

HWK CHP 6

$$D_A = 4''$$

$$D_B = 2''$$

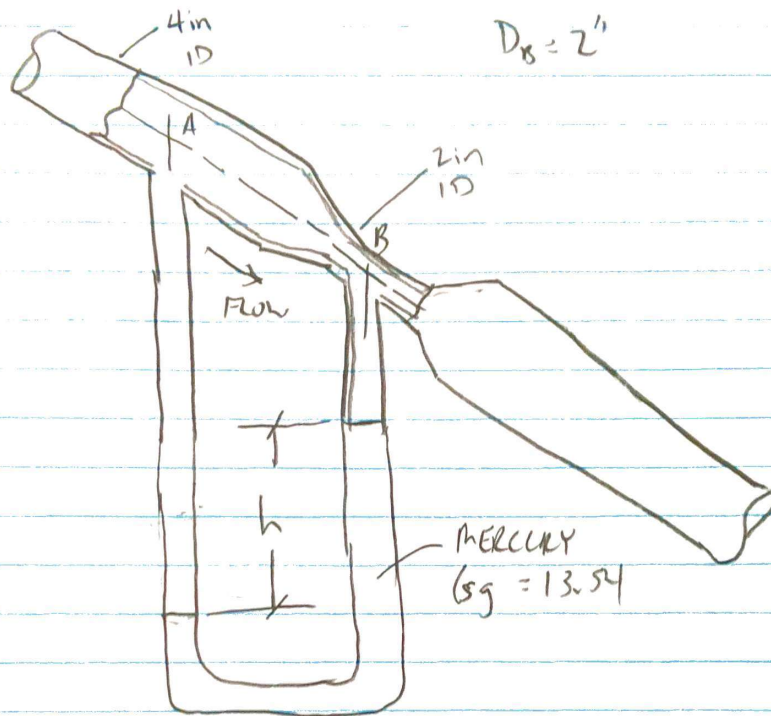
$$A_B V_B = A_A V_A$$

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

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

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

$$= 4 V_A$$



$$P_A = P_B$$

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

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

$$\gamma_o = sg_o \times \gamma_{H_2O}$$

$$= 0.9 \times 62.4$$

$$= 56.16 \text{ lb/ft}^3$$

$$\gamma_{Hg} = sg_{Hg} \times \gamma_{H_2O}$$

$$= 13.54 \times 62.4$$

$$= 844.896 \text{ lb/ft}^3$$

$$P_A - P_B = 56.16 \left(z_B - z_A - 28 \left(\frac{1}{12} \right) + 844.896 \times 28 \left(\frac{1}{12} \right) \right)$$

$$= 56.16 (z_B - z_A) - 131.04 + 1971.424$$

$$= 56.16 (z_B - z_A) + 1840.384$$

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

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

$$\frac{P_A - P_B + \gamma_o (z_A - z_B)}{\gamma_o} = \frac{[56.16 (z_A - z_B) + 1840.384] + 56.16 (z_A - z_B)}{56.16}$$

