

## Overview

### ▪ 3-D Linear Static Analysis

#### ▪ Model

- Unit : N, cm
- Isotropic Elastic Material
- Reinforcement Element
- Solid Element

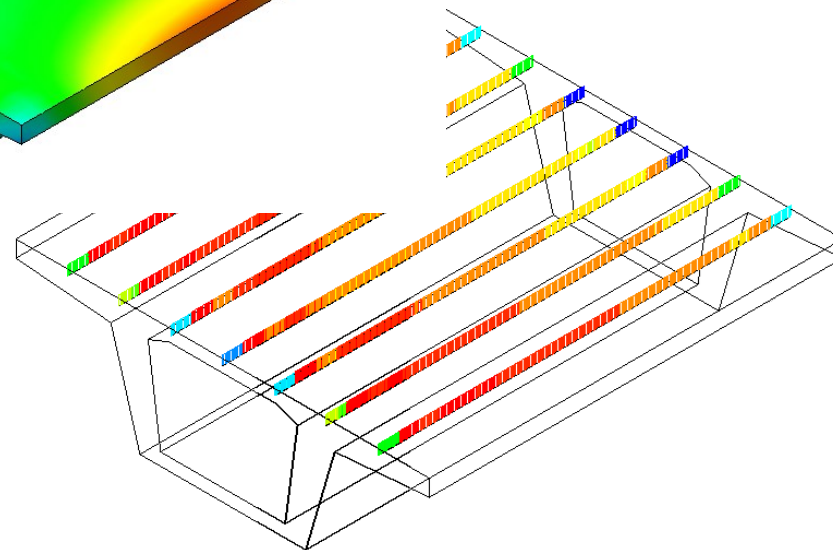
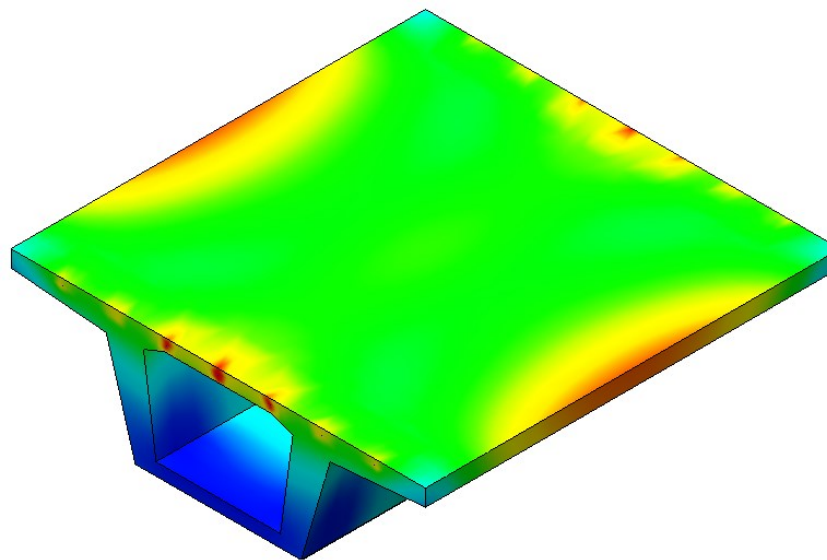
#### ▪ Load & Boundary Condition

- Body Force
- Pressure
- Prestress for Reinforcement
- Constraint

#### ▪ Result Evaluation

- Deformation
- Reinforcement Stress

# PSC Box Girder with Longitudinal Tendon



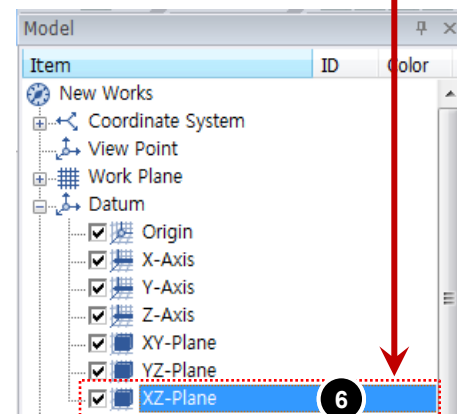
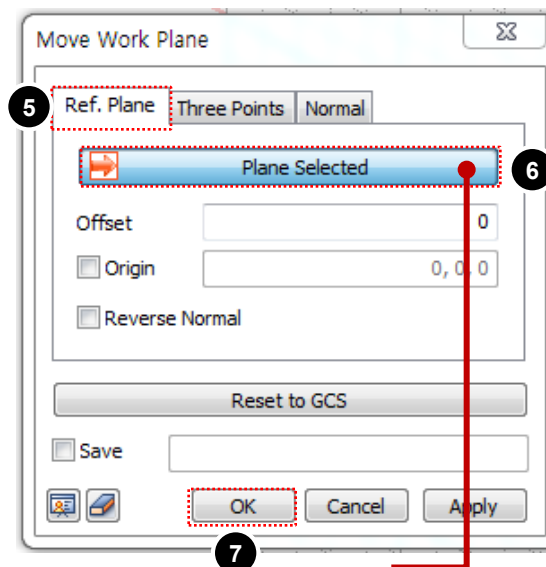
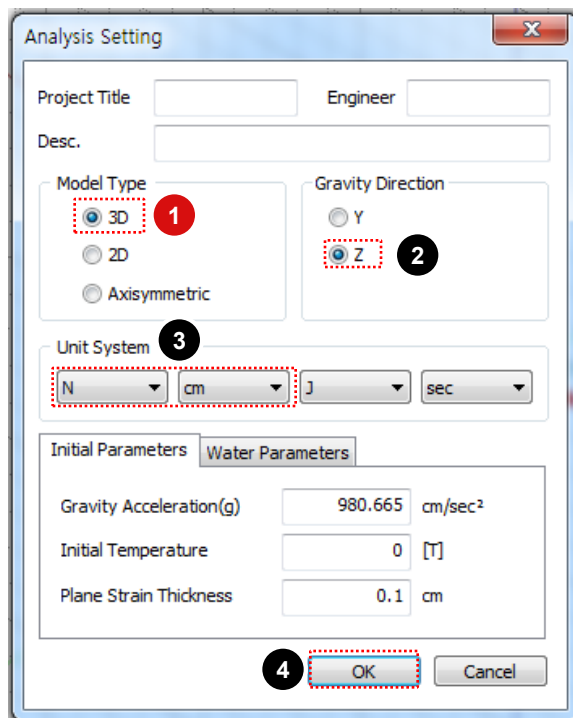
# Analysis Setting

## Procedure



- 1 Analysis Type : [3D]
- 2 Gravity Direction : [Z]
- 3 Force : [N] , Length : [cm]
- 4 Click [OK] Button
- 5 Click Right Mouse -  
Move Work Plane (Ref. Plane)
- 6 Select [XZ Plane]
- 7 Click [OK] Button

