

the Repair Guys Hydraulic Shock



In our line of work, we field questions from contractors and technicians concerning repairs, installations, and general backflow prevention practices. We'd like to share some questions we receive and our answers. Everyone has different opinions on these subjects and we would like to hear yours. Contact us with your questions and ideas via email at: imark@backflowparts.com or mail us at American Backflow Products Co., Post Office Box 37025, Tallahassee, FL 32315.

— Mark Inman and Jason Gregg

QUESTION —

As a tester, I am exposed to many different plumbing systems and problems. One of the problems that I experience is water hammer within the piping. Can you explain about what water hammer is, how to control it, and how it affects backflow assemblies?

Mark -

Water hammer is common in both residential and commercial piping systems that use valves to control the flow of water. Most customers will know it simply as 'banging pipes.' The customer will usually consider the rattling and banging of pipes as annoying but not necessarily dangerous. Water hammer is actually a destructive high-pressure surge or shock caused by quick closure of valves or fixtures within a piping system. This surge in pressure, also known as a pressure spike, can cause damage or accelerate failure of system components such as backflow preventers, water heaters, pressure reducing valves, washing machine hoses, pipe, fixtures, and fittings. Let's take a closer look at how and why water hammer occurs.

- Jason

We know that water hammer is an abnormal surge or spike in system pressure, but where does it come from and how does it get started? The two most important things to know about water are that

Outmoded 'air chamber'



it is a non-compressible liquid and it has kinetic energy or momentum as it flows inside the pipe. As water flows through a piping system, it must dissipate its energy. Normally, the friction of the pipeline and or the water discharging will dissipate the energy slowly and no shock is caused to the system. When the flow of water is stopped very quickly, like if an irrigation solenoid valve or flushometer closes, that energy has no time to dissipate. When this occurs, a pressure wave will travel back through the system trying to find a point of relief.

Mark -

This pressure wave is what causes all the problems. If not controlled, the pressure spikes can be as high as 300-400 psi or more. Of course, we know what a sudden increase in pressure like that can do to a piping system. Many times this pressure wave can be absorbed back into



Examples of commercial water hammer arresters meeting ASSE standard 1010.

These devices are sized according to the pipe size.

The Wilkins model 1250 — 3/4 and 1 inch are shown at the left.

The Watts model 15 — 3/4 inch is shown at the right.

Close to plumbing fixture or appliance.

the system water supply, but the initial shock has already done its damage. If the system has a backflow preventer installed, it is considered a closed system and the pressure wave can bounce back and forth in the piping like a ping-pong ball. Every time you hear the pipes banging, that is the pressure wave hitting a barrier in the line. The damaging pressure spikes affect not only the valve that is closed, but the entire system. To help control water hammer and protect the system, the pressure spikes must be absorbed rather than stopped abruptly.

- Jason

Water hammer can normally be controlled by an air chamber installed within the piping system. In the early days an air chamber could be handmade on the job. A plain air chamber is simply a capped piece of pipe or tubing approximately 12 inches long and the same diameter as the supply line. The air chamber would have a pocket



Not all water hammer arresters appear as a 'tube' mounted on top of a pipe. The 'ZURN Shoktrol' has an interior of all-welded nested bellows. The air cushion is hermetically sealed within the unit, and energy is displaced in the upper chamber.

of air that would compress and absorb the pressure spikes. The problem with the simple air chamber is that it could lose its air charge and become waterlogged very quickly. Most manufacturers now offer what is called a hammer arrestor. This mechanical device is an air chamber that has a cushion of air or gas that is sealed to keep the water and gas separated. A sealed piston is used to make the separation and maintain the pressure charge. The piston floats up and down inside the housing to absorb the pressure spike. The hammer arrestor should be installed upstream and as close to the source of shock as possible.

What the codes require:

UPC - 609.10: All building water supply systems in which quick-acting valves are installed shall be provided with devices to absorb the hammer caused by high pressures resulting from the quick closing of these valves. These pressure-absorbing devices shall be either air chambers or approved mechanical devices. Water pressure absorbing devices shall be installed as close as possible to quick-acting valves.

IPC - 604.9 Water hammer. The flow velocity of the water distribution system shall be controlled to reduced the possibility of water hammer. A water-hammer arrestor shall be installed where quick-closing valves are utilized, unless otherwise approved. Water-hammer arrestors shall be installed in accordance with the manufacturer's specifications. Water-hammer arrestors shall conform to ASSE 1010. dw&bp

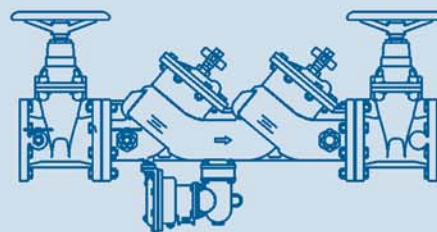


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