

Bending of a Curved Beam (Results-Interpretation) - Pre-Analysis & Start-Up

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Pre-Analysis & Start-Up

Pre-Analysis

There are three different theories for finding the solution for the bending of a curved beam. There is elasticity theory, where

$$\sigma_r = \left(\frac{LM}{tb^2N}\right)\left[\left(1 - \frac{r^2}{b^2}\right)\ln\left(\frac{r}{a}\right) - \left(1 - \frac{r^2}{b^2}\right)\ln\left(\frac{b}{a}\right)\right]$$

and

$$\sigma_\theta = \left(\frac{LM}{tb^2N}\right)\left[\left(1 - \frac{r^2}{b^2}\right)\left(1 + \ln\left(\frac{r}{a}\right)\right) - \left(1 + \frac{r^2}{a^2}\right)\ln\left(\frac{b}{a}\right)\right]$$

where

$$N = \left(1 - \frac{a^2}{b^2}\right)^2 - \ln\left(\frac{a}{b}\right)\ln\left(\frac{b}{a}\right)$$

There is Winkler Bach Theory, where

$$\sigma_\theta = \frac{M}{AR}\left[1 + \frac{y}{Z(R + y)}\right]$$

where

$$Z = -1 + \frac{R}{h}\ln\left[\left(R + \frac{h}{2}\right)/\left(R - \frac{h}{2}\right)\right]$$

And there is the straight beam theory, where

$$\sigma_\theta = \frac{My}{I}$$

ANSYS Simulation

Now, let's load the problem into ANSYS and see how a computer simulation will compare. First, start by [downloading the files here](#)

The zip file should contain the following contents:

- Curved Beam Solution_files folder
- Curved Beam Solution.wbpj

Please make sure to extract both of these files from the zip folder, the program will not work otherwise. (Note: The solution was created using ANSYS workbench 13.0 release, there may be compatibility issues when attempting to open with older versions).

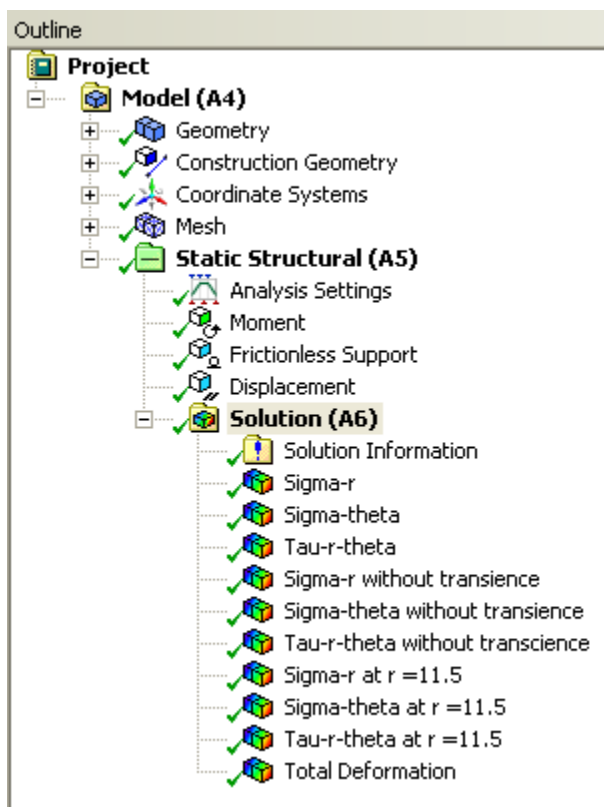
2. Double click "Curved Beam Solution.wbpj" - This should automatically open ANSYS workbench (you have to twiddle your thumbs a bit before it opens up). You will be presented with the ANSYS solution.

	A
1	Static Structural (ANSYS)
2	Engineering Data ✓
3	Geometry ✓
4	Model ✓
5	Setup ✓
6	Solution ✓
7	Results ✓

A tick mark against each step indicates that that step has been completed.

3. To look at the results, double click on "Results" - This should bring up a new window (again you have to twiddle your thumbs a bit before it opens up).

4. On the left-hand side there should be an "Outline" toolbar. Look for "Solution (A6)".



We'll investigate the items listed under Solution in the next step in this tutorial.

[Go to Step 2 - Numerical Results](#)

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