

6.25 We are asked to calculate the radius of a cylindrical brass specimen in order to produce an elongation of 5 mm when a load of 100,000 N is applied. It first becomes necessary to compute the strain corresponding to this elongation using Equation 6.2 as

$$\varepsilon = \frac{\Delta l}{l_0} = \frac{5 \text{ mm}}{100 \text{ mm}} = 5 \times 10^{-2}$$

From Figure 6.12, a stress of 335 MPa (49,000 psi) corresponds to this strain. Since for a cylindrical specimen, stress, force, and initial radius  $r_0$  are related as

$$\sigma = \frac{F}{\pi r_0^2}$$

then

$$r_0 = \sqrt{\frac{F}{\pi \sigma}} = \sqrt{\frac{100,000 \text{ N}}{\pi(335 \times 10^6 \text{ N/m}^2)}} = 0.0097 \text{ m} = 9.7 \text{ mm} \text{ (0.38 in.)}$$