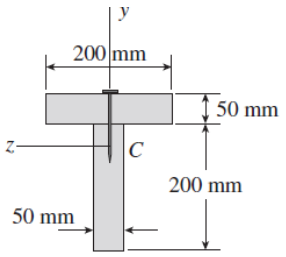
Homework #9

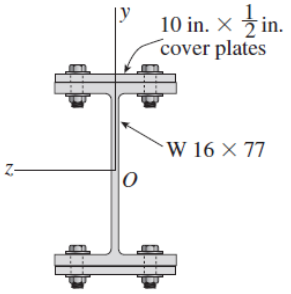
Problem 5.11-8 A beam of T cross section is formed by nailing together two boards having the dimensions shown in the figure.

If the total shear force V acting on the cross section is 1600 N and each nail may carry 750 N in shear, what is the maximum allowable nail spacing s?



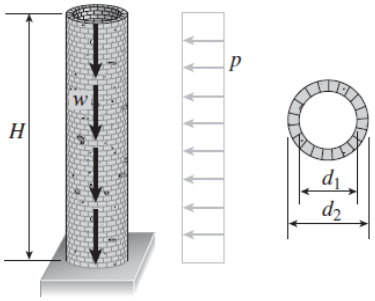
Problem 5.11-10 A steel beam is built up from a W 16 × 77 wide-flange beam and two 10 in. × 1/2 in. cover plates (see figure on the next page). The allowable load in shear on each bolt is 2.1 kips.

What is the required bolt spacing s in the longitudinal direction if the shear force $V = 30$ kips? (*Note:* Obtain the dimensions and moment of inertia of the W shape from Table E-1.)



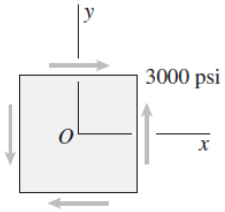
Problem 5.12-9 A cylindrical brick chimney of height H weighs $w = 825$ lb/ft of height (see figure). The inner and outer diameters are $d_1 = 3$ ft and $d_2 = 4$ ft, respectively. The wind pressure against the side of the chimney is $p = 10$ lb/ft^2 of projected area.

Determine the maximum height H if there is to be no tension in the brickwork.



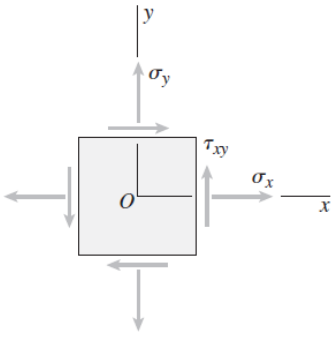
Problem 7.4-7 An element in *pure shear* is subjected to stresses $\tau_{xy} = 3000$ psi, as shown in the figure.

Using Mohr's circle, determine (a) the stresses acting on an element oriented at a counterclockwise angle $\theta = 70°$ from the x axis and (b) the principal stresses. Show all results on sketches of properly oriented elements.



Problems 7.4-10 An element in *plane stress* is subjected to stresses σ_x, σ_y, and τ_{xy} (see figure).

Using Mohr's circle, determine the stresses acting on an element oriented at an angle θ from the x axis. Show these stresses on a sketch of an element oriented at the angle θ. (*Note:* The angle θ is positive when counterclockwise and negative when clockwise.)



$\sigma_x = 21$ MPa, $\sigma_y = 11$ MPa, $\tau_{xy} = 8$ MPa, $\theta = 50°$