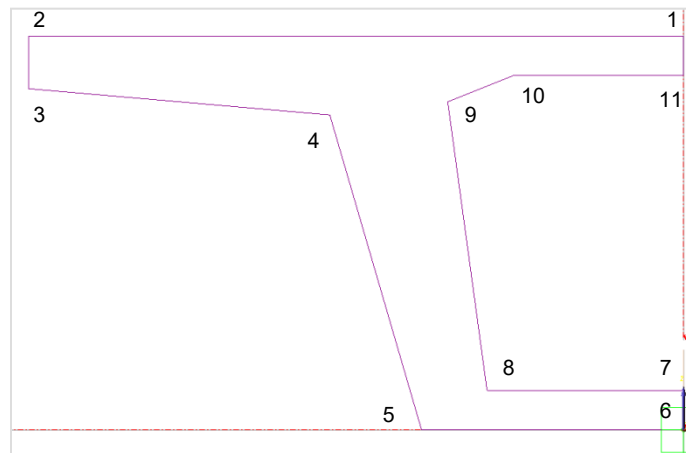
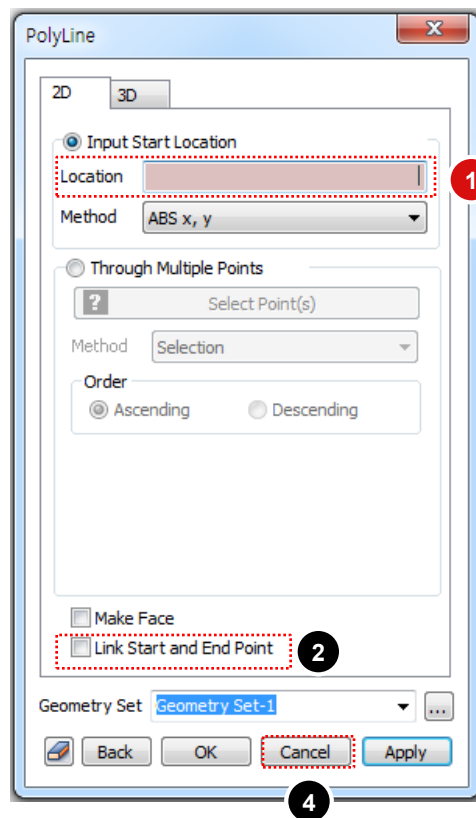



Analysis Control Dialog is automatically activated at startup.



**Procedure**



- 1 Location : “(0, 300), <-500>, <0, -40>, <230, -20>, <70, -240>, <200>,<0, 30>, <-150>, <-30, 220>, <50, 20>, <130> ” 
- 2 Check on **[Close]**
- 3 Click **[Right Mouse Button]** on the Work Window
- 4 Click **[Cancel]** Button 
- 5 Click **[Normal View]**

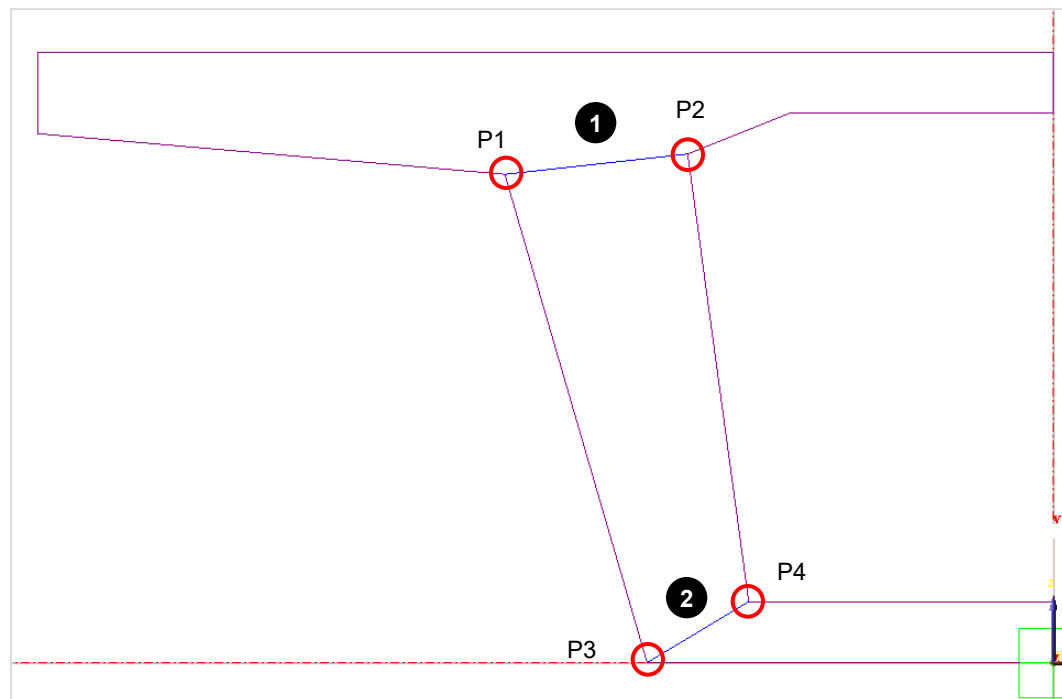
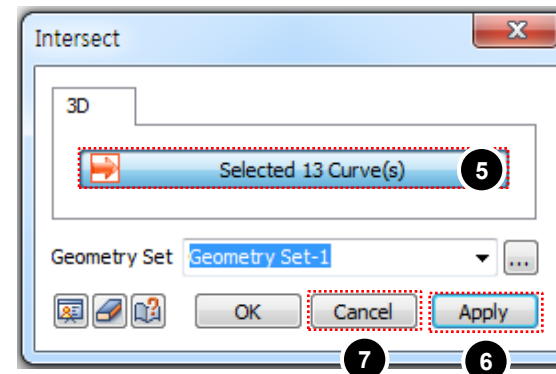
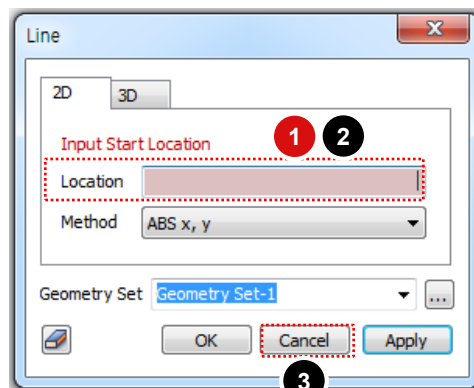




 ( ) : “ABS x, y”, < > : “REL dx, dy”  
(-500) same as (-500, 0)

 [Esc] as shortcut for [Cancel].

