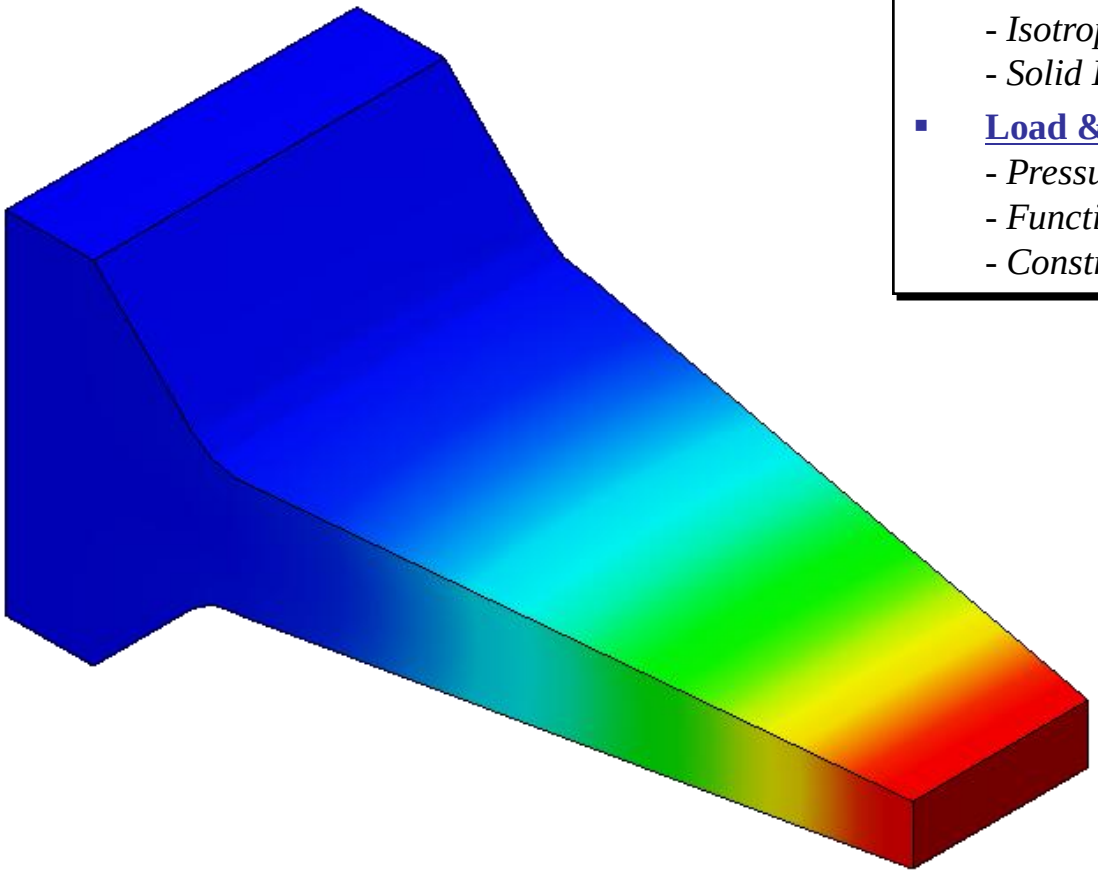
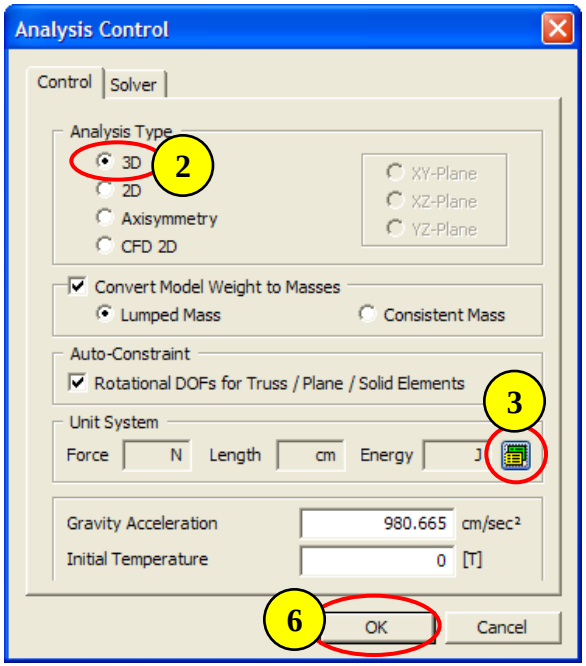
LS-12. Analysis of a Solid Block

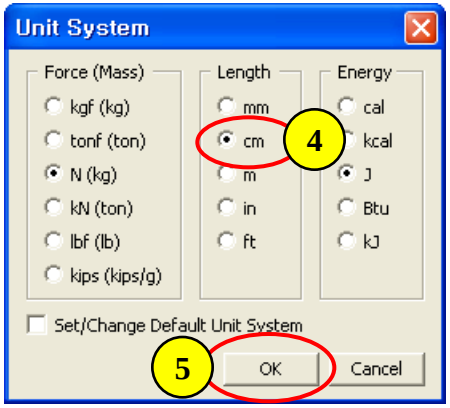


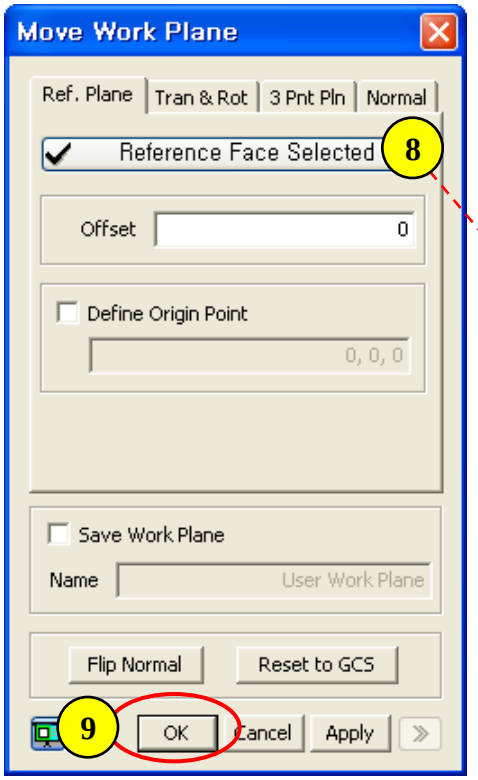
Overview

- 3-D Linear Static Analysis
- Model
  - *Unit : N, cm*
  - *Isotropic Elastic Material*
  - *Solid Element*
- Load & Boundary Condition
  - *Pressure*
  - *Function*
  - *Constraint*

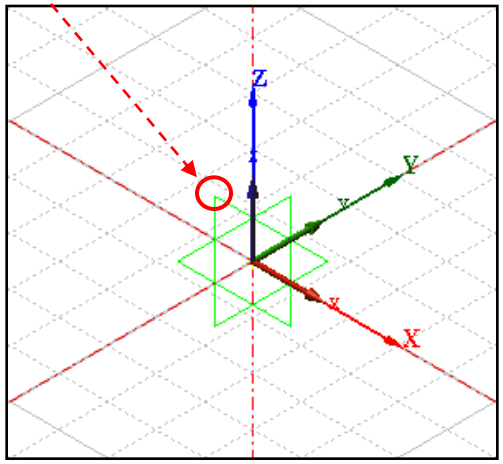
Step 1.





