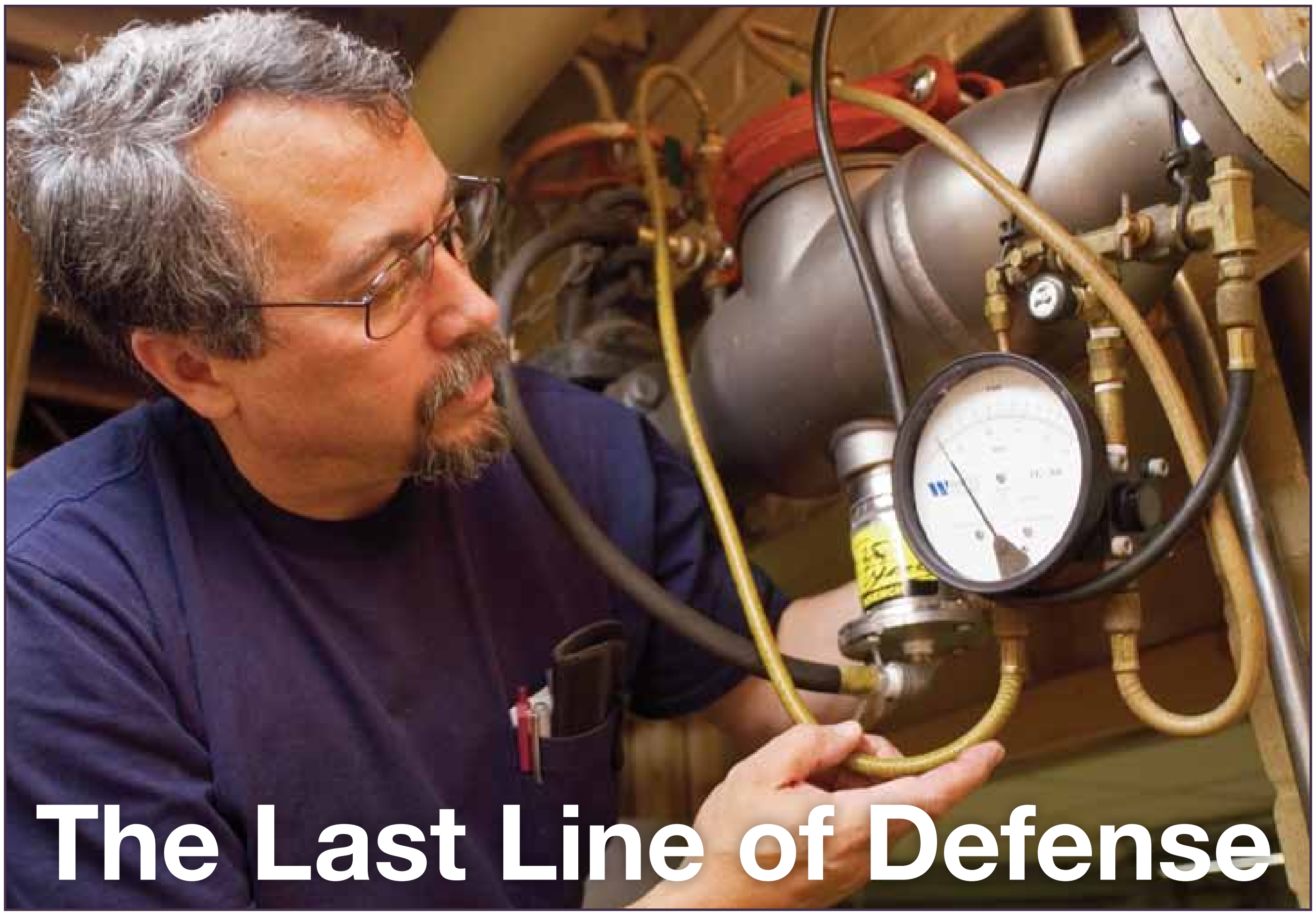


New England Water Works Assn.-certified tester Dave Yates, president of York, Pa.-based F.W. Behler Inc., checks pressure at a Watts stainless steel RP in an underground mechanical "bunker."

The Last Line of Defense

By John Vastyan

Selecting the correct backflow prevention method to ensure safe water

The threat of contaminated water is one of the hottest issues in the water distribution business today. For the most part, technology, technique and testing control the problem, but as infrastructure expands and old systems are pushed to fulfill their roles, the links in the once sturdy chain weaken and are at greater risk.

One of the most important roles in safeguarding water supplies is that of backflow testers. In many respects it is their role to verify system safety at the most critical link, the backflow assembly (BFA), designed to protect drinking water supplies from contaminants.

An F.W. Behler technician installs the water meter on a DCVA fire line backflow preventer.

