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TECHNICAL BULLETIN

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Check Valve Minimum Velocity and Installation Location Guidelines

In the interest of reducing field related installation problems, Hammond offers the following technical information regarding check valves.

Minimum Velocity:

Swing check valves require a minimum amount of flow, so that the valve functions correctly. If the flow through a check valve is not sufficient to hold the disc in a full open and stable position, the disc and associated internal parts will be in a constant state of motion (wobble). This type of installation results in premature wear, noisy operation, and vibration.

The solution to this problem is flow. A general rule of thumb for water systems has been to maintain a minimum velocity of 7.5 ft/sec. When it is difficult to maintain that velocity, it is sometimes recommended that the line size be reduced.

In piping systems containing other types of fluids, the flow requirements vary with the specific volume of the media. The following formula can be used to approximate the minimum velocity required to fully open the disc:

$$\mathbf{v_{min}\ (ft/sec) = 60\ \sqrt{V}}$$

where V = specific volume of fluid in ft^3/lb
(or 1 / fluid density in lb/ft^3)

Next, determine the mean velocity of flow in the pipe by using the following formula:

$$\mathbf{v\ (ft/sec) = 0.4085\ (Q/d^2)}$$

where Q = flow rate in GPM
d = internal pipe diameter in inches

Ensure that the calculated velocity **v** is greater than or equal to the minimum velocity required $\mathbf{v_{min}}$. If the calculated velocity is *less* than the recommended velocity, further investigation should be done to size the check valve and adjacent piping appropriately.

Silent check valves such as our Figure #IR9253 (Wafer) and #IR9354 (Globe) have slightly different flow requirements. Spring loaded silent check valves are designed to provide a cracking pressure of 0.5 psi and to fully open at a 4 ft/sec velocity.

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Installation Location Guidelines:

All check valves should be installed in a location that has smooth and laminar flow conditions. The following general rules exist for check valve installations:

1) Downstream of a reciprocating pump or other turbulence inducing device (elbow, tee, etc):

Swing Type: **Locate valve a minimum of 10-12 diameters downstream of the device**
Silent Type: **Locate valve a minimum of 4-5 diameters downstream of the device**

2) Pipe fittings, elbows, reductions, etc. downstream of the valve:

Swing Type: **Locate elbow a minimum of 5-7 diameters downstream of the valve**
Silent Type: **Locate elbow a minimum of 2-3 diameters downstream of the valve**

Please consult the factory with further installation questions or for additional information.