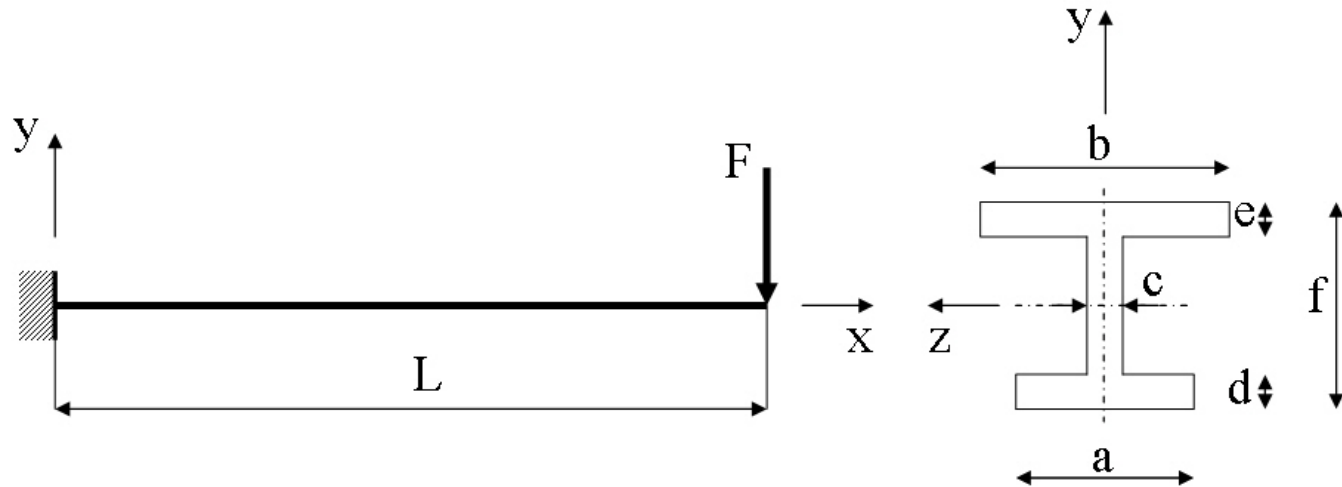


Course in ANSYS

Example0120

Example – Cantilever beam



Objective:

Compute the maximum deflection

Tasks:

Create a table and compare results with results obtained from beam theory?

Display the deflection figure?

Topics:

Topics: Start of analysis, Element type, Real constants, Material, modeling, element size for beam models, saving/restoring

$$E = 210000 \text{ N/mm}^2$$

$$\nu = 0.3$$

$$L = 5000 \text{ mm}$$

$$a = 250 \text{ mm}$$

$$b = 450 \text{ mm}$$

$$c = 10 \text{ mm}$$

$$d = 20 \text{ mm}$$

$$e = 15 \text{ mm}$$

$$f = 350 \text{ mm}$$

$$F = 100 \text{ N}$$

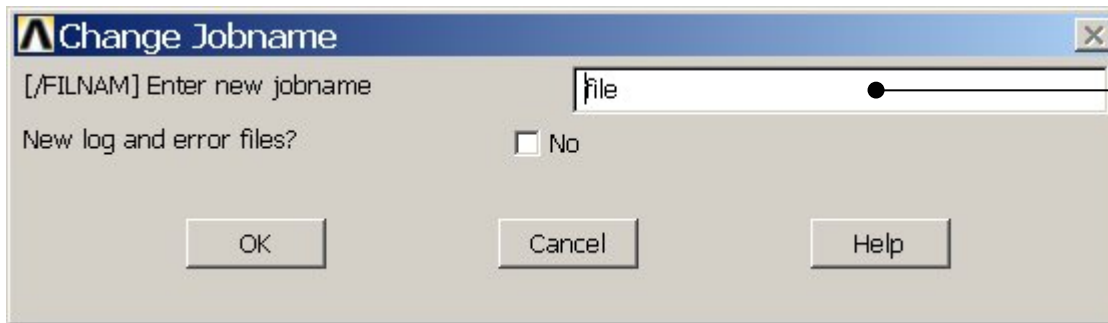
Example - title

Utility Menu > File > Change Jobname

/jobname, Example0120

GUI

Command line entry

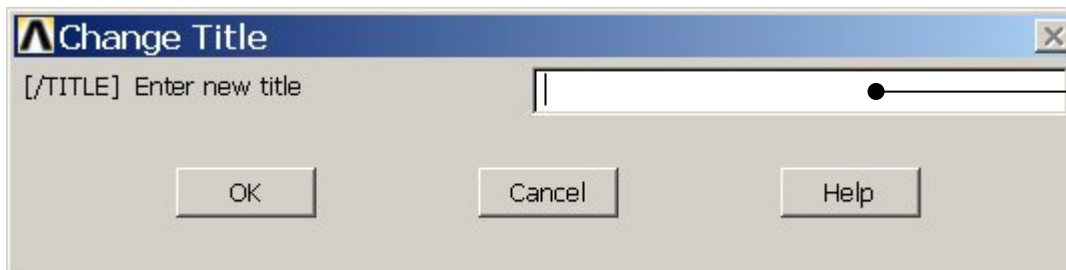


Enter: Example0120

Utility Menu > File > Change Title

/title, Cantilever beam

Enter: Cantilever beam



Example - Keypoints

Note: An empty # result in automatic numbering.

Preprocessor > Modeling > Create > Keypoints > In Active CS

/PREP7

K,,,

K,,5000,,

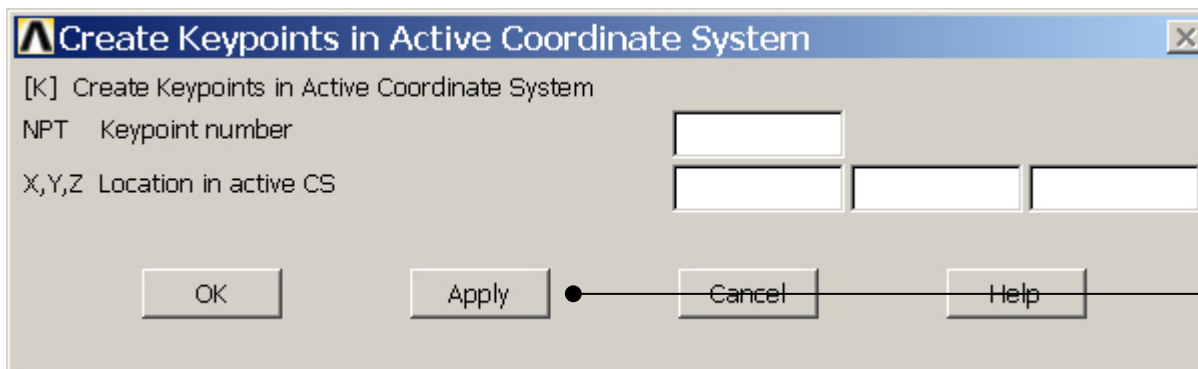
K,,50,

General format:

K,#,X,Y,Z

Keypoint number
X Keypoint x-coordinate
Y Keypoint y-coordinate
Z Keypoint z-coordinate

Enter 0,0,0 and
Press **Apply**
Enter 5000,0,0 and
Press **Apply**
Enter 0,50,0 and
Press **Apply**

