

inside: **flipping the disc / thermal expansion / tenth edition... and more**

CrossTalk

Winter 2005

A New Look

The coming year promises to be an exciting one for the Foundation. In 2005, the Foundation plans to roll out the Tenth Edition of the Manual of Cross-Connection Control to coincide with the Foundation's 60th Anniversary. In order to prepare for the coming year the Foundation will undergo some changes from a marketing standpoint.

First of all, as you can tell, *CrossTalk* has undergone a transformation. The newsletter will continue to focus on issues concerning cross-connection control and backflow. The new look for *CrossTalk* is designed to help the reader locate stories of interest quickly and efficiently. *CrossTalk's* new appearance will correspond with other marketing tools that will undergo a face-lift.

Furthermore, new to this issue is the USC Viterbi School of Engineering sig-

nature that can be found on the bottom right of the front page. The school of engineering has gone through a face-lift of its own. As one of the nation's finest engineering schools, a strong and coherent visual identity is essential. The Foundation is proud to be a part of the Viterbi School of Engineering.

Foundation members will notice the Viterbi signature and its 'V' mark on all of its training tools and marketing tools by the end of the year.

In addition to *CrossTalk*, the Foundation's website (www.usc.edu/fccchr) has also undergone a transformation. The website has become a crucial tool for members and non-members alike. Any information pertaining to the Foundation can be found on the website. It has become the gateway where the Foundation can communicate any late-breaking information instantly to anyone involved in backflow



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Foundation Membership

The Foundation's Membership Program provides many benefits to the Members of the Foundation. These include: a twenty-five percent discount on manuals, twenty percent discount on Foundation Training Courses for any employee of the Member company/organization, the *List of Approved Backflow Prevention Assemblies*, printed quarterly, and access to the up-to-the-minute version of the List for those Members with Internet access.

Members are encouraged to call the Foundation with technical questions. The Foundation's Engineering Staff is available to assist Members with the various aspects of field testing backflow preventers, installing backflow preventers and administering their cross-connection control program.

Many consider their Membership with the Foundation one of their best forms of insurance to protect the agency from liability involved when a distribution system becomes contaminated or polluted through cross-connections. Membership in the Foundation helps to provide the tools needed to effectively initiate and run a cross-connection control program.

Below is a list of those who have become members of the Foundation this past quarter:

Advance Custom Sensor, Inc.	Lockheed Martin Aeronautics
Brown's Heating & Air Cond.	Mark Rippon
Compton, City of	Orange County Sanitation District
Contra Coasts Water District	Pittsburg, City of
Defense Depot San Joaquin	Public Works Center Detachment
Dekalb County	R.J. Briner Plumbing
Doug Ayers	Surrey, City of- Engineering Department
Fluid Resources Management	Turlock, City of
Frank M. Sterzinar, Jr.	Valley Center Municipal Water District
Hunt's Water Services	Virginia Beach, City of
Interlakes Mechanical	Water Specialist Consultants
Liege Corporation	WTS Association

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Flipping the Disc while Repairing Assemblies

A common question received by the Foundation Engineering Staff is: "When repairing a backflow preventer is it OK to flip the disc?"

When testers come across problems during the field test of a backflow preventer, they normally try to assess the situation to determine the problem. Often when a tester obtains an inadequate reading on a check valve, the problem is merely debris, which was caught on the disc. This is cleaned off, the assembly reassembled and re-tested.

Sometimes, the disc may have had some debris embedded into it, which caused permanent deformation. In these cases the tester may be tempted to simply flip the disc over so that the smooth side of the disc (assuming it hasn't been flipped already), which had been against the disc retainer, is sealing against the seat. In some cases this may provide temporary solution, however, this is not the proper means of repairing a backflow preventer.

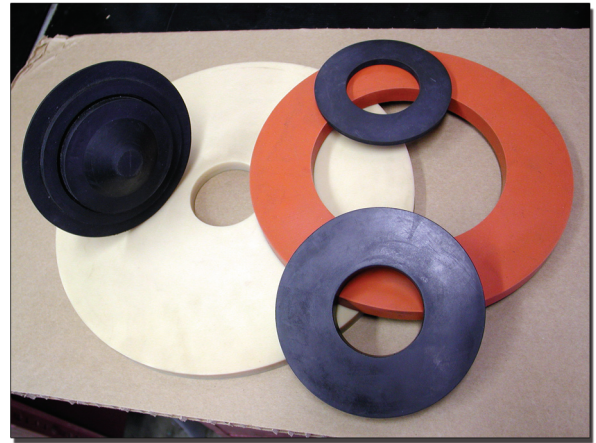


When any portion of a backflow preventer is damaged it is necessary to replace the part with the original manufacturer's replacement parts. To flip the disc is essentially the same as using a "used part." When repairing a backflow prevention assembly, the goal should be more than just getting the assembly to pass the test for the moment, by any means. The repair should leave the assembly in a properly operating condition so that it

will continue to operate properly. Flipping the disc is really not a repair, but a makeshift way of getting the assembly to pass the test for the moment.