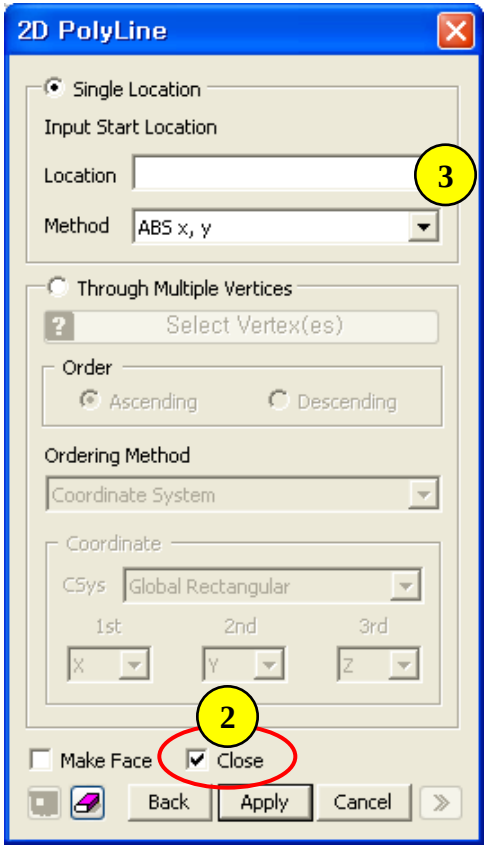


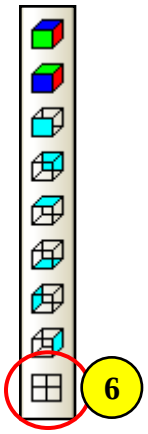
1. *Analysis > Analysis Control – "Control" tab*
2. *Analysis Type : 3D*
3. *Click* **Button** *(Unit System)*
4. *Length : cm*
5. *Click* **[OK]** *Button*
6. *Click* **[OK]** *Button*
7. *Geometry > Work Plane > Move …*
8. *Select "XZ Plane"*
9. *Click* **[OK]** *Button*



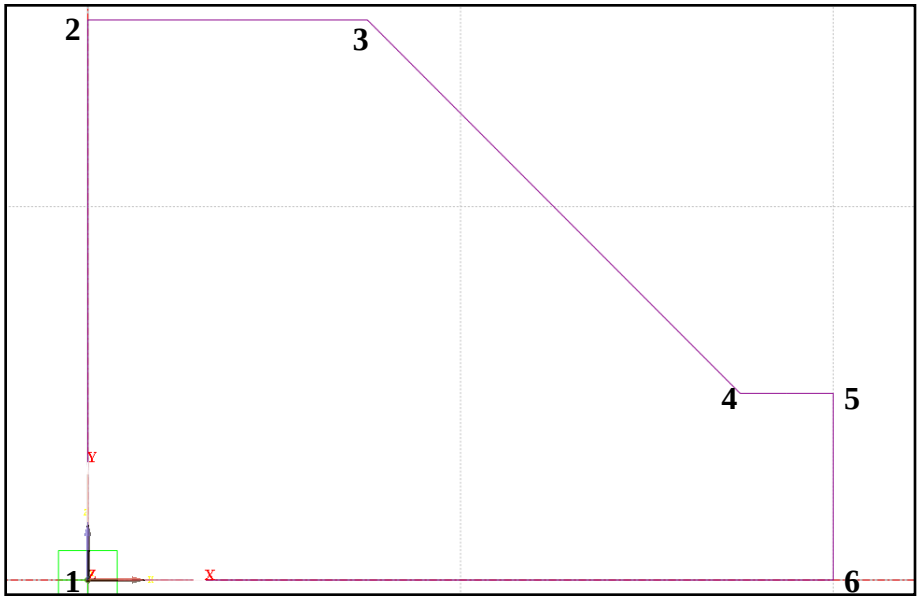
Analysis Control Dialog is automatically activated at startup.

Step 2.



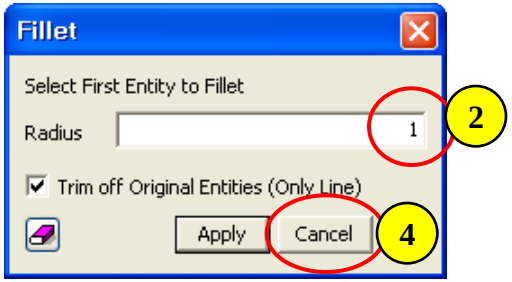


1. *Geometry > Curve > Create on WP > Polyline…*
2. *Check on "Close"*
3. *Location : (0) , <0, 3> , <1.5> , <2, -2> , <0.5> , <0, -1>*
4. *Click Right Mouse Button on the Work Window*
5. *Click* **[Cancel]** *Button*
6. *Click "Normal View"*

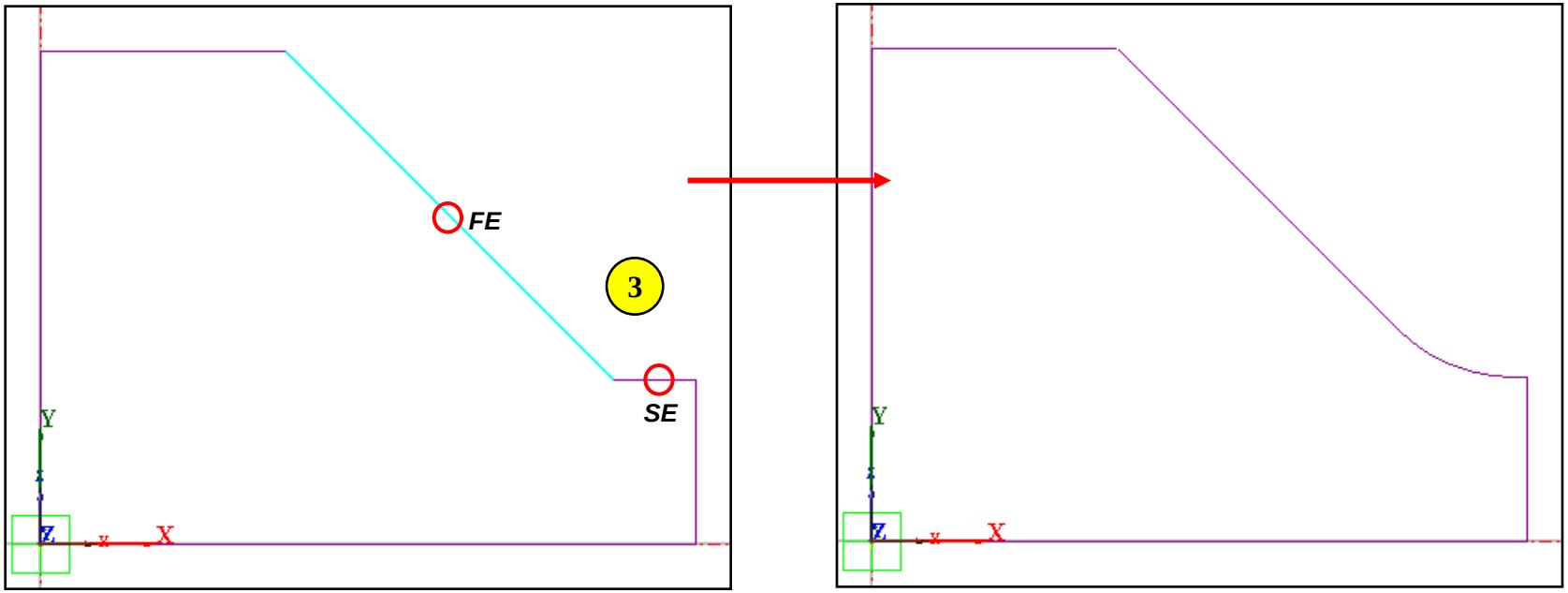


- *(): "ABS x, y", <>: "REL dx, dy"*
  (0) same as (0, 0)
- **[Esc]** *as shortcut for* **[Cancel].**

Step 3.

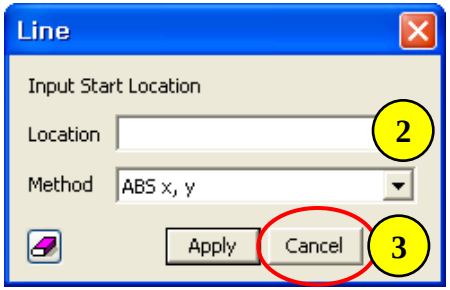


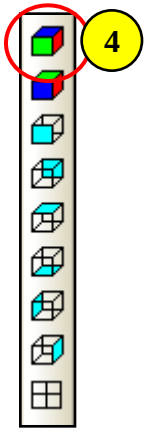
1. *Geometry > Curve > Fillet …*
2. *Radius : 1*
3. *Select FE and SE (See Figure)*
4. *Click* **[Cancel]** *Button*