**Procedure**

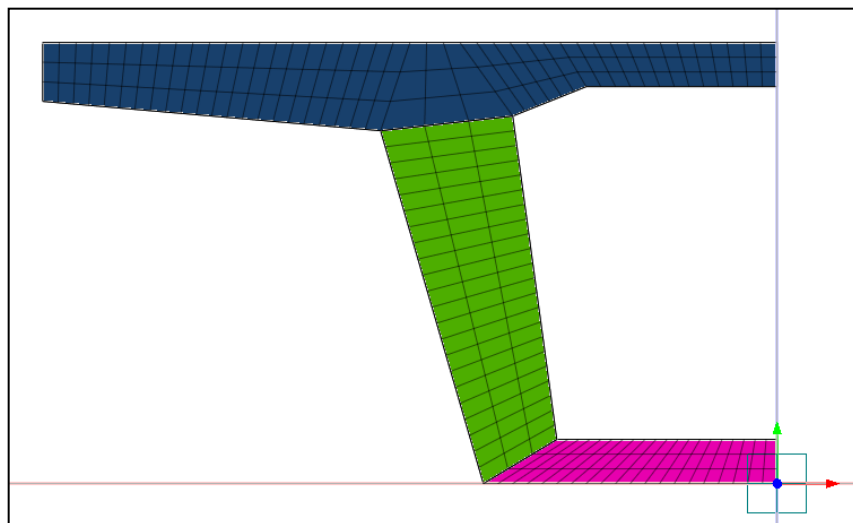
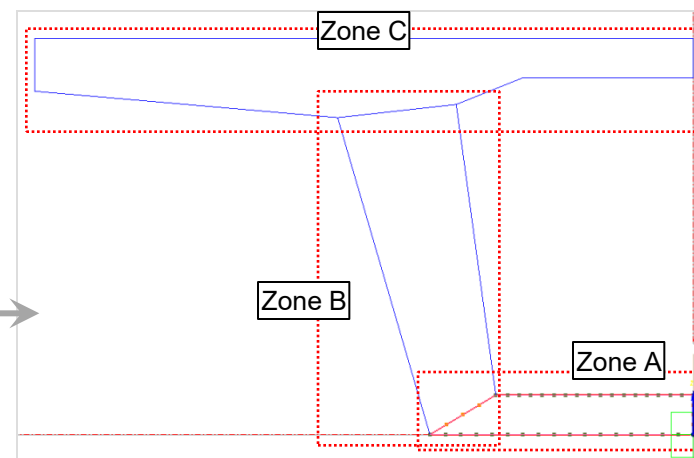
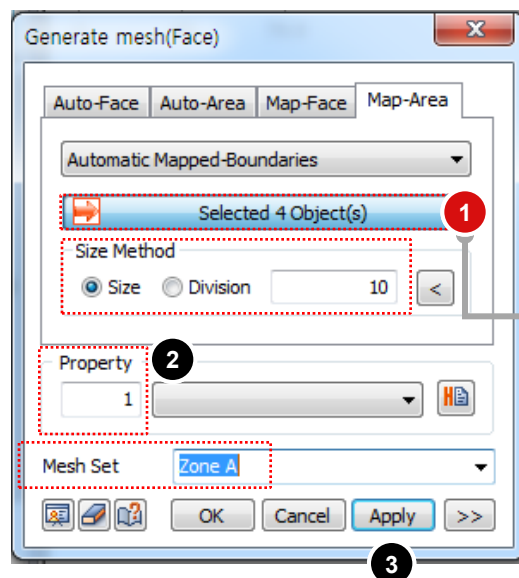
- 1 Select **[P1]** & **[P2]** (See Figure)
- 2 Select **[P3]** & **[P4]** (See Figure)
- 3 Click **[Cancel]** Button
- 4 Geometry >Point & Curve >**[Intersect]**
- 5 Select All Displayed
- 6 Click **[Apply]** Button 
- 7 Click **[Cancel]** Button 



- 
-  "Ctrl+A"  
"as shortcut for "Select Displayed".
-  "Enter" as shortcut for "Apply".

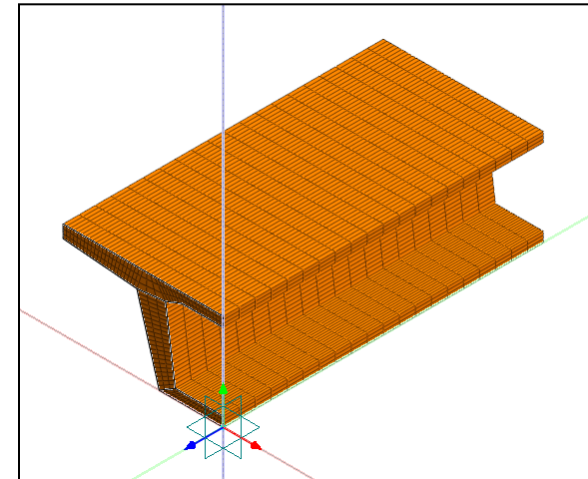
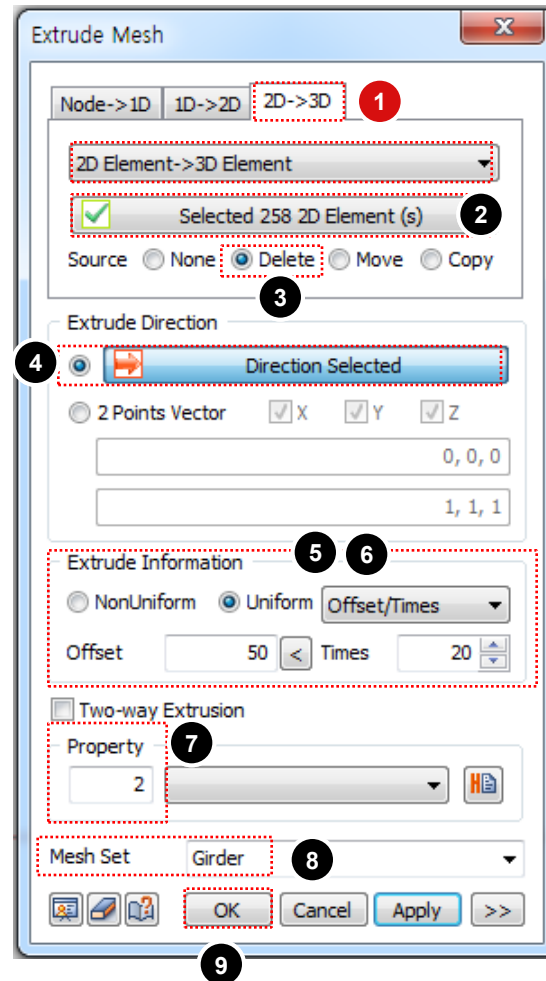
**Procedure**

- 1 Select **[Zone A]**  
Mesh Size - Element Size : "10"
- 2 Property : "1"
- 3 Click **[Apply]** Button
- 4 Repeat step [1~3]  
for "Zone B" & "Zone C"



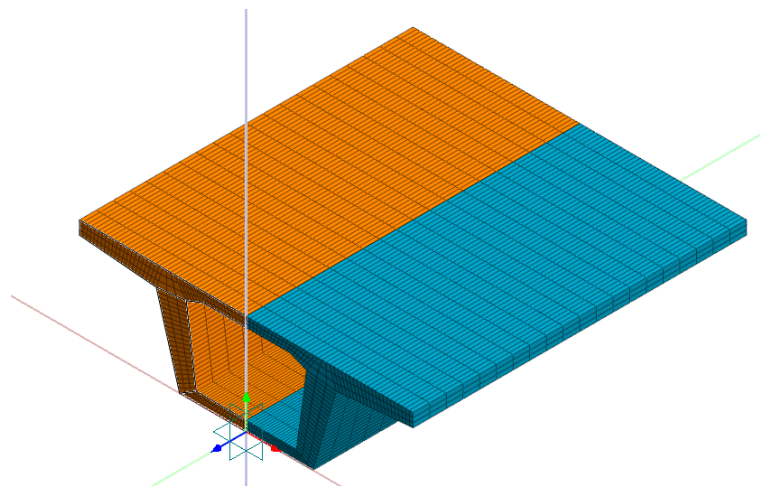
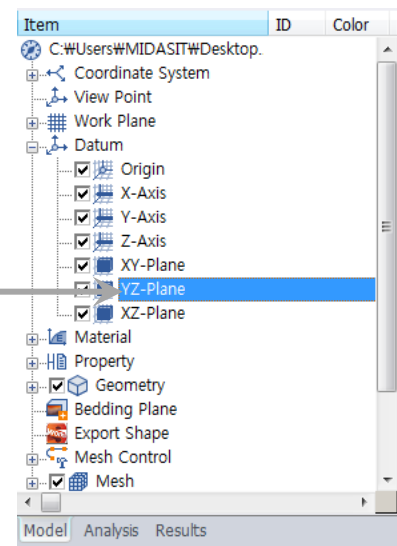
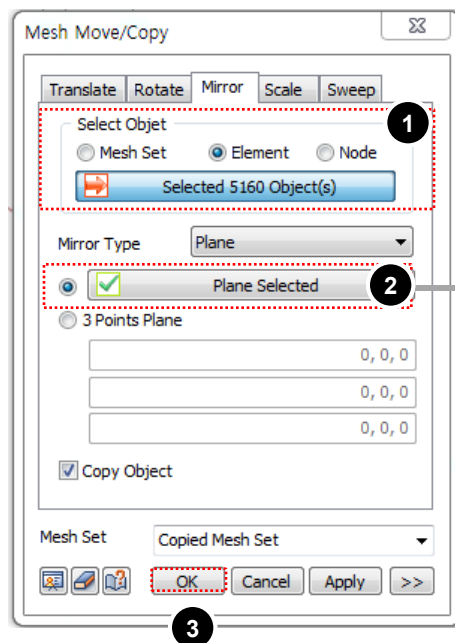
**Procedure**

