

ANSYS - 3D Curved Beam step 4

Problem Specification

1. Start-up and preliminary set-up
2. Specify element type and constants
3. Specify material properties
- 4. Specify geometry**
5. Mesh geometry
6. Specify boundary conditions
7. Solve!
8. Postprocess the results
9. Validate the results

Step 4: Specify geometry

We'll first create keypoints corresponding to the eight vertices of the model and then generate a volume from the keypoints. The keypoints will be created in the cylindrical coordinate system. Four of the keypoints are the vertices A,B,C and D shown in the figure of the geometry. The other four keypoints have the same r and z as A,B,C and D but are displaced in the z -direction with respect to them.

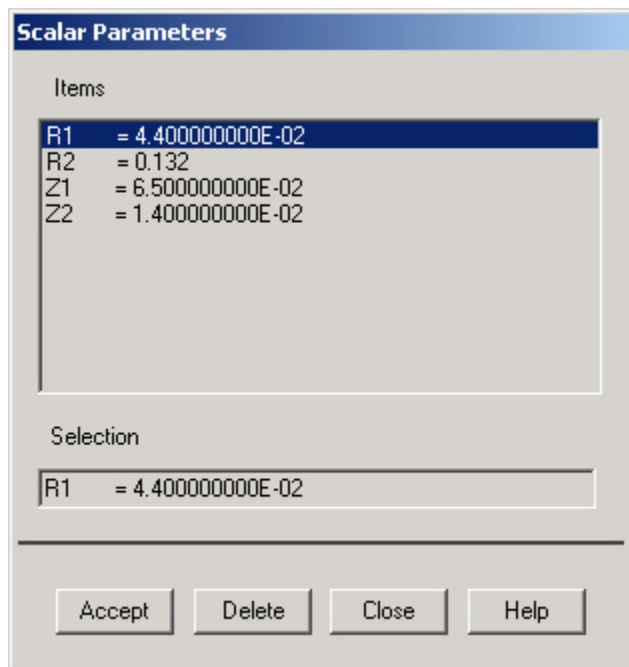
Create Scalar Parameters

For convenience, we'll create scalar parameters for the geometric dimensions in SI units.

Utility Menu > Parameters > Scalar Parameters

Enter the following parameters, clicking **Accept** after each. Check the figure of the geometry to see what dimension each parameter corresponds to.

R1=44e-3
R2=R1+88e-3
Z1=65e-3
Z2=14e-3



Click **Close**.

Switch to Cylindrical Coordinate System

Utility Menu > WorkPlane > Change Active CS to > Global Cylindrical

Check that ANSYS reports the active coordinate system in the *Output* window :

```
ACTIVE COORDINATE SYSTEM SET TO      1  (CYLINDRICAL) Z- CYL. AXIS
```

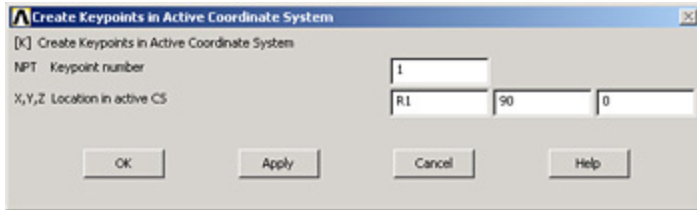
The reference number that ANSYS uses for the cylindrical coordinate system is 1 (the Cartesian system is 0).

Save your work: **Toolbar > SAVE_DB**

Create Keypoints

Main Menu > Preprocessor > Modeling > Create > Keypoints > In Active CS

When the active coordinate system is set to cylindrical, **X**, **Y**, and **Z** in the menus refer to the cylindrical coordinates r , (in degrees) and z , respectively. Remember to make this mental substitution as you enter the keypoint coordinates. Also, you can use the tab key to move the cursor to the next entry field. Don't forget to change the keypoint number as you enter the coordinates of the keypoints.



Enter the keypoint locations (think about where each one lies as you enter its coordinates):

Keypoint 1: **X**=R1, **Y**=90, **Z**=0, Click **Apply**.