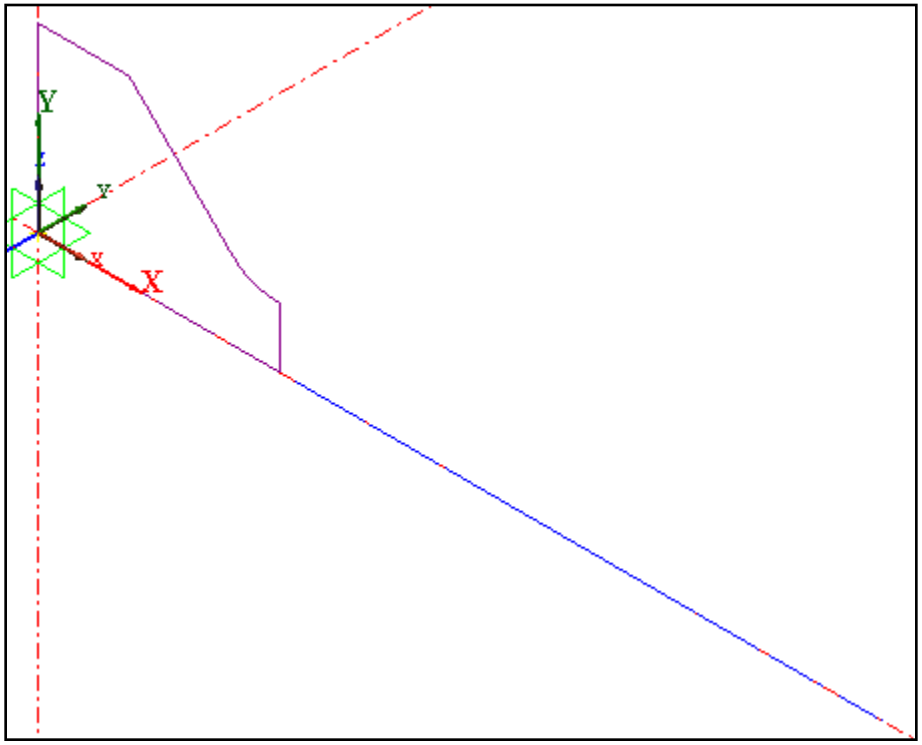
FE : First Entity , SE : Second Entity

Step 4.

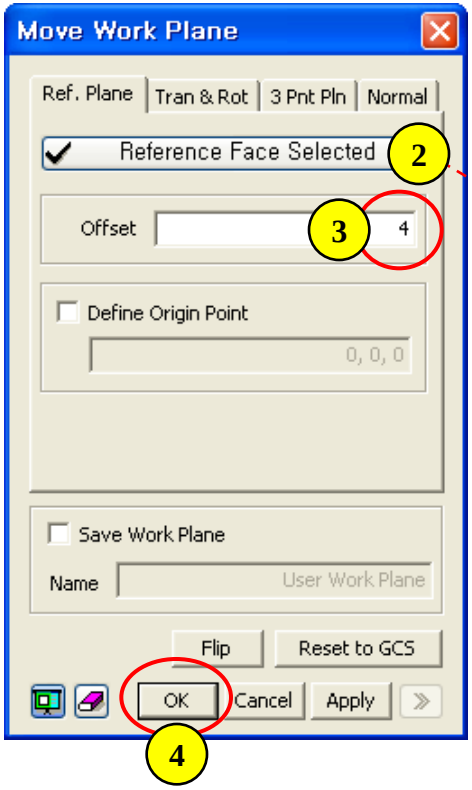




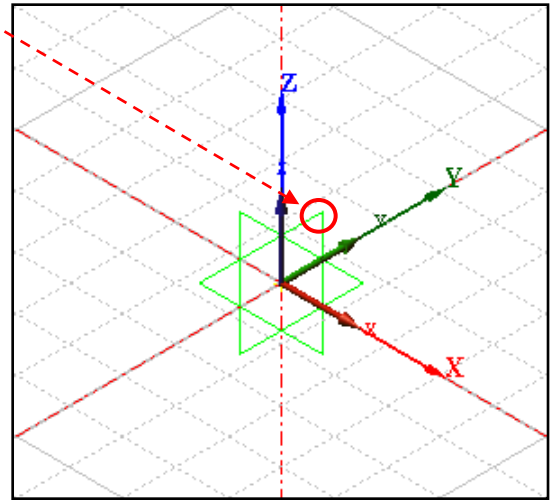
1. *Geometry > Curve > Create on WP > Line…*
2. *Location : (4) , <10>*
3. *Click* **[Cancel]** *Button*
4. *Select "Isotropic 1 View"*



Step 5.

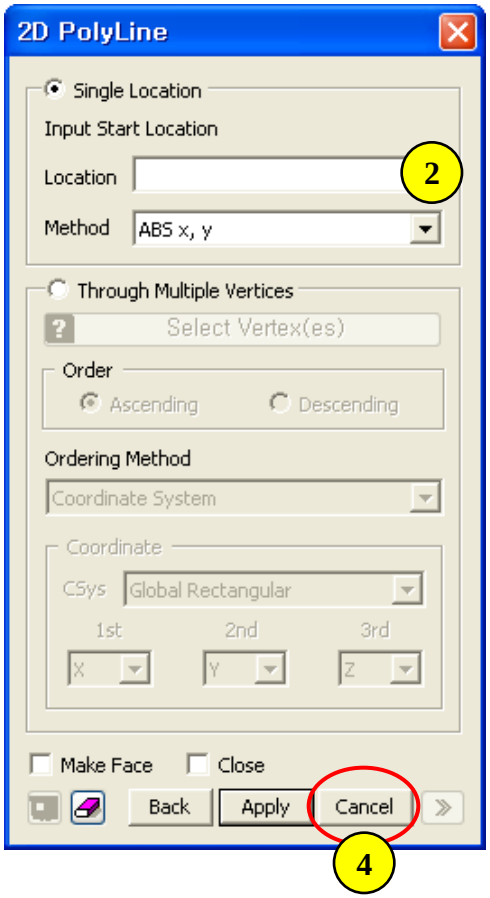


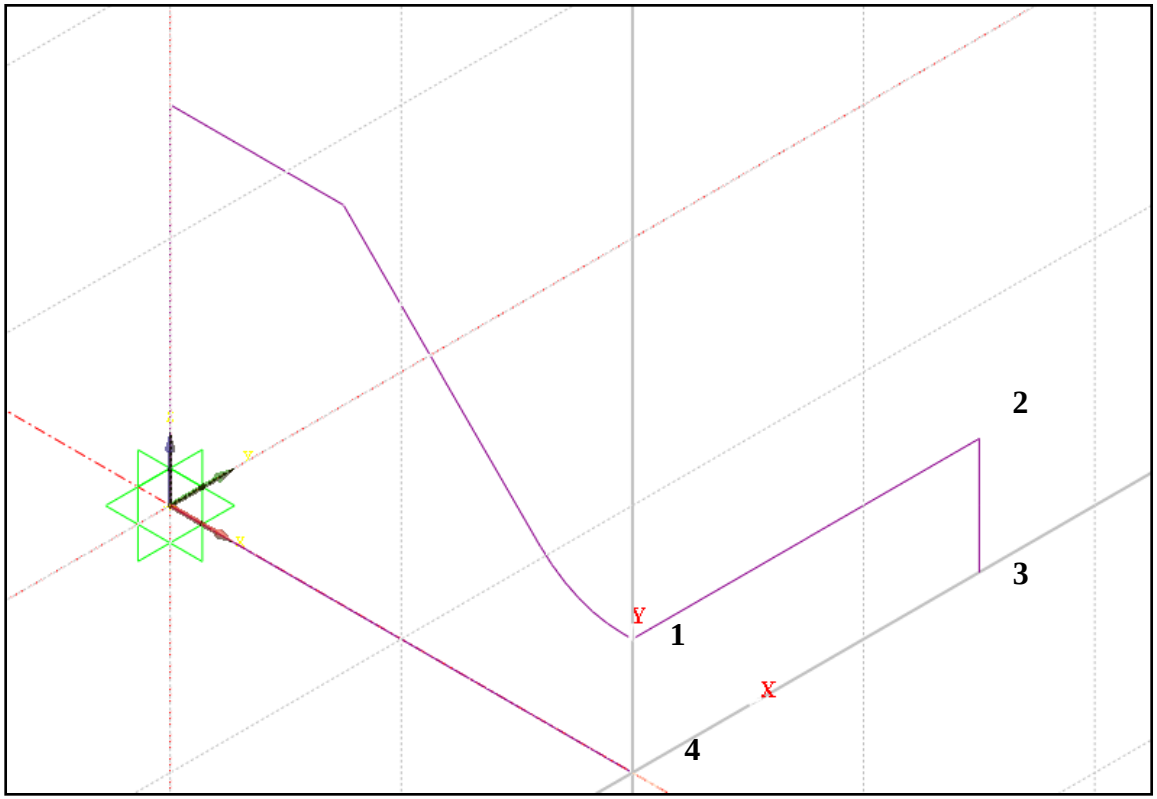
1. *Geometry > Work Plane > Move – "Ref. Plane" tab*
2. *Select "YZ Plane"*
3. *Offset : 4*
4. *Click* **[OK]** *Button*



