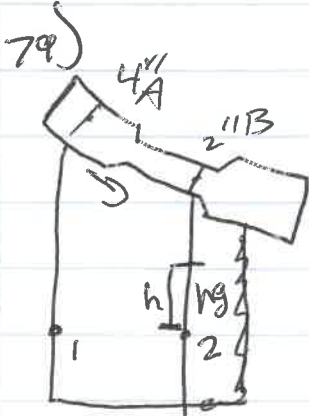


ME+330 Hw1.3

①



$$A_B V_B = A_A V_A$$

$$\frac{\pi D_B^2}{4} V_B = \frac{\pi D_A^2}{4} V_A$$

$$V_B = \left(\frac{D_A}{D_B}\right)^2 V_A \rightarrow V_B = \left(\frac{4}{2}\right)^2 V_A = 4V_A$$

$$P_1 = P_2$$

$$P_A + \gamma_0 z_A = P_B + \gamma_0 (z_B - h) + \gamma_{ng} \times h$$

$$\gamma_0 = 0.9 \times 62.4 = 56.16 \text{ lbf/ft}^3$$

$$\gamma_{ng} = 13.54 \times 62.4 = 844.896 \text{ lbf/ft}^3$$

$$h = 28''$$

$$\begin{aligned} \rightarrow P_A - P_B &= 56.16 \left[z_B - z_A - \frac{28}{12} \right] + 844.896 \times \frac{28}{12} \\ &= 56.16 (z_B - z_A) - 131.04 + 1971.424 \\ &= 56.16 (z_B - z_A) + 1840.384 \end{aligned}$$

$$\frac{P_A}{\gamma_0} + \frac{V_A^2}{2g} + z_A = \frac{P_B}{\gamma_0} + \frac{V_B^2}{2g} + z_B$$

$$\frac{P_A - P_B}{\gamma_0} + z_A - z_B = \frac{V_B^2 - V_A^2}{2g} \rightarrow \frac{(P_A - P_B) + \gamma_0 (z_A - z_B) - \frac{V_B^2 - V_A^2}{2g}}{\gamma_0}$$

$$\frac{(56.16 (z_B - z_A) + 1840.38) + 56.16 (z_A - z_B) - \frac{(4V_A)^2 - V_A^2}{2 \times 32.2}}{56.16}$$

$$\frac{1840.38}{56.16} = \frac{15V_A^2}{64.4}$$

$$V_A = 11.86 \text{ ft/s}$$

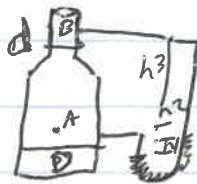
$$Q = \left[\frac{\pi \left(\frac{4}{12}\right)^2}{4} \right] (11.86)$$

$$Q = 1.035 \text{ ft}^3/\text{s}$$

82) Hunter/Linker met 330 Hw 2

9/2/21

②



given

$$h_1 = 8''$$

$$D = 4''$$

$$\gamma = 55 \text{ lb/ft}^3$$

$$h_2 = 6''$$

$$d = 2''$$

$$P_w = 62.4$$

$$h_3 = 24''$$

$$\frac{P_A}{\rho g} + \frac{v_A^2}{2g} + z_A = \frac{P_B}{\rho g} + \frac{v_B^2}{2g} + z_B$$

$$\frac{P_w}{\rho g} + \frac{Q^2}{2g A_A^2} + z_A = \frac{P_B}{\rho g} + \frac{Q^2}{2g A_B^2} + z_B$$

$$A_A = \frac{\pi}{4} D^2 = \frac{\pi}{4} (0.33)^2 = 0.0871 \text{ ft}^2$$

$$A_B = \frac{\pi}{4} d^2 = \frac{\pi}{4} (0.166)^2 = 0.0216 \text{ ft}^2$$

$$z_B - z_A = h_3 = 2'$$

$$\begin{aligned} P_A + \rho g (h_1 + h_2) &= P_B + \rho g (h_2 + h_3) + P_w h_1 \\ (P_A - P_B) &= \rho g (h_2 + h_3) + P_w h_1 - \rho g (h_1 + h_2) \\ &= 55(0.5 + 2) + (62.4 \times 32.18 \times 0.666) - 55(0.666 + 0.5) \\ P_A - P_B &= 1410.72 \text{ lb/ft}^2 \end{aligned}$$

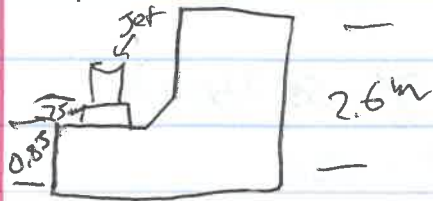
$$\frac{P_A - P_B}{\rho g} = \frac{Q^2}{2g} \left[\frac{1}{A_B^2} - \frac{1}{A_A^2} \right] + (z_B - z_A)$$

$$\frac{1410.72}{55} = \frac{Q^2}{2 \times 32.18} \left[\frac{1}{(0.0216)^2} - \frac{1}{(0.0871)^2} \right] + 2$$

$$23.65 = 31.254 Q^2$$

$$Q = 0.8698 \text{ ft}^3/\text{s}$$

91) Hunter linker met 330 Hw 3 9/21/21 ③



$$\begin{aligned} P &= \rho g h \\ &= 1000 \times 9.81 \times 2.60 \\ &= 25506 \text{ N/m}^2 \end{aligned}$$

$$\begin{aligned} P g h_1 + P g h_2 \\ 25,506 &= 1000 \times 9.81 (2.60 - 0.925) + 1000 \times 9.81 \times h_2 \\ &= 16431.75 + 9810 h_2 \end{aligned}$$

$$9074.25 = 9810 h_2$$

$$h_2 = 0.925 \text{ m}$$