

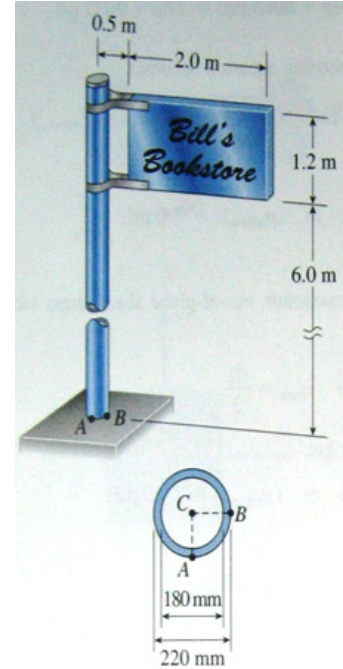
EGBE260 Homework: Week 14, Application of Plane Stress

**Ex 8-6.** A sign of dimensions 2.0m X 1.2 m is supported by a hollow circular pole having outer diameter 220 mm and inner diameter 180 mm. The sign is offset 0.5 m from the centerline of the pole and its lower edge is 6.0 m above the ground. Determine the principal stresses and maximum shear stresses at points A and B at the base of the pole due to a wind pressure of 2.0 kPa against the sign.

Answers:

A)  $\sigma_1 = 55.7 \text{ MPa}$ ,  $\sigma_2 = -0.7 \text{ MPa}$ ,  $\tau_{max} = 28.2 \text{ MPa}$

B)  $\sigma_1 = 7 \text{ MPa}$ ,  $\sigma_2 = -7 \text{ MPa}$ ,  $\tau_{max} = 7 \text{ MPa}$

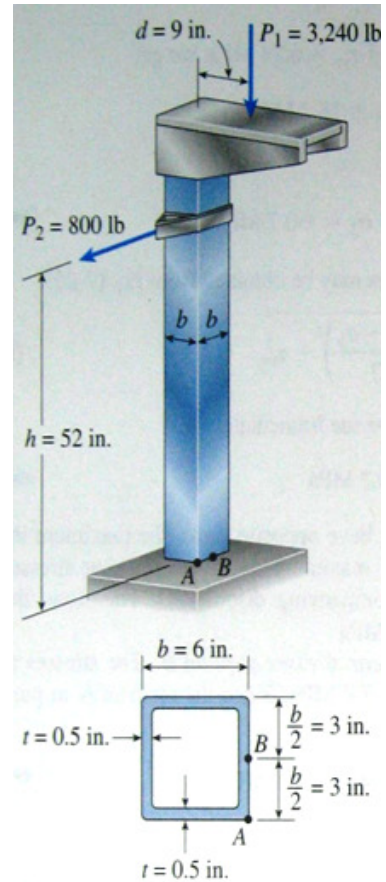


**Ex 8-7.** A tubular post of square cross section supports a horizontal platform. The tube has outer dimension  $b = 6$  in and wall thickness  $t = 0.5$  in. The platform has dimensions 6.75 in x 24.0 in. and supports a uniformly distributed load of 20 psi acting over its upper surface. The resultant of this distributed load is a vertical force  $P_1 = 3240$  lb. This force acts at the midpoint of the platform, which is at distance  $d = 9$  in from the longitudinal axis of the post. A second load  $P_2 = 800$  lb acts horizontally on the post at height  $h = 52$  in above the base. Determine the principal stresses and maximum shear stresses at points A and B at the base of the post due to the loads  $P_1$  and  $P_2$ .

Answers:

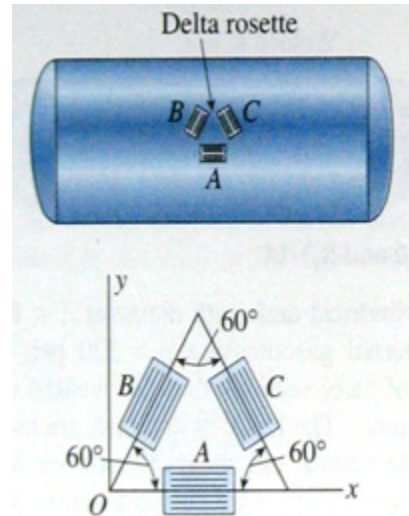
A)  $\sigma_1 = 0$ ,  $\sigma_2 = -0490 \text{ psi}$ ,  $\tau_{max} = 2050 \text{ psi}$

B)  $\sigma_1 = 14 \text{ psi}$ ,  $\sigma_2 = -1870 \text{ psi}$ ,  $\tau_{max} = 944 \text{ psi}$



8.3.14. A  $60^\circ$  strain-gage rosette is mounted on the outside of a cylindrical compressed air tank. The recorded strains are  $\epsilon_a = 80 \times 10^{-6}$  and  $\epsilon_b = \epsilon_c = 275 \times 10^{-6}$ . If the tank has an  $r/t$  ratio of 25 and the modulus of elasticity is 200 GPa, what is the air pressure  $p$  in the tank?

Answer:  $p = 3200 \text{ kPa}$



8.5.1. A bracket ABCD having a hollow circular cross section consists of a vertical arm AB, a horizontal arm BC parallel to the  $x_0$  axis, and a horizontal arm CD parallel to the  $z_0$  axis. The arms BC and CD have lengths of  $b_1 = 4 \text{ ft}$  and  $b_2 = 3 \text{ ft}$ . The outer and inner diameters of the bracket are  $d_2 = 8 \text{ in}$  and  $d_1 = 7 \text{ in}$ . A vertical load  $P = 2 \text{ k}$  acts at point D. Determine the maximum tensile, compressive, and shear stresses in the bracket.

Answer:  $\sigma_t = 5600 \text{ psi}$ ,  $\sigma_c = -5940 \text{ psi}$ ,  $\tau_{max} = 2970 \text{ psi}$