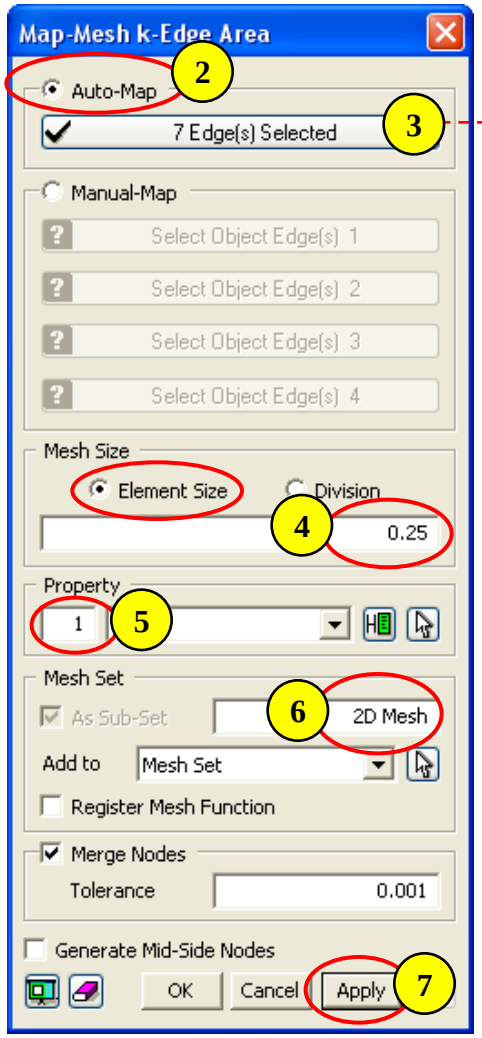
Step 6.

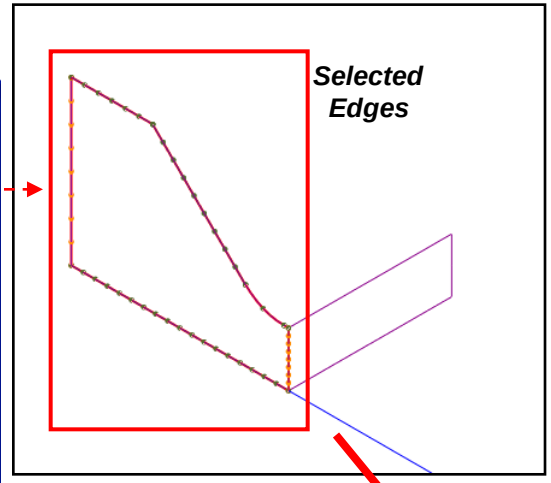
1. *Geometry > Curve > Create on WP > Polyline…*
2. *Location : (0, 1) , <3> , <0,-1> , <-3>*
3. *Click Right Mouse Button on the Work Window*
4. *Click* **[Cancel]** *Button*



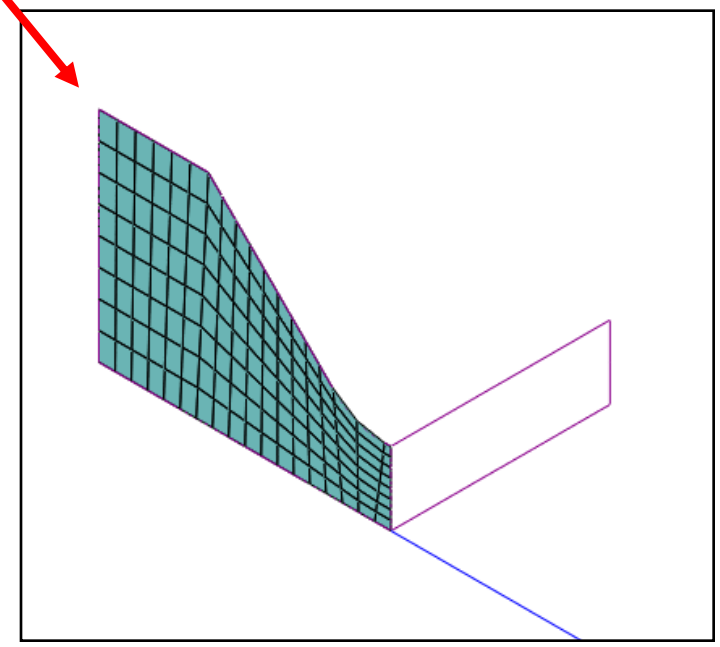


Step 7.

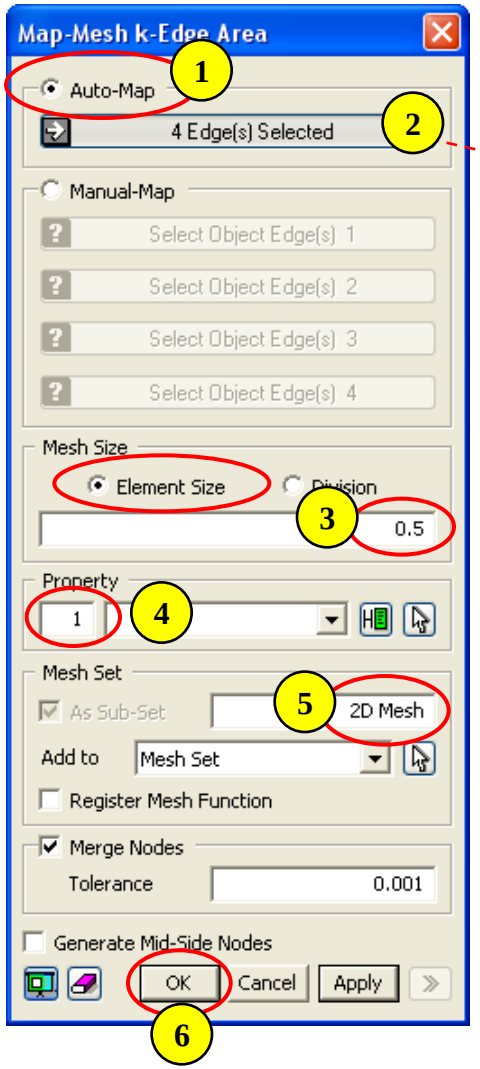


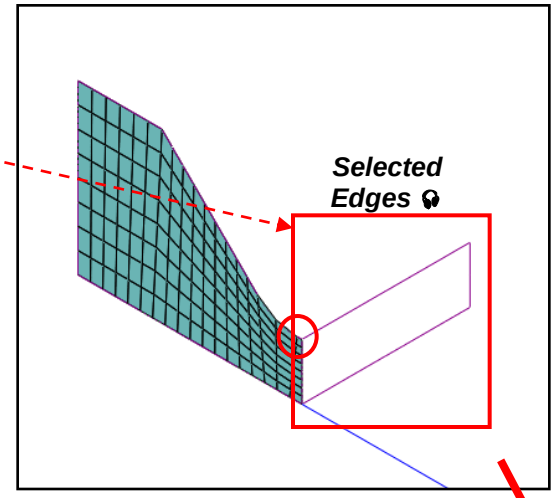


1. *Mesh > Map Mesh > k-Edge Area …*
2. *Select "Auto-Map"*
3. *Select 7 Edges (See figure)*
4. *Mesh Size - Element Size : 0.25*
5. *Property : 1*
6. *Mesh Set : 2D Mesh*
7. *Click* **[Apply]** *Button*

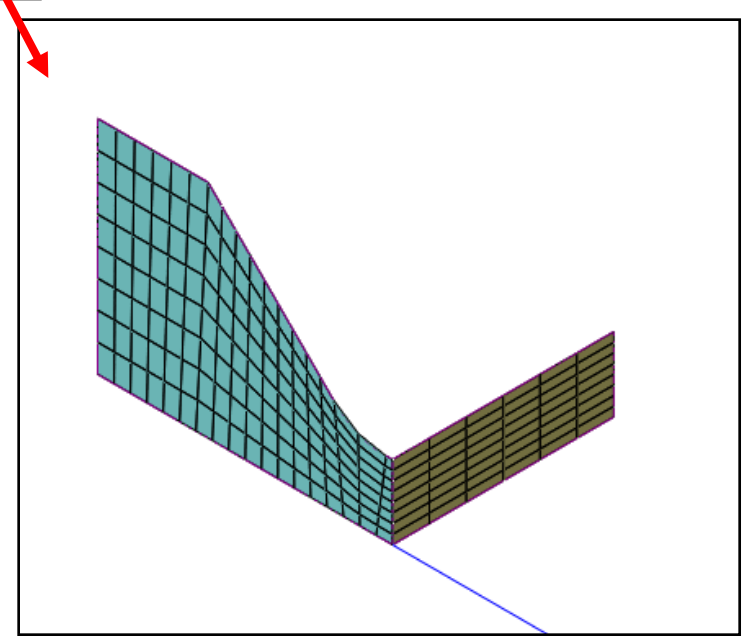


Step 8.