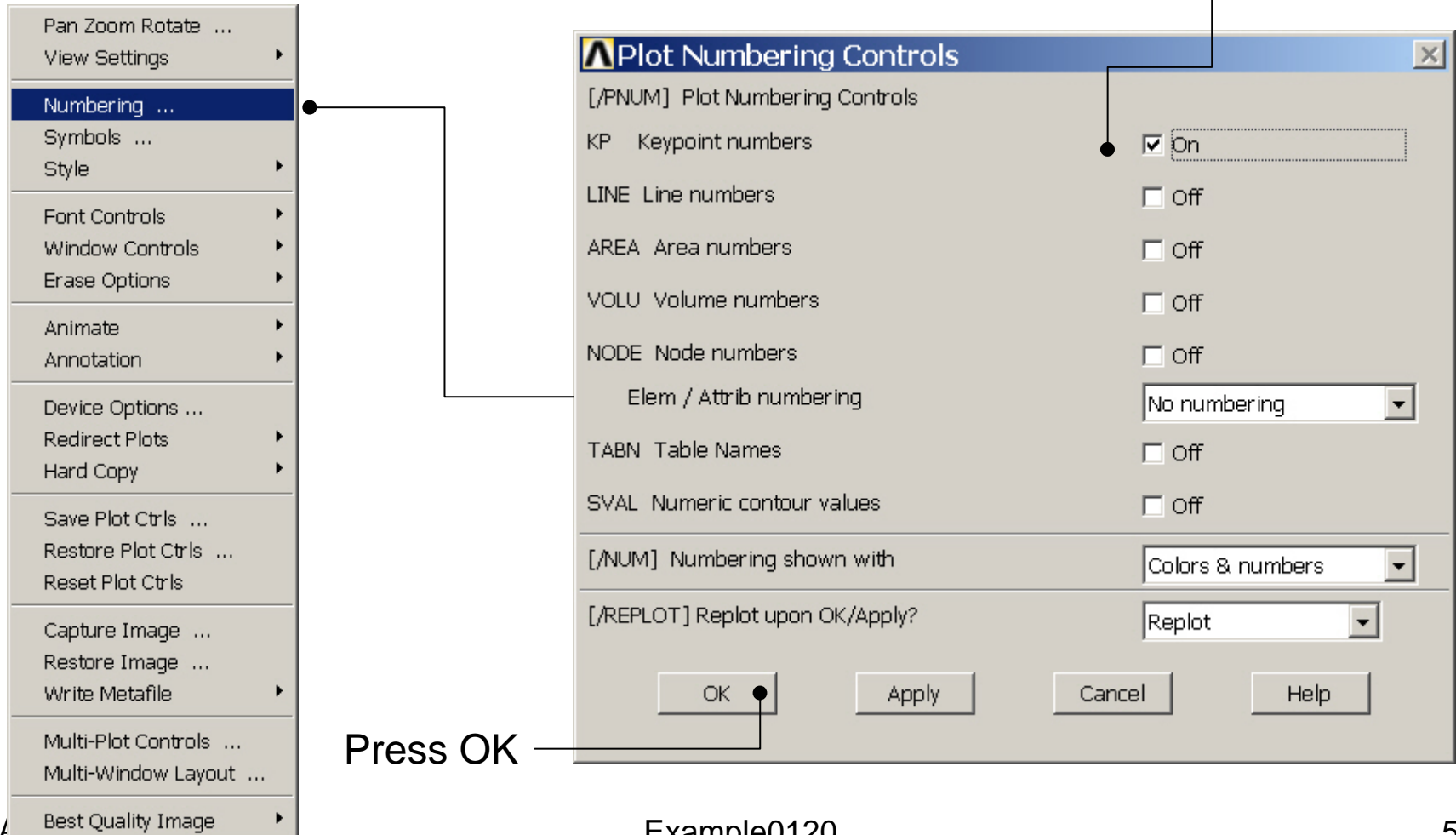


Note: An empty box result in a zero. It is allowed to enter 0.0 in each box.

Example - Numbering

Utility Menu > PlotCtrls > Numbering

Switch on Keypoint numbers

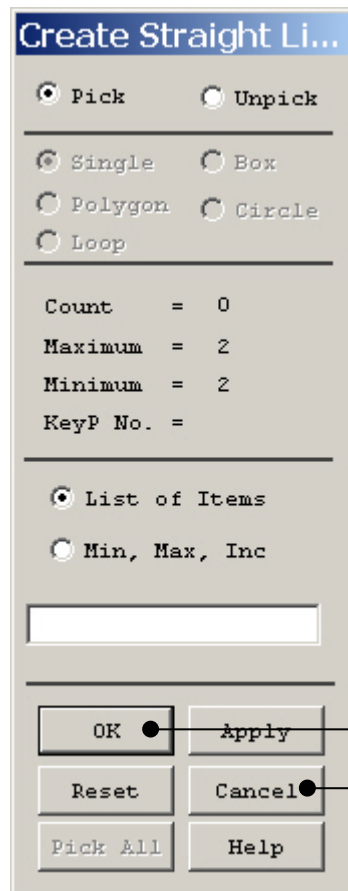


Example - Lines

Preprocessor > Modeling > Create > Lines > Lines > Straight Line

Create a line between Keypoint 1 and Keypoint 2.

L,1,2



HINT: By clicking with the right-hand mouse button you shift between the Pick/Unpick function. This is indicated by the direction of the cursor arrow:

