midas FEA Training Series

2. Basic Tutorials

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DISCLAIMER

The concepts, methods, directives, illustrations and examples presented in this document are strictly intended for educational and demonstrative purposes only. This document is not intended to be exhaustive, and as such it shall not be applied to any particular engineering problem, application or design.

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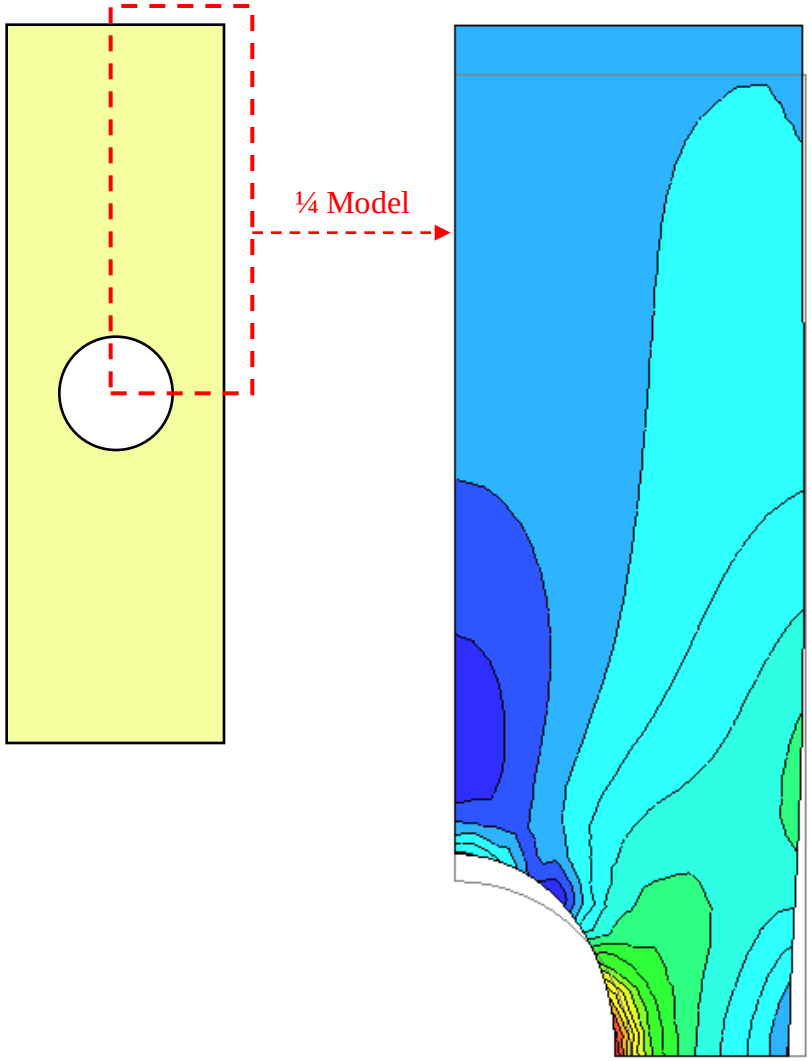
Directions for the use of Basic Tutorial

This tutorial contains overall process from Geometry Modeling to Post Processing about each Analysis Case.

Before starting this tutorial, it is important to learn basic program usage and framework which can be found in Getting Started. We also recommend to try fundamental examples of Geometry Modeling and Mesh Generation in Getting Started.

You can try this tutorial after verifying figure of model and type of analysis through Overview of first page.

LS-1. Plate with a Hole

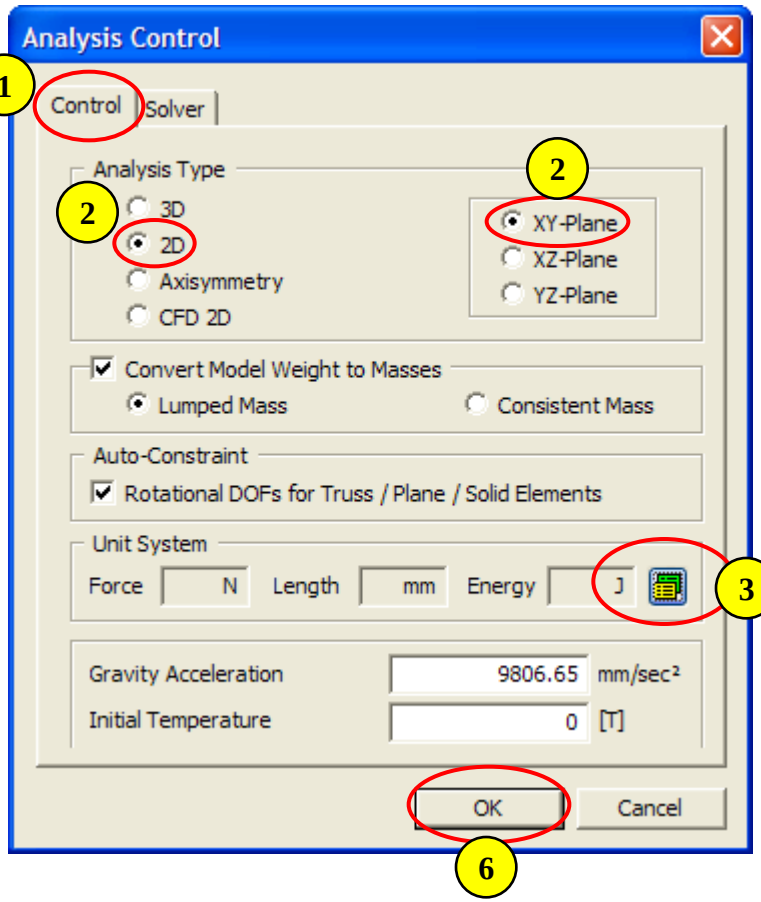


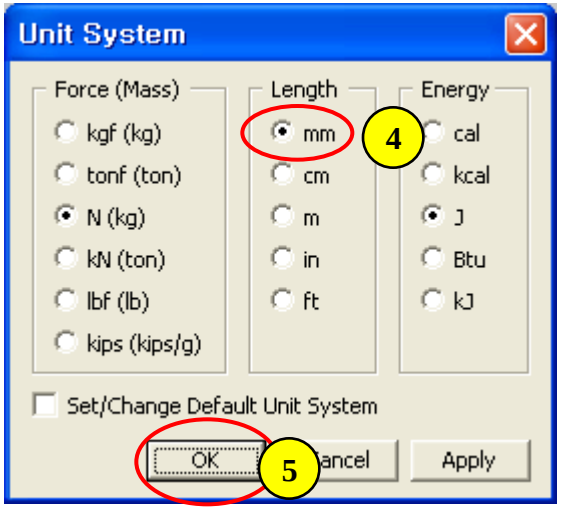
Overview

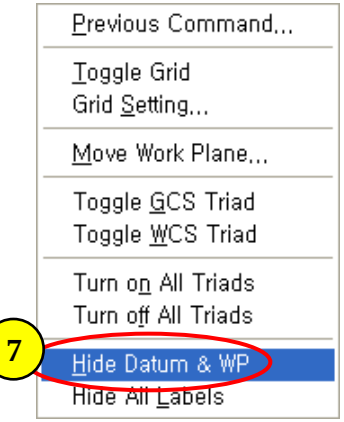
- 2-D Linear Static Analysis
- Model
  - *¼ Symmetric Model*
  - *Unit : N, mm*
  - *Isotropic Elastic Material*
  - *Plane Stress Elements*
- Load & Boundary Condition
  - *Edge Pressure*
  - *Constraint (Symmetry)*
- Result Evaluation
  - *von Mises Stress*
  - *Principal Stress Vector*
  - *Probe Result*

Step 1.