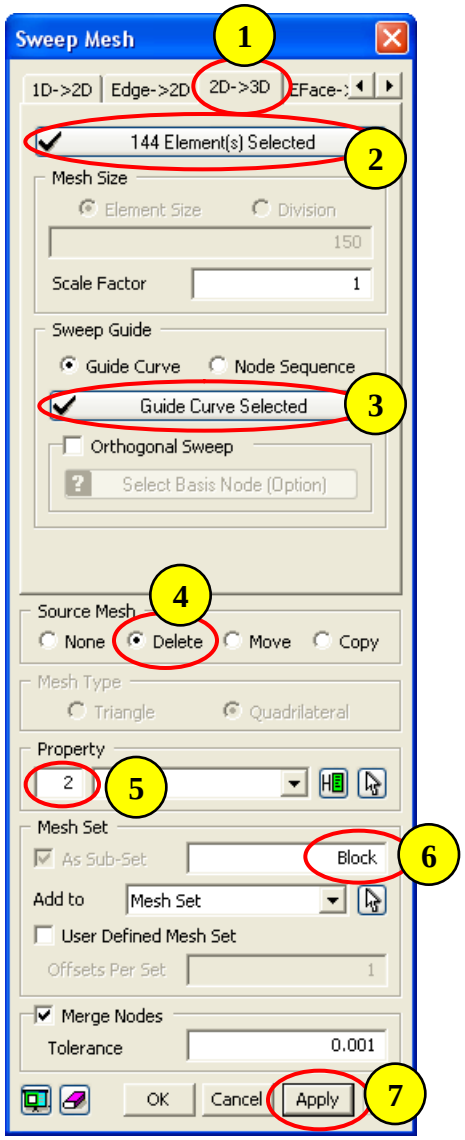


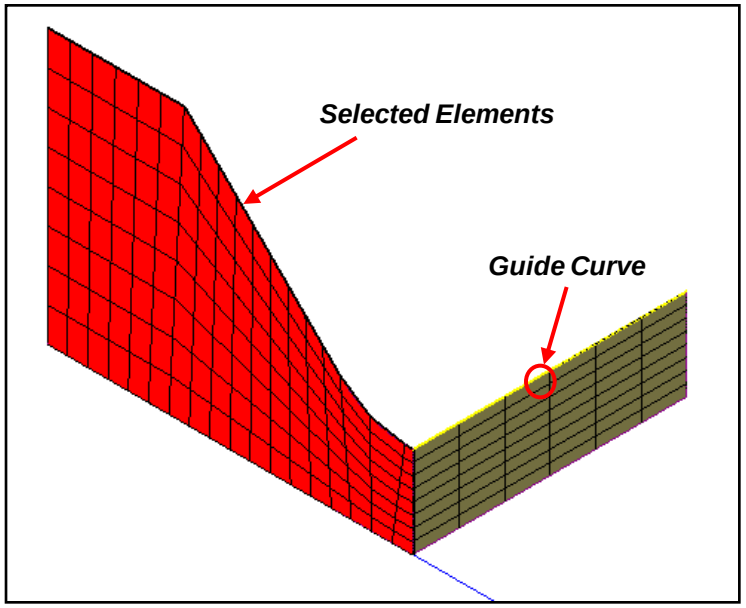
1. *Select "Auto-Map"*
2. *Select 4 Edges (See figure)*
3. *Mesh Size - Element Size : 0.5*
4. *Property : 1*
5. *Mesh Set : 2D Mesh*
6. *Click* **[OK]** *Button*



4 Edges should be selected.

Step 9.

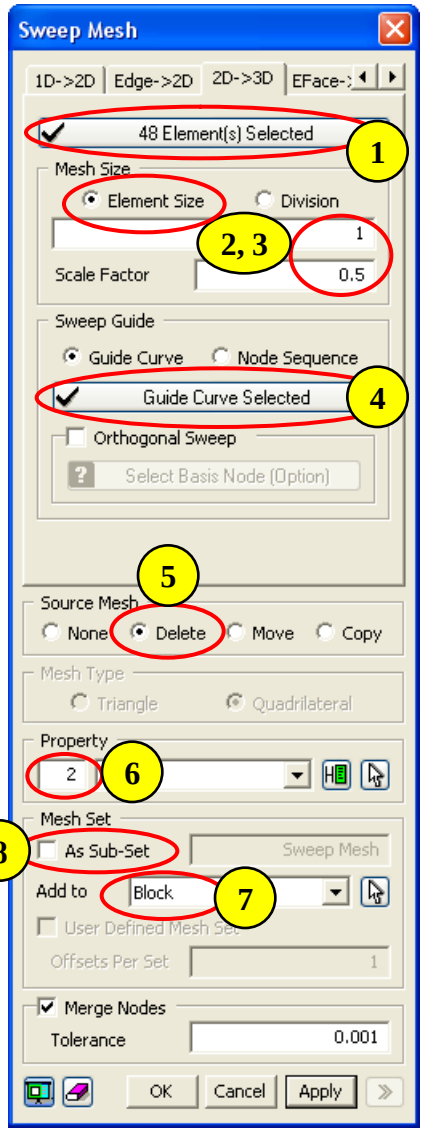


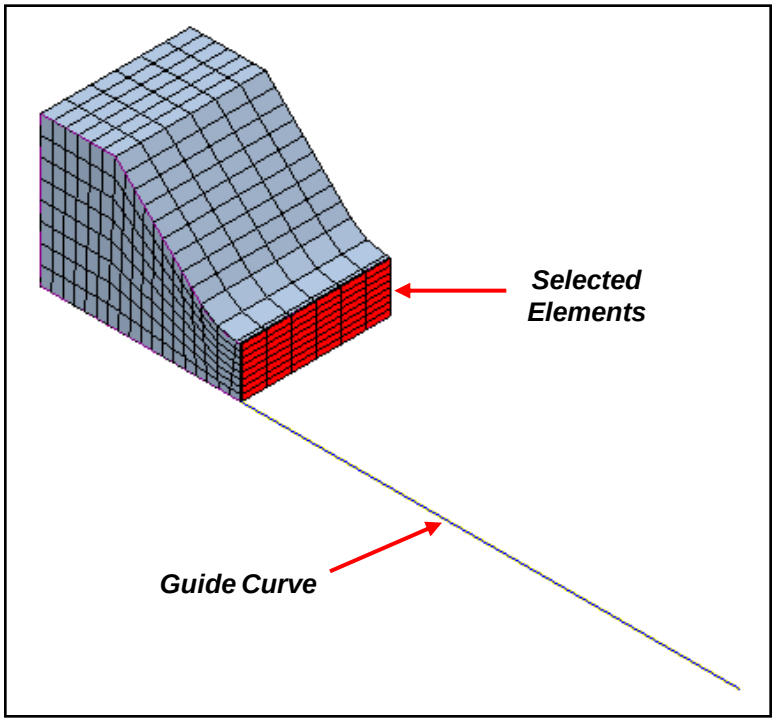


1. *Mesh > Protrude Mesh > Sweep – "2D->3D" tab*
2. *Select 144 Elements (see figure)*
3. *Select Guide Curve (see figure)*
4. *Source Mesh : Delete*
5. *Property : 2*
6. *Mesh Set : Block*
7. *Click* **[Apply]** *Button*

Mesh Size is automatically disabled after the selection of guide curve

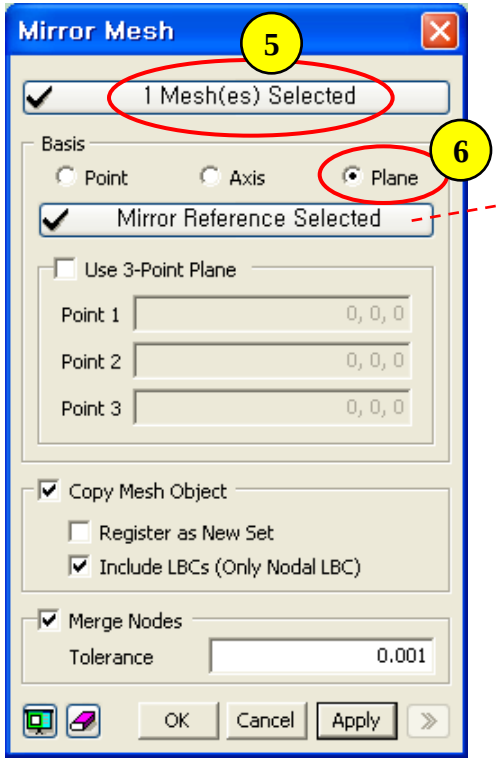
Step 10.

