

# ANSYS 12 - Beam - Step 6

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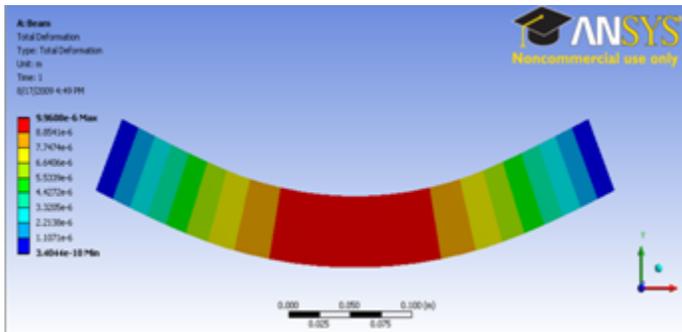
## Problem Specification

1. Pre-Analysis & Start-Up
2. Geometry
3. Mesh
4. Setup (Physics)
5. Solution
6. Results
7. Verification & Validation

## Step 6: Results

### Total Deformation

Let first look at Total Deformation. Under **Solution (A6)**, click on **Total Deformation**. The Total Deformation plot is then shown in the Graphics window.

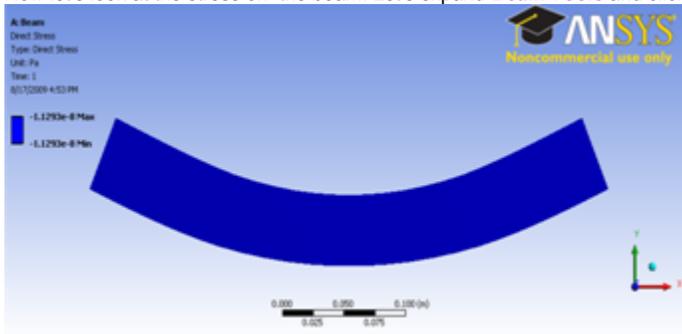


[Higher Resolution Image](#)

You can also animate the deformation by clicking play button right under **Graphics** window.

### Bending Stress

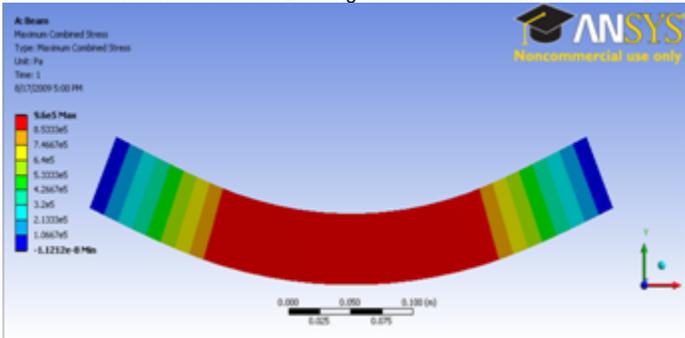
Now let's look at the stress on the beam. Let's expand **Beam Tools** and click on **Direct Stress**.



[Higher Resolution Image](#)

The direct stress is the stress component due to axial load encountered by the beam element. Since there is not axial load, we expect a direct stress of zero value throughout the beam.

Next let's look at the Maximum Bending Stress of the beam. Click on [Maximum Combined Stress](#).



[Higher Resolution Image](#)

Maximum Combined Stress is combination of direct stress and maximum bending stress. Since we have pure bending problem, the maximum combined stress will be the maximum bending stress.

We expect a pure bending stress in the central region between the two applied forces. Elementary beam theory predicts the bending stress as  $\sigma_{xx} = My/I$ . Here

$$M = 4000 \cdot 0.1 = 400 \text{ N m}$$

$$I = bh^3/12 = (1) \cdot (0.05)^3/12 = 1.04e-5 \text{ m}^4 \text{ (assuming unit thickness in the z direction)}$$

For this geometry, we expect the neutral axis to be at  $y = h/2 = 0.025 \text{ m}$ . So the max value of  $\sigma_{xx} = M \cdot (h/2)/I = 9.6e5 \text{ Pa}$ . This is exact solution to the computational solution.

### Force Reaction, Moment Reaction

If we click on the [Force Reaction](#), we see that the force reaction at point A and B is 4000, which is what we are expecting. The moment reaction at A and B is also zero, as expected.

[Go to Step 7: Verification & Validation](#)

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