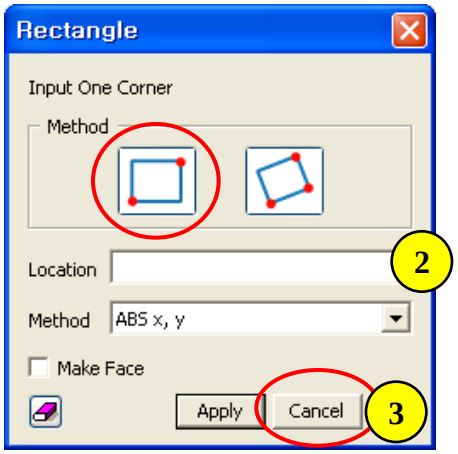
1. *Analysis > Analysis Control - "Control" tab*
2. *Analysis Type : 2D, XY-Plane*
3. *Click* [ ] *Button (Unit System)*
4. *Length : mm*
5. *Click* **[OK]** *Button*
6. *Click* **[OK]** *Button*
7. *Click Right Mouse Button in Work Window and Select "Hide Datum & WP"*

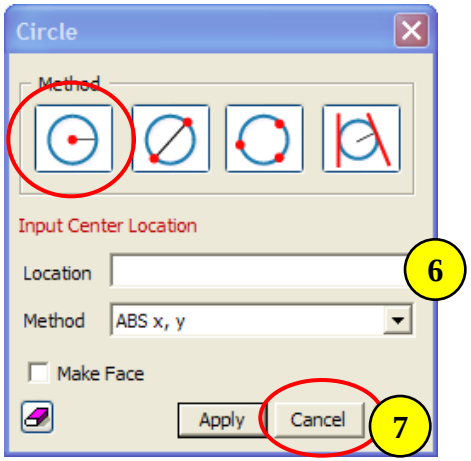




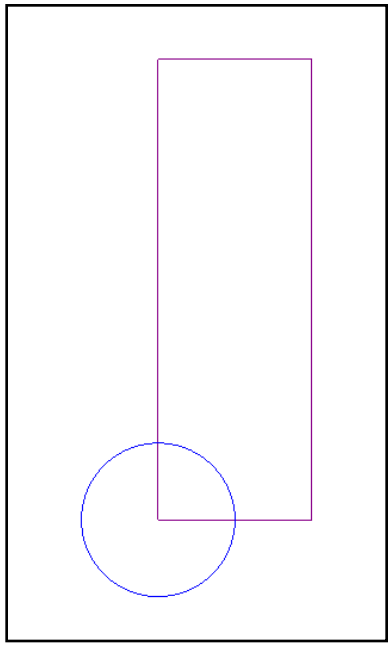


Step 2.



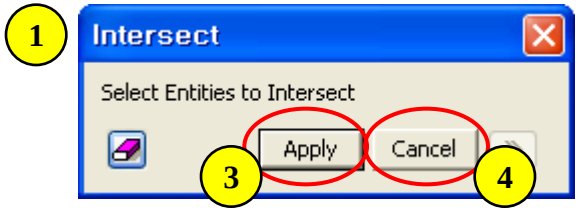


1. *Geometry > Curve > Create on WP > Rectangle (Wire)…*
2. *Location : (0) , <10, 30>*
3. *Click* **[Cancel]** *Button*
4. *Click "Zoom All"*
5. *Geometry > Curve > Create on WP > Circle…*
6. *Center : (0) , Radius : 5*
7. *Click* **[Cancel]** *Button*

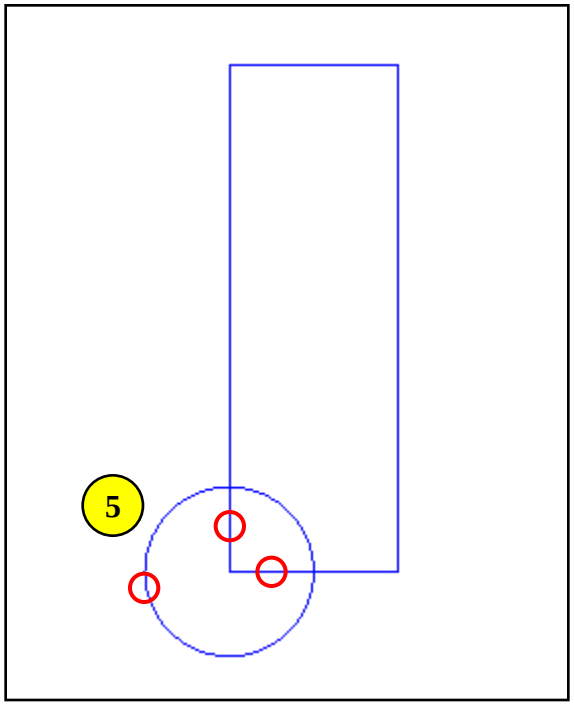


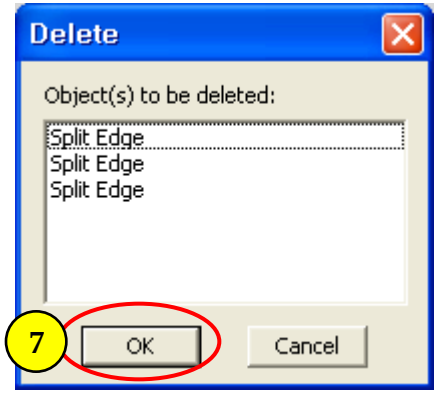
- *(): "ABS x, y", <>: "REL dx, dy"*
  (0) same as (0, 0)
- **[Esc]** *as shortcut for* **[Cancel].**

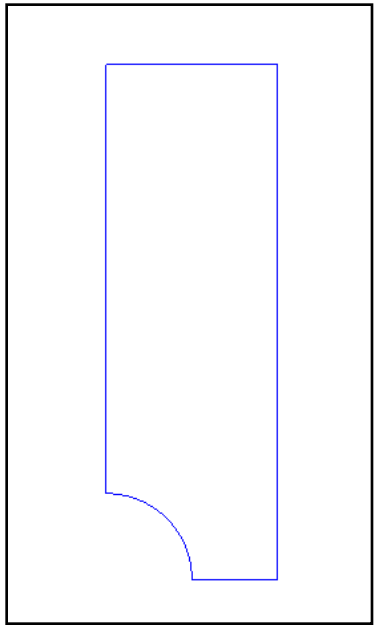
Step 3.



1. *Geometry > Curve > Intersect…*
2. *Select* *"Displayed"*
3. *Click* **[Apply]** *Button*
4. *Click* **[Cancel]** *Button*
5. *Select 3 Edges Marked by "O" (See Figure)*
6. *Press* **[Delete]** *Key*
7. *Click* **[OK]** *Button*

