

23)

$$Q = 30 \text{ GPM} \\ \rightarrow 0.0001893 \frac{\text{m}^3}{\text{s}}$$

$$h_1 = K \left(\frac{V_1^2}{2g} \right)$$

$$V_1 = \frac{0.0001893 \frac{\text{m}^3}{\text{s}}}{2.168 \times 10^{-3} \text{ m}^2} = 0.08732 \frac{\text{m}}{\text{s}}$$

$$\frac{(0.08732 \frac{\text{m}}{\text{s}})^2}{17.62 \frac{\text{m}}{\text{s}^2}} = \frac{0.0076 \frac{\text{m}^2}{\text{s}^2}}{17.62 \frac{\text{m}}{\text{s}^2}} = 3.89 \times 10^{-4} \text{ m}$$

$$h_2 = f \left(\frac{L}{D} \right) \left(\frac{V_2^2}{2g} \right)$$

$$L = 14 \text{ ft}$$

$$D = 1.660 \text{ in} \rightarrow 0.136 \text{ ft}$$

$$0.014 \left(\frac{14 \text{ ft}}{0.136 \text{ ft}} \right) = 1.826 \left(3.89 \times 10^{-4} \text{ m} \right)$$

$$= 7.1034 \times 10^{-4} \text{ m}$$

$$h_3 = f_{\text{fit}} \left(\frac{L}{D} \right) \left(\frac{V_3^2}{2g} \right)$$

$$h_3 = 0.014 (8) (2.19 \times 10^{-4}) = 2.19 \times 10^{-4}$$

$$V_d = \left(\frac{Q}{A_d} \right) = \frac{0.0001893 \frac{\text{m}^3}{\text{s}}}{9.653 \times 10^{-4} \text{ m}^2} = 0.196 \frac{\text{m}}{\text{s}}$$

$$\frac{0.196^2}{17.62} = \frac{0.0386}{17.62} = 0.00196$$

$$h_4 = f_{\text{fit}} \left(\frac{L}{D} \right) \left(\frac{V_4^2}{2g} \right)$$

$$= 0.014 (8) = 1.420 (3.11 \times 10^{-4}) = 3.11 \times 10^{-4}$$

3.1

$$h_4 = 2.4528 \times 10^{-5}$$