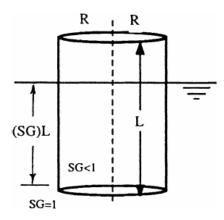
**2.135** Consider a homogeneous right circular cylinder of length L, radius R, and specific gravity SG, floating in water (SG = 1) with its axis *vertical*. Show that the body is stable if

$$R/L > [2SG(1-SG)]^{1/2}$$

**Solution:** For a given SG, the body floats with a draft equal to (SG)L, as shown. Its center of gravity G is at L/2 above the bottom. Its center of buoyancy B is at (SG)L/2 above the bottom. Then Eq. (2.52) predicts the metacenter location:



$$MB = I_o/v_{sub} = \frac{\pi R^4/4}{\pi R^2(SG)L} = \frac{R^2}{4(SG)L} = MG + GB = MG + \frac{L}{2} - SG\frac{L}{2}$$

Thus 
$$MG > 0$$
 (stability) if  $\mathbb{R}^2/\mathbb{L}^2 > 2SG(1 - SG)$  Ans.

For example, if SG = 0.8, stability requires that R/L > 0.566.