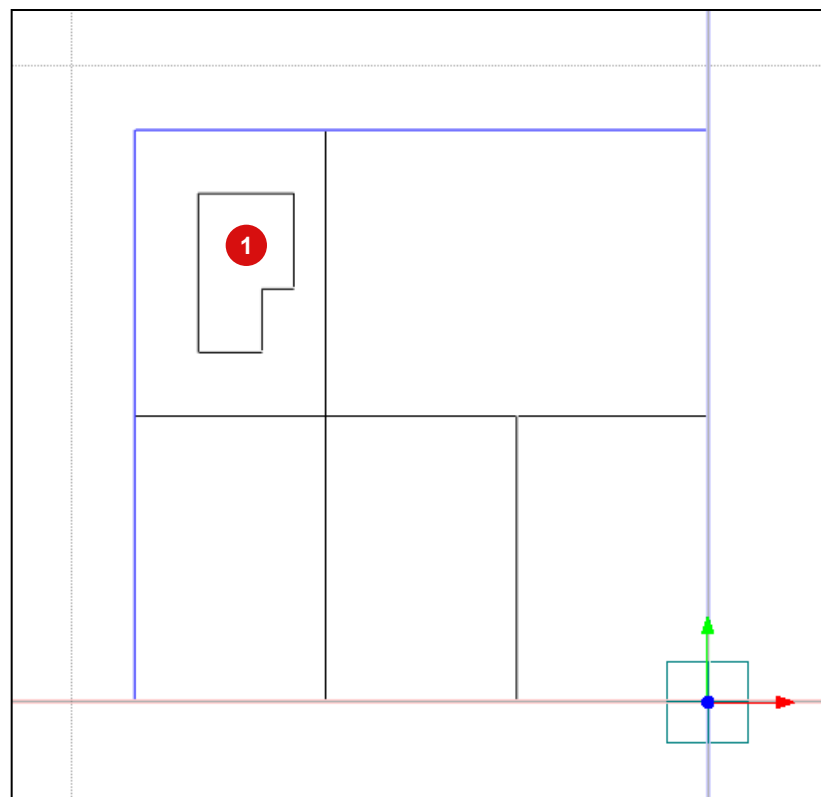
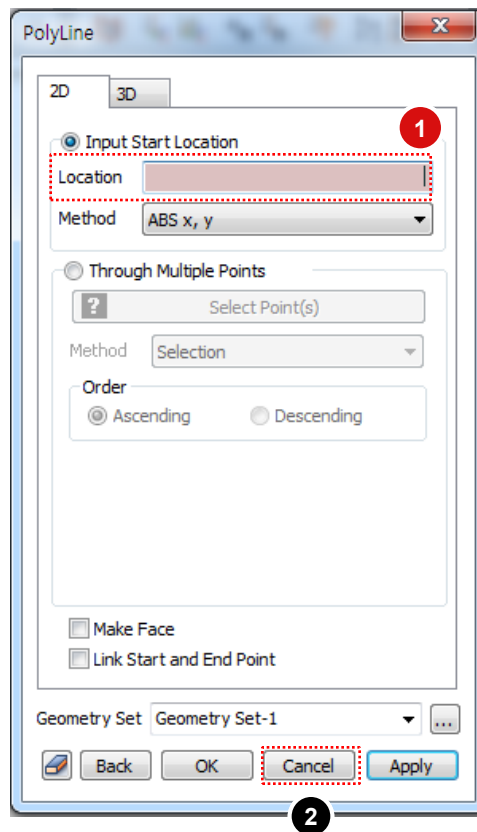
 1 () : "ABS x, y", < > : "REL dx, dy"
<-18> same as <-18, 0>

 2 [Esc] as shortcut for [Cancel].





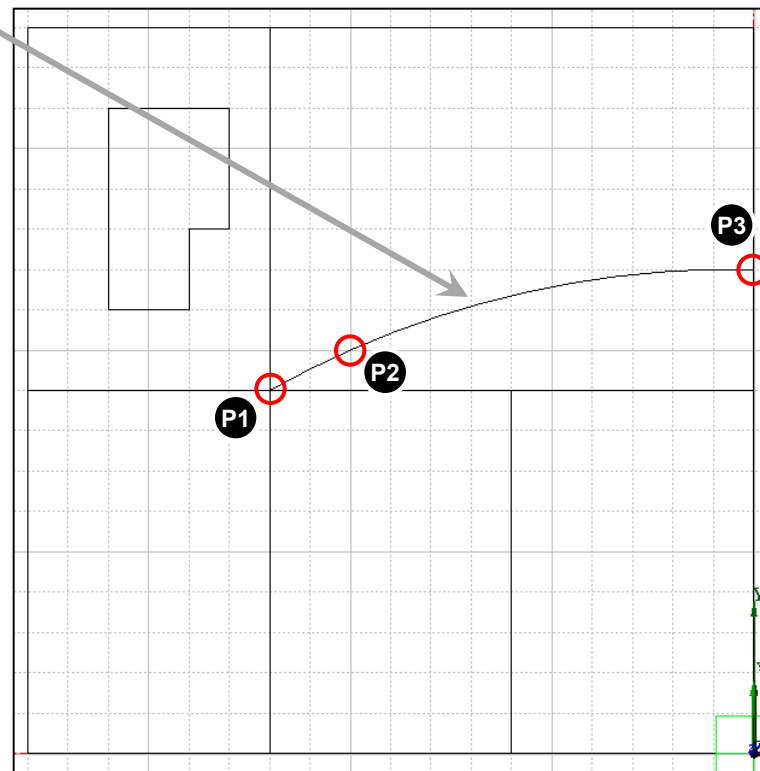
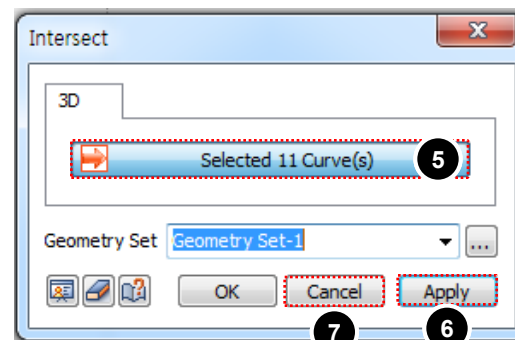
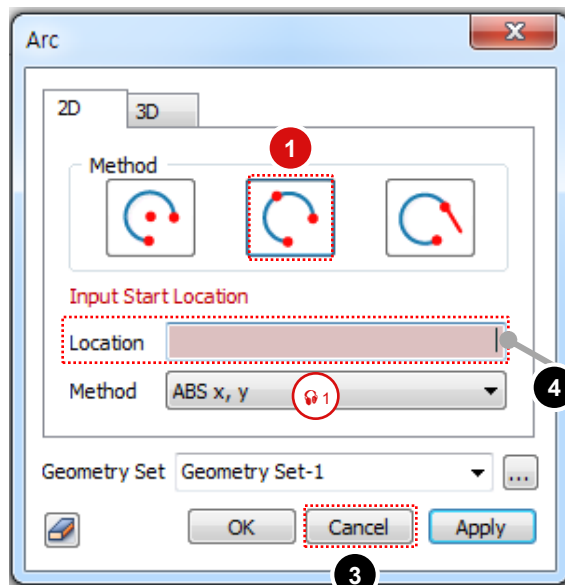
Procedure


- 1 Location : $(-16, 11)$, $\langle 2 \rangle$, $\langle 0, 2 \rangle$,
 $\langle 1 \rangle$, $\langle 0, 3 \rangle$, $\langle -3 \rangle$, $\langle 0, -5 \rangle$
- 2 Click **[Cancel]** Button




Procedure


- 1 Select “3-Point Arc”
- 2 Start **(-12,9)**, Second **(-10,10)**,
End **(0,12)**
- 3 Click **[Cancel]** Button
- 4 Geometry > Point&Curve > **Intersect**
- 5 Select “Displayed” 
- 6 Click **[Apply]** Button 
- 7 Click **[Cancel]** Button



