## Homework #4
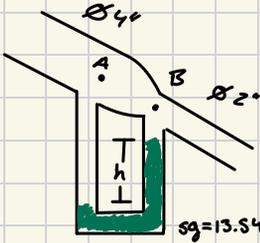
### Problem 6-79

$h = 28 \text{ in}, \quad sg_w = .9$



$A_A v_A = A_B v_B \rightarrow v_B = \left(\frac{D_A}{D_B}\right)^2 v_A \quad \Rightarrow \quad v_B = 4 v_A$

$P_A - P_B = \gamma(z_B - z_A - h) + (\gamma_m \times h)$

$\gamma_{oil} = .9(62.4) \Rightarrow 56.2$

$\gamma_m = 13.54(62.4) \Rightarrow 844.9 \quad \text{so...} \quad P_A - P_B = 56.2(z_B - z_A) + 1840.4$

$sg = 13.54$

$\rightarrow \frac{(P_A - P_B) + \gamma_0(z_A - z_B)}{\gamma_0} = \frac{v_B^2 - v_A^2}{2g} \rightarrow \frac{56.2(z_B - z_A) + 1840.4 + 56.2(z_A - z_B)}{56.2} = \frac{4 v_A^2 - v_A^2}{64.4}$

$\Rightarrow v_A = 11.9 \text{ ft/s}$

$Q = A_A v_A \rightarrow \pi^2(11.9) \Rightarrow \boxed{1.04 \text{ ft}^3/\text{s}}$

### Problem 6-82

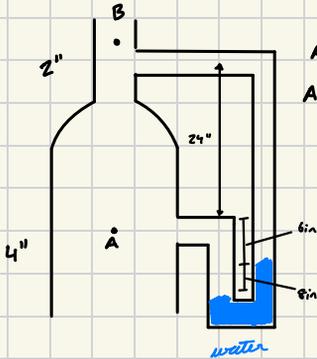$Q = C_d \frac{A_1 \times A_2 \sqrt{2gh}}{\sqrt{A_1^2 - A_2^2}}$



$A_A = \frac{\pi}{4}\left(\frac{4}{12}\right)^2 \Rightarrow 8.7\text{E-}2$

$A_B = \frac{\pi}{4}\left(\frac{2}{12}\right)^2 \Rightarrow 2.2\text{E-}2$

$h = x\left(\frac{62.4}{55} - 1\right) \Rightarrow .09 \text{ ft}$

$\rightarrow Q = \frac{2.2\text{E-}2 \times 8.7\text{E-}2 \sqrt{2 \cdot 32.2 \cdot .09}}{\sqrt{8.73\text{E-}2^2 - 2.2\text{E-}2^2}}$
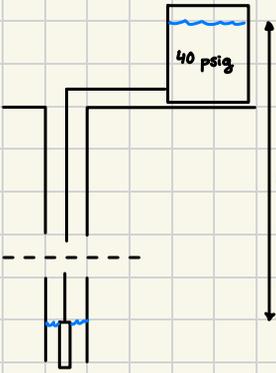
$\Rightarrow \boxed{Q = 5.42\text{E-}2 \text{ ft}^3/\text{s}^2}$

## Problem 7-11

$Q = 745$ gal/h → $.03$ ft³/s

$d = 1$ in
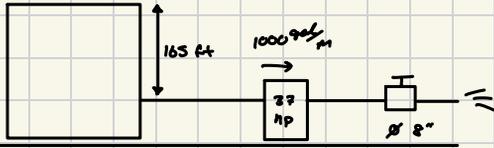
murgy lon $= 10.5 \frac{lb \cdot ft}{lb}$



40 psig

120 ft

a) $z_1 + h_A - h_L = \frac{P_2}{\gamma} + z_2 \rightarrow h_A = \frac{40(144)}{62.4} + 120 + 105 \Rightarrow h_A = 225 f$

$P_D = h_A \times \gamma \times Q \rightarrow \frac{222.8 \times 62.4 \times .03}{550} \Rightarrow .7 hp$

no... b) $\frac{.7}{1} = ? \quad \eta = 70\%$

## Problem 7-30

$A = \pi(.33)^2 \Rightarrow .35 ft^2 \qquad Q = \frac{2.2 \frac{ft}{s}}{.33} \Rightarrow 6.39 \frac{ft}{s}$



165 ft

1000 gal/m →

37 hp

⌀ 8"

$h_r = \frac{P}{w Q} \rightarrow \frac{37(550)}{62.4 \cdot .33} \Rightarrow 146.4$

no... $h_L = (z_1 - z_2) - \frac{v_2^2}{z_g} - h_g$

→ $(165 - 0) - \frac{6.4^2}{2(32.2)} - 146.4 \Rightarrow \underline{17.94}$

IUSE study: 678163 Biddlecomb

DRK12 Study: 581488 Biddlecomb