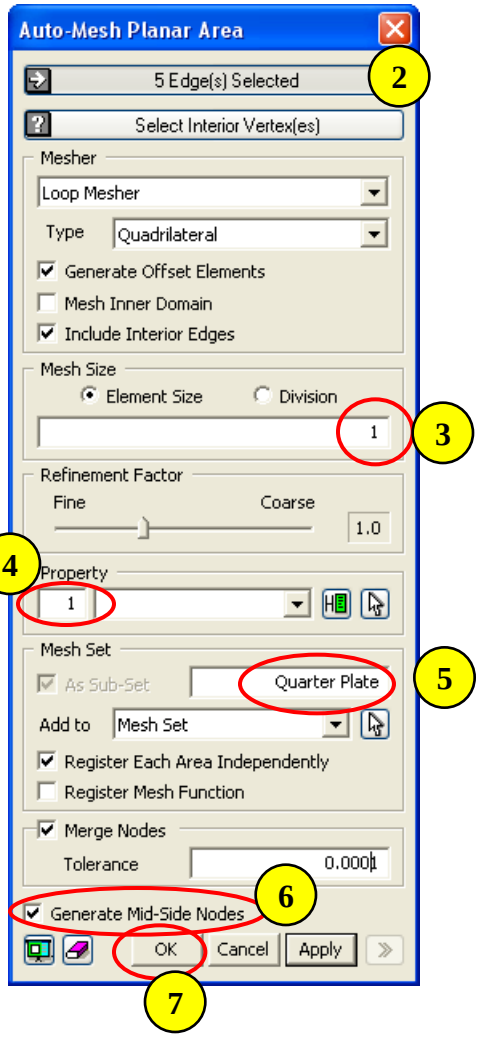


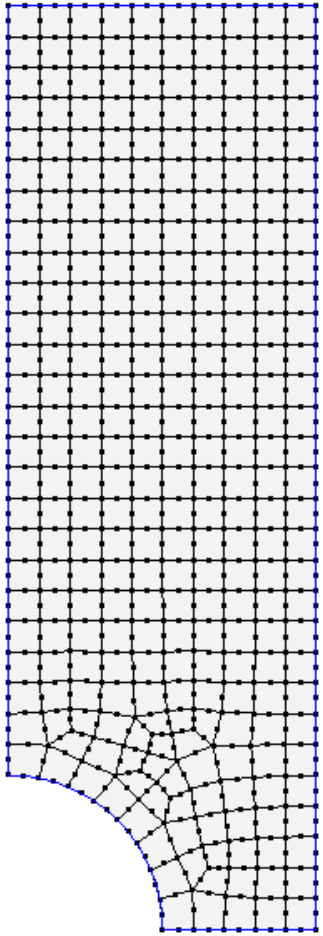




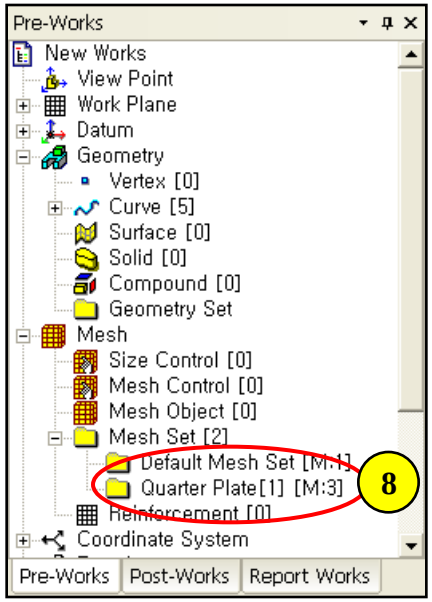
- *"Ctrl+A" as shortcut for "Select Displayed".*
- **[Enter]** *as shortcut for* **[Apply]**.

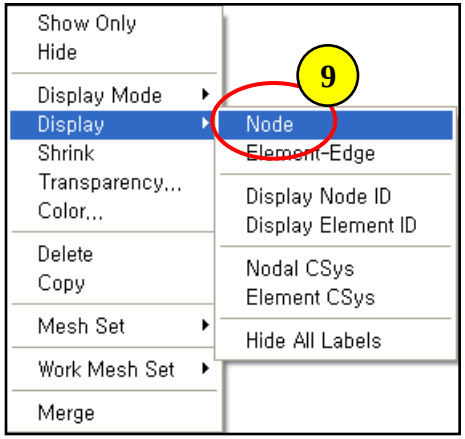
Step 4.



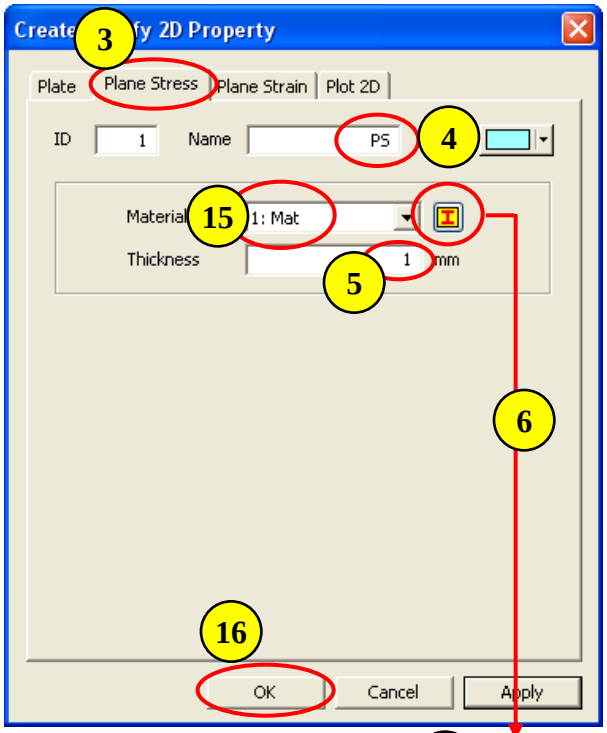


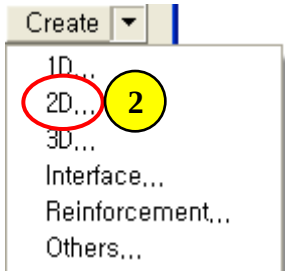
1. *Mesh > Auto Mesh > Planar Area…*
2. *Select “Displayed”*
3. *Mesh Size - Element Size : 1*
4. *Property : 1*
5. *Mesh Set : Quarter Plate*
6. *Check on “Generate Mid-Side Nodes”*
7. *Click* **[OK]** *Button*
8. *Pre-Works Tree : Mesh - Mesh Set - Quarter Plate*
9. *Click Right Mouse Button and Select “Display > Node”*

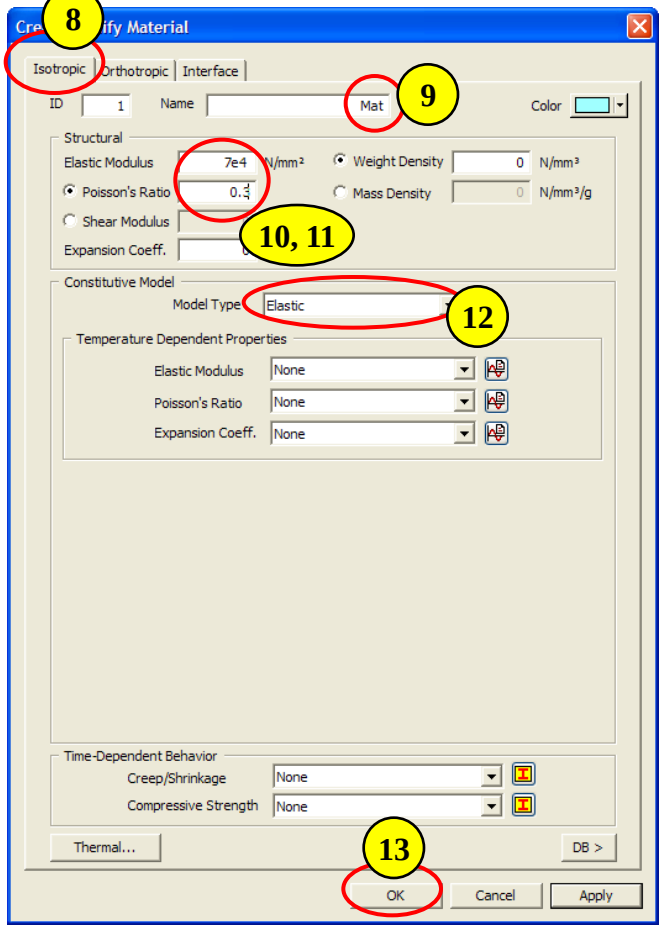


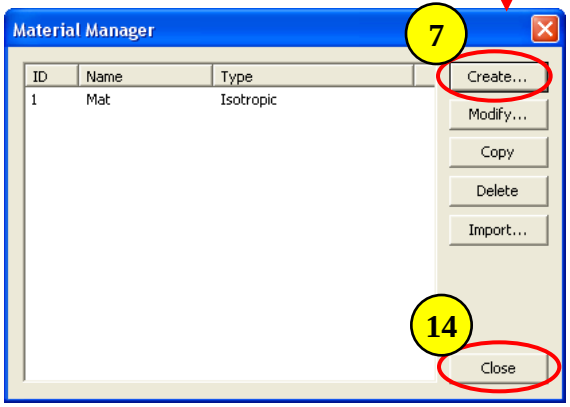


Step 5.