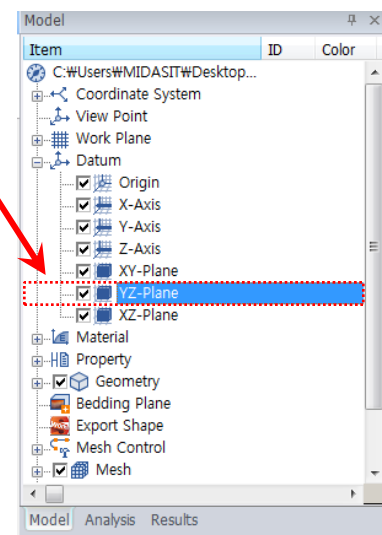
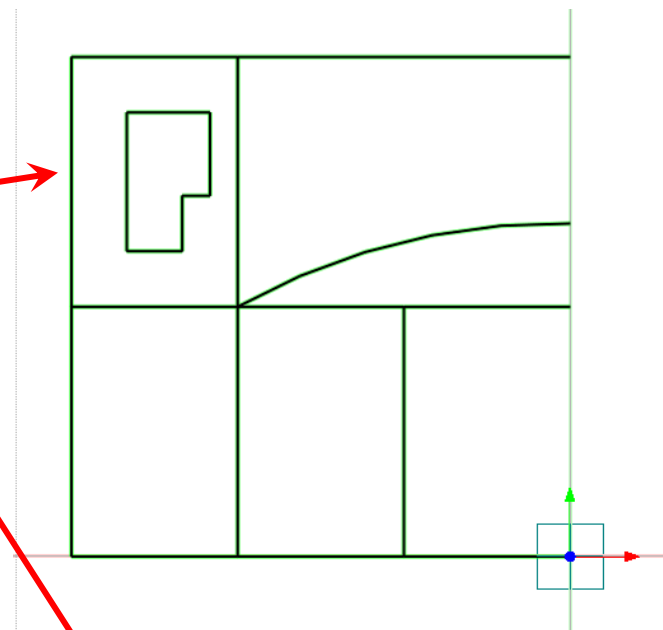
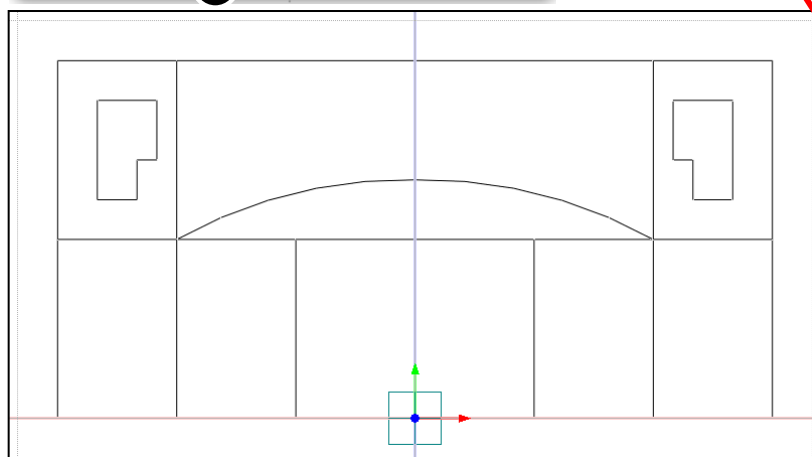
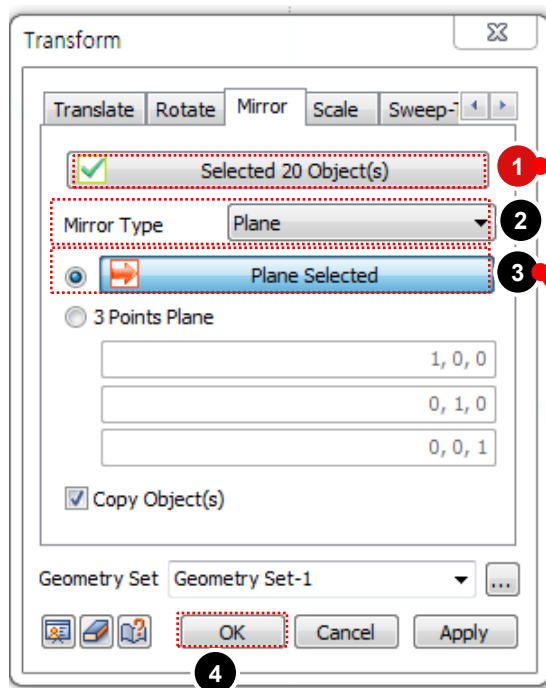
 1 “Ctrl+A” as shortcut for “Select Displayed”.

 2 [Enter] as shortcut for [Apply].

Procedure

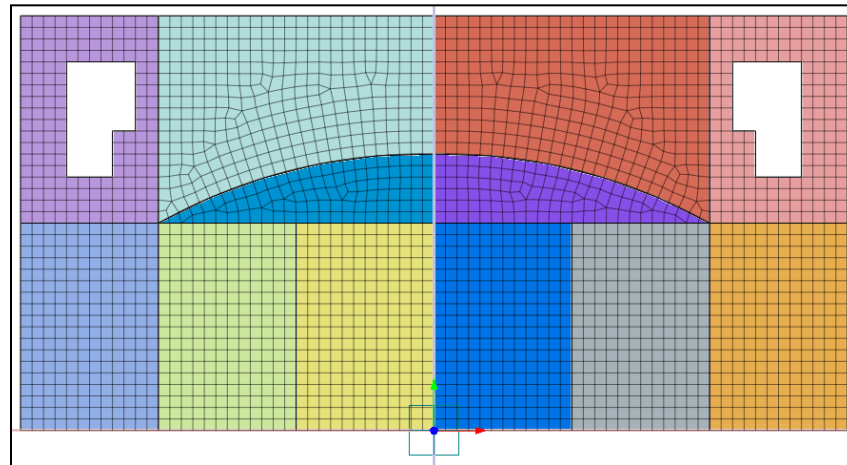
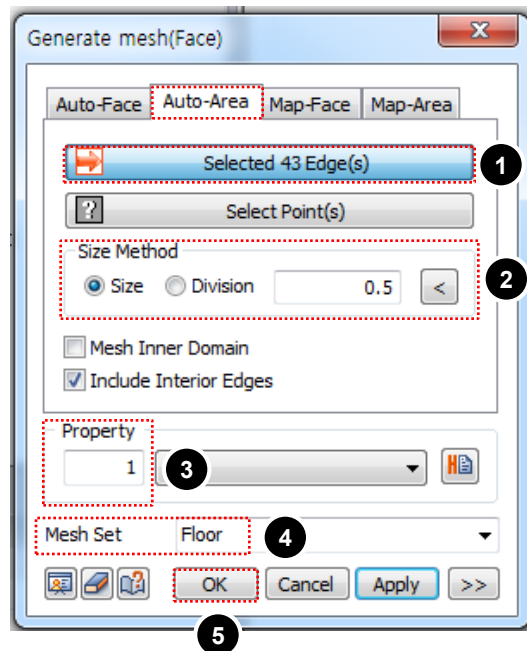
- 1 Select Object : **"Displayed"**
- 2 Mirror Type : **"Plane"**
- 3 Plane Selected : **"YZ-Plane"** 
- 4 Click **[OK]** Button