- 1 [2D→3D] tab >  
2D Element → 3D Element
- 2 Select Displayed All
- 3 Source Mesh : [Delete]
- 4 Extrusion Direction : [Y-Axis]
- 5 Check on [Uniform]
- 6 Offset : "50", Number of Times : "20"
- 7 Property : "2"
- 8 Mesh Set : [Girder]
- 9 Click [OK] Button



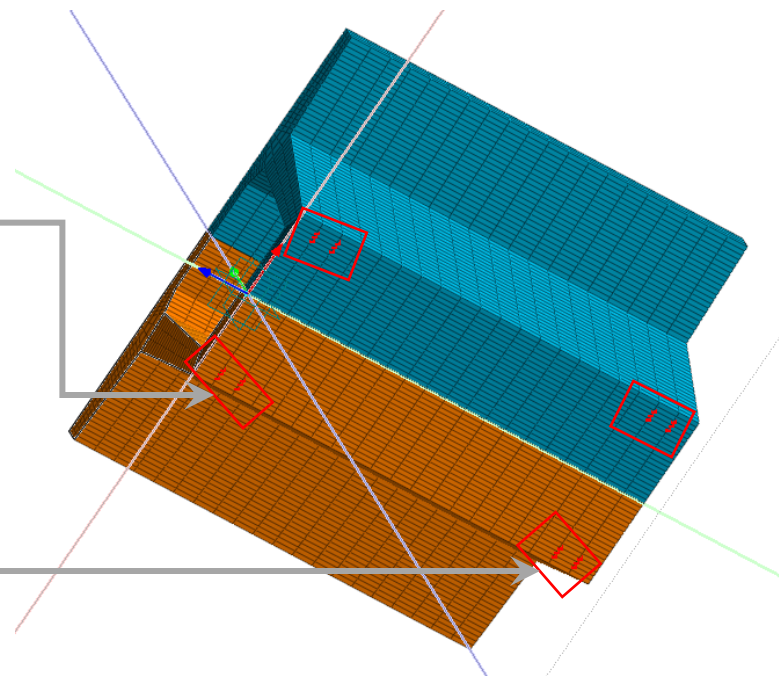
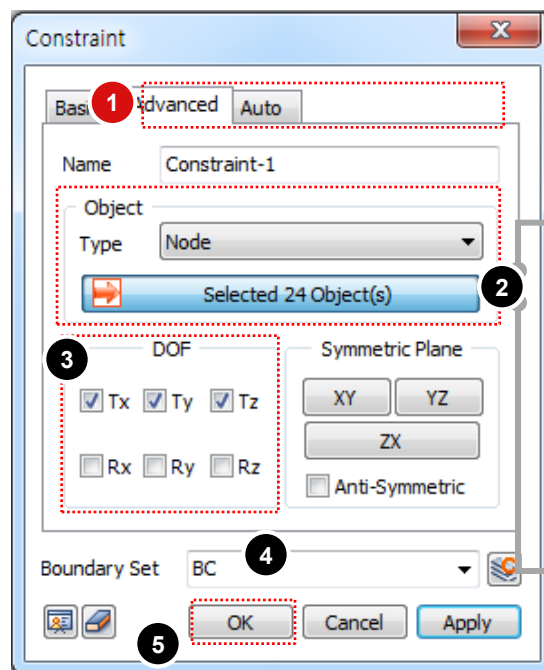
**Procedure**

- 1 Select All Displayed
- 2 Mirror Plane : [YZ Plane]
- 3 Click [OK] Button



**Procedure**

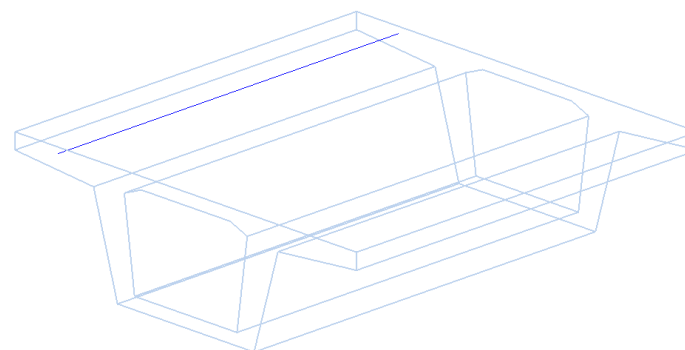
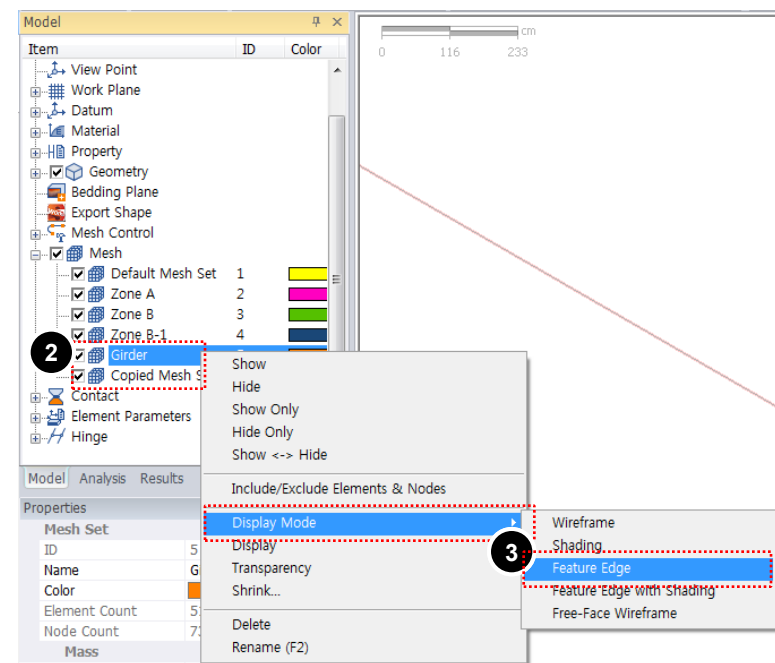
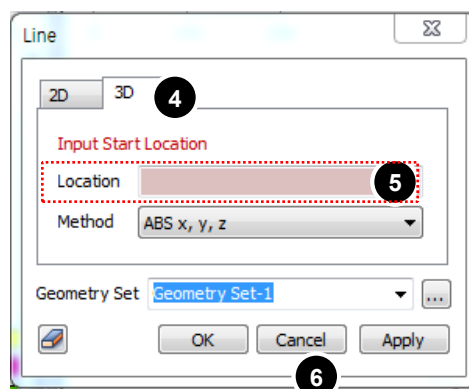
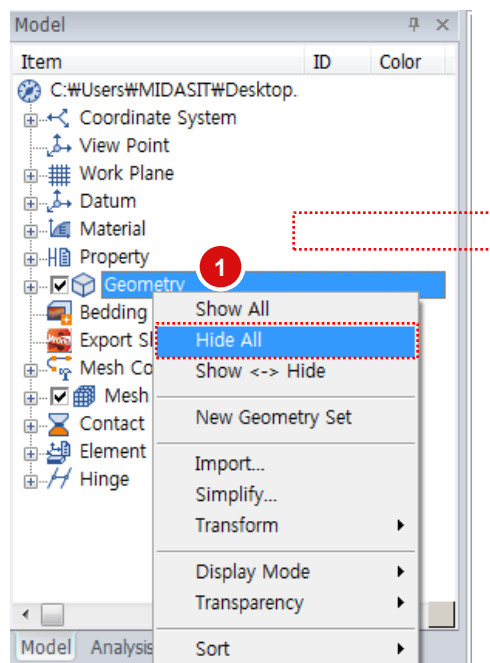
- 1 **[Advanced]** tab
- 2 Select **[24 Nodes]** of Bottom Face  
(See Figure)
- 3 DOF : **Tx, Ty, Tz**
- 4 Boundary Set : **BC**
- 5 Click **[OK]** Button