Keypoint 2: **X**=R1, **Y**=95, **Z**=0, Click **Apply**.

Keypoint 3: **X**=R1, **Y**=95, **Z**=Z1, Click **Apply**.

Keypoint 4: **X**=R1, **Y**=90, **Z**=Z1, Click **Apply**.

Keypoint 5: **X**=R2, **Y**=90, **Z**=0, Click **Apply**.

Keypoint 6: **X**=R2, **Y**=95, **Z**=0, Click **Apply**.

Keypoint 7: **X**=R2, **Y**=95, **Z**=Z2, Click **Apply**.

Keypoint 8: **X**=R2, **Y**=90, **Z**=Z2, Click **OK**.

Save your work: **Toolbar > SAVE_DB**

Then click on the isometric view button  on the right toolbar.



[Higher Resolution Image](#)

Create Volume

We'll next generate a volume from the 8 keypoints. The order of the keypoints should be around the bottom first and then the top.

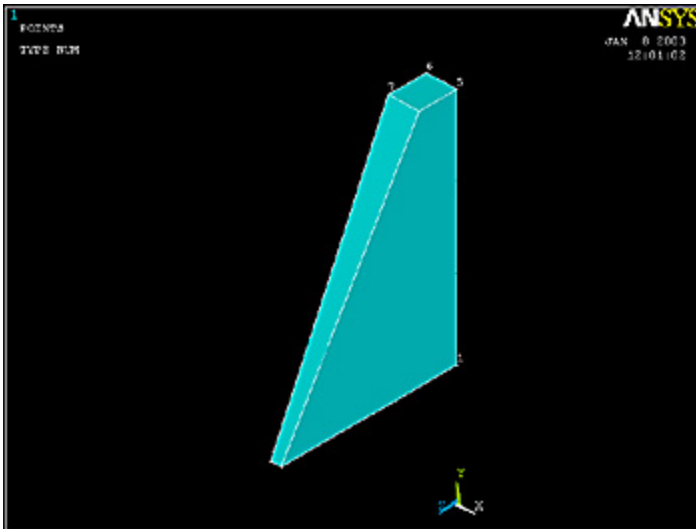
Switch to the Cartesian coordinate system for generating the volume:

Utility Menu > WorkPlane > Change Active CS to > Global Cartesian

The lines (i.e. edges) connecting the keypoints that ANSYS generates during the volume creation are "straight" in the active coordinate system. Since we want these edges to be straight, the active coordinate system needs to be Cartesian rather than a curvilinear system like the Cylindrical.

Main Menu > Preprocessor > Modeling > Create > Volumes > Arbitrary > Through KPs

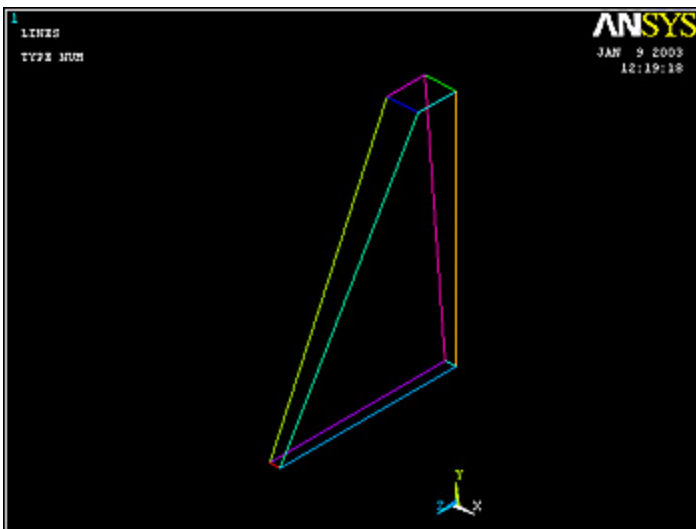
Pick the 8 keypoints in the order in which they are numbered. Click **OK** in the pick menu.



Plot Lines

Let's take a look at the lines that ANSYS generated in the volume creation process:

Utility Menu > Plot > Lines



Save Your Work

Toolbar > SAVE_DB

[Go to Step 5: Mesh geometry](#)

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