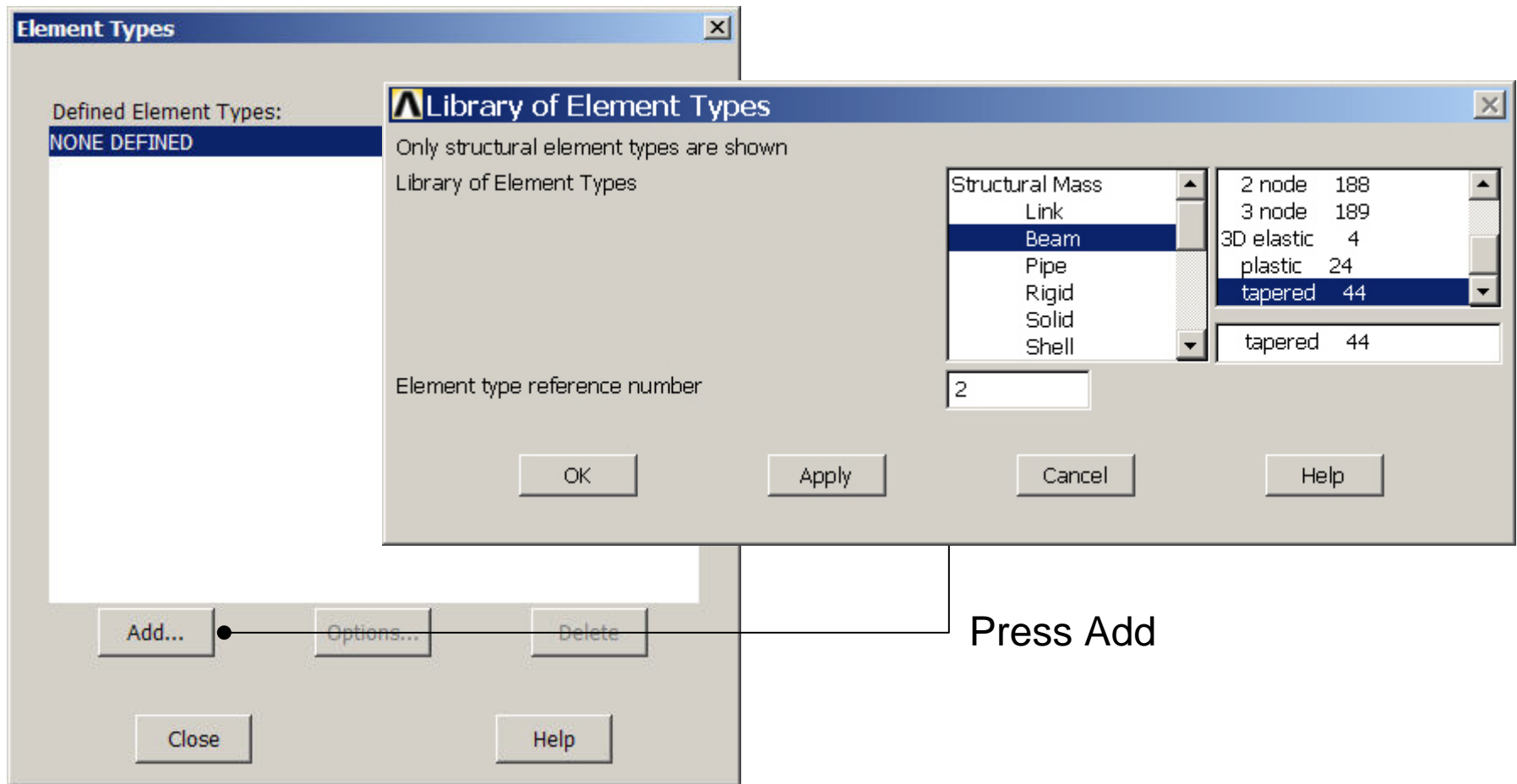
Pick: upward arrow

Unpick: downward arrow

Press OK or Cancel to finish selection

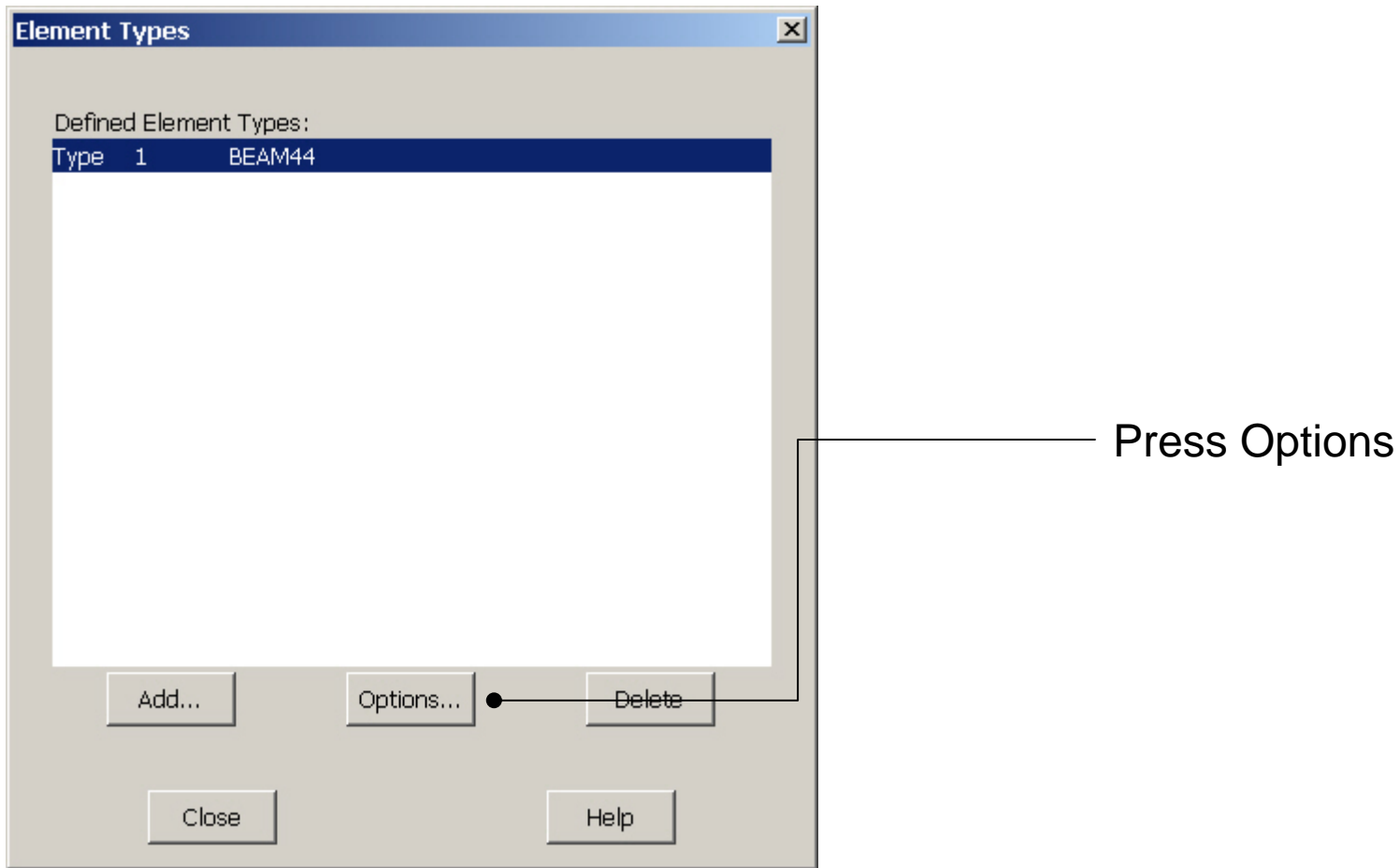
Example – Element Type

Preprocessor > Element Type > Add/Edit/Delete



Example - Element Type

Preprocessor > Element Type > Add/Edit/Delete



Example - Element Type

Preprocessor > Element Type > Add/Edit/Delete

BEAM44 element type options

Options for BEAM44, Element Type Ref. No. 1

Selection: Consistent

Member force + moment output K6: Exclude output

Output at extra intermed pts K9: No intermed pts

Load offset in terms of K10: Length units

Stiffness release at node I K7:

- ROTZ ☐
- ROTY ☐
- ROTX ☐
- UZ ☐
- UY ☐
- UX ☐

Stiffness release at node J K8:

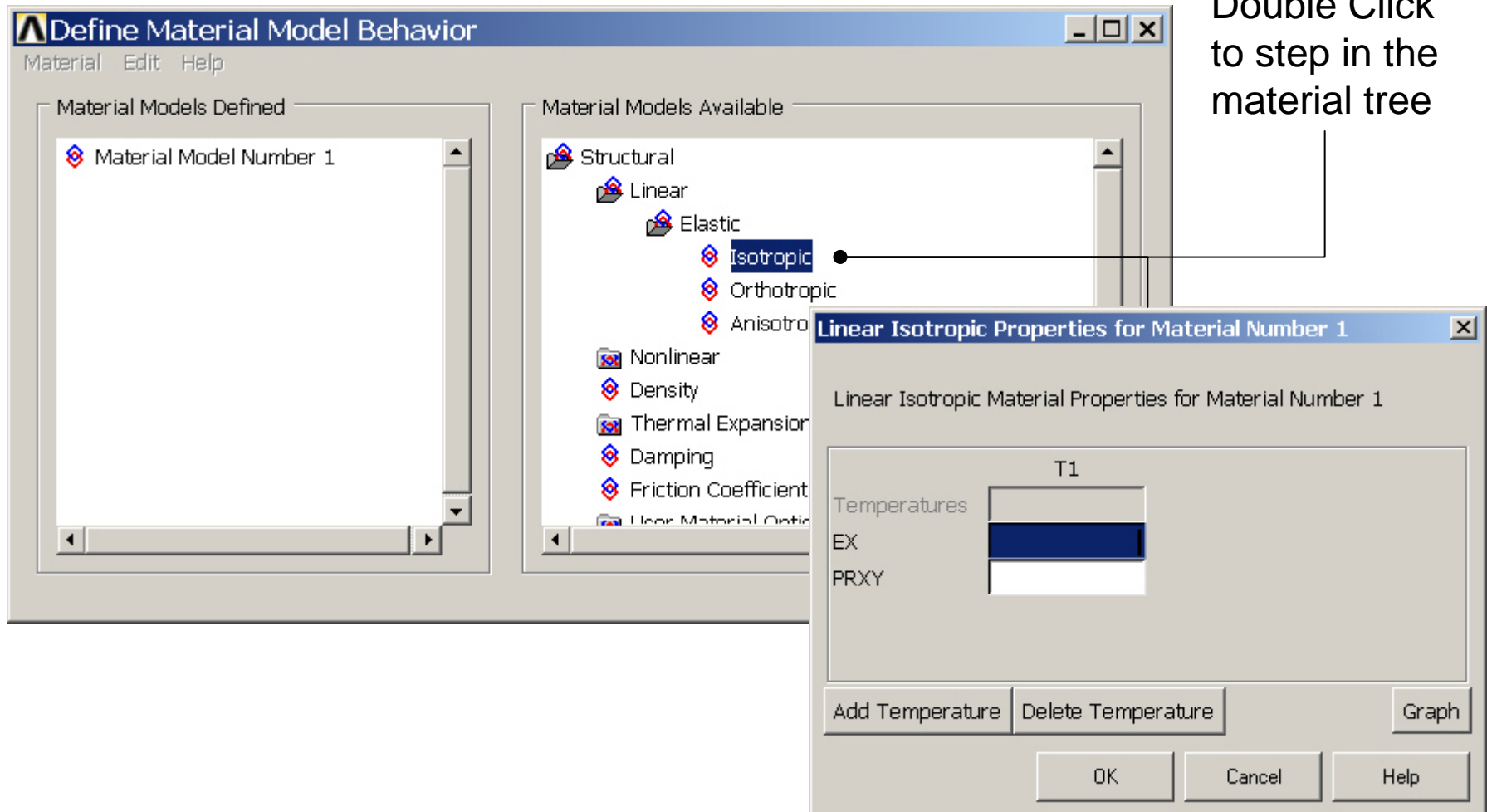
- ROTZ ☐
- ROTY ☐
- ROTX ☐
- UZ ☐
- UY ☐
- UX ☐

OK Cancel Help

Press Help to learn more about the element.