 Select "XY/YZ/XZ-Plane" in Work Window or Pre-Works Tree



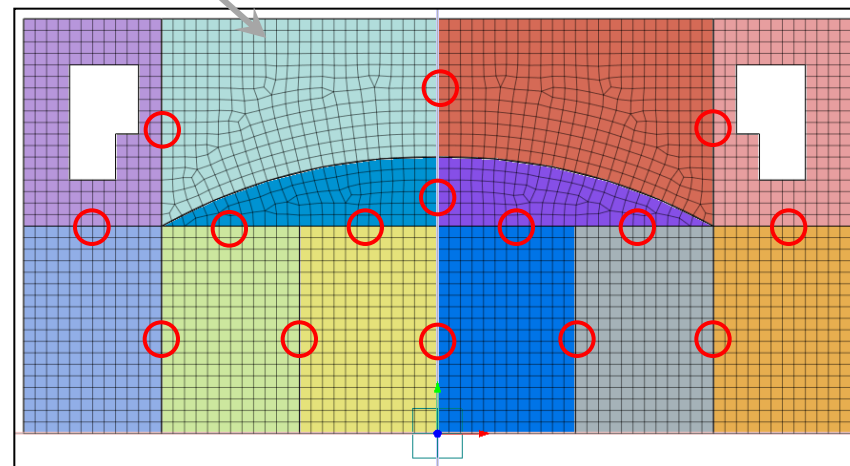
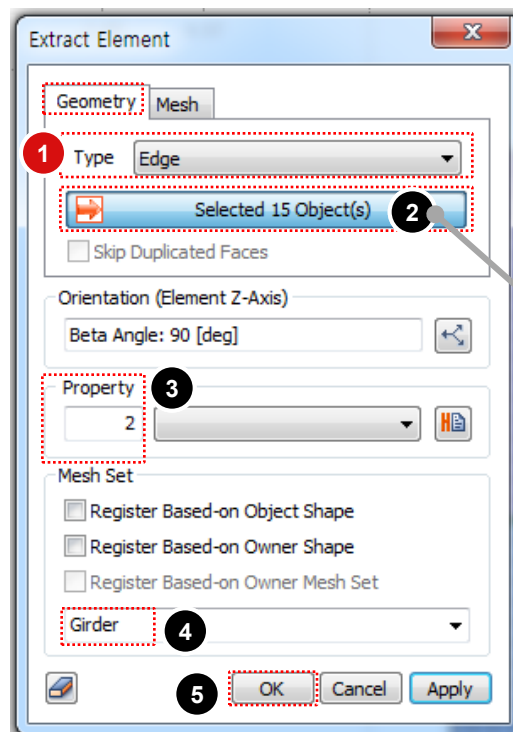
Procedure

- 1 Select **"Displayed"**
- 2 Size Method : **Size : 0.5**
- 3 Property : **"1"**
- 4 Mesh Set : **"Floor"**
- 5 Click **[OK]** Button



Procedure

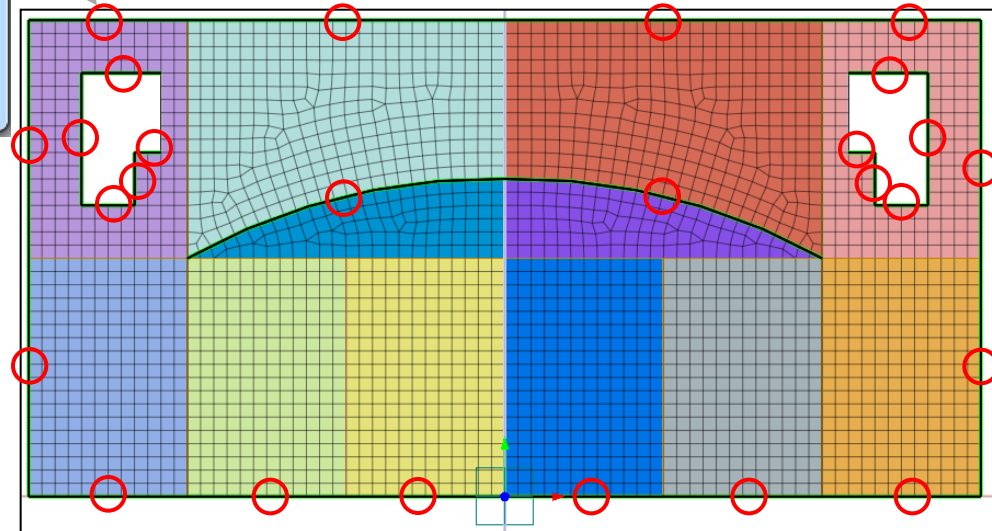
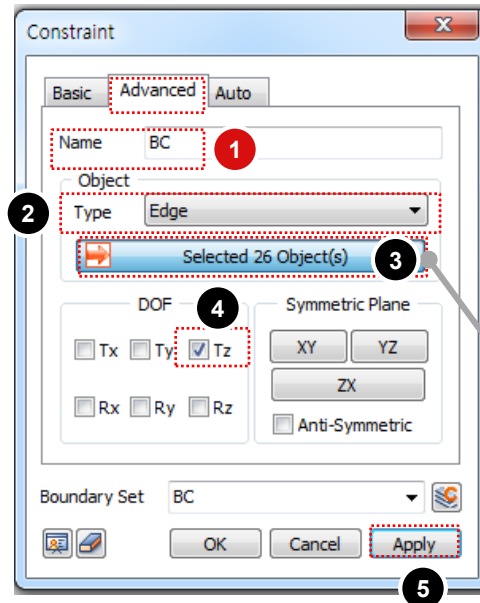
- 1 [Geometry] Tab / Type : “Edge”
- 2 Select 15 Edges Marked by “O” (See Figure)
- 3 Property : “2”
- 4 Mesh Set : “Girder”
- 5 Click [OK] Button



Procedure

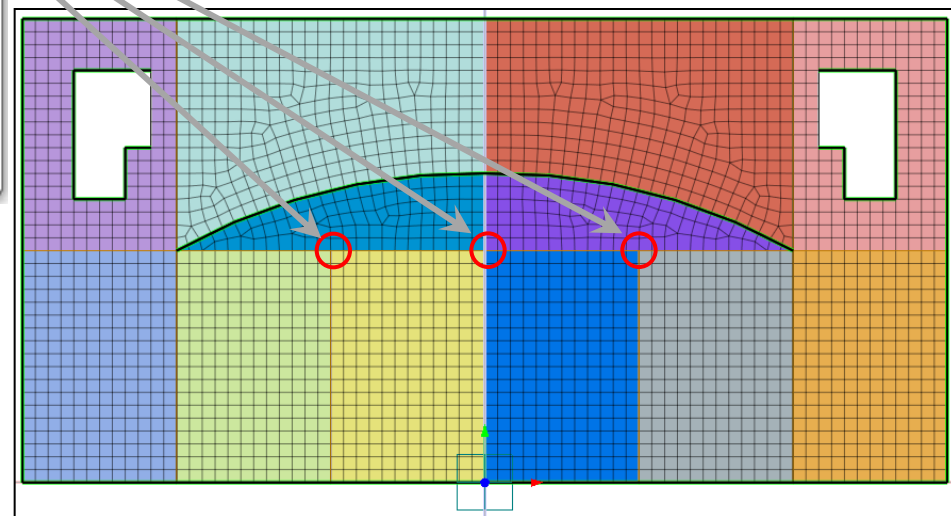
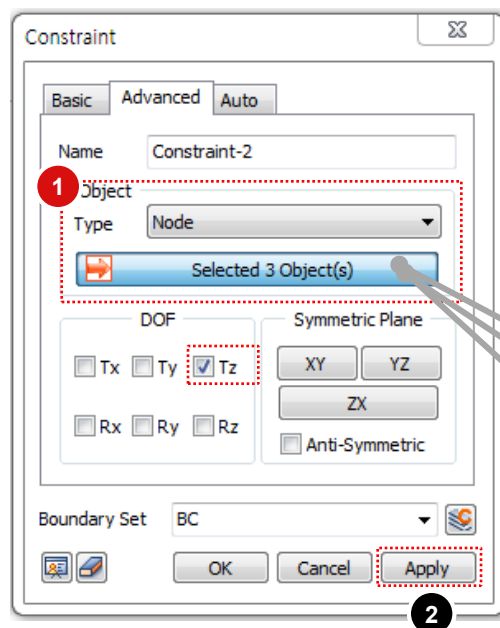
- ❶ BC Set : “BC”
- ❷ Object Type : “Edge ”
- ❸ Select 26 Edges Marked by “○” (See Figure) 🗣️
- ❹ Check on : “Tz”
- ❺ Click [Apply] Button

🗣️ Nodes generated on the selected edges are selected.