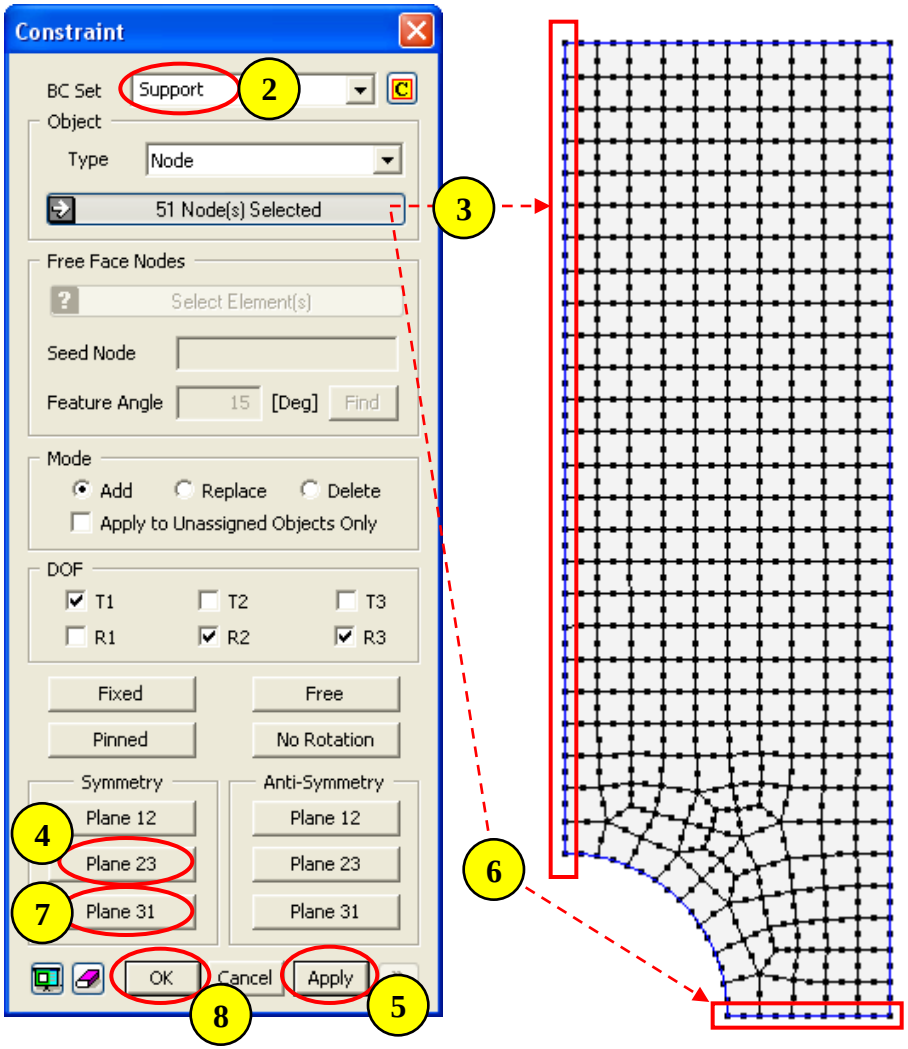




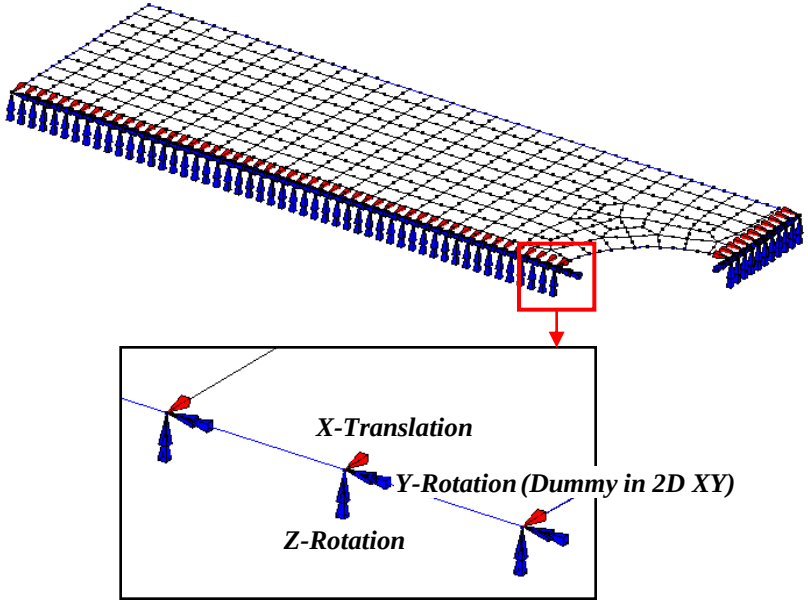


1. *Analysis > Property …*
2. *Create 2D …*
3. *Select "Plane Stress" tab*
4. *ID : 1 , Name : PS*
5. *Thickness : 1 mm*
6. *Click* [I] *Button (Material)*
7. *Click* **[Create...]** *Button*
8. *Select "Isotropic" tab*
9. *ID : 1 , Name : Mat*
10. *Elastic Modulus : 7e4 N/mm²*
11. *Poisson's Ratio : 0.3*
12. *Model Type : Elastic*
13. *Click* **[OK]** *Button*
14. *Click* **[Close]** *Button*
15. *Select "1: Mat" for Material*
16. *Click* **[OK]** *Button*
17. *Click* **[Close]** *Button*

Step 6.

