

# Plane Frame - Pre-Analysis & Start-Up

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## Pre-Analysis

In the cantilever beam tutorial, we considered the case when a bar is subjected to a transverse load. We solved this case using the Euler-Bernoulli beam theory which assumes that transverse loads can only cause any point on the midline to move in the transverse direction. We denoted this transverse displacement as  $u_y$ .

Now consider the case when a bar is subjected to a transverse load as well as an axial load. The transverse load causes a transverse displacement  $u_y$  of the midline as before. In addition, the axial load causes an elongation or contraction of the midline (as in a truss model). We can denote this axial displacement as  $u_x$ . The total displacement of any point on the midline is calculated as a superposition of these transverse and axial displacements.

In this problem, each member experiences both transverse and axial loads. So  $u_x$  and  $u_y$  are non-zero. The axial displacement has a simple linear variation along the midline as in a truss model.

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