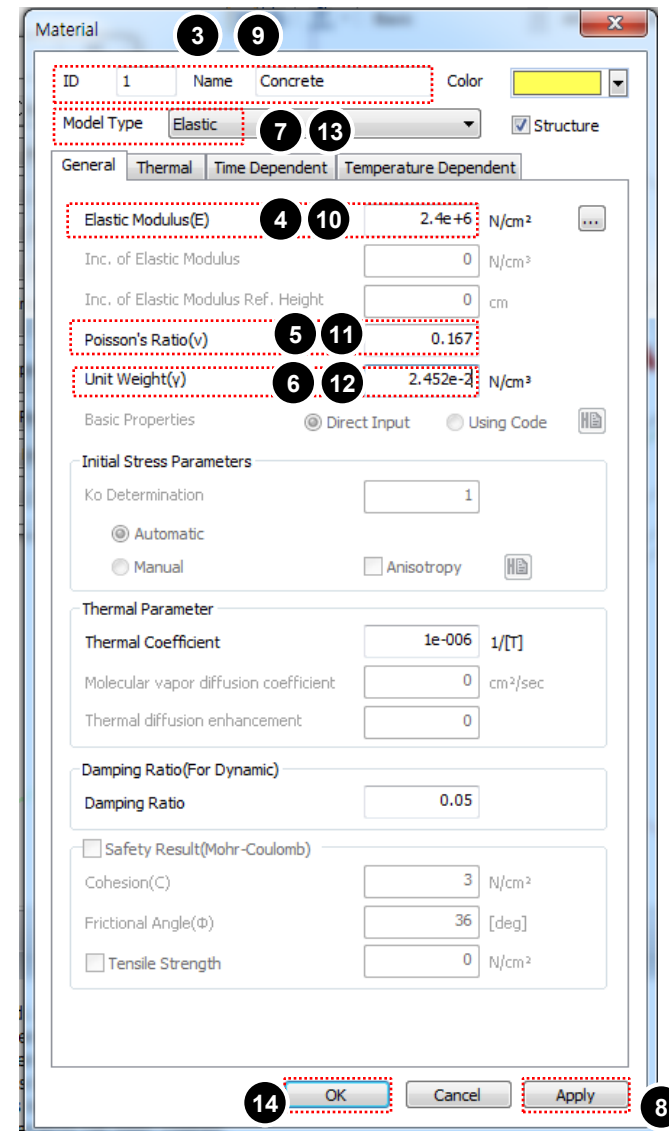
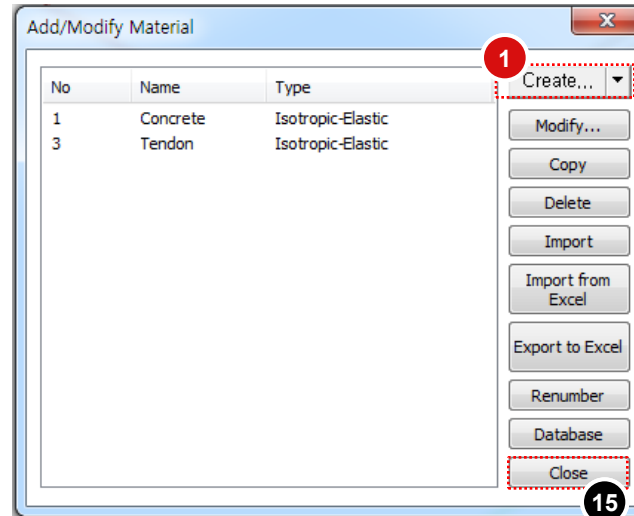
**Procedure**

- 1 Click Right Mouse Button and Select **[Hide All]**
- 2 Merge Mesh : Click Copied Mesh Set And drag to Girder
- 3 Model Tree : Mesh > **[Girder]**  
Click Right Mouse Button and Select **[Display Mode > Feature Edge]**
- 4 Geometry > Point & Curve > **[Line (3D)]**
- 5 Location :  
“(-375, 0, 285), <0, 1000, 0>”  
Click **[Cancel]** Button



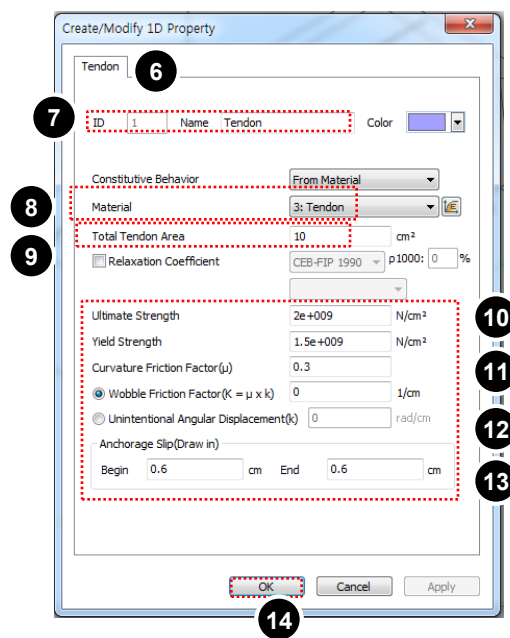
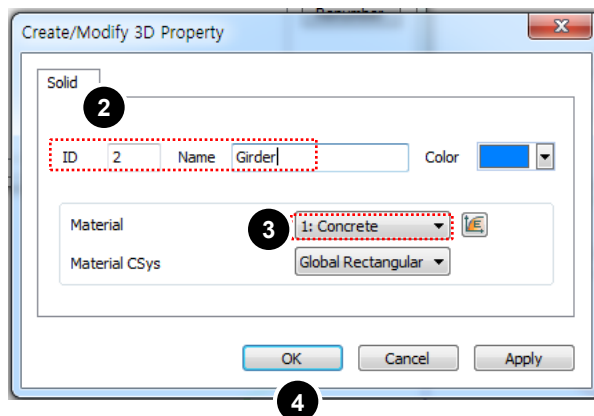
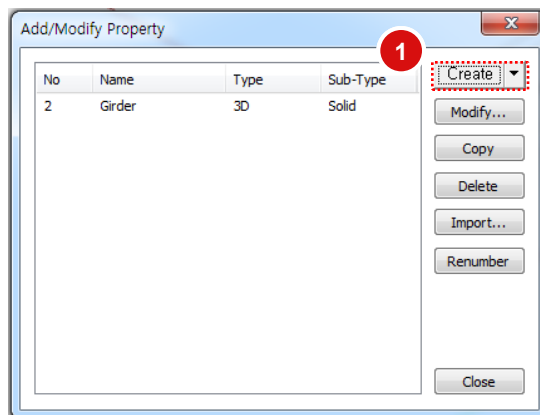
**Procedure**