Rules of Engagement

To protect itself from liability claims, and its customers from the potential of catastrophic accidents, experts generally agree that a water company's backflow prevention program should be written with all specifics articulated and fully enforced. Certain checks and balances for customers and testers become the rules of engagement.

If a stand-alone policy stipulates what, exactly, is to be done during testing of BFAs, the data become fully revealing and forthright. With these demands met upfront, backflow testing provides timely, intelligent information.

The Danger Within

By design, water is expected to flow in one direction within piping systems, from the water supply to the point of delivery. Yet danger lurks when pressure in the piping system exceeds that of the water supply. Any time pressure in the system drops, even momentarily, the system is subject to backflow, back pressure or back siphonage, opening the door to contamination. This can happen all too easily when a water main is shut off or broken, or water demand surges in a specific area.

Ultimately, it is rigorous backflow prevention and competent, thorough testing that guard against the possibility of cross contamination. System designers and testers of these complex piping systems know the importance of eliminating potential cross connections.

This goal has its challenges, however, especially when considering the vastly more complicated connections to water at user sites such as medical and diagnostic centers, research facilities, exterior fire sprinkler systems with glycol antifreeze, and recycled water carwashes, to name a few.

Selecting a Backflow Preventer

The type of BFA needed varies according to the type of substance that may be at risk of flowing into a clean water supply. A pollutant may be a substance that would affect the color or odor of water, but not necessarily pose a health hazard. A true health hazard exists when a substance, if ingested, could cause illness or death.

System hydraulics is the second factor to consider when selecting a BFA. Hydraulics mandate whether a back siphonage, back pressure or continuous pressure device is needed. In the case of back siphonage, reverse flow is caused by negative pressure, or vacuum, in the supply piping. With back pressure, reverse flow happens when the downstream pressure is greater than the supply pressure. The types of BFAs are broken into six methods of backflow prevention:

Air gap assembly. This method uses physical separation by an air space of drinking water and a potential source of contamination. Air gaps are applied only in instances when the loss of system pressure is acceptable. It is considered the best backflow system, but is not practical for modern plumbing systems. This method is approved for severe risk.

Double check valve assembly (DCVA). This method consists of two independent check valves. They protect against back siphonage or back pressure. This method is used under continuous pressure, low-risk connections. Typical uses of these devices include lawn sprinklers, non-toxic fire sprinkler systems, commercial swimming pools and similar applications. A DCVA is approved for moderate risk.

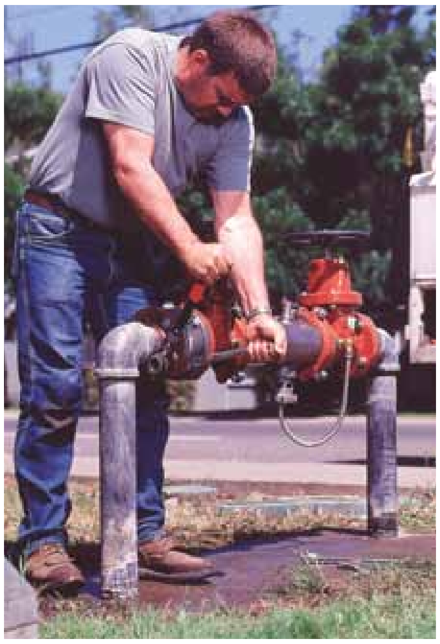
A related device, the double check detector valve, is applied to prevent the reverse flow of fire protection substances. Two examples are Watts' patented SilverEagle 757DCDA Series, manufactured from stainless steel for non-health-hazard uses, and 957RPDA Series, for higher-risk uses such as antifreeze loops. These assemblies detect underground leaks or the unauthorized use of unmetered water.

Pressure vacuum breaker (PVB). These devices are used on connections to nonpotable systems. They protect against back siphonage, but not against back pressure, and may be used under continuous pressure for low- or high-risk connections. Typical applications include irrigation and laboratory equipment. A PVB is approved for severe risk if a reduced pressure zone backflow preventer (RP) is installed upstream as well.

Atmospheric vacuum breaker (AVB). These are used only on cross connections where back siphonage is a potential hazard. It does not protect against back pressure. An AVB is approved for severe risk if an RP is installed upstream as well.

An AVB's air inlet valve closes when water flows in the normal, anticipated direction. But as water ceases to flow, the air inlet valve opens, eliminating the possibility of back siphonage by introducing air into the downstream piping.

This type of assembly must be installed at least 6 in. above all downstream piping and outlets. Unlike a PVB, an AVB cannot be used under continuous pressure.



An installer completes a backflow assembly by tightening the flange.

A technician measures the differential pressure across a backflow preventer's check valves.

