IRRIGATION – VALVES

Gate valve

Globe valve

Ball valve

Butterfly valve

Hydraulic, diaphragm control valve
Solenoid, diaphragm control valve

Check valves

Pressure relief valve

Pressure regulating valve
A flow of 176 gpm exits a 6-in diameter pipe (ID=6.031 in) into a 4-in pipe (ID=3.521 in). What is the flow rate in the 4-in pipe?

\[ Q_1 = Q_2 \]

\[ v_1 A_1 = v_2 A_2 \]

\[ v_1 x_1^2 = v_2 x_2^2 \]

\[ Q_{1\text{gpm}} = v_{(gpm)} A_{\text{avg}} \]

\[ Q_{1\text{gpm}} = \left( \frac{1728 \text{ in}^3}{1 \text{ ft}^3} \right) \left( \frac{1 \text{ gal}}{231 \text{ in}^3} \right) \left( \frac{60 \text{ sec}}{1 \text{ min}} \right) v_{(gpm)} A_{\text{avg}} \]

\[ Q_{1\text{gpm}} = 448.8 v_{(gpm)} A_{\text{avg}} \]

\[ A_{\text{avg}} = \frac{A_{\text{area}}}{144} \]

\[ A_{\text{area}} = 3.125 A_{\text{ID}} \]

\[ v_{(gpm)} = 0.3208 \frac{Q_{1\text{gpm}}}{A_{\text{avg}}} \]

\[ Q_{1\text{gpm}} = 176 \text{ gpm} \]

What is the velocity in the 6-in pipe?

\[ A = \pi D^2/4 = \pi (6.031)^2/4 = 28.57 \text{ in}^2 \]

\[ v = Q/A = 176/28.57 = 6.12 \text{ fps} \]

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Example

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\[ A = \pi \cdot \left(\frac{D}{2}\right)^2 = \pi \cdot \left(\frac{3.521}{2}\right)^2 = 9.737 \text{ in}^2 \]

\[ v = \frac{Q}{A} = \frac{176}{9.737} = 5.80 \text{ fps} \]