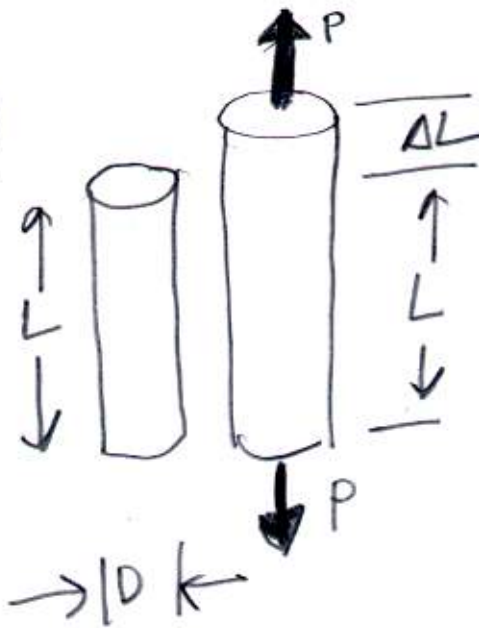


B&J 9.3

Nylon thread



Given; $P = 2\text{ lbf}$, $E = \underbrace{0.7 \cdot 10^6 \text{ lbf/in}^2}_{\text{one 40th that of steel}}$

$$\Delta L/L = 1.1\% = 0.011$$

Find: D , σ ?

Key facts: $A = \pi D^2/4$, $\sigma = E \epsilon$, $\epsilon = \frac{\Delta L}{L}$, $\sigma = P/A$

Usually,

$$\Rightarrow \begin{aligned} \sigma &= \sigma \\ \frac{P}{A} &= E \epsilon \\ \Rightarrow \frac{\pi D^2}{4} &= \frac{P}{E \epsilon} \Rightarrow D = \sqrt{\frac{4P}{\pi E \epsilon}} \end{aligned}$$

$$D = \sqrt{\frac{4 \cdot 2\text{ lbf}}{\pi (7 \cdot 10^5 \text{ lbf/in}^2) \cdot (11 \cdot 10^{-3})}} = \sqrt{\frac{8}{\pi \cdot 7.7}} \cdot 10^{-1} \text{ in}$$
$$= 0.18 \cdot 10^{-1} \text{ in} \Rightarrow \text{(a) } \boxed{D = 18 \cdot 10^{-3} \text{ in}} \quad (\text{about } 1/2 \text{ mm})$$

$$\sigma = E \epsilon = (7 \cdot 10^5 \text{ lbf/in}^2) \cdot (11 \cdot 10^{-3}) = \boxed{7700 \text{ lbf/in}^2} \quad \text{(b)}$$