Similar to a PVB, an AVB protects against both non-health and health hazard cross connections.

Reduced pressure zone backflow preventer (RP). An RP delivers the highest level of protection against backflow and typically is applied in health hazard cross connections. It can be used on all direct connections subject to back siphonage, back pressure or a combination of the two, and on systems operating under continuous pressure. For instance, Watts' 909 offers RP protection with a high discharge rate due to its dual-ported relief valve. The double-seated relief valve design allows the admission of air through one passage to accelerate the discharge of potentially contaminated water from the intermediate zone of the assembly. RP devices are approved for severe risk.

A device of this caliber is required for conditions of extreme risk, when back pressure and back siphonage may be combined with the fouling of both internal checks. With both checks fouled, the discharge capacity of the relief valve is left to safeguard the water supply. Typical RP installations include main supply lines, boiler feed lines, medical aspirators and other health hazard connections.

Specialty devices. Suppliers also make a variety of specialty backflow preventers for point-of-use applications. Watts' NLF9 dual check with atmospheric vent for laboratory faucets, for instance, includes an intermediate vacuum breaker to provide protection against back siphonage. Specialty backflow devices are approved for moderate risk only.

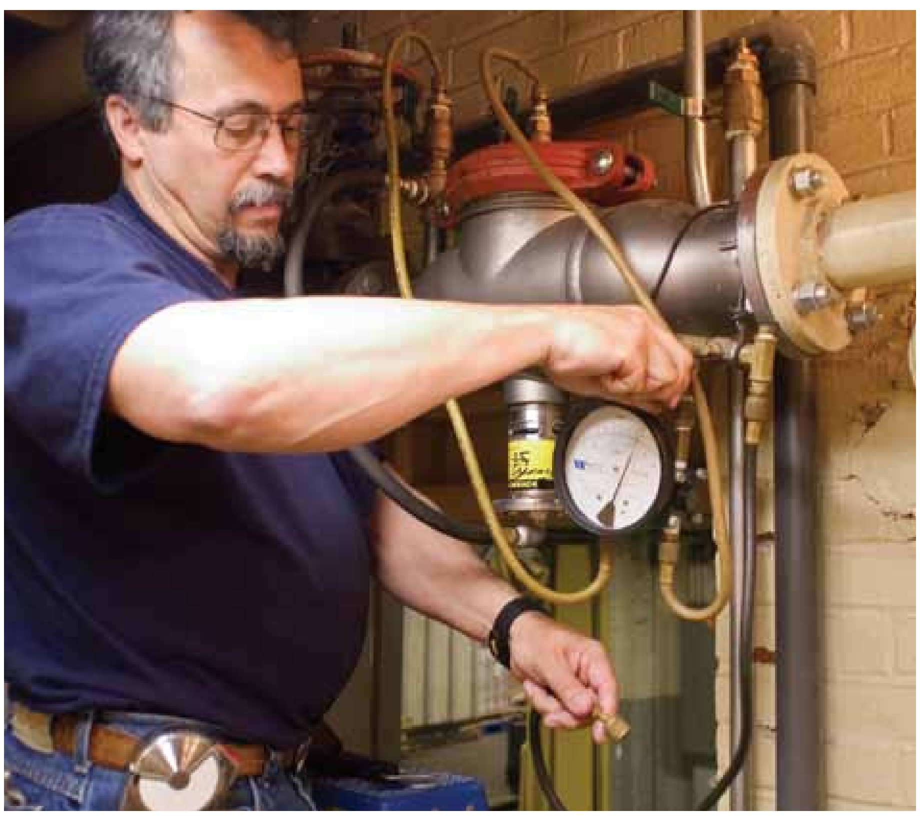
Sizing is determined by system requirements. In most cases, backflow preventers are sized to be line-sized, but this is not true in all cases.

Discharge

A common problem with an RP involves the discharge of water. More often than not, improper flushing of the system during installation is the cause of the discharge.

For this reason, it is important to use certified installers. It is not uncommon for RP manufacturers to receive returned valves as defective, when in fact the valves are designed to be serviced in-line. If discharge occurs upon installation, it simply needs to be cleaned and put back in service.

It is not a matter of if the unit will discharge water, but when. When the valve discharges, it is nearly always fouling on the first check. If dirt has caused damage to the check, then the elastomer needs to be replaced. Adequate floor drain capacity needs to be provided to accommodate discharge water from the relief valve of the RP. *wqp*



Yates double checks the differential pressure for the first check on an RP serving a glycol-infused loading dock sprinkler system.

John Vastyan, owner of Common Ground, is a journalist whose work focuses on the plumbing and mechanical, HVAC, geothermal and radiant heat industries. He can be reached at cground@ptd.net or 717.664.0535.

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