

2D Beam - Pre-Analysis & Start-Up

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Pre-Analysis & Start-Up

Pre-Analysis

It is recommended that you make some back-of-the-envelope estimates of expected results before launching into your computer solution. Here this can be done using Euler-Bernoulli beam theory. Calculate the expected non-dimensionalized maximum deflection from E-B beam theory.

$$\text{Maximum moment} = \frac{P}{L}(L-a)a \quad @ \ x = a$$

$$\text{Maximum transverse deflection} = \frac{-Pa}{3EI} \left(\frac{L^2 - a^2}{3} \right)^{3/2} \quad @ \ x = L - \sqrt{\frac{L^2 - a^2}{3}}$$

We'll compare this to the ANSYS results later. Also, list the assumptions embedded in your beam theory result. These will be important to consider when we critique the comparison between beam theory and finite-element results later.

Start-Up

Launch ANSYS Workbench and start a "Static Structural" analysis in the project page as shown in the video below.

Summary of steps in the above video:

1. Start Workbench Session
2. Click and drag Static Structural from the Analysis Systems Toolbox into Project Schematic.
3. Underneath the new system, rename the project from 'Static Structural' to '2D Beam'.
4. Double click on Engineering Data
 - a. With Structural Steel selected in Outline of Schematic, and Isotropic Elasticity selected in Toolbox, turn your attention to the properties of Structural Steel at the bottom of the window.
 - b. Double check that the values and units for Young's Modulus and Poisson Ratio of Structural Steel are correct.
 - c. Click Return to Project.
5. Save Project.
 - a. Upon saving you should verify that both a .wbproj file and a folder of project files have been created.

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