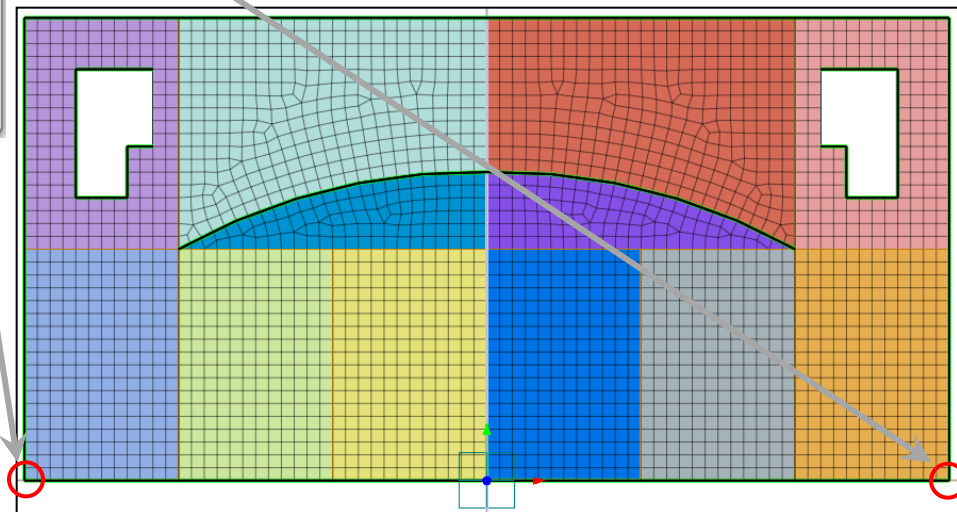
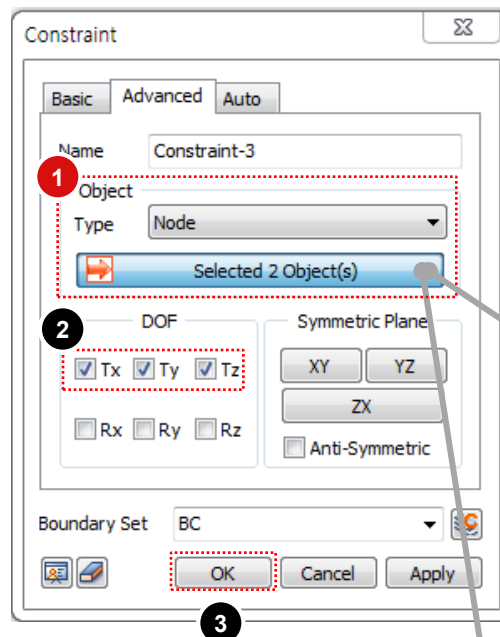
Procedure

- 1 Select 2 Nodes Marked by “○” (See Figure)
- 2 Click [Apply] Button



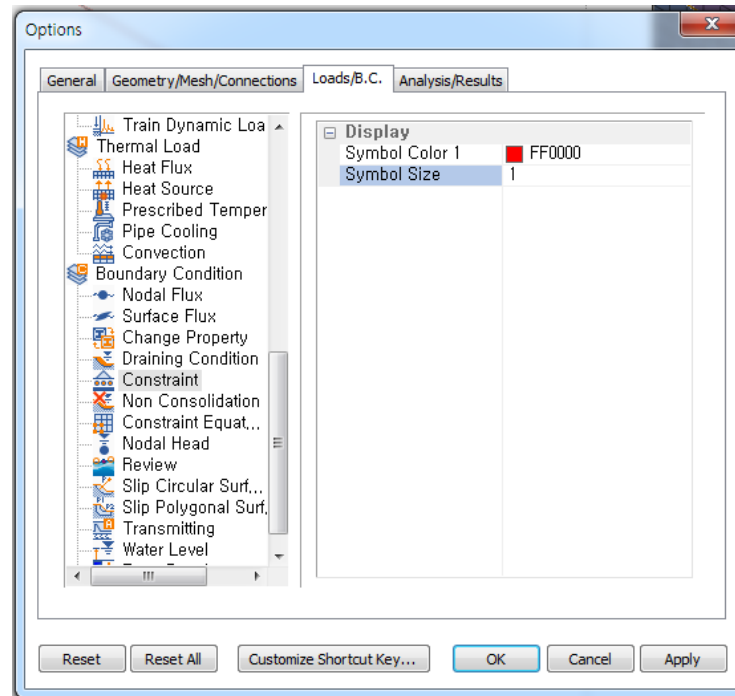
Procedure

- 1 Select 1 Node Marked by "○" (See Figure)
- 2 Check on : "Tx, Ty, Tz"
- 3 Click [OK] Button



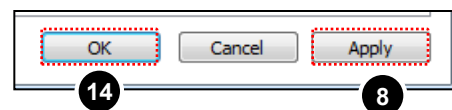
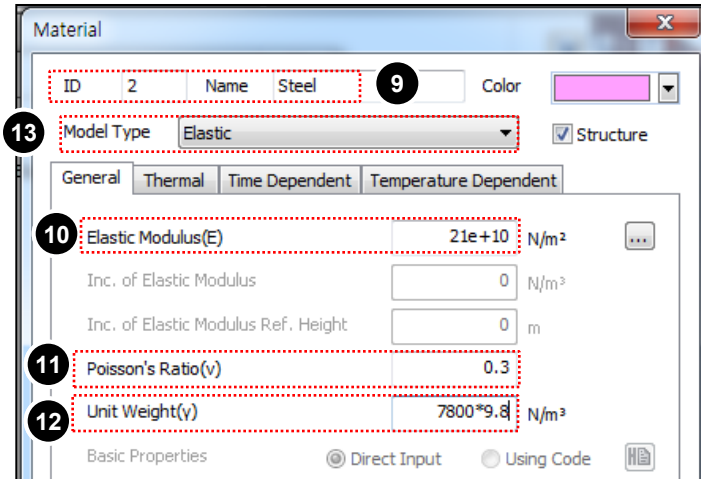
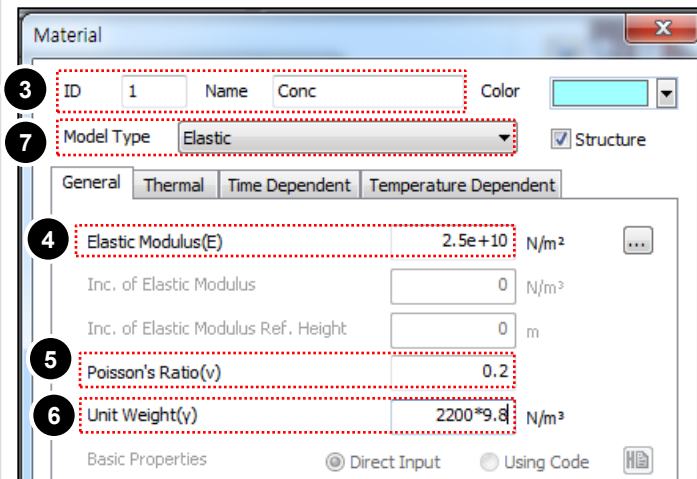
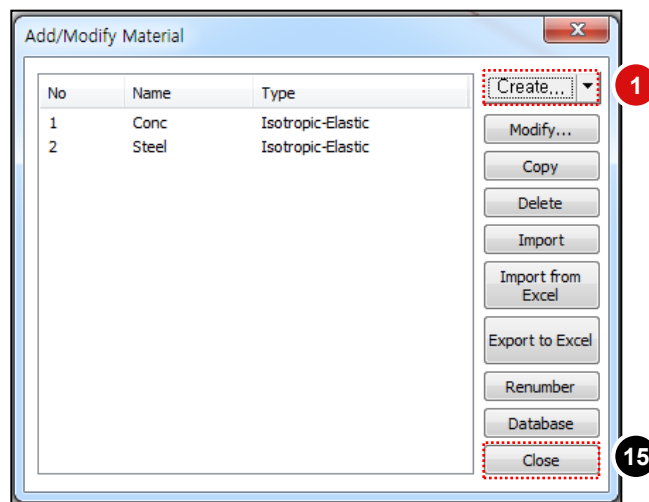
Procedure