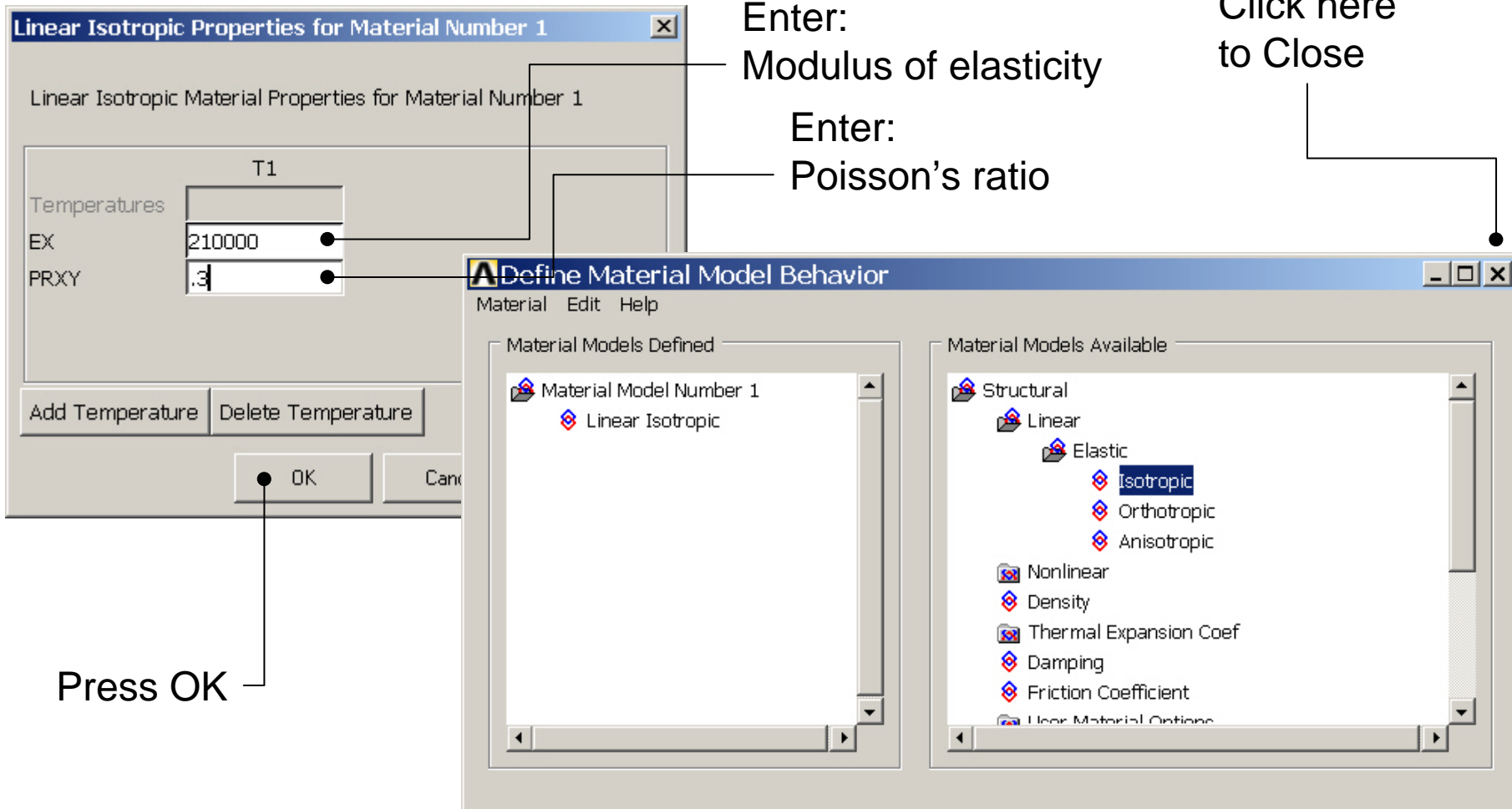
Example - Material Properties

Preprocessor > Material Props > Material Models

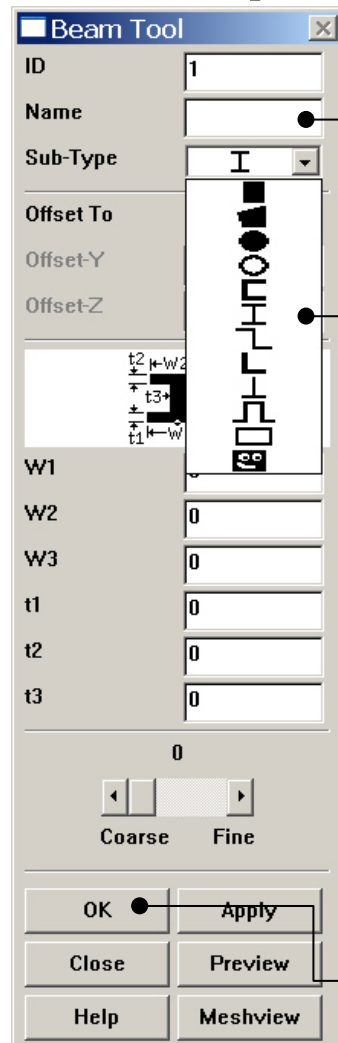
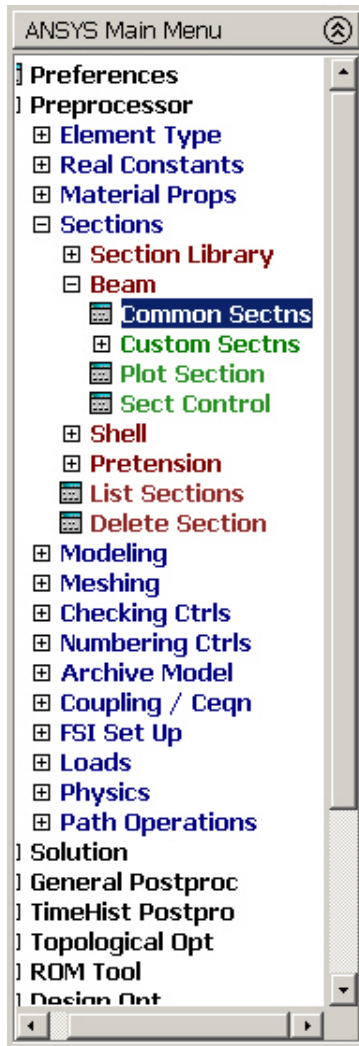


Example - Material Properties

Preprocessor > Material Props > Material Models



Example - Section

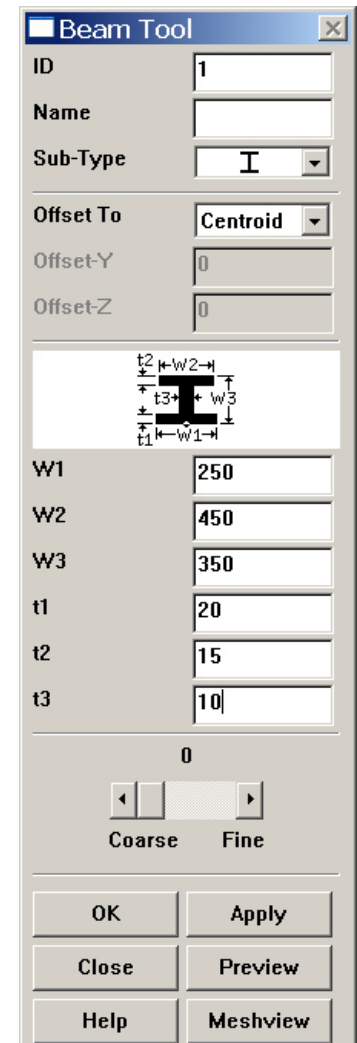


Enter i253

Select the I profile

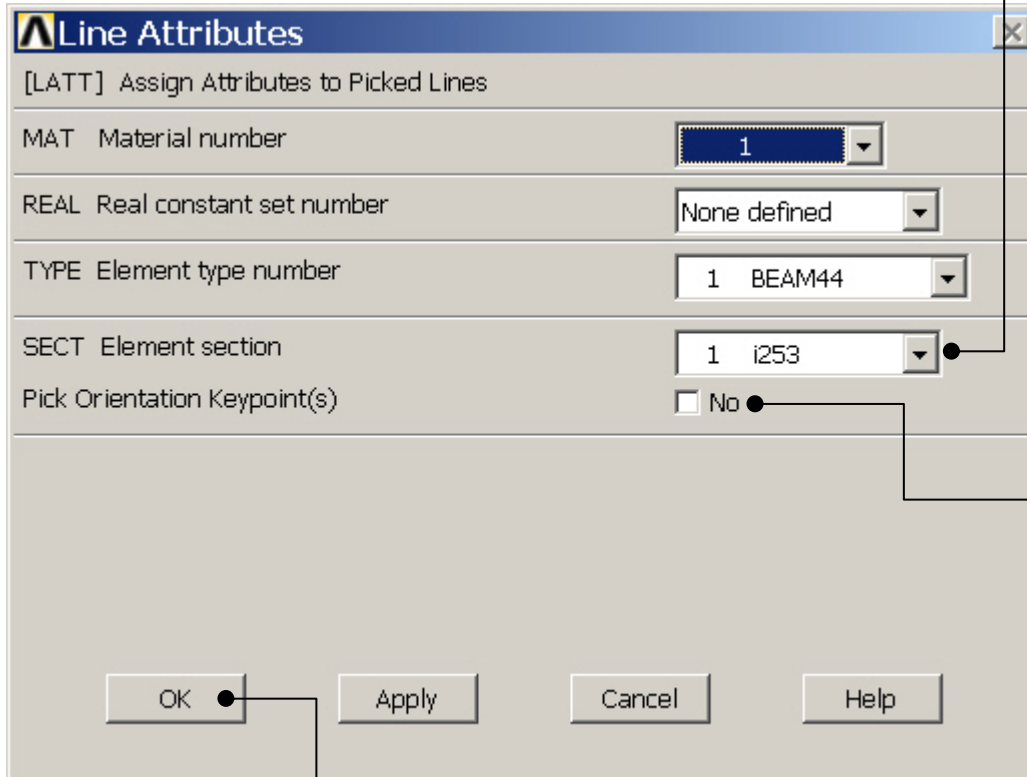
Follow the guidelines at Enter the appropriate cross-sectional data

Press OK to finish



Example – Line Attributes

Preprocessor > Meshing > Mesh Attributes > Picked Lines

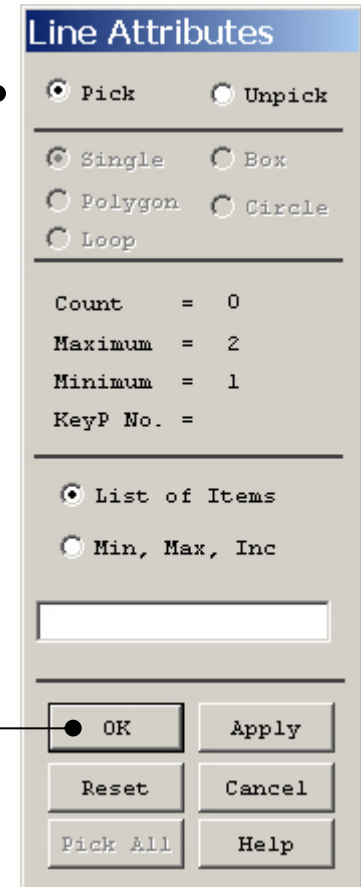


Select section I253

Change to Yes

Select KP3

Press OK to finish



Example - Meshing

Preprocessor > Meshing > Size Cntrls > ManualSize > Lines > Picked Lines

Select/Pick
Lines to
specify
mesh size
for

Element Size on P...