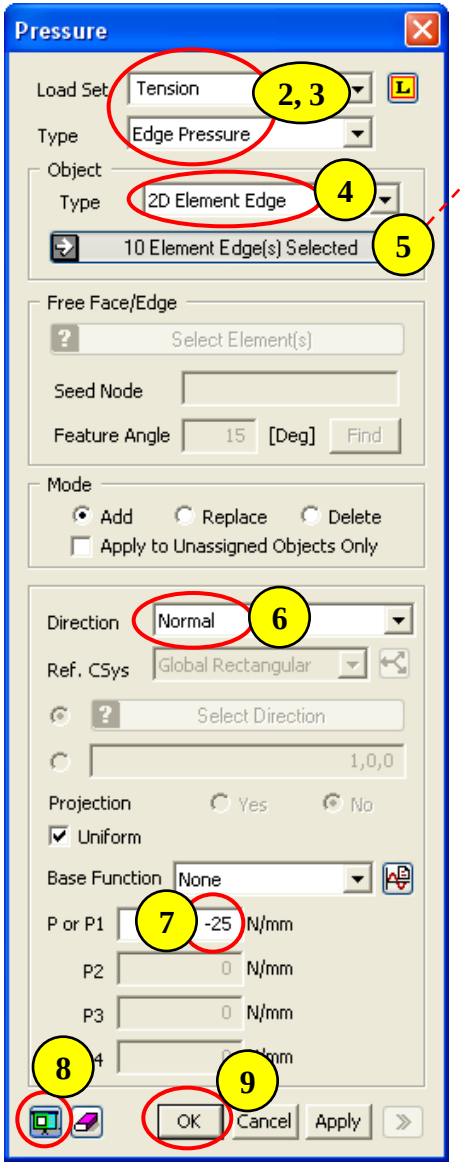


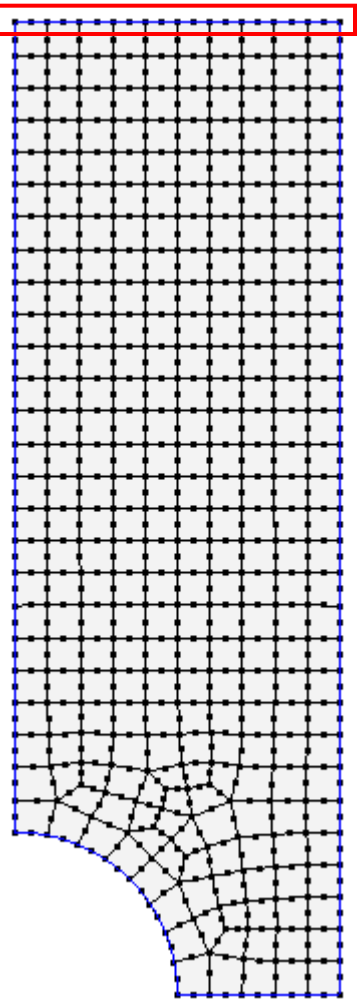
1. *Analysis > BC > Constraint…*
2. *BC Set : Support*
3. *Select Left Nodes (51 Nodes)*
4. *Click "Symmetry"* – **[Plane 23]** *Button*
5. *Click* **[Apply]** *Button*
6. *Select Bottom Nodes (11 Nodes)*
7. *Click "Symmetry"* – **[Plane 31]** *Button*
8. *Click* **[OK]** *Button*



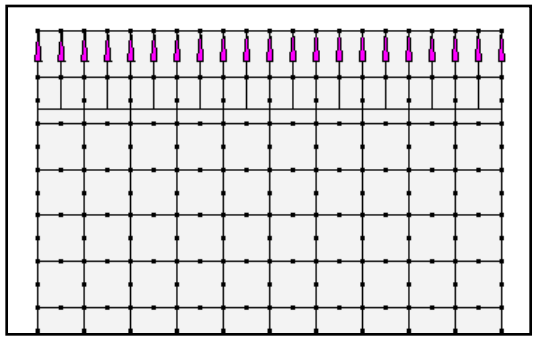
Drag mouse to select nodes (Window Selection)

Step 7.



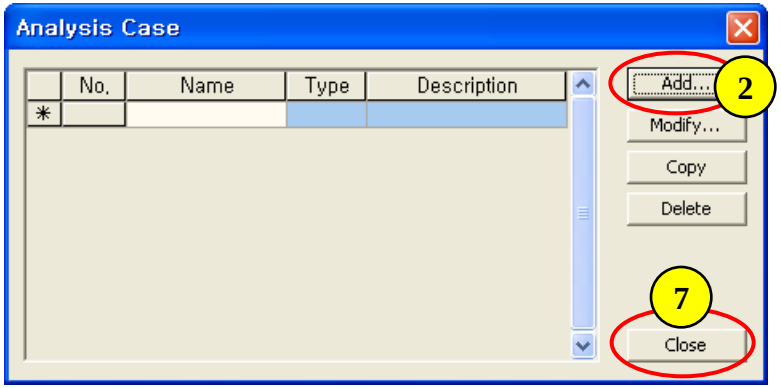


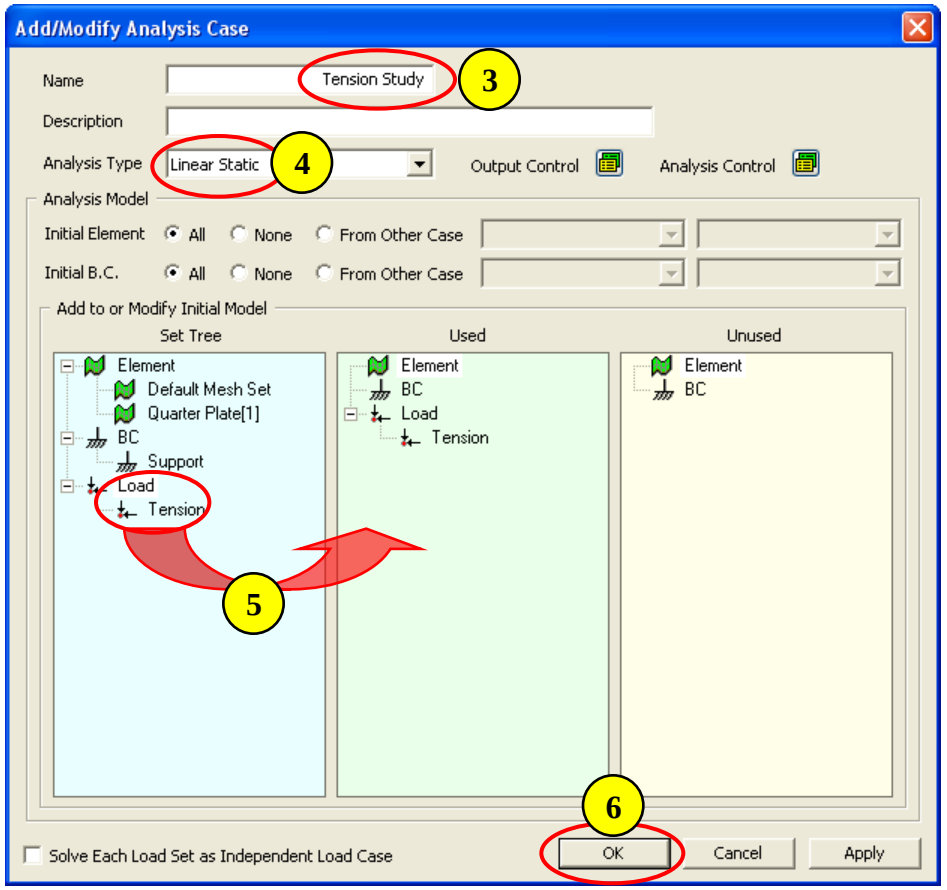
1. *Analysis > Load > Pressure…*
2. *Load Set : Tension*
3. *Type : Edge Pressure*
4. *Object Type: 2D Element Edge*
5. *Select 10 Element Edges*
6. *Direction : Normal*
7. *P : -25 N/mm*
8. *Click "Preview" Button*
9. *Click* **[OK]** *Button*



Drag mouse to select element edges (Window Selection)

Step 8.