- 1 Symbol size can be changed at
“Option”-”Loads/B.C.” tab.
(Boundary Condition - Constraint)



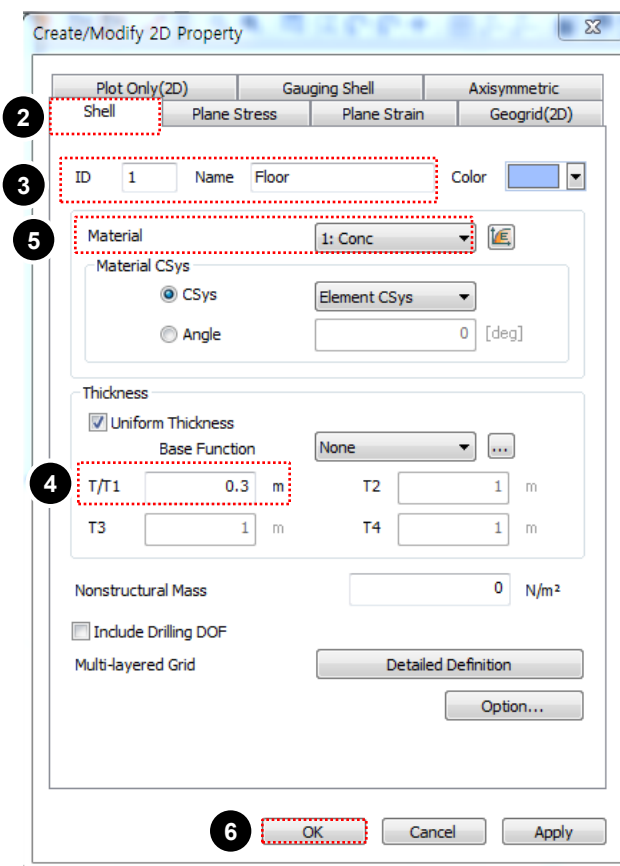
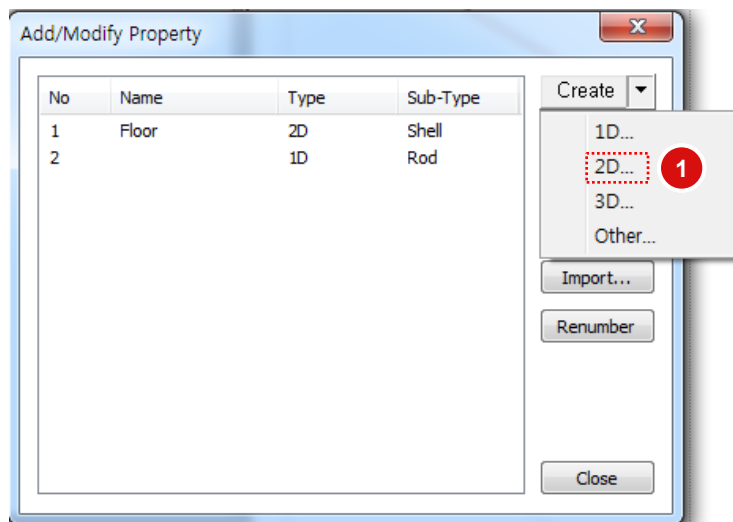
Procedure

- 1 Click **[Create...]** Button
- 2 Select **"Isotropic"**
- 3 ID : **"1"** , Name : **"Conc"**
- 4 Elastic Modulus : **2.5e10 N/m²**
- 5 Poisson's Ratio : **"0.2"**
- 6 Weight Density : **2200*9.8 N/m³**
- 7 Model Type : **"Elastic"**
- 8 Click **[Apply]** Button
- 9 ID : **"2"** , Name : **"Steel"**
- 10 Elastic Modulus : **21e10 N/m²**
- 11 Poisson's Ratio : **"0.3"**
- 12 Weight Density : **7800*9.8N/m³**
- 13 Model Type : **"Elastic"**
- 14 Click **[OK]** Button
- 15 Click **[Close]** Button



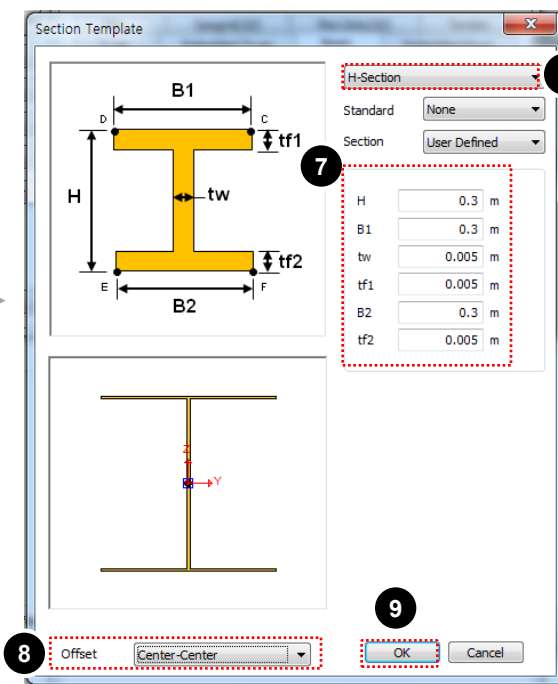
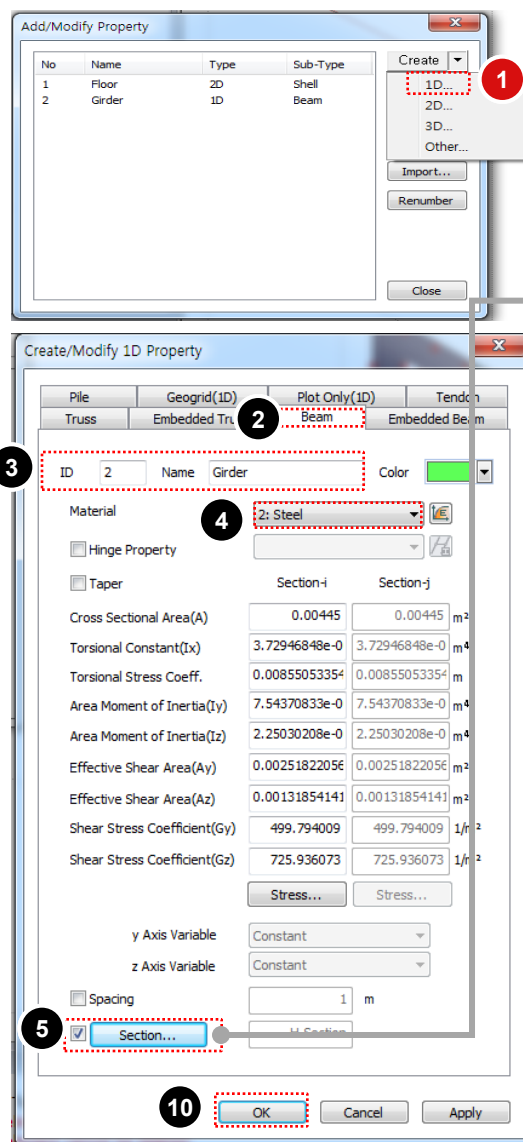
Procedure