☒ Pick ☐ Unpick

☒ Single ☐ Box

☐ Polygon ☐ Circle

☐ Loop

Count = 0

Maximum = 1

Minimum = 1

Line No. =

☒ List of Items

☐ Min, Max, Inc

OK Apply

Reset Cancel

Pick All Help

Element Sizes on Picked Lines

[LESIZE] Element sizes on picked lines

SIZE Element edge length

NDIV No. of element divisions

(NDIV is used only if SIZE is blank or zero)

KYNDIV SIZE,NDIV can be changed ☒ Yes

SPACE Spacing ratio

ANGSIZ Division arc (degrees)

(use ANGSIZ only if number of divisions (NDIV) and element edge length (SIZE) are blank or zero)

Clear attached areas and volumes ☐ No

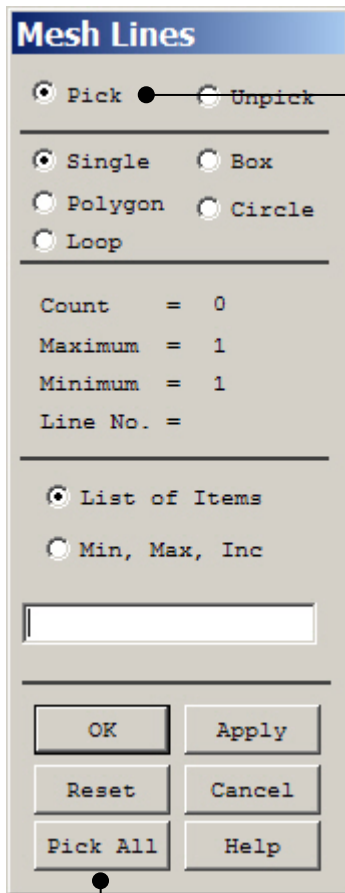
OK Apply Cancel Help

Press OK when finish with selection

Enter 5

Example - Meshing

Preprocessor > Meshing > Mesh > Lines

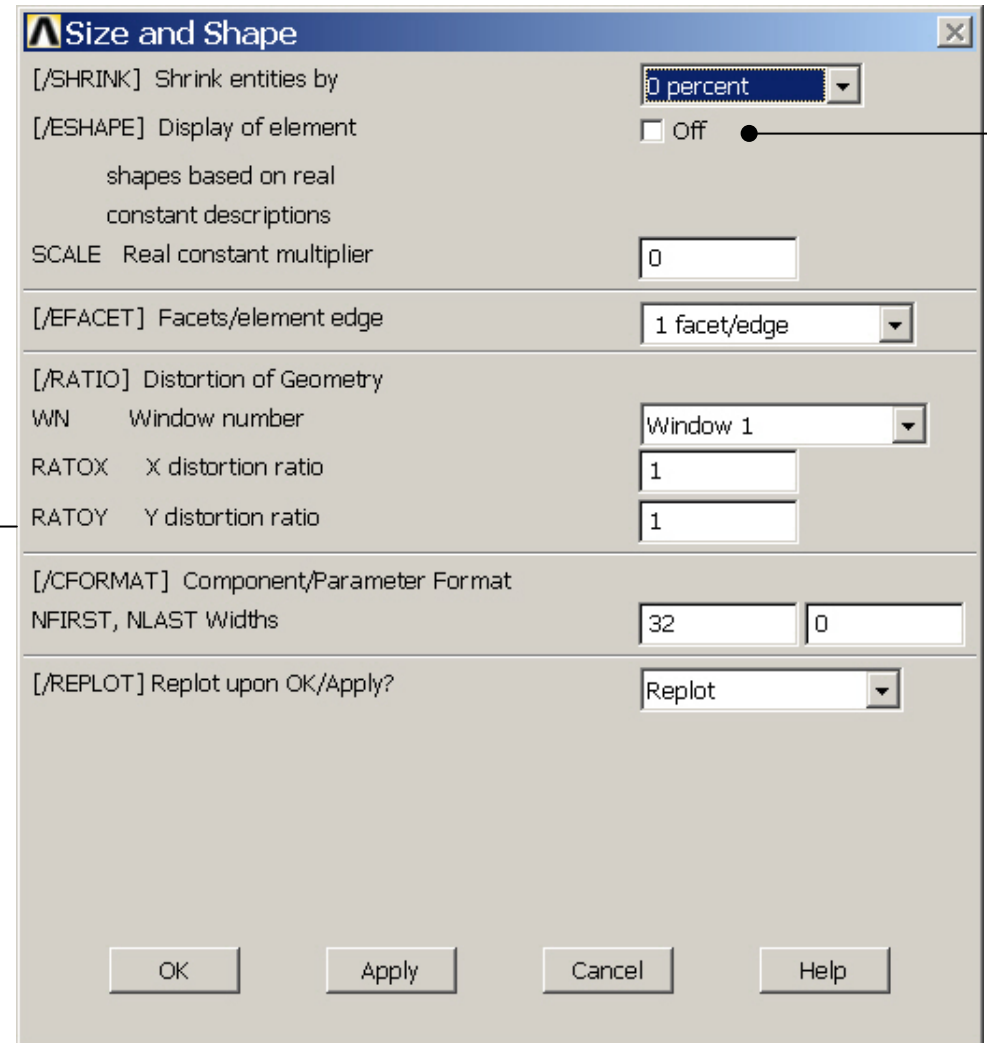
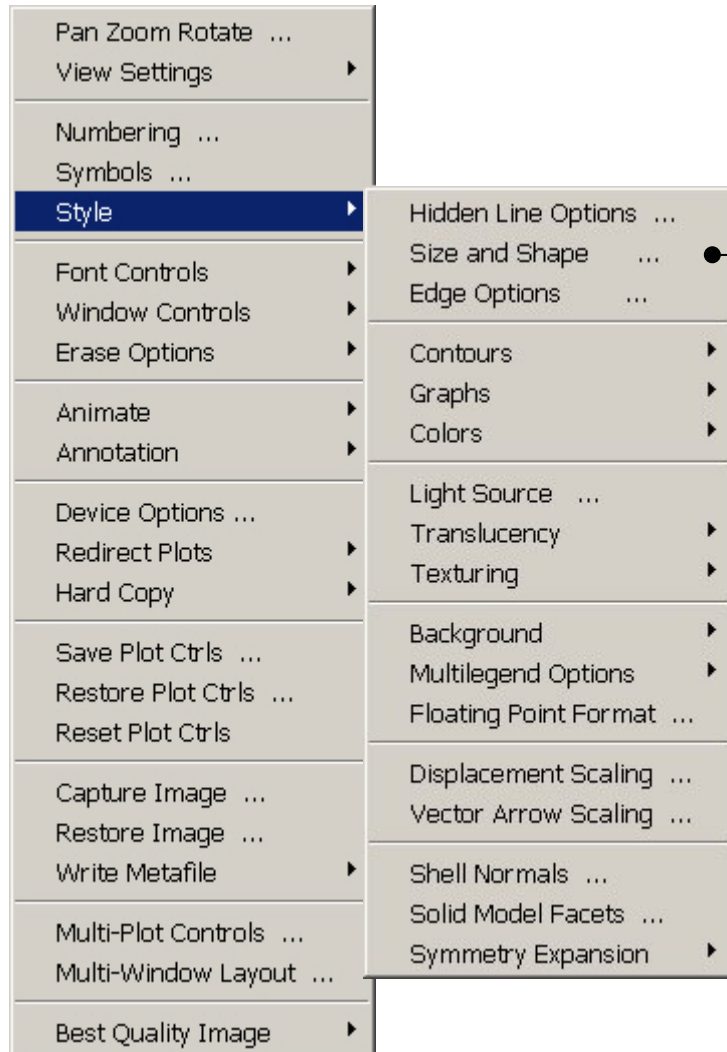


Select individual lines to be meshed by Picking

NB: It is often necessary to “Clear” the model for example if Element Type is to be changed