1. Analysis > Analysis Case …

2. Click **[Add]** *Button*

3. Name : Tension Study

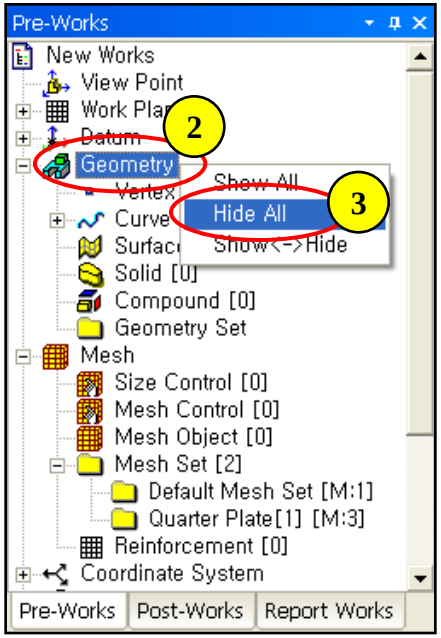
4. Analysis Type : Linear Static

5. Drag & Drop "Load" to "Used" Window

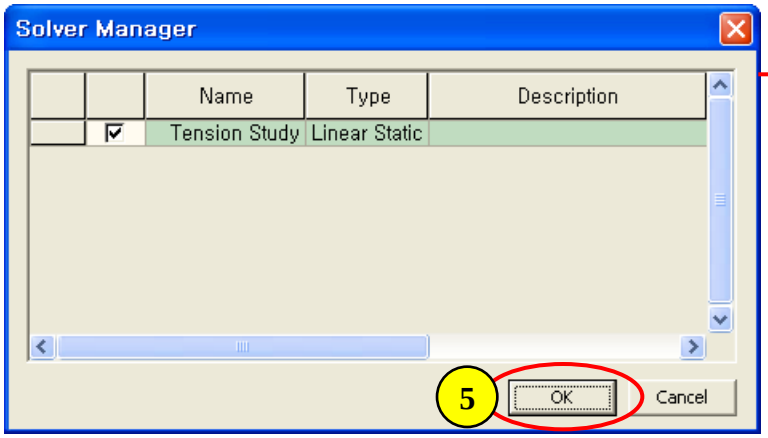
6. Click **[OK]** *Button*

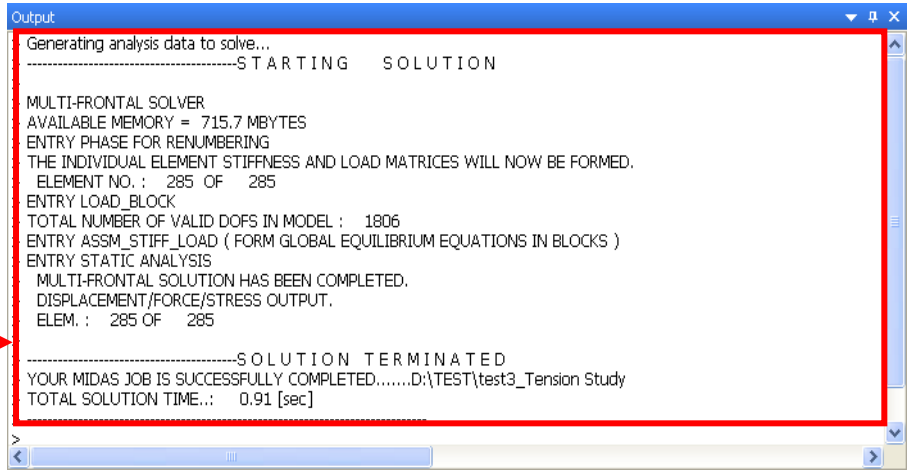
7. Click **[Close]** *Button*

Step 9.



1. *File > Save… (Plate with a Hole.feb)*
2. *Pre-Works Tree : Geometry ...*
3. *Click Right Mouse Button and Select "Hide All"*
4. *Analysis > Solve …*
5. *Click* **[OK]** *Button*

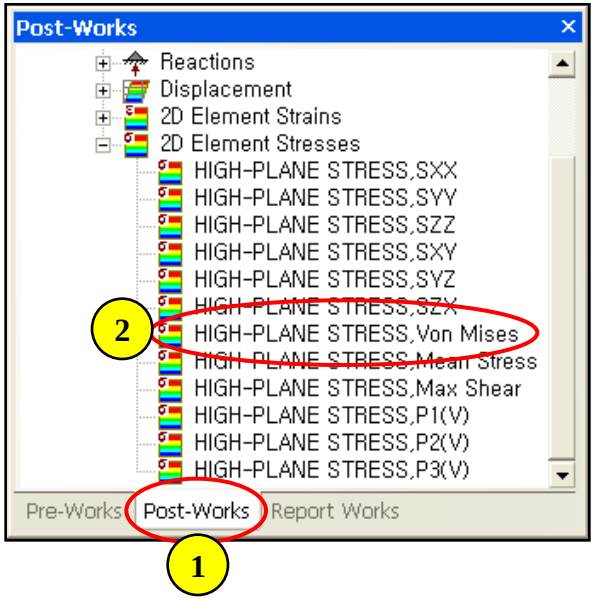


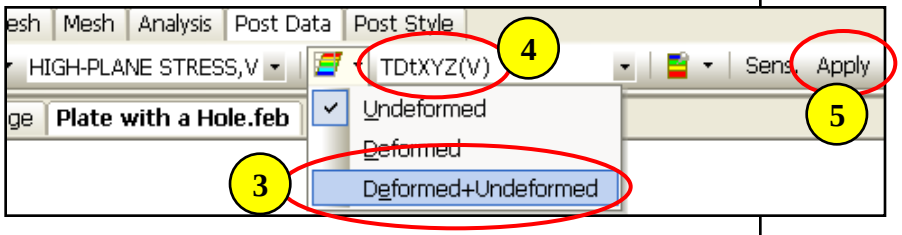


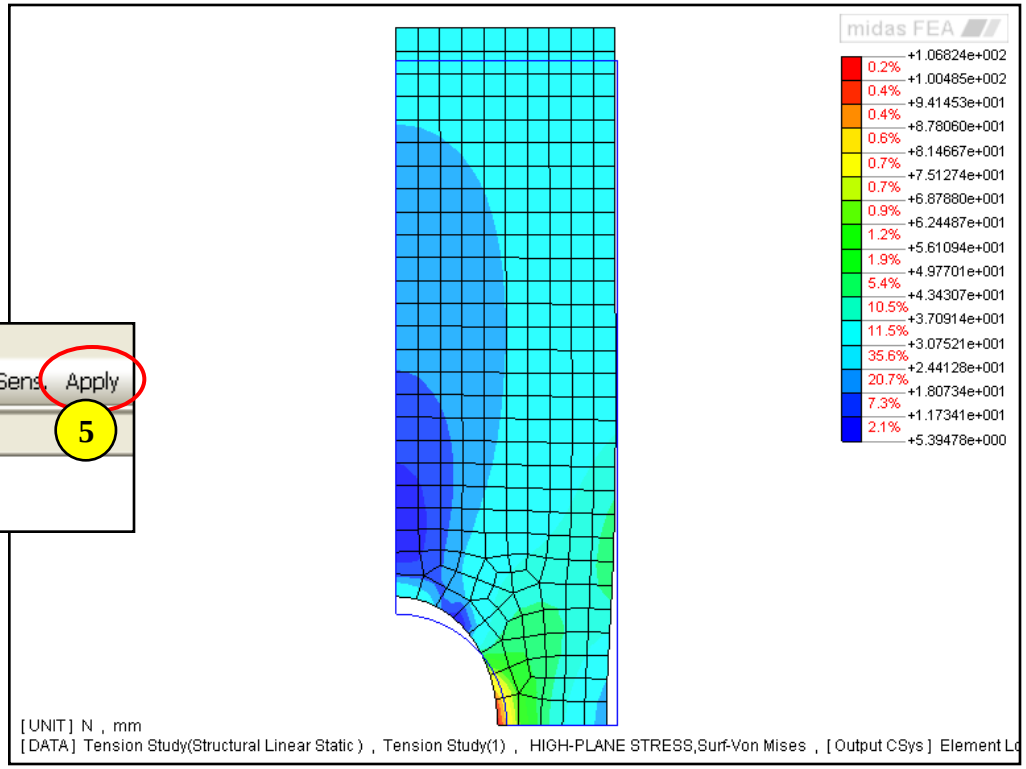
<Output Window> Analysis Procedure and Messages

Step 10.