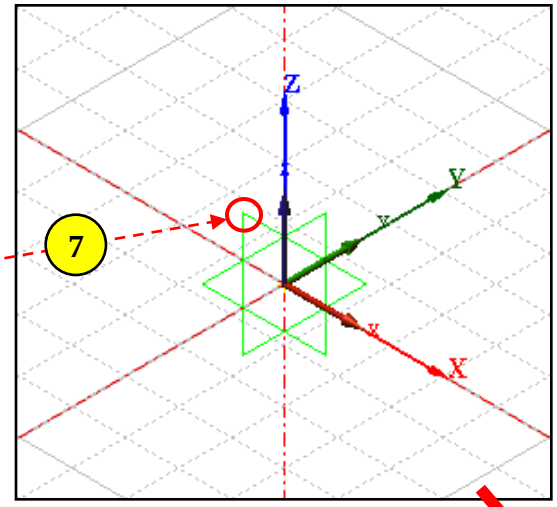




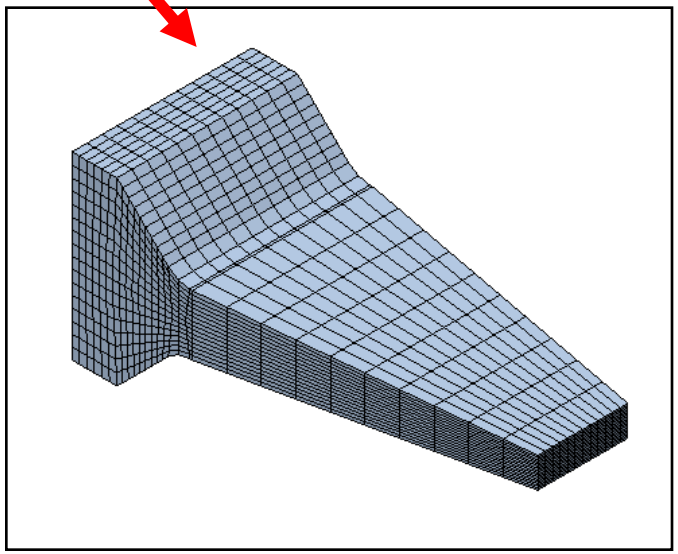
1. *Select 48 Elements (see figure)*
2. *Mesh Size – Element Size : 1*
3. *Scale Factor : 0.5*
4. *Select Guide Curve (see figure)*
5. *Source Mesh : Delete*
6. *Property : 2*
7. *Mesh Set – Add to "Block"*
8. *Check off "As Sub-Set"*
9. *Click* **[OK]** *Button*

Step 11.

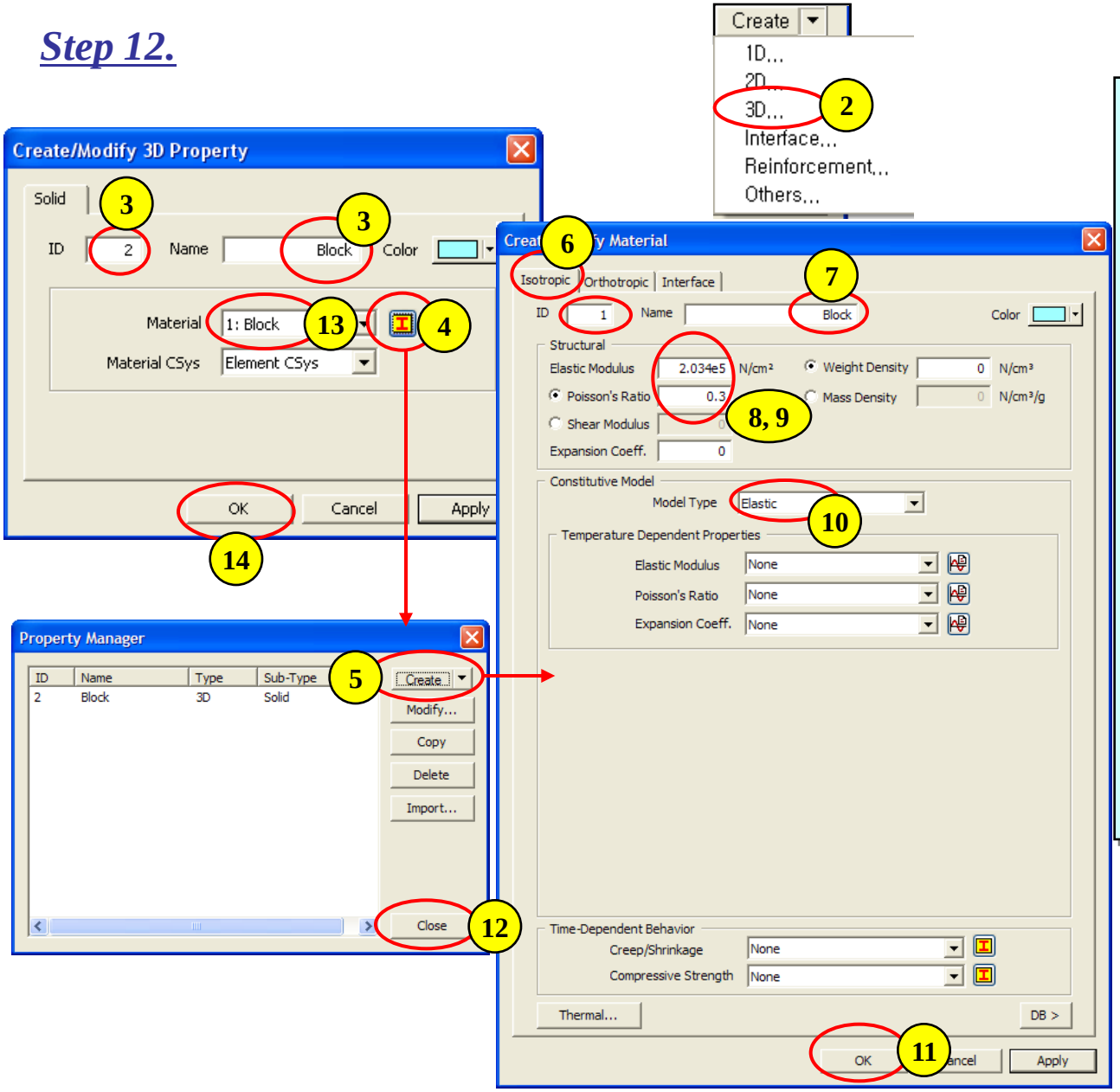




1. *Pre-Works Tree : Geometry*
2. *Click Right Mouse Button and Select "Hide All"*
3. *Mesh > Transform > Mirror…*
4. *Select "Displayed"*
6. *Basis : "Plane"*
7. *Mirror Plane : XZ Plane*
8. *Click* **[Apply]** *Button*
9. *Repeat step 4~8 for XY Plane*
10. *Click* **[Cancel]** *Button*