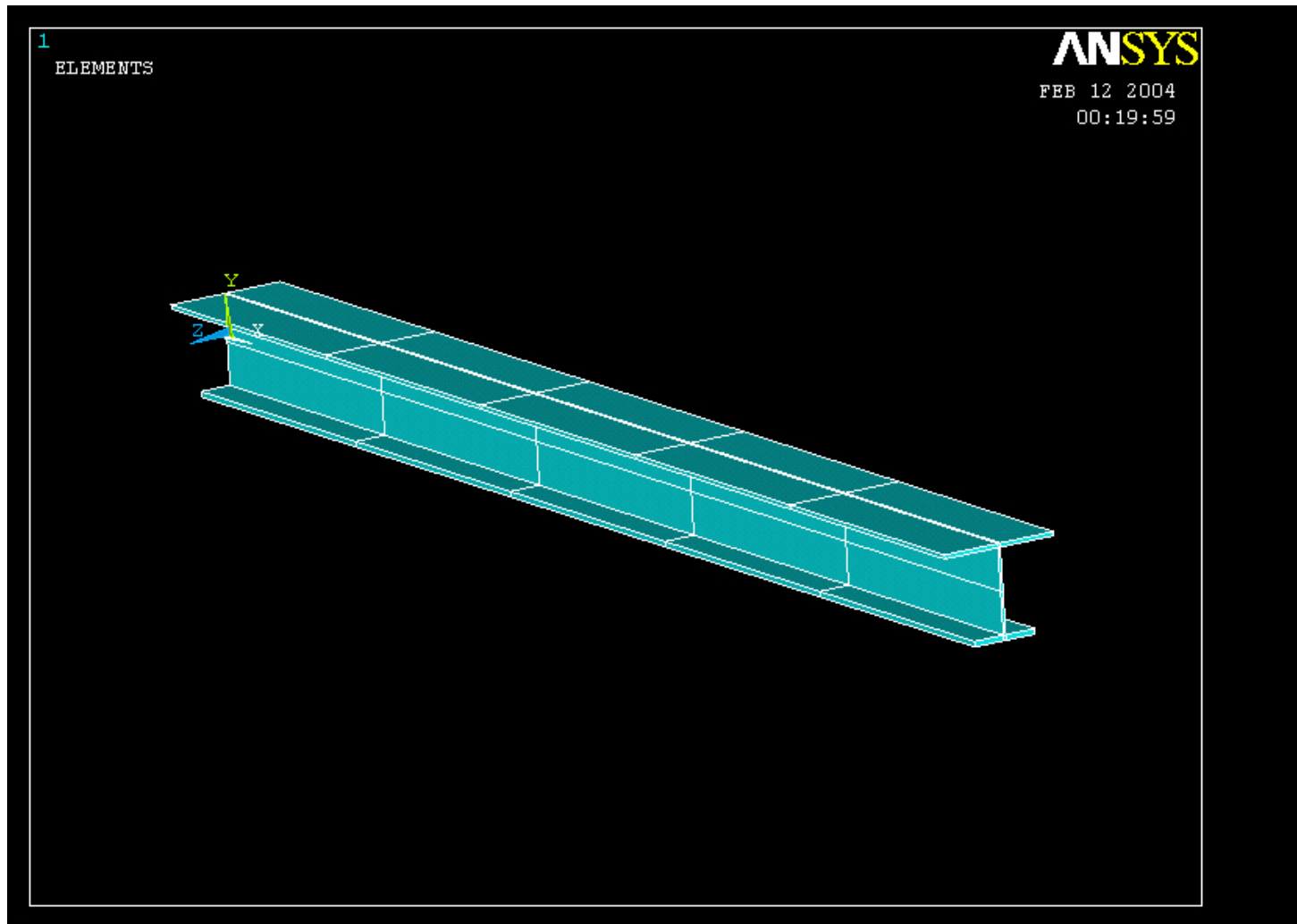
Select all lines defined to be meshed

Example - PlotCtrls Menu



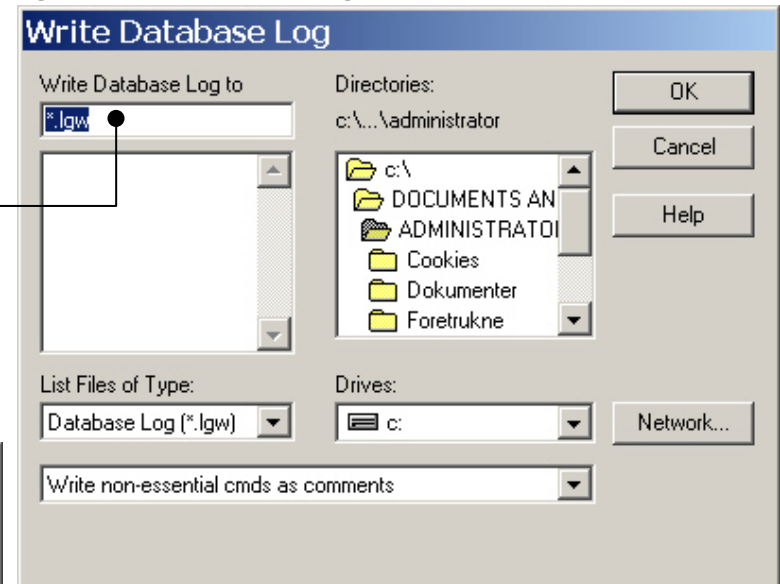
Change to On

Example – Display of Element

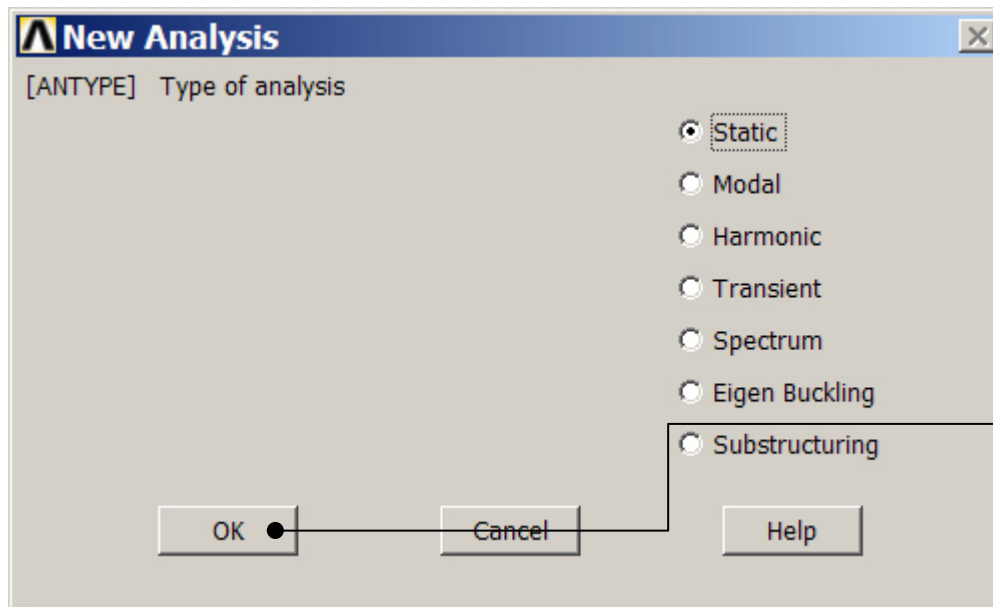


Example – Analysis Type

File > Write DB log file
Enter “example0120.lgw”



