6.4 We are asked to compute the maximum length of a cylindrical nickel specimen (before deformation) that is deformed elastically in tension. For a cylindrical specimen

$$A_0 = \pi\left(\frac{d_0}{2}\right)^2$$

where d_0 is the original diameter. Combining Equations 6.1, 6.2, and 6.5 and solving for l_0 leads to

$$l_0 = \frac{\Delta l}{\varepsilon} = \frac{\Delta l}{\frac{\sigma}{E}} = \frac{\Delta l\, E}{\frac{F}{A_0}} = \frac{\Delta l\, E\pi\left(\frac{d_0}{2}\right)^2}{F} = \frac{\Delta l\, E\pi\, d_0^2}{4F}$$

$$= \frac{(0.25 \times 10^{-3}\ \text{m})(207 \times 10^9\ \text{N/m}^2)\ (\pi)(10.2 \times 10^{-3}\ \text{m})^2}{(4)(8900\ \text{N})}$$

$$= 0.475\ \text{m} = 475\ \text{mm}\ (18.7\ \text{in.})$$