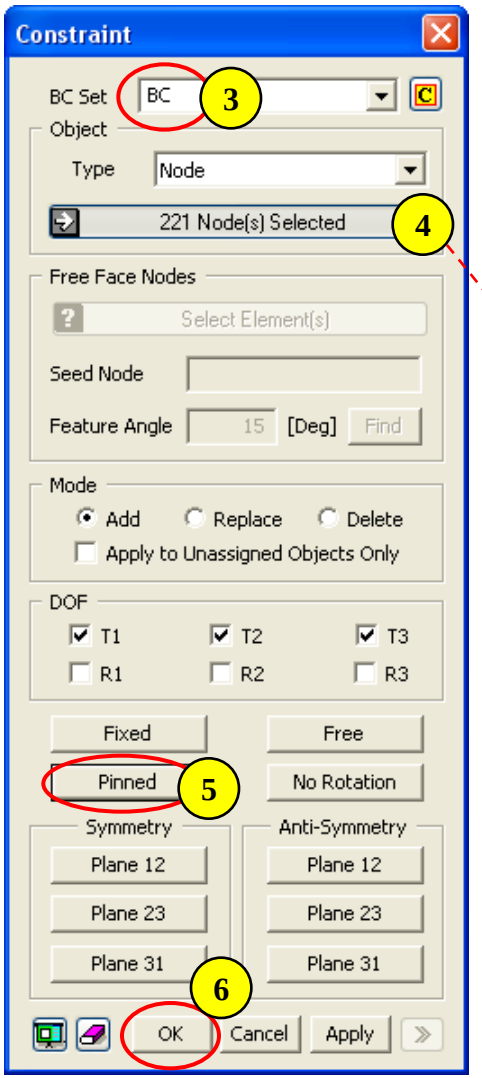


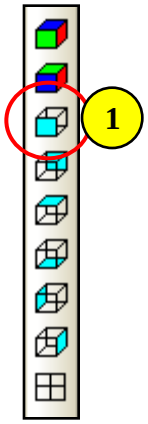
Step 12.



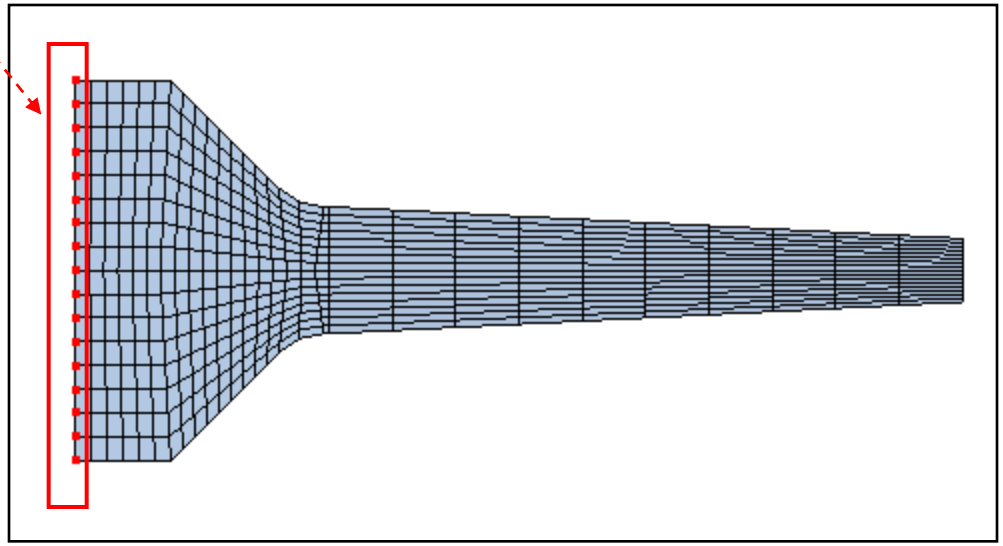
1. *Analysis > Property …*
2. *Create 3D …*
3. *ID : 2 , Name : Block*
4. *Click Button (Material)*
5. *Click* **[Create]** *Button*
6. *Select "Isotropic" tab*
7. *ID : 1 , Name : Block*
8. *Elastic Modulus : 2.034e5 N/cm²*
9. *Poisson's Ratio : 0.3*
10. *Model Type : Elastic*
11. *Click* **[OK]** *Button*
12. *Click* **[Close]** *Button*
13. *Select "1: Block" for Material*
14. *Click* **[OK]** *Button*
15. *Click* **[Close]** *Button*

Step 13.



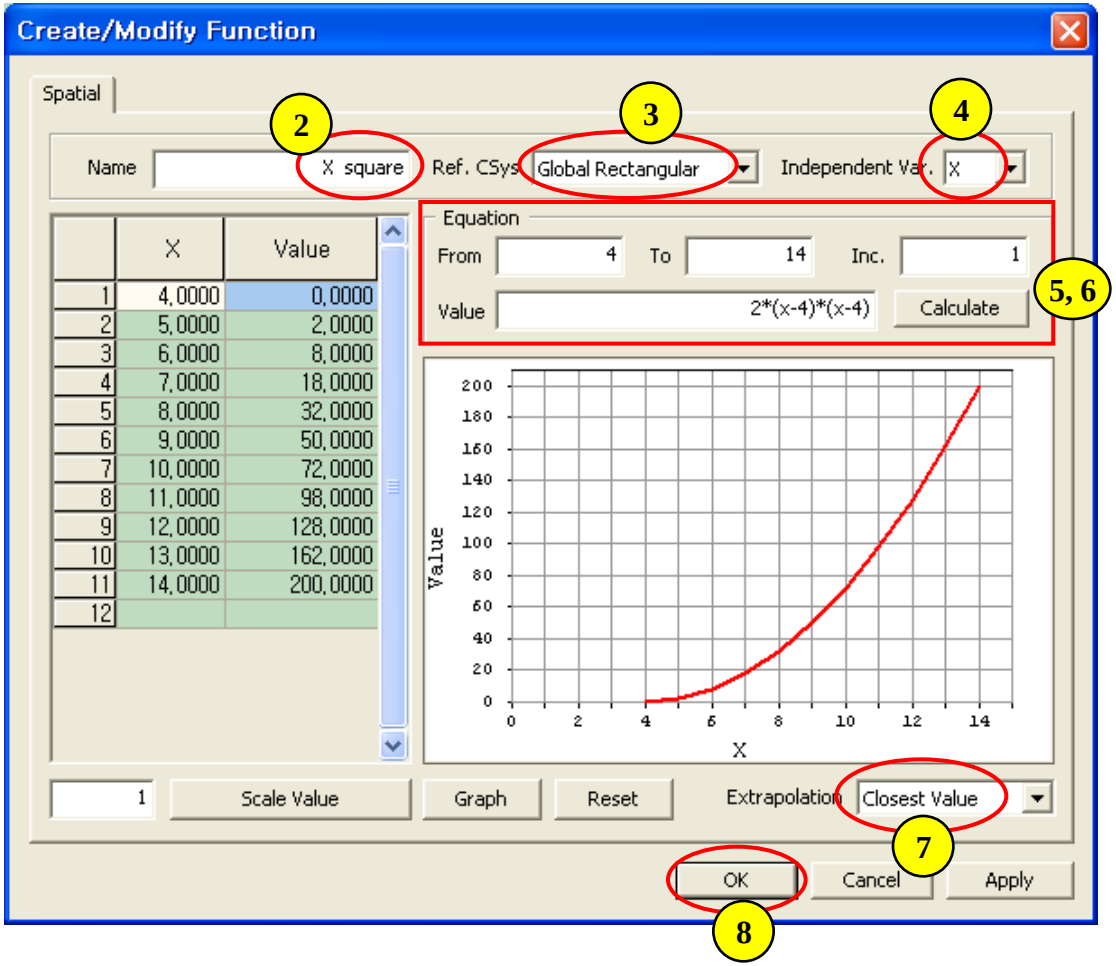


1. *Click "Front View"*
2. *Analysis > BC > Constraint …*
3. *BC Set : BC*
4. *Select 221 Nodes (See Figure)*
5. *Click* **[Pinned]** *Button*
6. *Click* **[OK]** *Button*



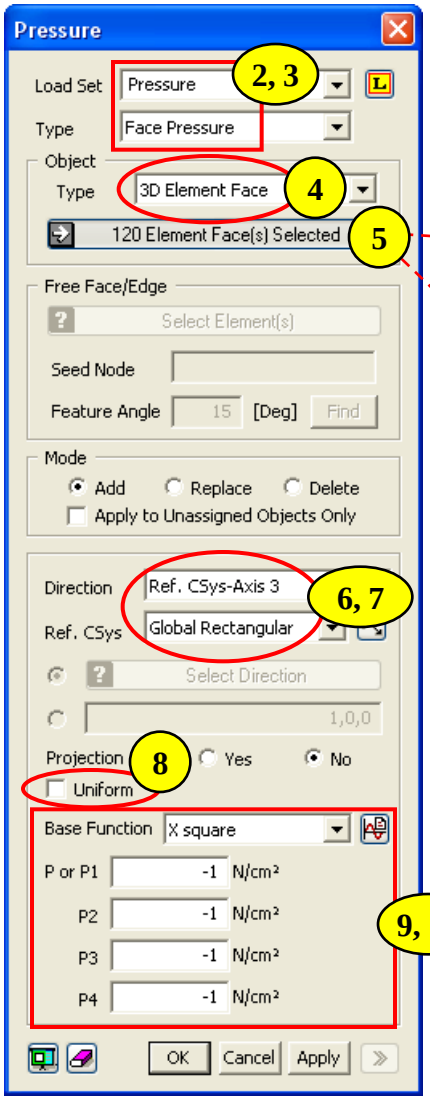
Drag mouse to select element edges (Window Selection)

