10-13

Determine the diameter of wire BD in Problem 10-12 so that the deformations of the two wires are equal. Other data remain unchanged.

From P10-12

$$T_{BD} = 600\ \text{lb}, \quad \delta_{Ac} = 0.00136\ \text{in.}$$

$$\delta = \frac{PL}{AE}$$

$$A = \frac{PL}{\delta E}$$

$$A_{BD} = \frac{(600\ \text{lb})\left(5\ \text{ft} \times \frac{12\ \text{in}}{\text{ft}}\right)}{(0.00136\ \text{in})(30 \times 10^6\ \text{lb/in.}^2)} = 0.8824\ \text{in.}^2$$

$$\frac{\pi d^2}{4} = 0.7854\, d_{BD}^2 = 0.8824\ \text{in.}^2$$

$$d_{BD} = \sqrt{\frac{0.8824\ \text{in.}^2}{0.7854}}$$

$$= 1.06\ \text{in}$$

use $d = 1\frac{1}{16}$ in.

(1.0625 in)