

T-Beam - Pre-Analysis & Start-Up

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Pre-Analysis & Start-Up

Pre-Analysis

Let's consider that Euler-Bernoulli beam theory is reasonable for this problem. Computing predictions for the axial bending stresses at the extreme fibers at the beam mid-span using this theory and comparing with the experimental results:

	Dimensionless Axial Stress, Bottom of Beam	Dimensionless Axial Stress, Top of Beam
From measured strains in mechanics lab	0.1108	-0.2464
From simple beam theory	0.1134	-0.2724
From finite element analysis with 1D beam elements	0.1134 ³	-0.2724

Here the axial stresses are normalized so as to be independent of the material properties, load and geometry. Dimensionless maximum stresses are

$$\hat{\sigma} = PLh/2I$$

reported here, normalized by:

The predictions of Euler-Bernoulli beam theory differ from the experimental measurements by 2% along the bottom of the beam and by approximately 10% along the top of the beam. This is reasonably close given potential experimental error, yet the disagreement may be enough to consider if the theory is applicable. We will continue with a full three-dimensional analysis to investigate any issues related to application points of loads, boundary conditions and the like as appeared in Tutorial #2 for the relatively short I-Beam.

Start-Up

Launch ANSYS Workbench and start a "Static Structural" analysis in the project page as shown in the video below. Note that this video comes from a different tutorial but the process is the same.

[Go to Step 2: Geometry](#)

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