- 1 Click **[Create...]** Button
- 2 Select **[Isotropic]** tab
- 3 ID : **"1"** , Name : **"Concrete"**
- 4 Elastic Modulus : **"2.4e6"** N/cm<sup>2</sup>
- 5 Poisson's Ratio : **"0.167"**
- 6 Unit Weight : **"2.452e-2"** N/cm<sup>3</sup>
- 7 Model Type : **[Elastic]**
- 8 Click **[Apply]** Button
- 9 ID : **"2"** , Name : **"Tendon"**
- 10 Elastic Modulus : **"1.96e7"** N/cm<sup>2</sup>
- 11 Poisson's Ratio : **"0.3"**
- 12 Weight Density : **"7.698e-2"** N/cm<sup>3</sup>
- 13 Model Type : **[Elastic]**
- 14 Click **[OK]** Button
- 15 Click **[Close]** Button




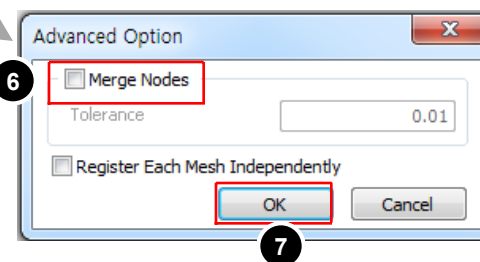
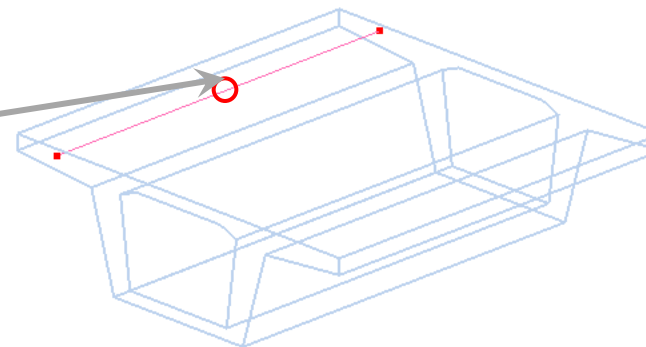
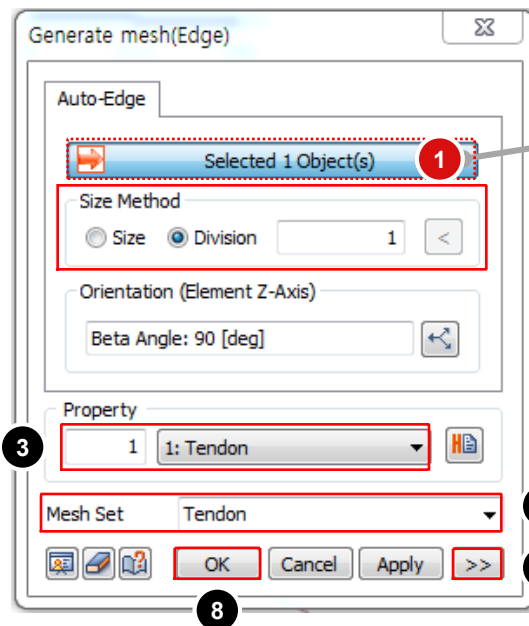
**Procedure**

- 1 Create [3D]
- 2 ID : "2", Name : "Girder"
- 3 Select [1:Concrete] for Material
- 4 Click [OK] Button
- 5 Create [1D- Embedded Truss]
- 6 Create [1D-Tendon]
- 7 ID : "3", Name : "Tendon"
- 8 Select [2: Tendon] for Material
- 9 Cross Section Area : "10" cm<sup>2</sup>
- 10 Ultimate Strength : 2e+9
- 11 Yield Strength : 1.5e+9
- 12 Curvature Friction Factor : 0.3
- 13 Anchorage Slip : "0.6" cm
- 14 Click [OK] Button



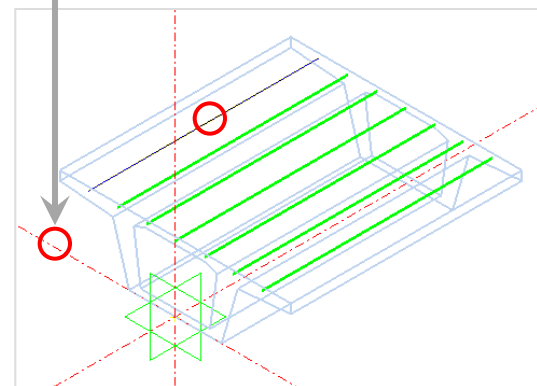
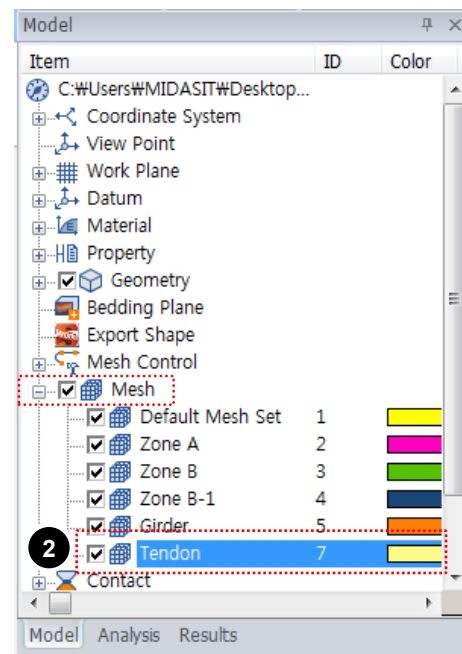
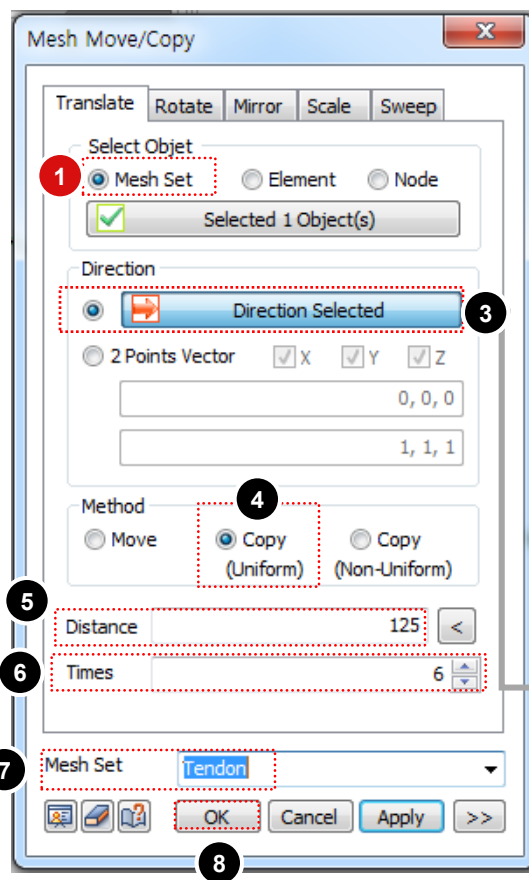
## Procedure

- 1 Select Edge marked by [  ]  
(See Figure)
- 2 Size Method  
- **[Number of Divisions] : "1"**
- 3 Property : **"4: Tendon"**
- 4 Mesh Set : **[Tendon]**
- 5 Click **Advanced Option**
- 6 Check off **"Merge Nodes"**
- 7 Click **[OK]** Button
- 8 Click **[OK]** Button