$$= \frac{(4V_A)^2 - V_A^2}{2(32.2)}$$

$$\frac{1840.384}{56.16} = \frac{15V_A^2}{64.4} =$$

$$32.77 = \frac{15V_A^2}{64.4}$$

$$32.77(64.4) = 15V_A^2$$

$$2110.411 = 15V_A^2$$

$$\frac{2110.411}{15} = V_A^2$$

$$V_A^2 = 140.694$$

$$V_A = \sqrt{140.694}$$

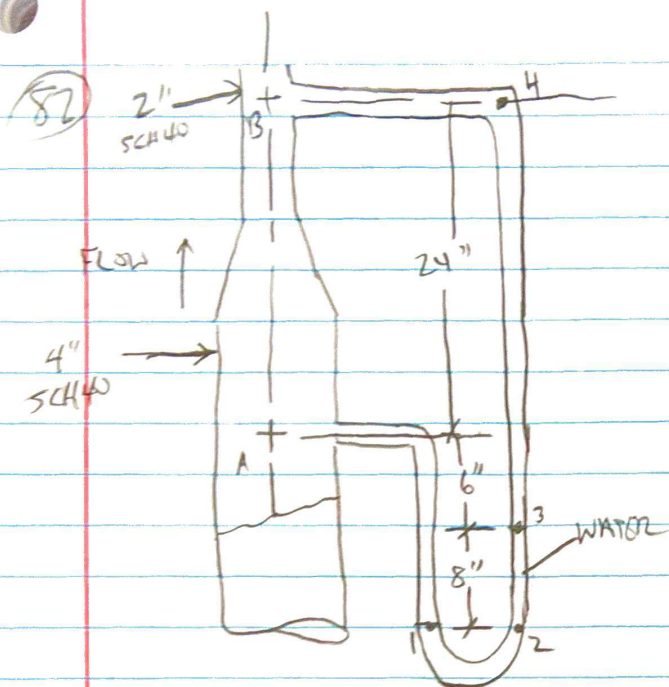
$$V_A = 11.86 \text{ ft/s}$$

$$Q = A_A V_A = \left(\frac{\pi D_A^2}{4} \right) V_A$$

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

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

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



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

$$Q = Av$$

$$D_A = 4 \text{ in}$$

$$A = \frac{\pi D^2}{4}$$

$$D_A = \frac{\pi \left(\frac{4}{12}\right)^2}{4}$$

$$D_B = 2 \text{ in}$$

$$D_A = 0.087 \text{ ft}^2$$

$$\left[\frac{\pi (4)^2}{4} \right] V_A = \left[\frac{\pi (2)^2}{4} \right] V_B$$

$$12.566 V_A = 3.142 V_B$$

$$V_B = 4 V_A$$

$$\frac{P_A}{\gamma_o} + z_A + \frac{V_A^2}{2g} = \frac{P_B}{\gamma_o} + z_B + \frac{(4V_A)^2}{2g}$$

$$P_1 = P_A + \gamma_o h_1 \quad (14/12)$$

$$P_A + 55(1.17)$$

$$= P_A + 64.35 \text{ lb/ft}^2$$

$$\frac{16V_A^2 - V_A^2}{2g} = \frac{P_A - P_B}{\gamma_o} + (z_A - z_B)$$

$$P_2 = P_1$$

$$V_A^2 = \left(\frac{2g}{15} \right) \left[\frac{P_A - P_B}{\gamma_o} + (z_A - z_B) \right]$$

$$P_3 = P_2 - \gamma_w h_2$$

$$P_3 = P_A + 64.35 - (62.4)(0.67) \quad (8/12)$$

$$= P_A + 22.542 \text{ lb/ft}^2$$

$$V_A = \sqrt{\left(\frac{2g}{15} \right) \left[\frac{P_A - P_B}{\gamma_o} + (z_A - z_B) \right]}$$

$$P_B = P_3 - \gamma_o h_3$$

$$(30/12)$$

$$V_A = \sqrt{\left(\frac{(2)(32.2)}{15} \right) \left[\frac{114.958}{55} + (0 - 2) \right]}$$

$$P_B = P_A + 22.542 - (55)(2.5)$$

$$\sqrt{(4.293)(0.09)}$$

$$= P_A - 114.958 \text{ lb/ft}^2$$

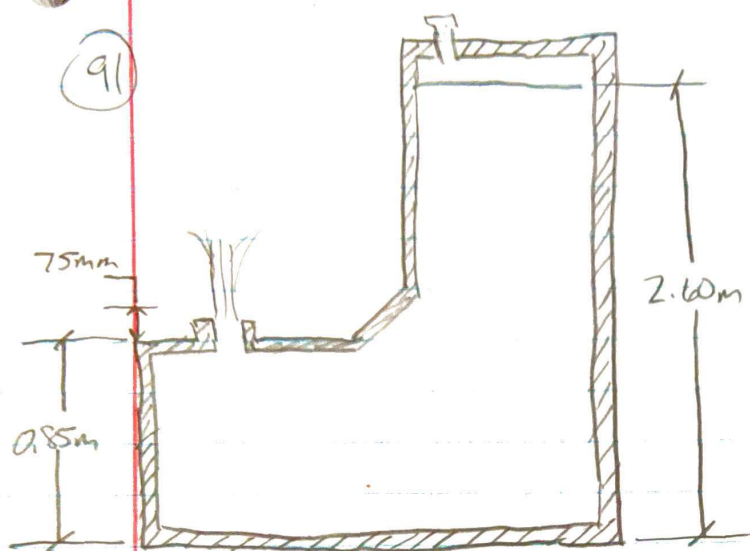
$$V_A = 0.621 \text{ ft/s}$$

$$P_A - P_B = 114.958 \text{ lb/ft}^2$$

$$Q = Av$$

$$= (0.087)(0.621) = \boxed{0.054 \text{ ft}^3/\text{s}}$$

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$$h = 2.6m$$

$$h_1 = 0.85m$$

$$h_2 = 7.5mm = 0.075m$$

$$h_j = h - (h_1 + h_2)$$

$$h_j = 2.6 - (0.85 + 0.075)$$
$$= 2.6 - .925$$

$$h_j = 1.675m$$