- 1 Create [2D]
- 2 Select : “Shell” tab
- 3 ID : “1” , Name : “Floor”
- 4 T or T1 : “0.3”
- 5 Select : “1: Conc” for Material
- 6 Click [OK] Button



Procedure


- 1 Create [1D]
- 2 Select : “Beam” tab
- 3 Name : “Girder”
- 4 Select : “Steel” for Material
- 5 Click [Section Template...] Button
- 6 Section : “H-Section”
- 7 H “0.3”, B1 “0.3”, tw “0.005”,
tf1 “0.005”, B2 “0.3”, tf2 “0.005”,
- 8 Offset : [Center-Center]
- 9 Click [OK] Button
- 10 Click [OK] Button

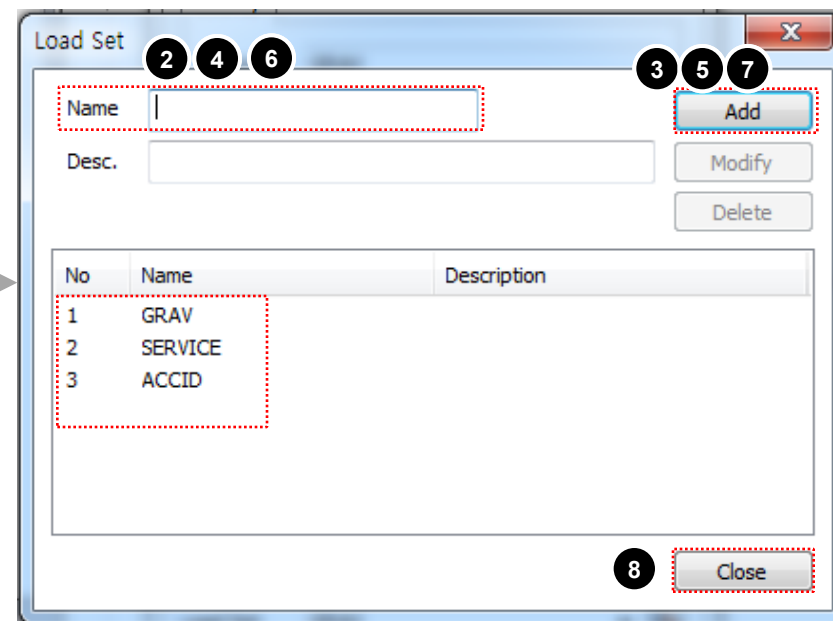
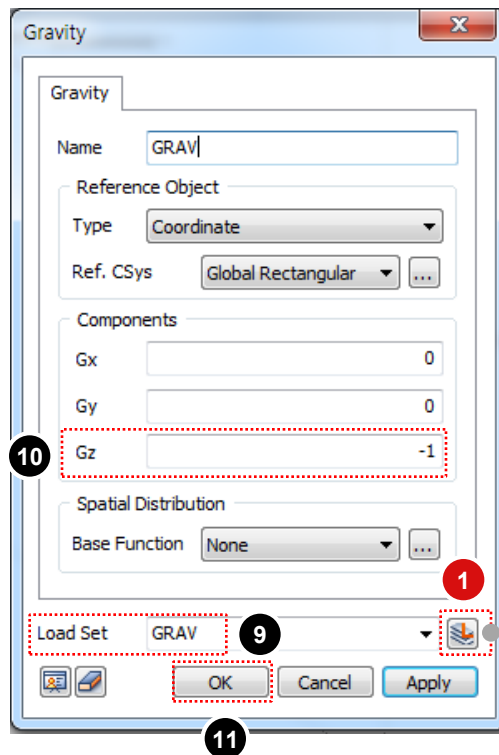


Cross Sectional Area(A)	0.00445
Torsional Constant(Ix)	3.72946848e-0
Torsional Stress Coeff.	0.00855053354
Area Moment of Inertia(Iy)	7.54370833e-0
Area Moment of Inertia(Iz)	2.25030208e-0
Effective Shear Area(Ay)	0.00251822056
Effective Shear Area(Az)	0.00131854141
Shear Stress Coefficient(Gy)	499.794009
Shear Stress Coefficient(Gz)	725.936073

All sectional properties are automatically calculated.

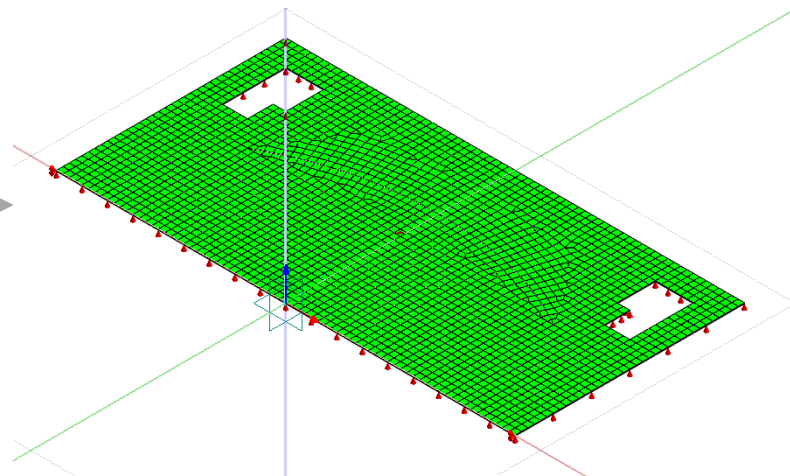
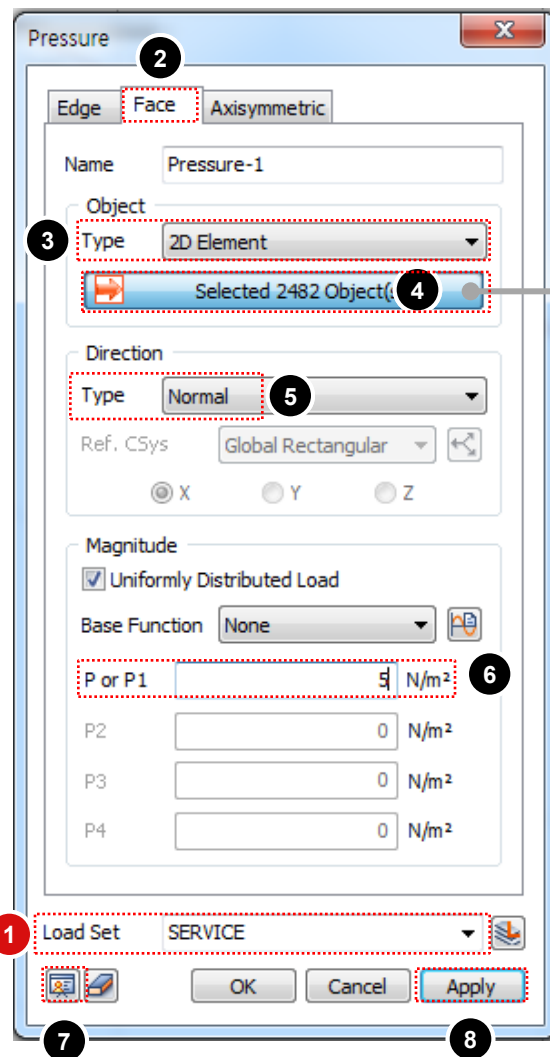
Procedure

- 1 Click  Button
- 2 Name : **[GRAV]**
- 3 Click **[Add]** Button
- 4 Name : **[SERVICE]**
- 5 Click **[Add]** Button
- 6 Name : **[ACCID]**
- 7 Click **[Add]** Button
- 8 Click **[Close]** Button
- 9 Load Set : **[GRAV]**
- 10 Gravitational Force Factor : **Z(-1)**
- 11 Click **[OK]** Button