1. *Post-Works Tree : Tension Study (Structural Linear Static) > Tension Study (1) > 2D Element Stresses*
2. *Double Click "HIGH-PLANE STRESS,Von Mises"*
3. *Select "Deformed+Undeformed" for Mesh Shape at "Post Data" Toolbar (See Figure)*
4. *Select "TDtXYZ(V)" for Deformation Data*
5. *Click* **[Apply]** *Button*

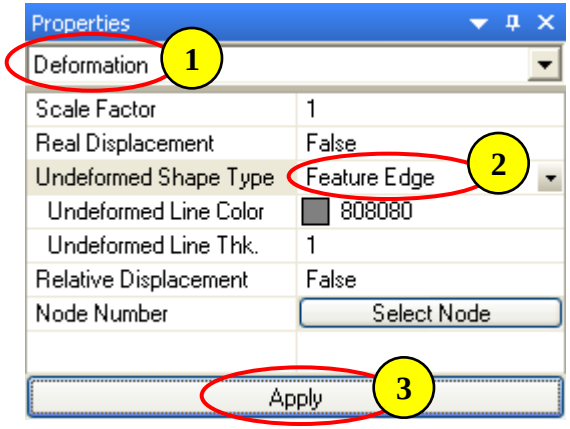


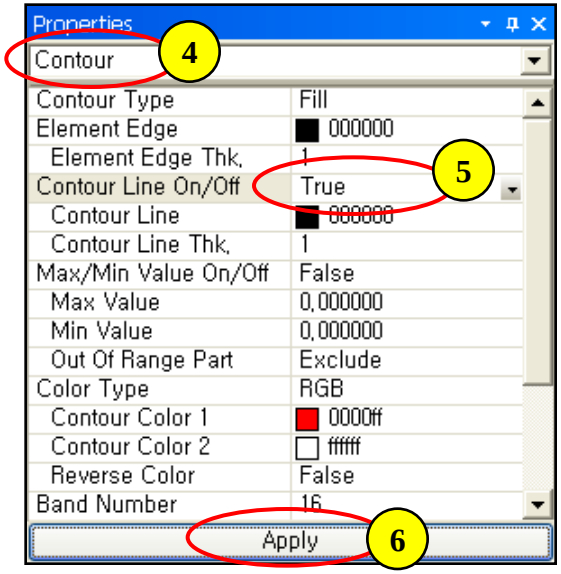


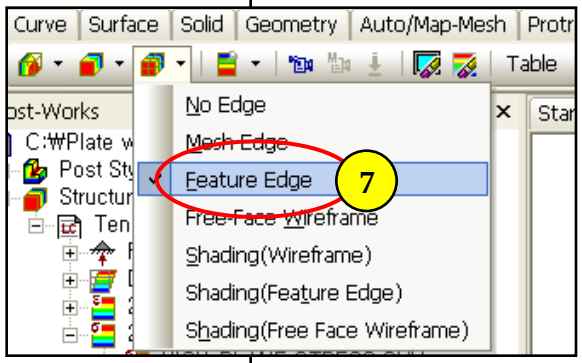


Step 11.

1. *Property Window : Deformation*
2. *Select "Feature Edge" for Undeformed Shape Type*
3. *Click* **[Apply]** *Button*
4. *Property Window : Contour*
5. *Select "True" for Contour Line On/Off*
6. *Click* **[Apply]** *Button*
7. *Select "Feature Edge" for Edge Type at "Post Style" Toolbar (See Figure)*

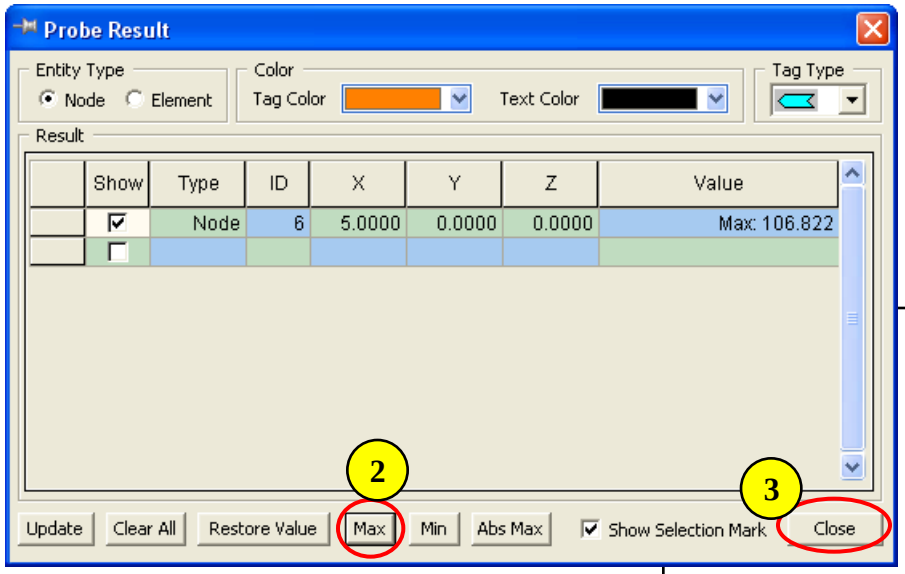


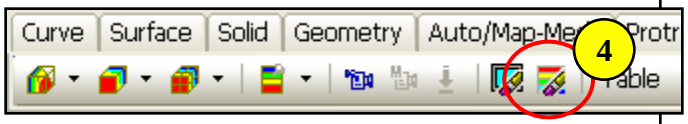


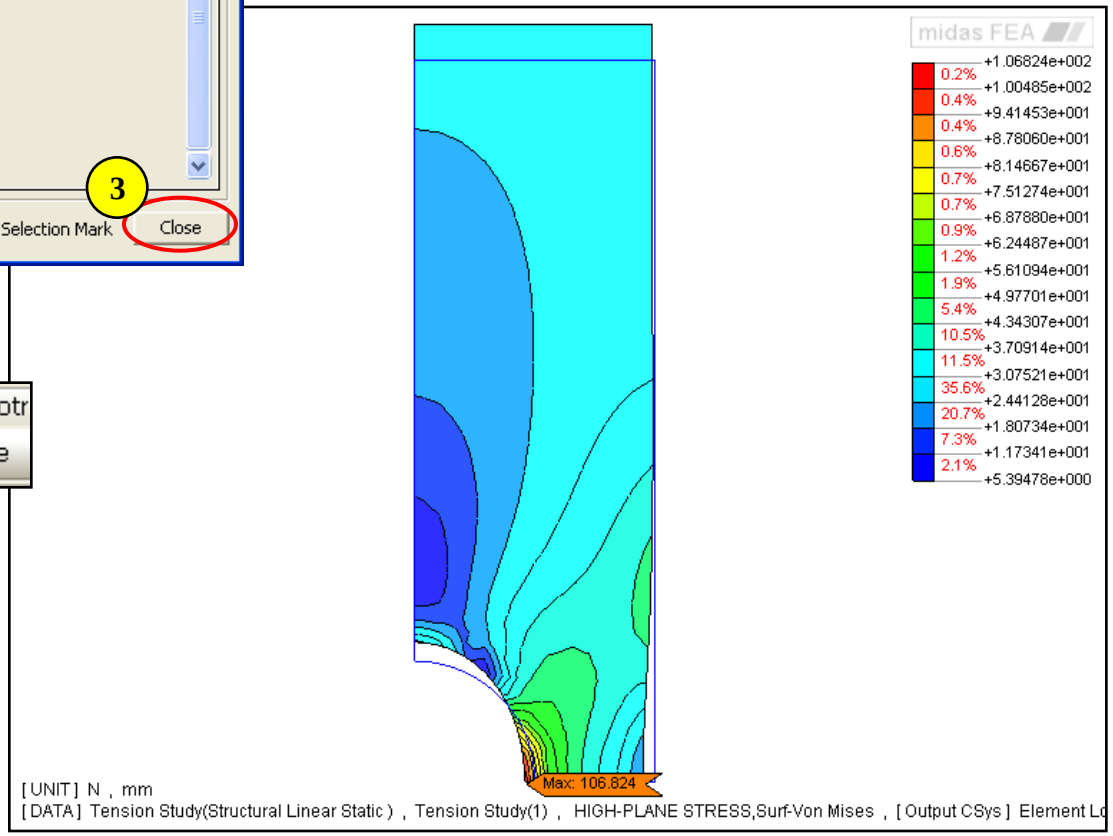


Step 12.