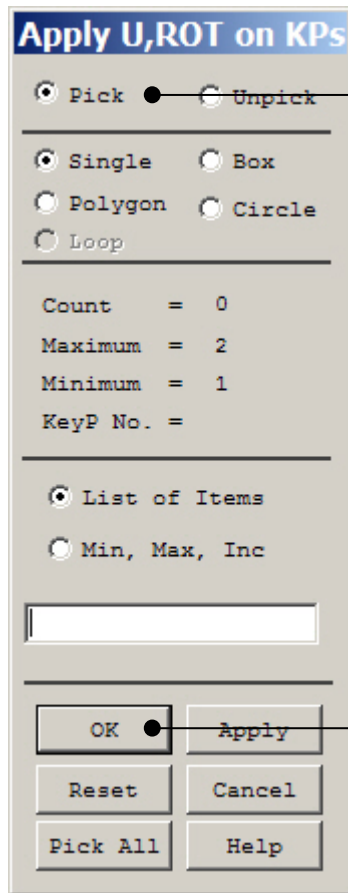
Solution > Analysis Type > New Analysis



Press OK

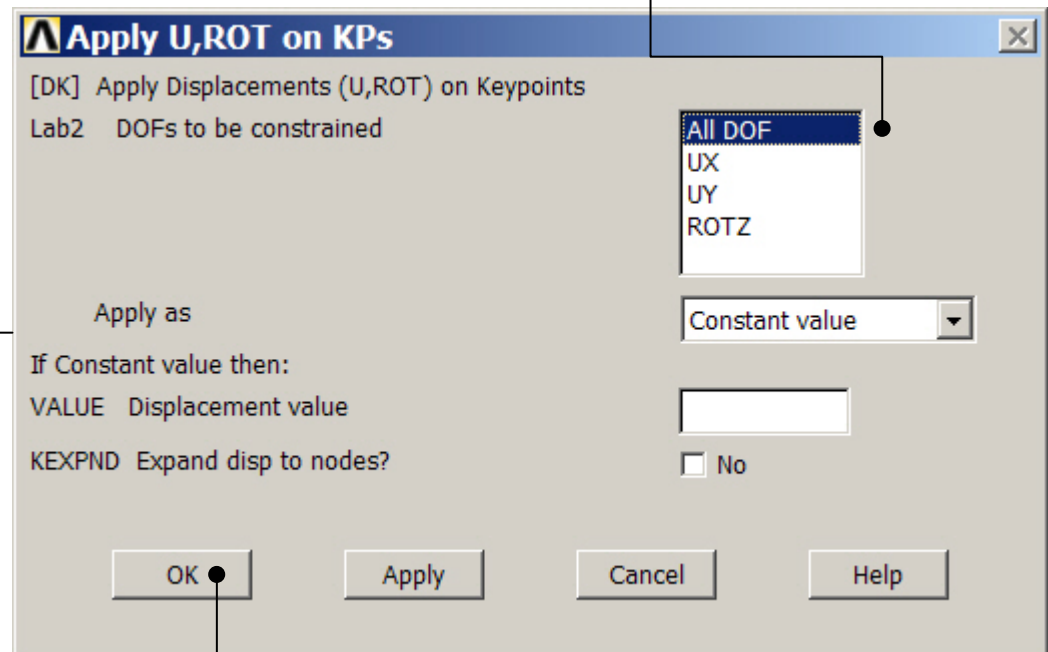
Example – Define Loads

Solution > Define Loads > Apply > Structural > Displacement > On Keypoints



Select keypoint 1

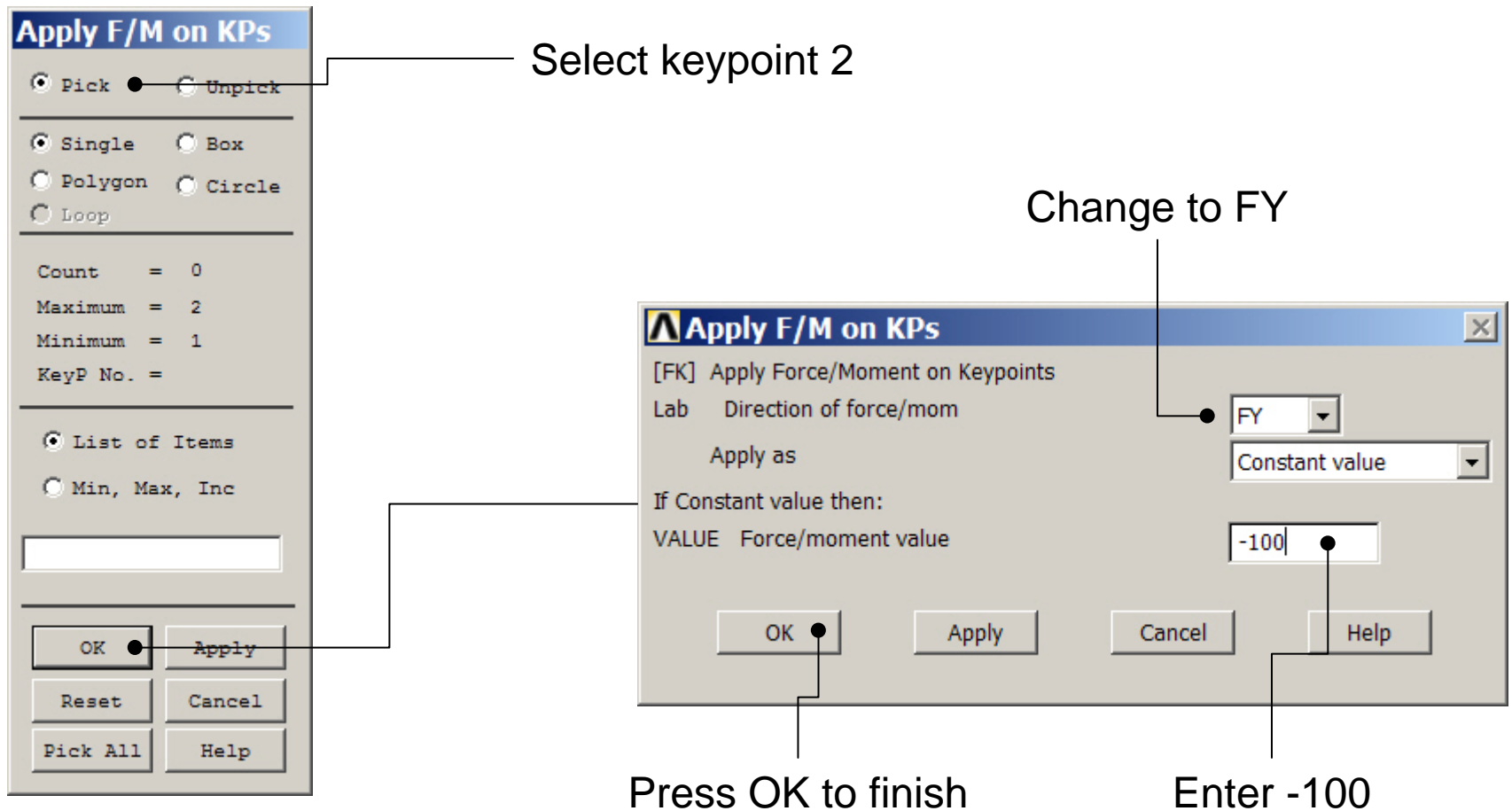
Select All DOF to fix/clamp the beam



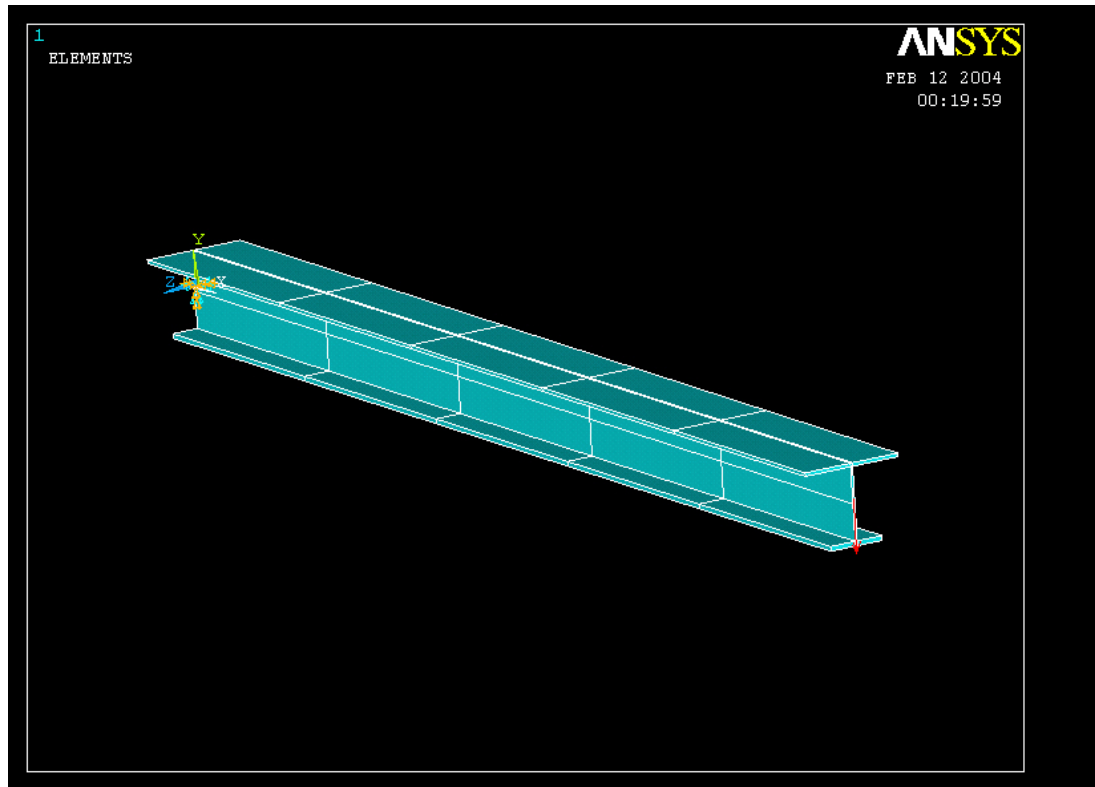
Press OK

Example – Define Loads

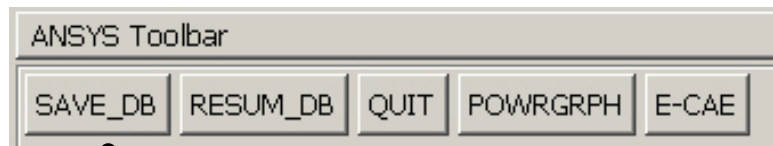
Solution > Define Loads > Apply > Structural > Force/Moment > On Keypoints