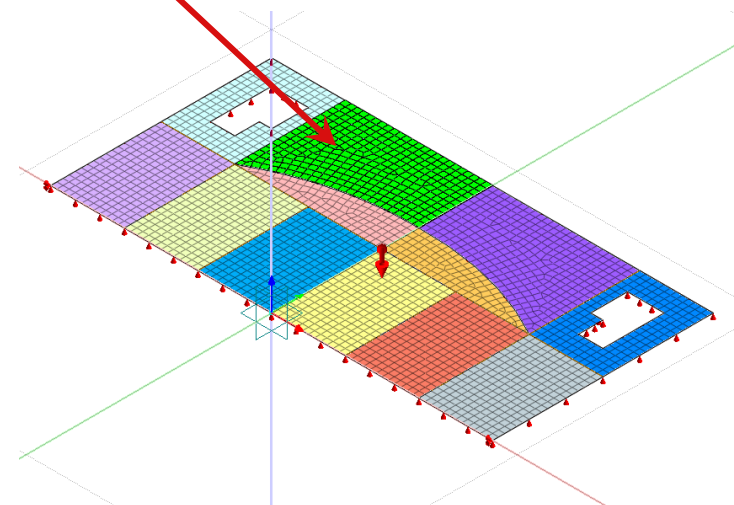
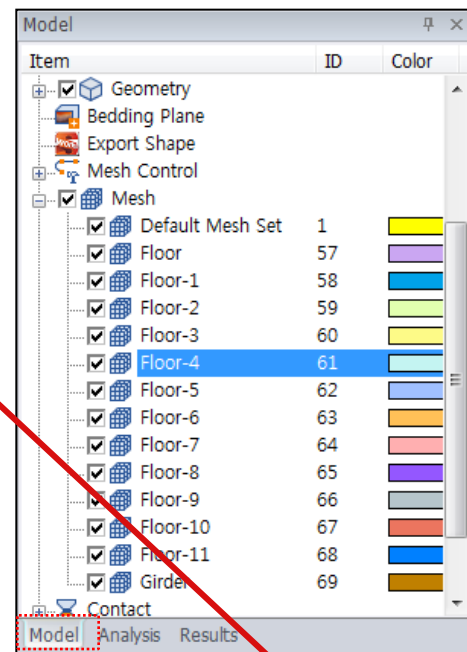
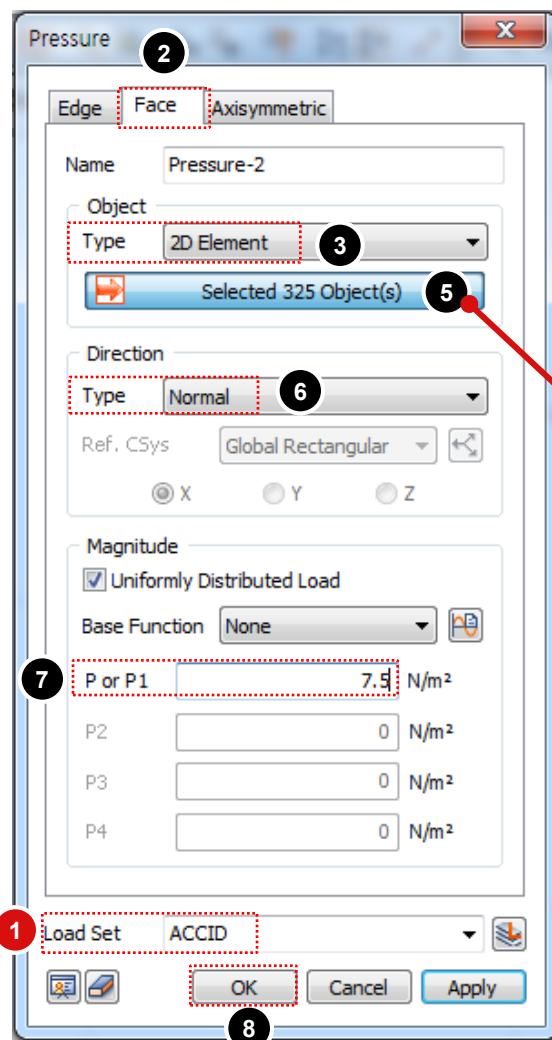
Procedure

- 1 Load Set : **"SERVICE"**
- 2 Type : **"Face Pressure"**
- 3 Object Type : **"2D Element"**
- 4 Select **"Displayed"**
- 5 Direction : **"Normal"**
- 6 P or P1 : **"5"**
- 7 Click **"Preview"** Button
- 8 Click **[Apply]** Button



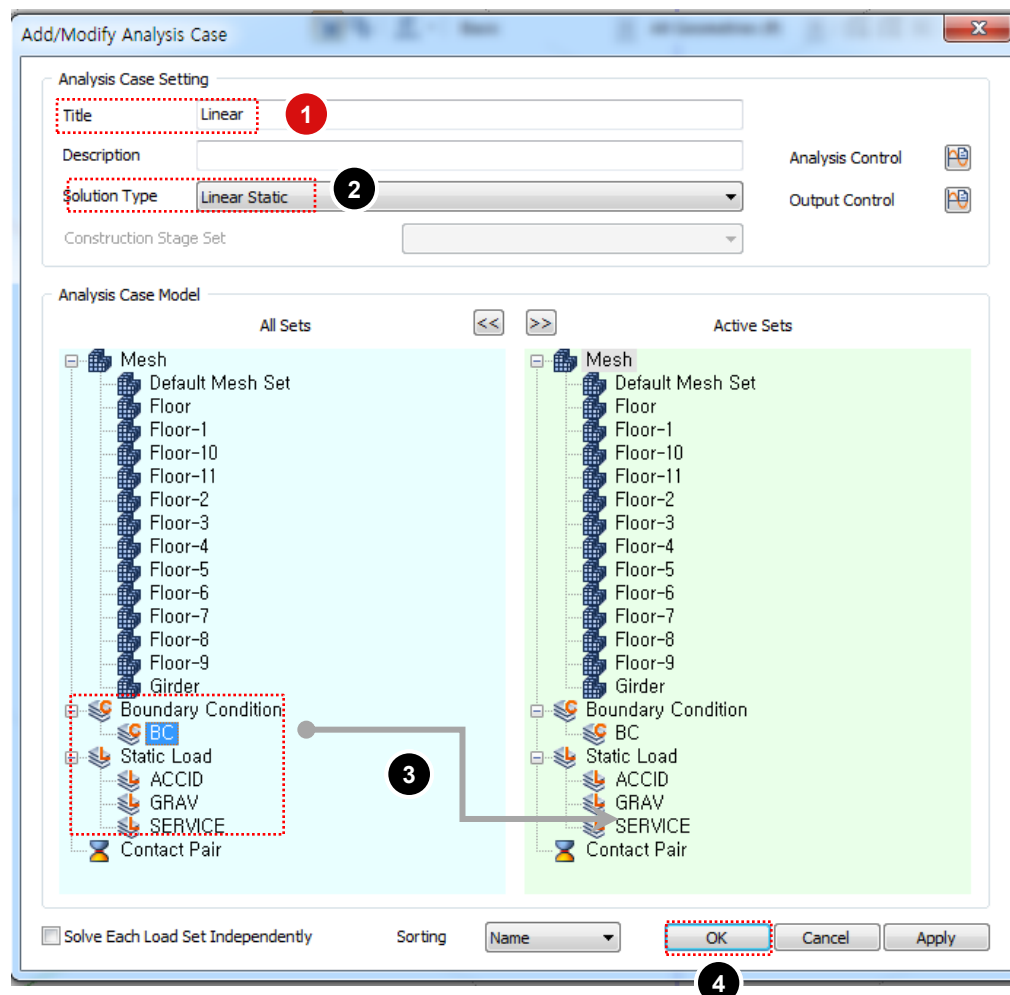
Procedure

- 1 Load Set : **"ACCID"**
- 2 Type : **"Face Pressure"**
- 3 Object Type : **"2D Element"**
- 4 Model Tree > Mesh
- 5 Select Mesh Set
- 6 Direction : **"Normal"**
- 7 P or P1 : **"7.5"**
- 8 Click **[OK]** Button



