

Scanned Documents

4. Minor Losses

2. $d_1 = 150 \text{ mm} = 0.15 \text{ m}$ $d_2 = 75 \text{ mm} = 0.075 \text{ m}$
 $A_1 = \frac{\pi \times 0.15^2}{4} = 0.018 \text{ m}^2$ $A_2 = \frac{\pi \times 0.075^2}{4} = 0.004 \text{ m}^2$

$\frac{P_1}{\rho} = 180 \text{ mm} = 0.18 \text{ m}$ $\frac{P_2}{\rho} = ?$

$C_d = 0.96$ $\rho_{\text{gas}} = 0.8$

$Q = 40 \text{ lit/sec} = 0.04 \text{ m}^3/\text{s}$ $h = ?$
 $(Z_2 - Z_1) = 160 \text{ mm} = 0.16 \text{ m}$

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

$$\frac{Q}{C_d A_2} = \frac{\sqrt{2gh}}{\sqrt{A_1^2 - A_2^2}} \Rightarrow \frac{Q^2 (A_1^2 - A_2^2)}{C_d^2 A_2^2} = 2gh$$

$$h = \frac{1}{2g} \times \left(\frac{Q^2 (A_1^2 - A_2^2)}{C_d^2 A_2^2} \right)^2$$

$$h = \frac{1}{2 \times 9.81} \times \frac{(0.04^2 \times 0.018^2 - 0.004^2)}{(0.96^2 \times 0.004^2)} = 4.26 \text{ m}$$

$$h = 4.26 \text{ m}$$

$$h = \left[\left(\frac{P_1}{\rho} + z_1 \right) - \left(\frac{P_2}{\rho} + z_2 \right) \right]$$

$$h = \left[\left(\frac{P_1 - P_2}{\rho} \right) + (z_1 - z_2) \right]$$

$$4.26 = \frac{P_1 - P_2}{\rho} + (z_1 - z_2)$$

2. $d_1 = 500 \text{ mm}$
 $A_1 = \frac{\pi \times 0.5^2}{4} = 0.196 \text{ m}^2$
 $\rho_{\text{gas}} = 0.8$
 gauge reading = 250 mm = 0.25 m