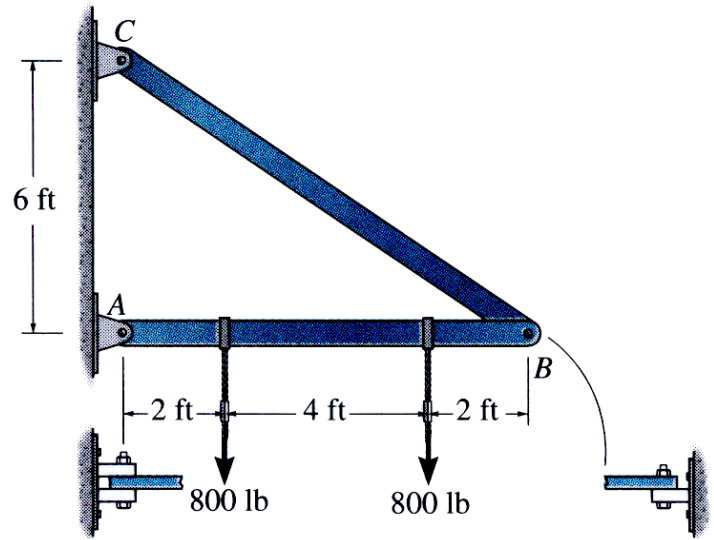
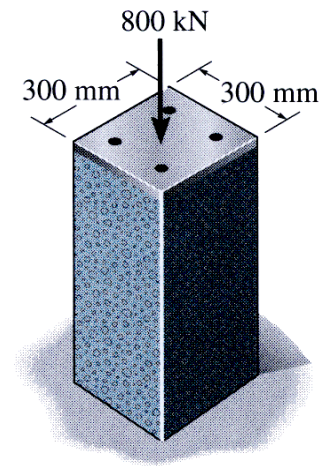


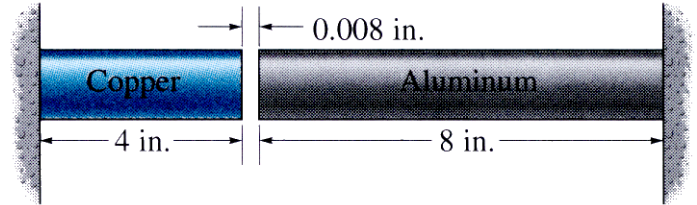
1. Determine the required **cross-sectional area** of member  $BC$  and the **diameter** of the pin at  $B$  if the allowable normal stress for  $BC$  is  $\sigma_{\text{allow}} = 8$  ksi and the allowable shear stress for the pin is  $\tau_{\text{allow}} = 5$  ksi.



2. The concrete column is reinforced using four steel reinforcing rods, each having a diameter of 18 mm. Determine the **force** in the **concrete** and the **steel** if the column is subjected to an axial load of 800 kN. Let  $E_{st} = 200 \text{ Gpa}$  and  $E_c = 25 \text{ Gpa}$ .



3. The two solid circular rod segments, one of aluminum and the other of copper, are fixed to the rigid walls such that there is a gap of 0.008 in. between them when  $T_1 = 60^\circ\text{F}$ . Each rod has a diameter of 1.25 in. and  $\alpha_{\text{cu}} = 9.4 \times 10^{-6}/^\circ\text{F}$ ,  $E_{\text{cu}} = 18 \times 10^6$  psi,  $\alpha_{\text{al}} = 13 \times 10^{-6}/^\circ\text{F}$ ,  $E_{\text{al}} = 10 \times 10^6$  psi. Determine the **force in each rod** if  $T_2 = 300^\circ\text{F}$ .



4. A solid steel shaft  $AB$  transmits 5 hp from the motor  $M$  to the pulley at a speed of  $\omega = 175$  rpm. If the steel has an allowable shear stress of  $\tau_{\text{allow}} = 14.5$  ksi, determine the required **diameter** of the shaft.