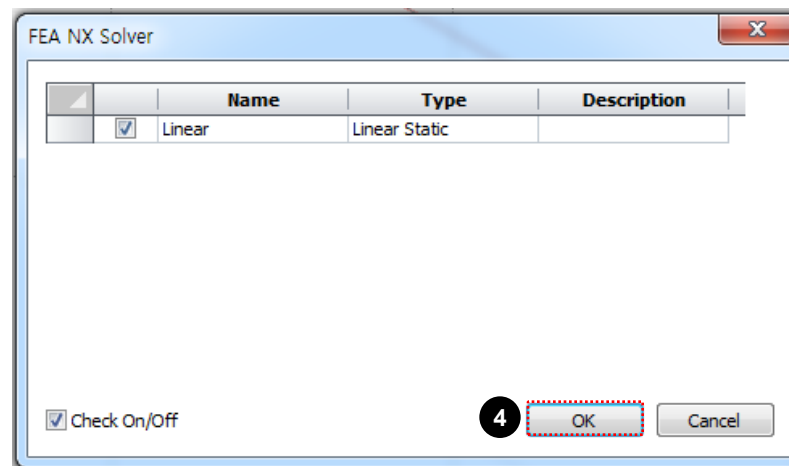
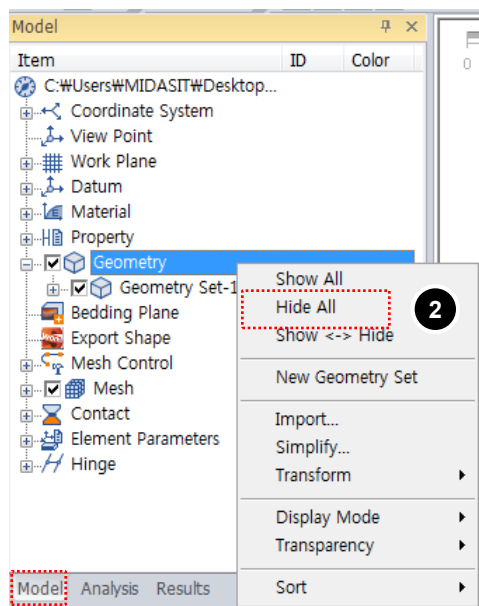
Procedure

- 1 Title : **"Linear"**
- 2 Solution Type : **[Linear Static]**
- 3 Drag & Drop **[Static Load]** &
[Boundary Condition] to
[Active Sets] Window
- 4 Click **[OK]** Button
- 5 File > **Save...** : **"Floor.feb"**



Procedure

- 1 Model Tree : **Geometry ...**
- 2 Click Right Mouse Button and Select
“**Hide All**”
- 3 Analysis > **Perform...**
- 4 Click **[OK]** Button



Procedure

- 1 Double Click [TZX TRANSL...]

The screenshot shows the software interface with the Results Tree on the left, a displacement plot in the center, and the Probe Results dialog box in the foreground.

Results Tree: The tree shows the hierarchy: Item > C:\Users\#MIDASIT\Desktop... > Post Style > Default Style > Linear > Linear Static > Displacements > TOTAL TRANSL... (highlighted with a red circle and '1').

Probe Results Dialog Box:

- Entity Type:** Node (selected), Element
- Color:** Tag Color (white), Text Color (black)
- Value:** Exponential (unchecked), Decimal Point (4)
- Tag Type:** (dropdown menu)

Results Table:

Show	Type	ID	Value
<input checked="" type="checkbox"/>	Node	829	Max: 0.0057
<input checked="" type="checkbox"/>	Node	1365	0.0009
<input type="checkbox"/>			


Buttons: Max, Min, Abs Max, Clear All, Min/Max Value of Each Part (checkbox), Close.

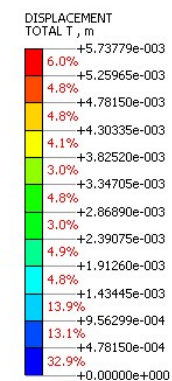
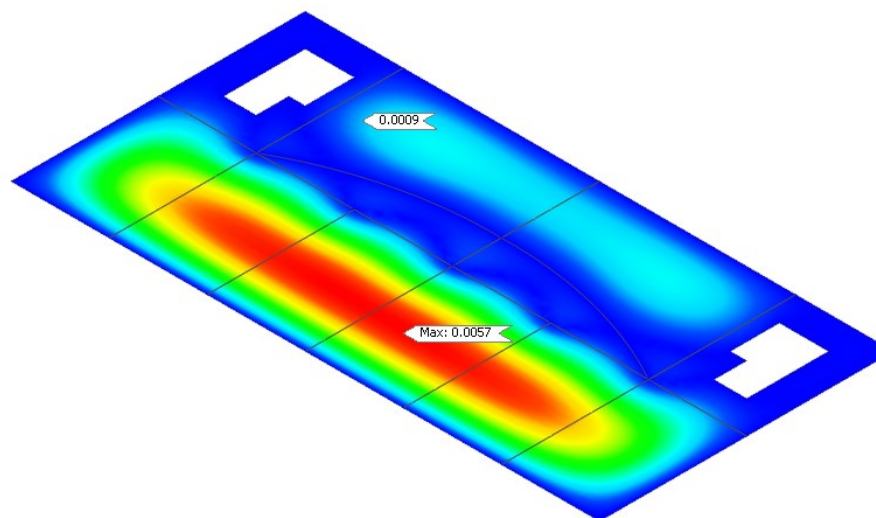
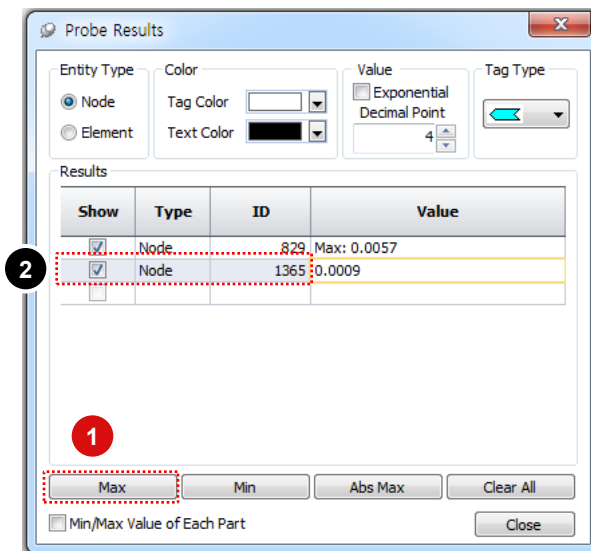
Displacement Plot: A 3D model of a structure with a color-coded displacement field. A legend on the right shows the displacement values in meters (m).


Legend: DISPLACEMENT TOTAL T, m

6.0%	+5.73779e-003
4.8%	+5.25965e-003
4.8%	+4.78150e-003
4.8%	+4.30335e-003
4.1%	+3.82520e-003
3.0%	+3.34705e-003
4.8%	+2.86890e-003
3.0%	+2.39075e-003
4.9%	+1.91260e-003
4.8%	+1.43445e-003
13.9%	+9.56299e-004
13.1%	+4.78150e-004
32.9%	+0.00000e+000

Procedure

- 1 Click **[Max]** Button
- 2 Enter Node ID : **"1365"** 
- 3 **[Enter]**



 Same as select node in Work Window.

Procedure

- 1 Cutting Diagram Mode > **Cutting Line**
- 2 Define Positions :
Type > **2-Points Line**
Point 1 : **-18,0,0** / Point 2 : **18,18,0**
- 3 Direction : **(+) Z dir.** / Division : **"100"**
- 4 Click **[OK]** Button