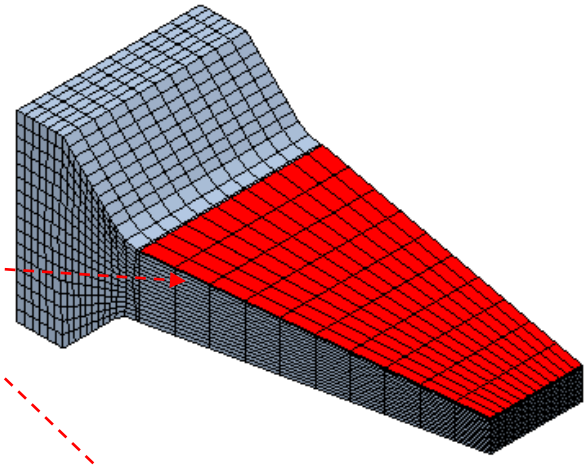
Step 14.



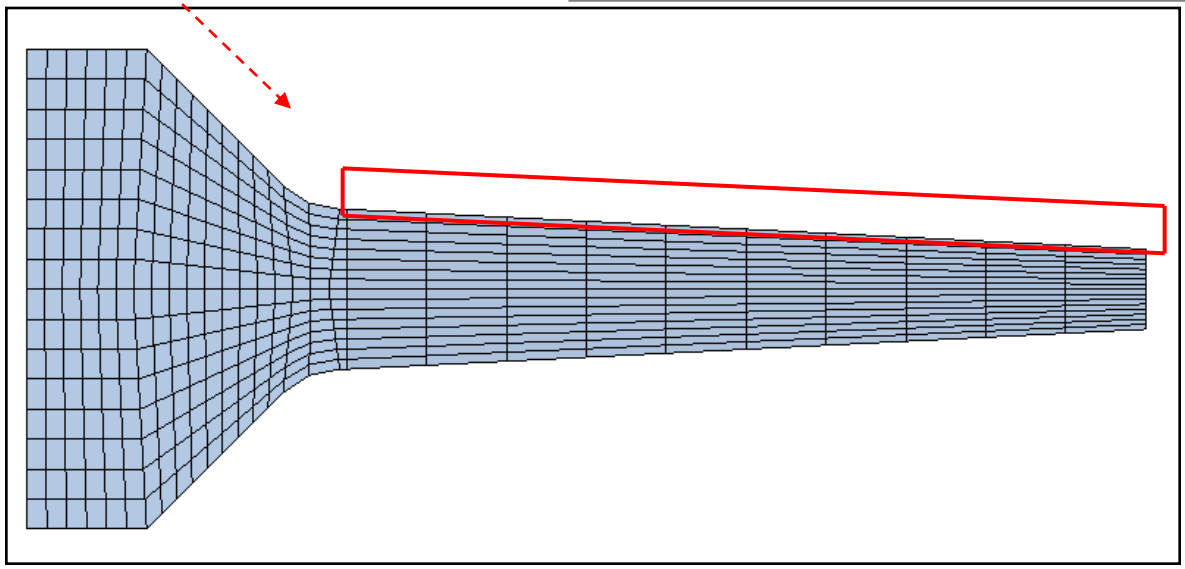
1. *Analysis > General Function…*
2. *Name : X square*
3. *Ref. CSys : Global Rectangular*
4. *Independent Var. : X*
5. *From : 4 , To : 14 , Inc. : 1*
   Value : 2(X-4)*(X-4)*
6. *Click* **[Calculate]** *Button*
7. *Extrapolation : "Closest Value"*
8. *Click* **[OK]** *Button*

Step 15.



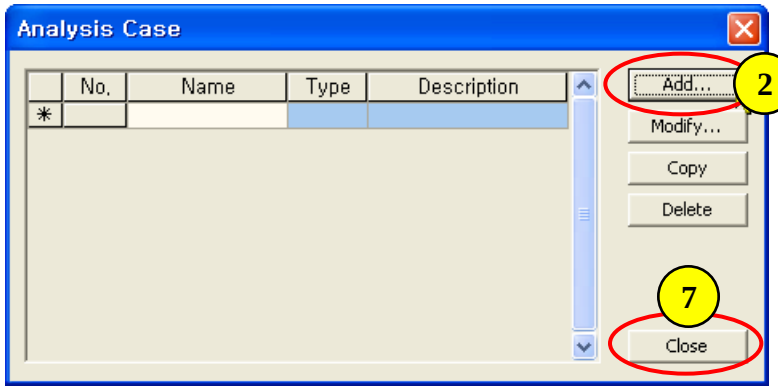


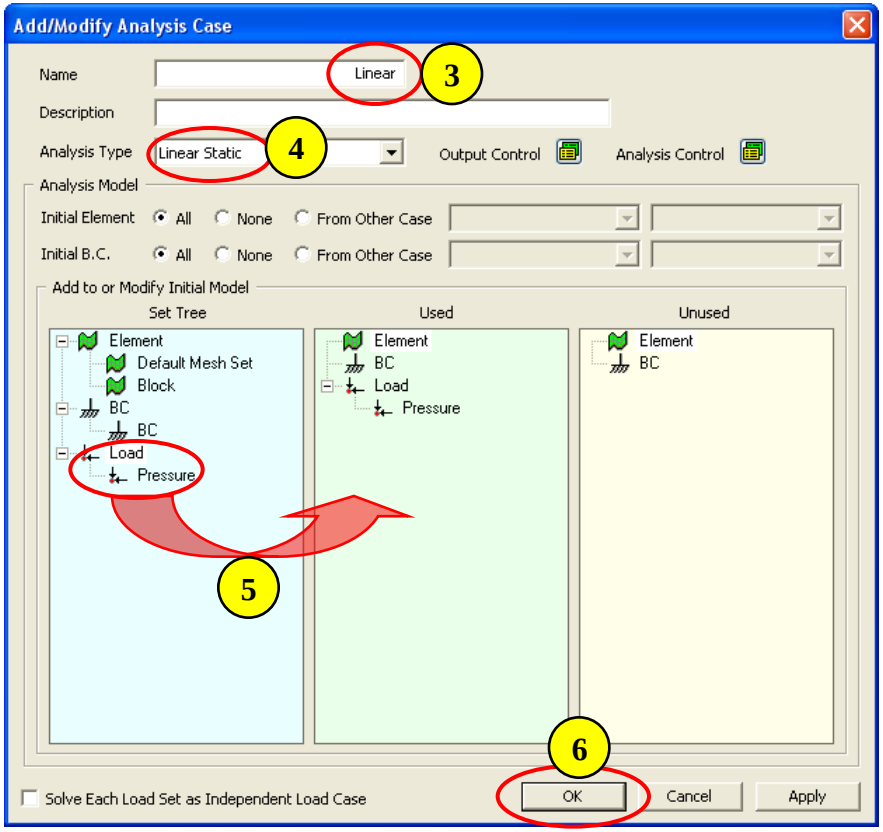
1. *Analysis > Load > Pressure …*
2. *Load Set : Enter "Pressure"*
3. *Type : Face Pressure*
4. *Object Type : 3D Element Face*
5. *Select 120 Elements Faces*
6. *Direction : Ref. Csys-Axis 3*
7. *Ref Csys : Global Rectangular*
8. *Check off "Uniform"*
9. *Select Base Function : "X square"*
10. *P1~P4 : -1*
11. *Click* **[OK]** *Button*



Use "Polyline" Selection.

Step 16.





1. *Analysis > Analysis Case …*
2. *Click* **[Add]** *Button*
3. *Name : Linear*
4. *Analysis Type : Linear Static*
5. *Drag & Drop "Load" to "Used" Window*
6. *Click* **[OK]** *Button*
7. *Click* **[Close]** *Button*
8. *File > Save… (Block.feb)*
9. *Analysis > Solve ...*
10. *Click* **[OK]** *Button*