1. *Post > Probe Result…*
2. *Click* **[Max]** *Button*
3. *Click* **[Close]** *Button*
4. *Click "Initial Post Style" at "Post Style" Toolbar*

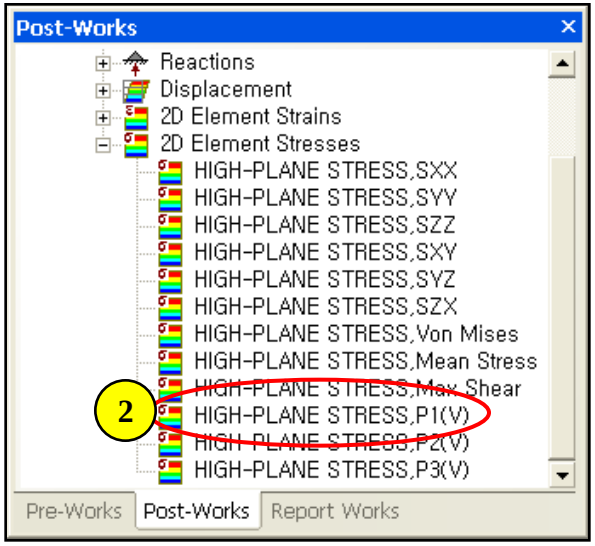


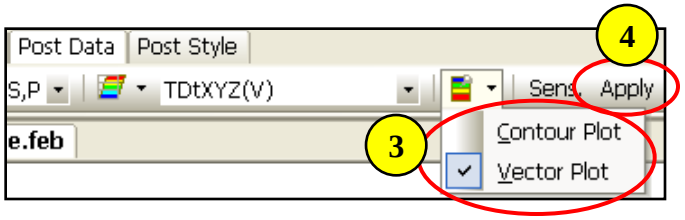


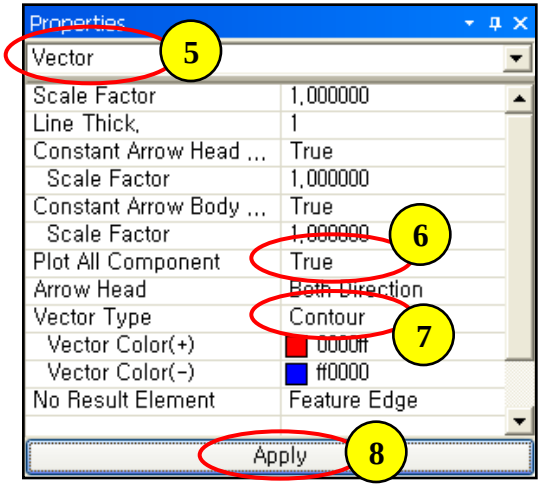


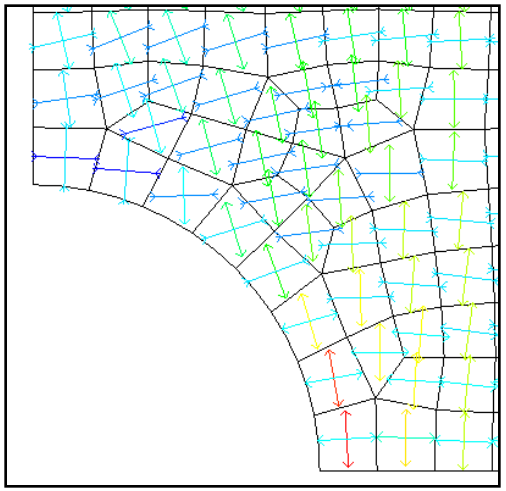
Step 13.

1. *Post-Works Tree : Tension Study (Structural Linear Static) > Tension Study (1) > 2D Element Stresses*
2. *Double Click "HIGH-PLANE STRESS,P1(V)"*
3. *Check on "Vector Plot" and Check off "Contour Plot" at "Post Data" Toolbar (See Figure)*
4. *Click* **[Apply]** *Button*
5. *Property Window : Vector*
6. *Select "True" for Plot All Components*
7. *Select "Contour" for Vector Type*
8. *Click* **[Apply]** *Button*

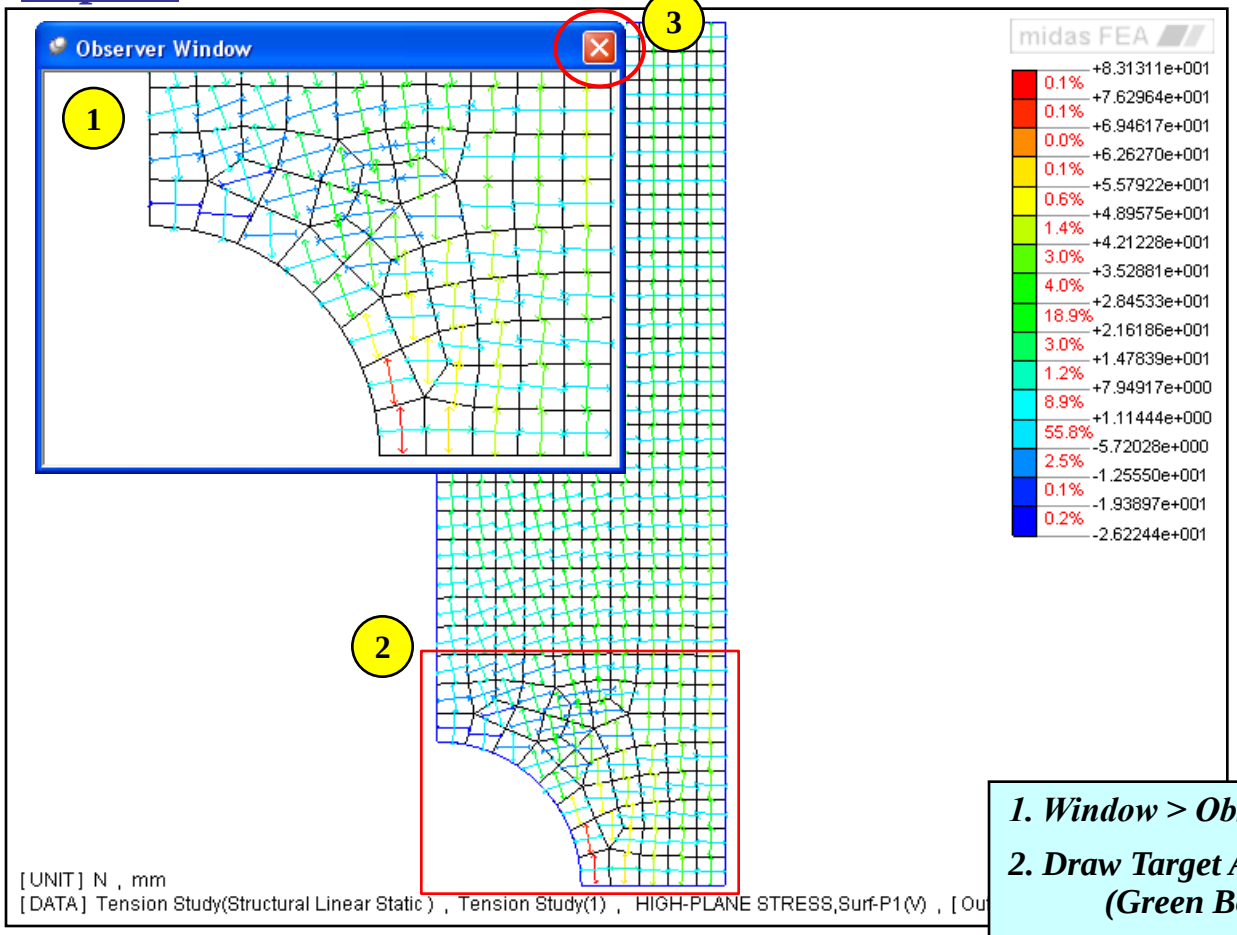


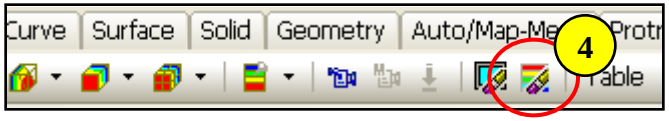






Step 14.





1. Window > Observer Window…

2. Draw Target Area by Dragging Mouse
(Green Box in Work Window)

3. Close Observer Window

4. Click "Initial Post Style" at "Post Style" Toolbar