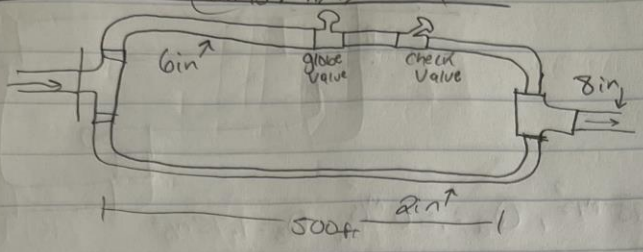
Fluid HW Nicholas Albano

Ch12: 7, 9
Ch14: 6, 15, 21, 36, 42
Ch15: 4, 9, 18

12.7:



Pipe 1&2: $h = kQ^2$

$Q_1 = .65$ ft/s $Q_3 = 1.54$ ft/s $f_2 = .011$

$Q_2 = .89$ ft/s $f_1 = .0093$

$h_1 = 340ft + 100ft + 405ft(.65)^2 = 4.249$

$h_2 = 305ft + 30ft(.89)^2 = .591$

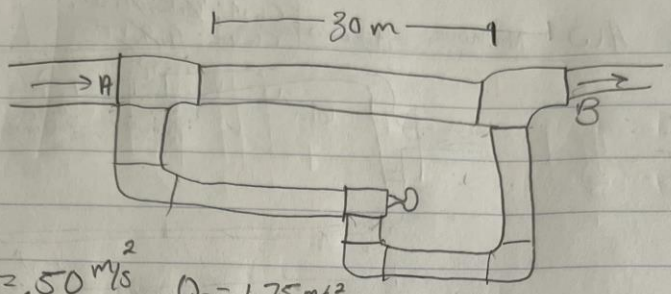
$2kQ_1 = 5.803$ $\Delta Q = \frac{4.249}{5.803} = .732$ $\Delta Q = \frac{.591}{1.247} = .473$

$2kQ_2 = 1.247$

$Q_1' = -.082$ $Q_2' = .417$

I understand

12.8:



$Q_1 = 1.25\ m^3/s$, $Q_2 = .50\ m^3/s$ $Q_3 = 1.75\ m^3/s$

$h = KQ^2$

$h_1 = 40 ft_T (1.25)^2 = .9375$

$h_2 = 40 ft_T + 20 ft + 150 ft_T + 40 ft_T (.5)^2 = 3.526$

$2KQ_1 = 1.5$

$2KQ_2 = 5.712$

$\Delta Q_1 = \frac{.9375}{1.5} = .625$

$\Delta Q_2 = \frac{3.526}{5.712} = .617$

$Q_1' = Q - \Delta Q = .625$

$Q_2' = Q - \Delta Q = -.117$

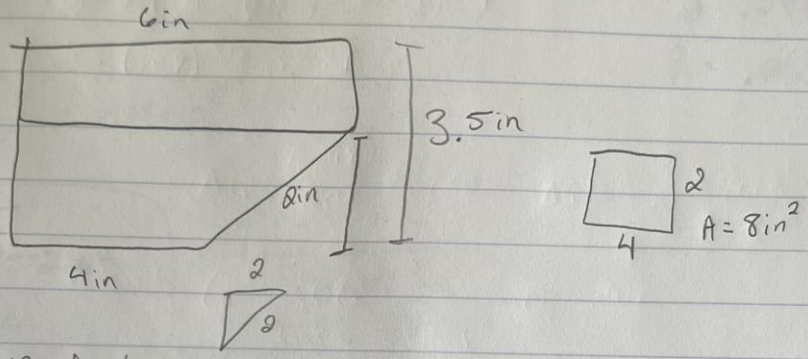
150mm

Find hydraulic Radius: $R = \frac{A}{WP}$ $W_P = h + L$

$A = \frac{150+10}{2} \cdot 62 = 4960mm$

$R = \frac{4960}{62+150} = 23.39mm$?

14.6:

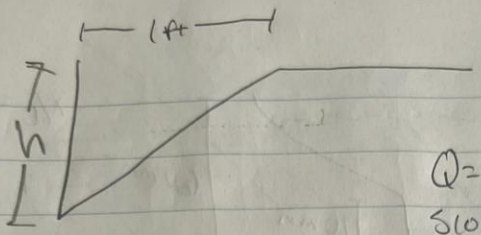


$R = \frac{A}{WP}$, $WP = h + L$

$A = \frac{1}{2} b \cdot h = \frac{1}{2} 2 \cdot 2 = 2in^2$ $A = 10in^2$ $WP = \sqrt{2^2 + 6^2} = 6.32$

$R = \frac{10}{6.32} = 1.58in$

14.21:



$Q = 500 \text{ gal/m} = 1.114 \text{ ft}^3/\text{s}$

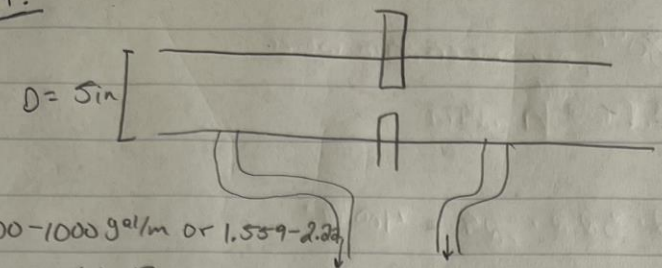
Slope $= .1\% = .001$

$$Q = \frac{1.49}{n} A S^{1/2} R^{2/3} \rightarrow AR^{2/3} = \frac{nQ}{1.49 S^{1/2}} = .4019$$

$$\frac{h}{2}\left(\frac{1}{2}\frac{h}{h+\sqrt{1+h^2}}\right)^{2/3} = .4019$$

$h = 2.09$ ft

15.9:



Q = 700-1000 gal/m or 1.559-2.22

Manometer: 0-8in mere → 0-.67ft

$A_1 = .1259\ ft^2$

$$A_2 = \frac{A_1}{\sqrt{\frac{2gh\left(\frac{\gamma_m}{\gamma_{oil}} - 1\right)}{\left(\frac{Q}{A_1 \cdot C}\right)^2} + 1}} = .06905\ ft^2$$

$.06905 = \frac{\pi}{4} d^2$

$d = .2965$

$\frac{d}{D} = .2655$

$$Re = \frac{VD}{\nu} \rightarrow \frac{\frac{Q}{A} \cdot D}{\nu} = 4.18 \times 10^5$$

$C = .595$

$A_2 = .09752\ ft^2$

$d = .3523 ft$

$\frac{d}{D} = .3213 ft$

$h = .6257 in$

15.15:

$V = \frac{Q}{A}$, $T = 80°F$, manometer = .24 in water

$\rho = 1.93$, $\gamma = 62.2$ lb/ft³, $h = .24$ in

$p = 62.2 \cdot 32.2 \cdot .24 = 480$ lb/ft²

$V = ?$