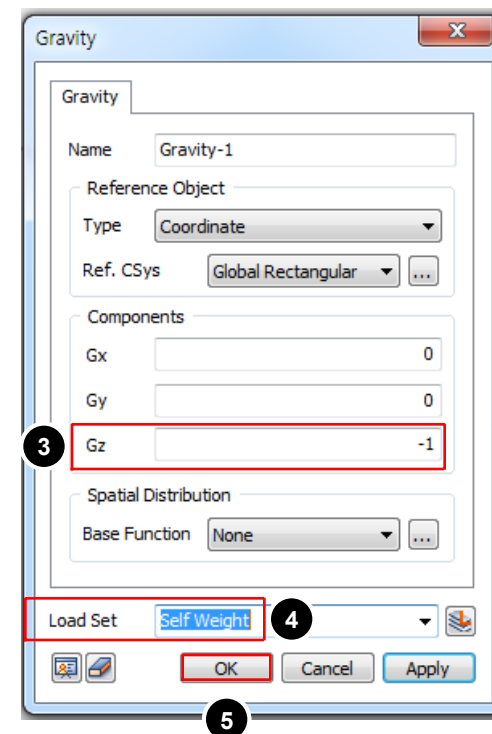
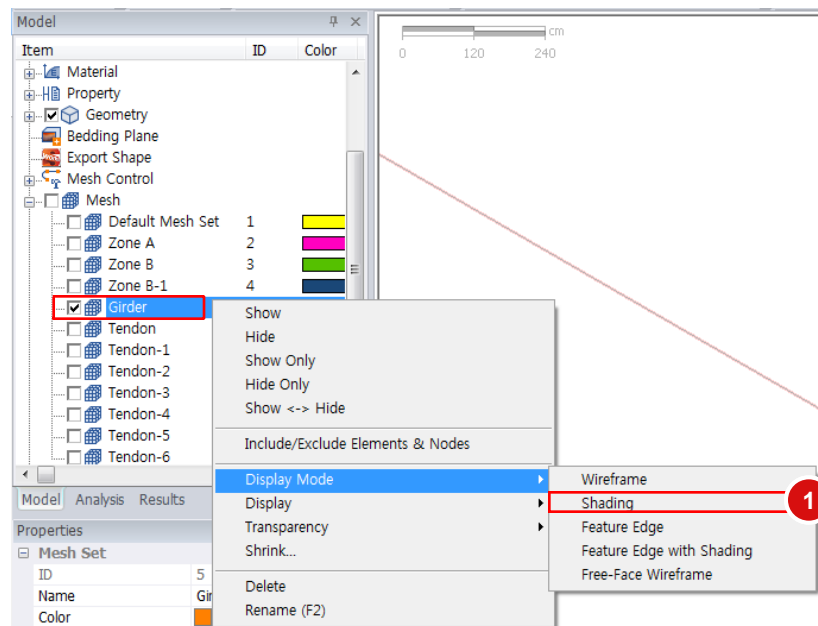
**Procedure**

- 1 Check on **[Mesh Set]**
- 2 Select **[Tendon]**  
Mesh Set in Model Tree  
(See Figure)
- 3 Direction **[X-Axis]**
- 4 Select **[Uniform Copy]**
- 5 Distance : **"125"**,
- 6 Number of Times : **"6"**
- 7 Mesh Set : **[Tendon]**
- 8 Click **[OK]** Button



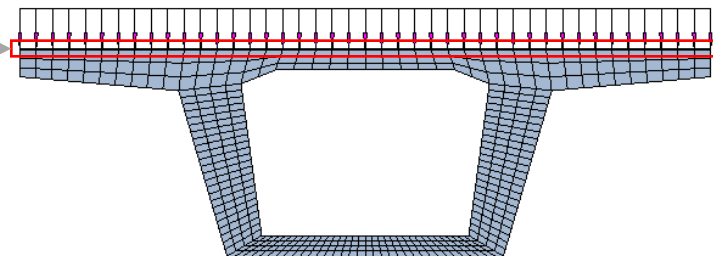
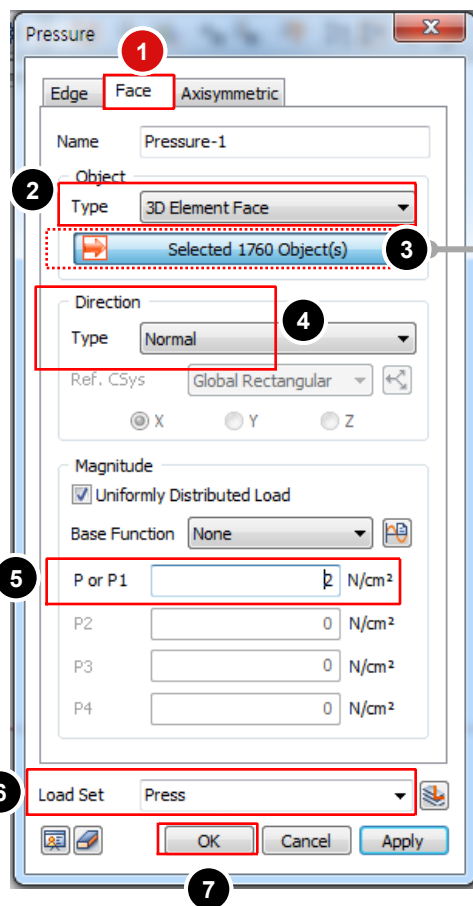
**Procedure**

- 1 Click Right Mouse Button and Select Display Mode > **[Shading]**
- 2 Static Analysis > Load > **[Self Weight]**
- 3 Gravitational Force Factor : **[GZ] “-1”**
- 4 Load Set : **[Self Weight]**
- 5 Click **[OK]** Button



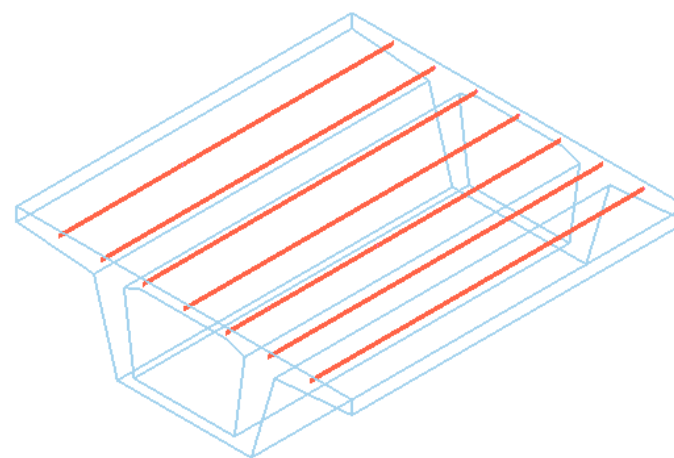
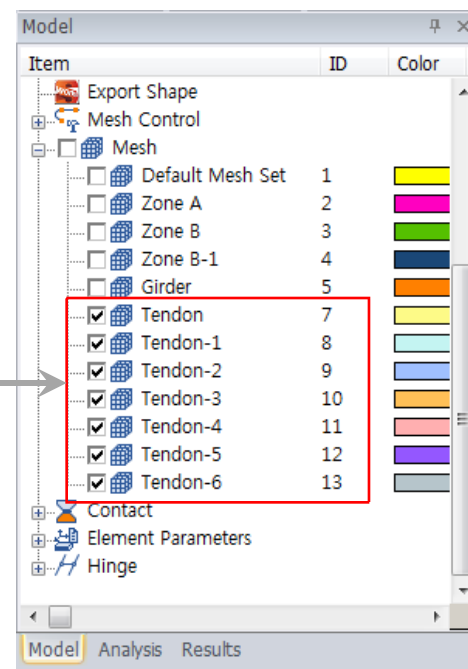
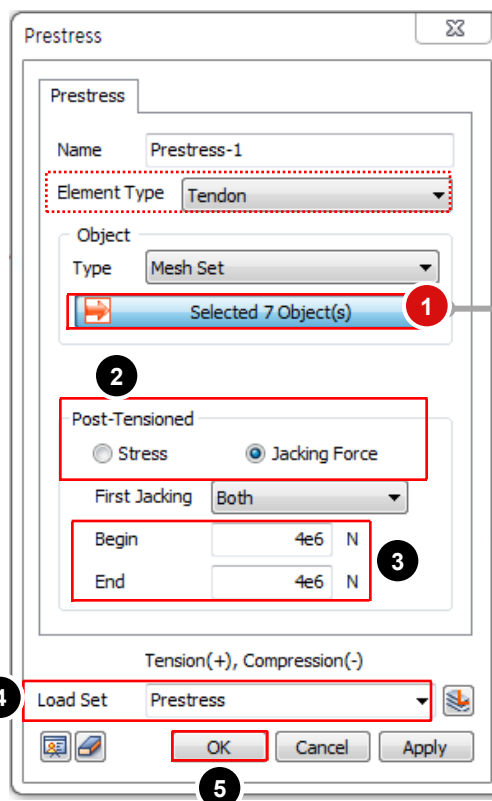
**Procedure**

