ANSYS - 3D Signpost

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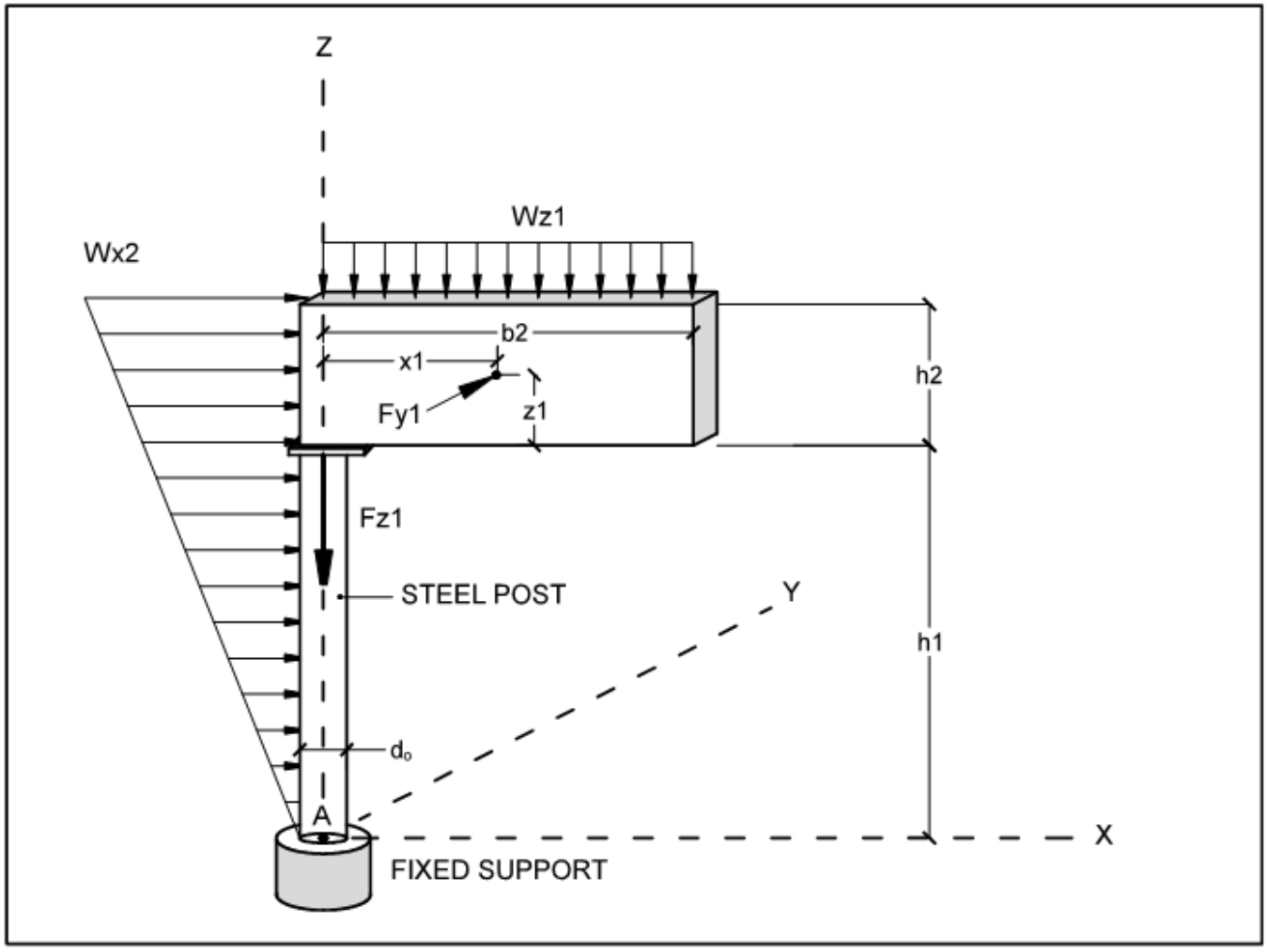
Three-dimensional analysis of combined loading in a signpost

Created using ANSYS 13.0

Problem Specification

A simply-supported 3D signpost with a cylindrical cross-section is subjected to the following combined loading situation.



x1 = 6 ft, z1 = 4 ft, b2 = 13 ft, h1 = 28ft, h2 = 8ft;

The system is subjected to the following external loads:

Wz1 = weight per unit length of the sign = 900 lb/ft, Wx2 = spatially variable wind load in the x-direction = 700*z lbs,

Fy1 = net wind force in the y-direction = 8000 lb, and Fz1 = net weight of the post (using a specific weight of 490 lb/ft^3)

The signpost is made of steel, which is a homogeneous and isotropic material (same properties at all points and in all directions) with Young's modulus *E*= 3.0e7 psi, Poisson's ratio of 0, and a density of 490 lb/ft^3. It is assumed that the post is a solid cylinder of diameter, d. It is further assumed that after loading, the signpost will remain in its *elastic range*. This means that when the external load is removed, the material will return to its original shape without suffering permanent deformation.

Using ANSYS Mechanical, design the post so that the total combined normal stresses and combined shear stresses do not exceed allowable values. Assume allowable stresses of 25 ksi and 16 ksi for normal and shear stress, respectively, which already account for an appropriate factor of safety.

Learning Goals

The purpose of this tutorial is to showcase how fully three-dimensional analysis can be applied to capture both stress states from simple combined loading as well as stress concentrations in the vicinity of sharp and/or re-entrant corners and other near-discontinuities in geometry.

Go to Step 1: Pre-Analysis & Start-Up

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