Example - Save



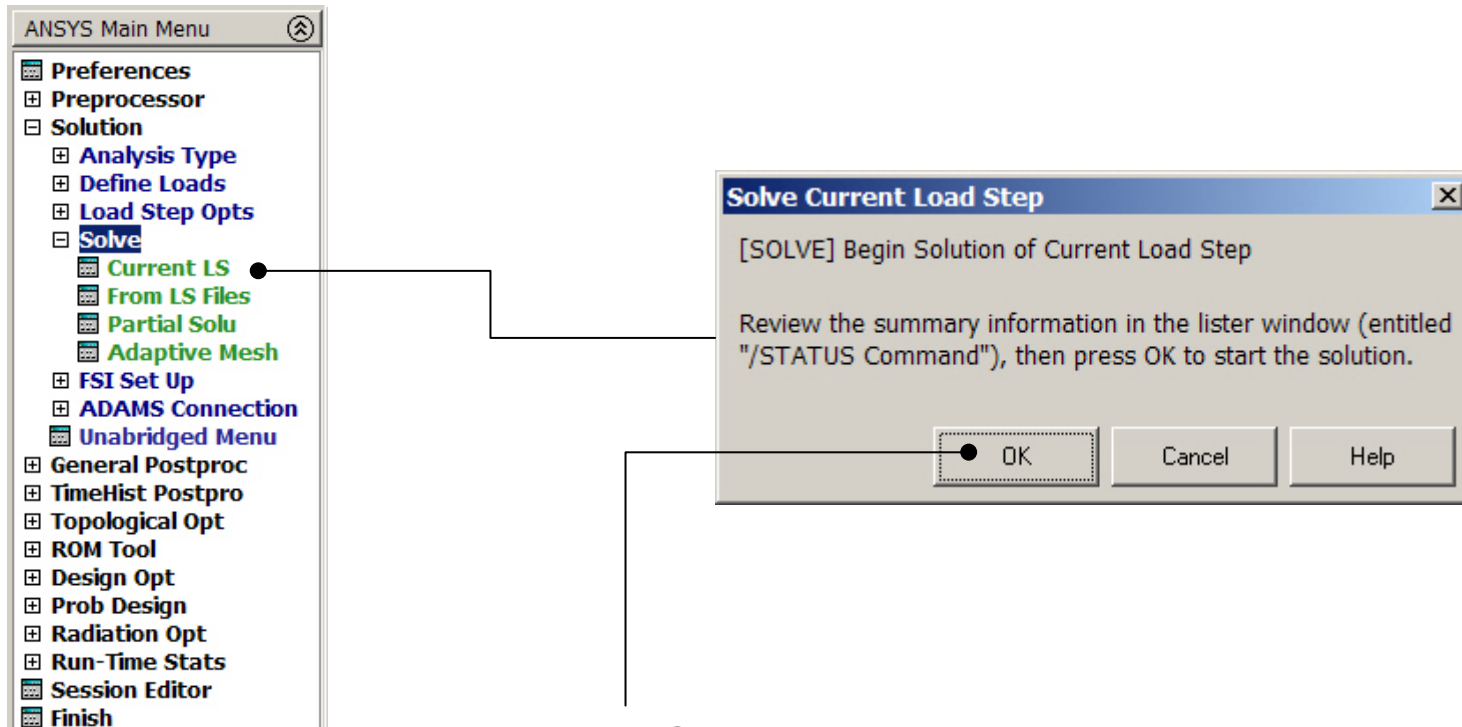
Display of Analysis model



Save the model

Example - Solve

Solution > Solve > Current LS

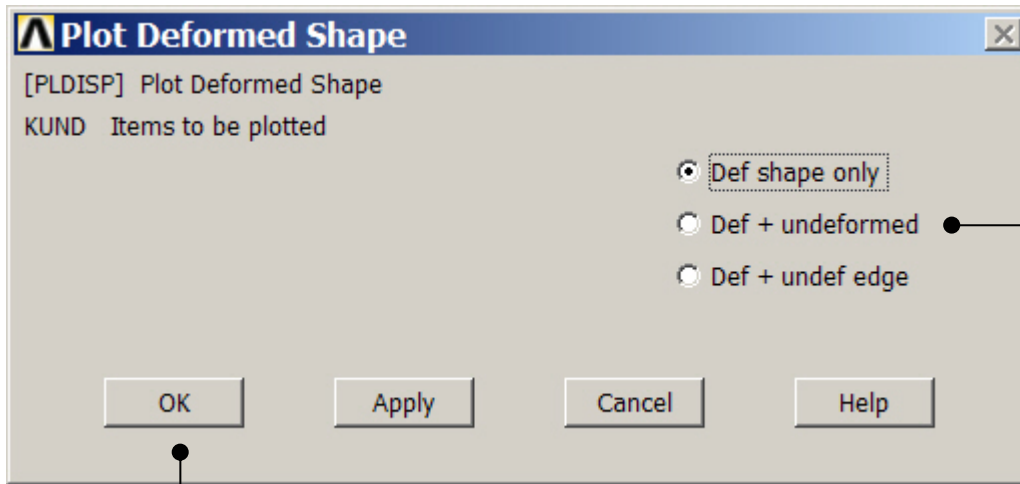


Press OK

Example0120

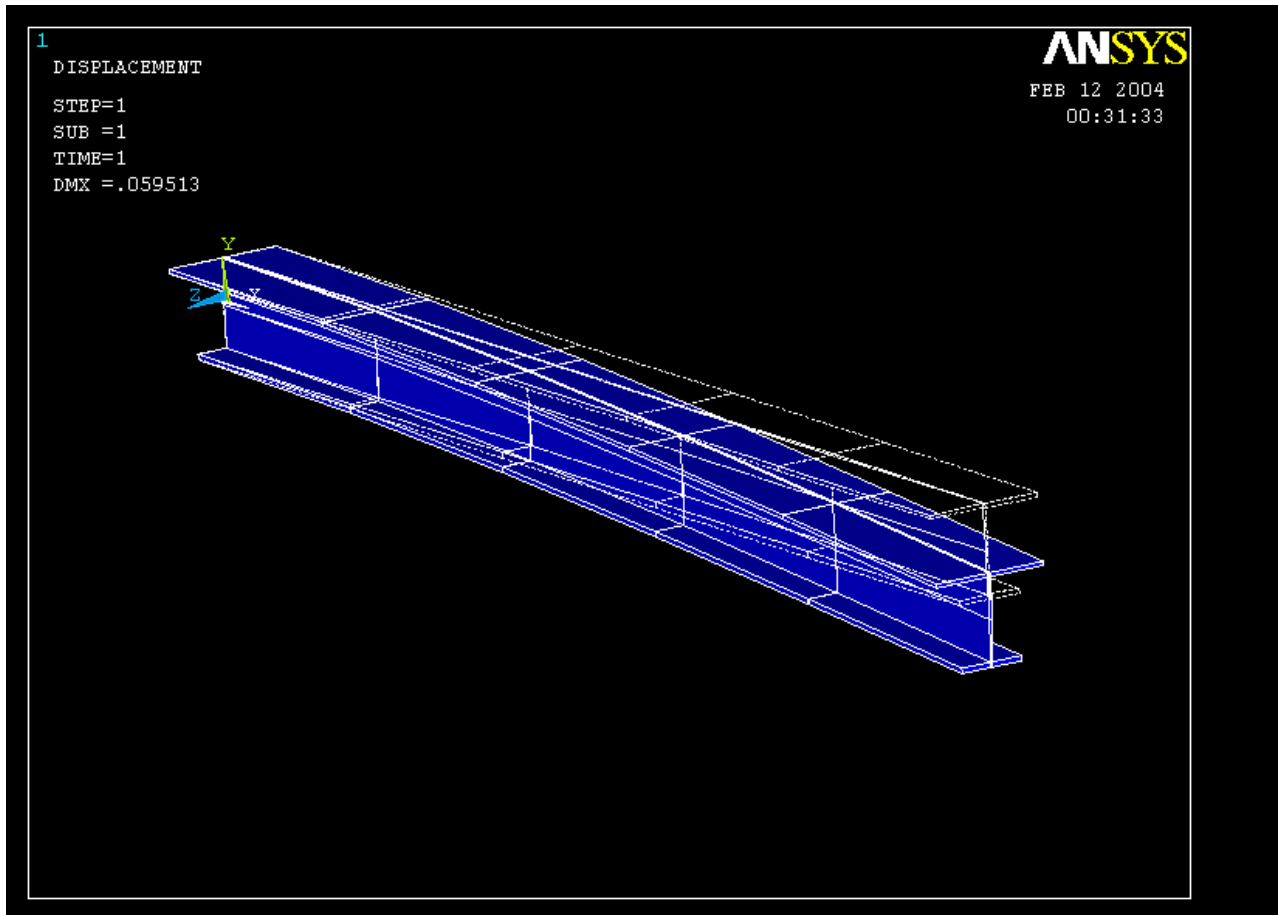
Example - PostProcessing

General Postproc > Plot Results > Deformed Shape



Select "Def+undeformed"
and Press OK

Example - PostProcessing



Read Maximum displacement: DMX