- 1 Select **[Face]** tab
- 2 Object Type : **[3D Element Face]**
- 3 Select **[Top Element Faces]** of Girder  
(See Figure)
- 4 Direction : **[Normal]**
- 5 P or P1 : **"2"** N/cm<sup>2</sup>
- 6 Load Set : **[Press]**
- 7 Click **[OK]** Button



**Procedure**

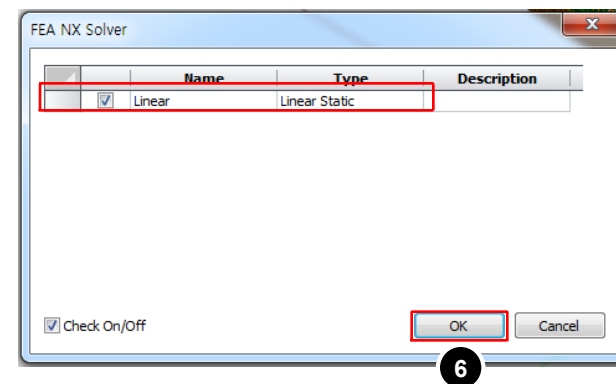
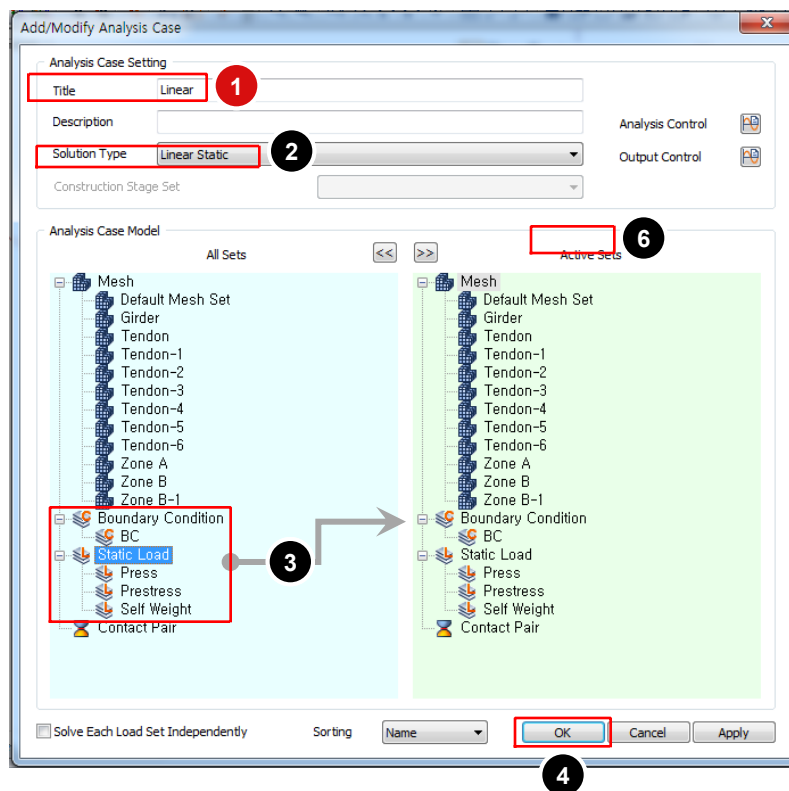
- 1 Select **[7 Tendon]** in Model Tree (See Figure)
- 2 Select **[Post Tensioned]** (Jacking Force)
- 3 Begin & End : **"4e6" N**
- 4 Load Set : **[Prestress]**
- 5 Click **[OK]** Button





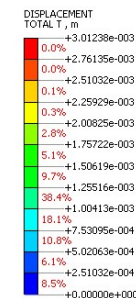
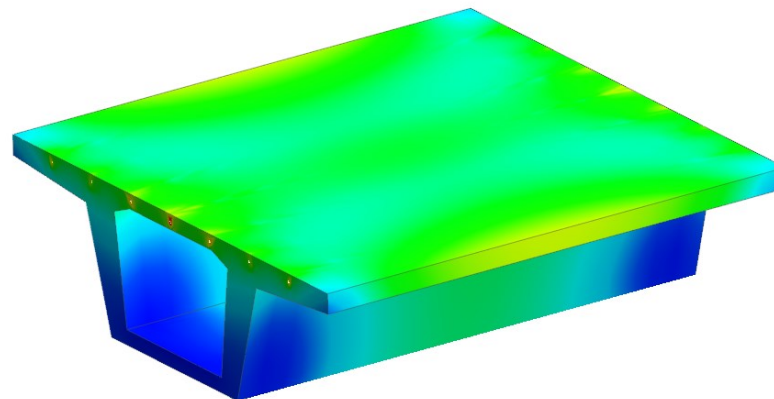
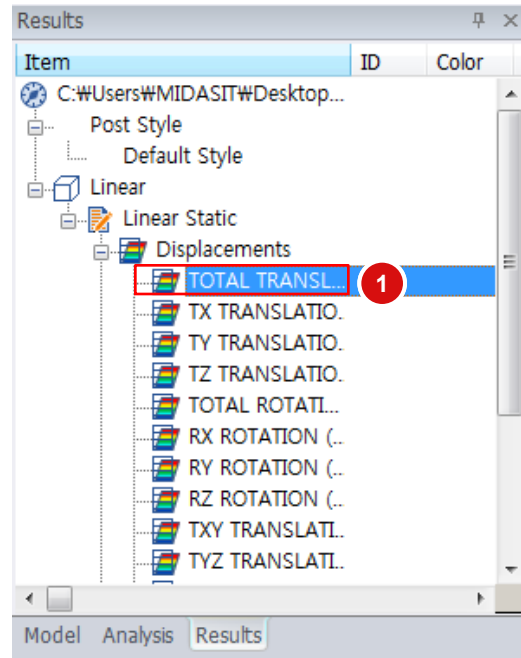
**Procedure**

- 1 Title : **[Linear]**
- 2 Solution Type : **[Linear Static]**
- 3 Drag & Drop  
**[Boundary Condition]** & **[Load]**  
to **[Active Sets]** Window
- 4 Click **[OK]** Button
- 5 Analysis > **[Perform]**
- 6 Click **[OK]** Button



**Procedure**

- 1 Double Click **[TOTAL TRANSL...]**



**Procedure**

- 1 Double Click **[AXIAL]**
- 2 Property Window : **[Diagram]**
- 3 Fill Type : **[Solid Fill]**
- 4 Click **[Apply]** Button

