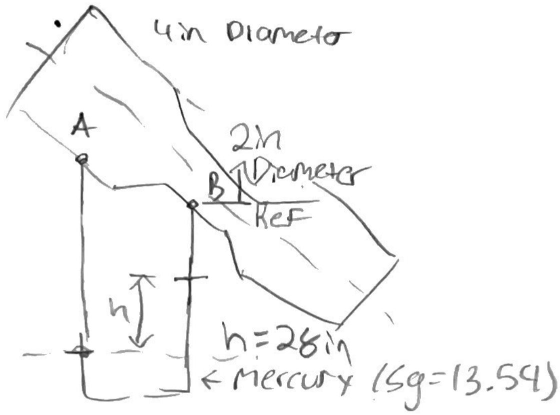
MET 330 | Ch. 6 | JB - Group I

79) FBD



$$A_B V_B = A_A V_A$$
$$\frac{\pi D_B^2}{4} V_B = \frac{\pi D_A^2}{4} V_A$$
$$V_B = \left(\frac{4}{2}\right)^2 V_A$$
$$\gamma_{oil} = Sg_{oil} \times \gamma_{water} = 0.9 \times 62.4$$
$$\gamma_{oil} = 56.16\ lb/ft$$
$$\gamma_{Hg} = Sg_{Hg} \times \gamma_{water}$$
$$= 13.54 \times 62.4$$
$$\gamma_{Hg} = 844.9\ lb/ft$$

Apply Bernoulli's

$$\frac{P_A}{\gamma_o} + \frac{V_A^2}{2g} + z_A = \frac{P_B}{\gamma_o} + \frac{V_B^2}{2g} + z_B \Rightarrow \frac{(P_A - P_B) + \gamma_o(z_A - z_B)}{\gamma_o} = \frac{V_B^2 - V_A^2}{2g}$$

$$(P_A - P_B) = \gamma_o(z_B - z_A - h) + \gamma_{Hg} h$$

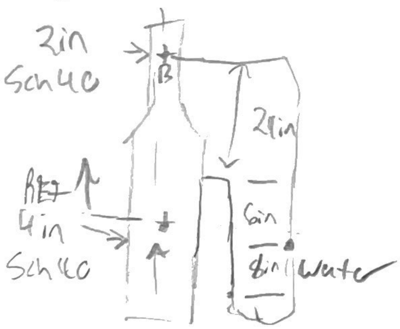
$$\frac{(56.16\cancel{(z_B - z_A)} + 1840.38) + 56.16\cancel{(z_A - z_B)}}{56.16} = \frac{(4V_A)^2 - V_A^2}{64.4}$$

$$\Rightarrow (56.16 + 1840.38) - 5616) = \frac{1840.38}{56.16} = \frac{15 V_A^2}{64.4} \qquad V_A = 11.9\ ft/s$$

Volume Flow rate

$$Q = A \times V = \left(\frac{\pi D_A^2}{4}\right) \times V_A = \frac{\pi \times (4/12)^2}{4} \times 11.86 \qquad \underline{Q = 1.035\ ft/s}$$

82) FBD



$$\gamma_{oil} = 55.0\ lb/ft^3$$
$$d_B = 2in = 0.167\ ft \qquad d_A = 4in = 0.33\ ft$$
$$Q = \frac{0.02\sqrt{2gh}}{\sqrt{\ \ -\ \ }} \qquad a_1 = \pi/4\, d_A^2 = (.33)^2 = 0.085\ ft^2$$
$$a_2 = \pi/4\,(0.167)^2 = 0.0219\ ft^2$$

$$h = 8in\left(\frac{62.43}{55} - 1\right) = \frac{1.08 in}{12} = 0.09\ ft$$

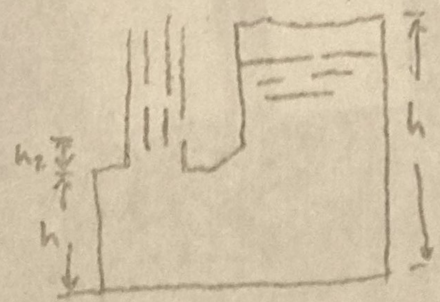
Volume Flow rate

$$Q = \frac{0.085 \times 0.0219\sqrt{2 \times 32.2 \times 0.09}}{\sqrt{(0.085)^2 - (0.0219)^2}}$$

$$\underline{Q = 54.56E\text{-}3\ ft/s}$$

Chpt. 6 #91

$h = 2.6\,m$, $h_1 = .85\,m$ (elevation of base), $h_2 = 75\,mm$ or $.075\,m$ (elevation of top)



→ No Energy Loss

$h_j = h - (h_1 + h_2)$

$h_j = 2.6m - (.85m + .075m)$

$= 2.6m - .925m$

$\boxed{= 1.675m}$