

2.83

2.83 The homogeneous wooden block A of Fig. P2.83 is 0.7 m by 0.7 m by 1.3 m and weighs 2.4 kN. The concrete block B (specific weight = 23.6 kN/m^3) is suspended from A by means of the slender cable causing A to float in the position indicated. Determine the volume of B.

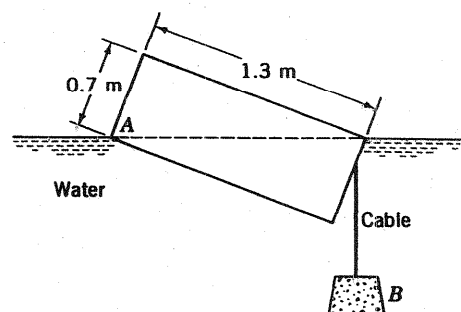


FIGURE P2.83

For equilibrium,

$$\sum F_{\text{vertical}} = 0$$

so that (see figure)

$$T = F_B - W$$

where

$$F_B = \gamma_{\text{H}_2\text{O}} \times (\text{submerged volume})$$

$$= \left(9.80 \frac{\text{kN}}{\text{m}^3} \right) \left(\frac{1}{2} \right) (1.3 \text{ m} \times 0.7 \text{ m} \times 0.7 \text{ m})$$

$$= 3.12 \text{ kN}$$

Thus,

$$T = 3.12 \text{ kN} - 2.4 \text{ kN} = 0.72 \text{ kN}$$

Since,

$$F_{B_c} = W_c - T$$

or

$$\gamma_{\text{H}_2\text{O}} (V_c) = \gamma_c (V_c) - 0.72 \text{ kN}$$

then

$$V_c = \frac{0.72 \text{ kN}}{\gamma_c - \gamma_{\text{H}_2\text{O}}} = \frac{0.72 \text{ kN}}{23.6 \frac{\text{kN}}{\text{m}^3} - 9.80 \frac{\text{kN}}{\text{m}^3}} = \underline{\underline{0.0522 \text{ m}^3}}$$