In some cases the disc retainer has a phonograph finish or raised rings in order to help the disc stay in place. If this type of disc is flipped the "back" side of the disc may have the markings of the phonograph finish in the sealing area and will likely provide a poor seal against the check valve seat.

The tester should always be prepared to



repair the assembly they are testing. One should have commonly needed spare parts available, such as discs, gaskets, o-rings, etc., or know where original manufacturer's replacement parts are available. If the tester initiates a repair without the proper parts at hand, they could find, when they decide to flip the disc, that it has already been flipped and neither surface is suitable to get a proper seal.

Overall, testers should be sure, when a repair or maintenance is necessary, to do a professional and complete job. A backflow preventer, which is not properly repaired or maintained, may not provide adequate backflow protection when needed.

Thermal Expansion and Water Hammer

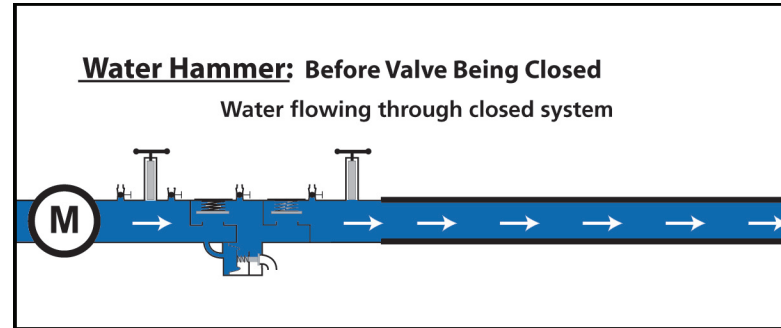
One of the consequences of installing a backflow prevention assembly on any water system is the system becoming a closed system. A closed system is a system, which is not open to the atmosphere. A pressurized tank would be a closed system, since there is no means for the pressure to escape.

A water user's system may be considered an open system if there is no backflow protection. Water flows from the water supplier into the water user's premises through the water meter. Should something cause the pressure on the water user's property to increase, water can freely flow back out into the water distribution system.

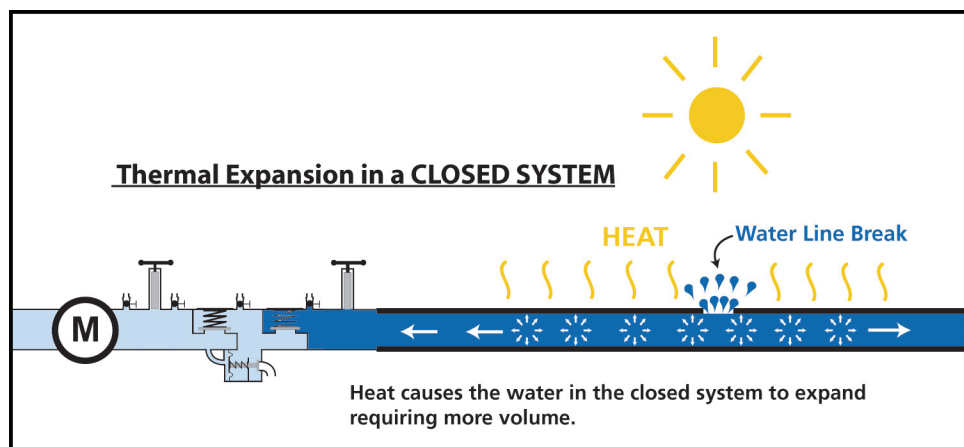
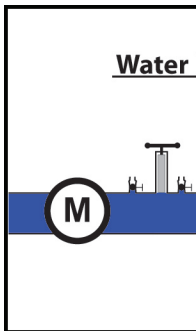
What can cause the water user's system to increase in pressure?

A common phenomenon, which increases pressure, is thermal expansion. Thermal expansion occurs when water in the pipes heats up. This may be due to environmental conditions such as a hot room, or it may be caused by a piece of water-using equipment that is generating heat. Regardless of what causes the water to heat up, when it does it expands and requires more volume. This is no problem in an open system, the water flows back through the meter into the distribution system. However, when the system is a closed system, which occurs when a double check valve assembly or a reduced pressure principle assembly is installed; the water doesn't have anywhere to go. In these conditions the pressure can increase dramatically.

Another phenomenon occurring in hydraulic systems is a water hammer. A water ham-

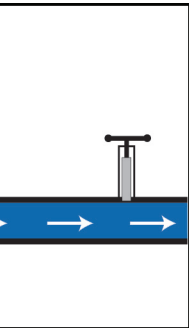


mer occurs when the flow of water through a pipe is stopped quickly. This may occur because of a solenoid valve, or even a quarter-turn ball valve being closed too quickly. The flowing water is stopped when it hits the closed valve, but a shock wave is sent back in the opposite direction. Again, this wave would dissipate if the system was an open system. However, in a system, which is closed, because of a backflow preventer, the shock wave will hit the downstream check valve of the backflow preventer and the wave will move back throughout

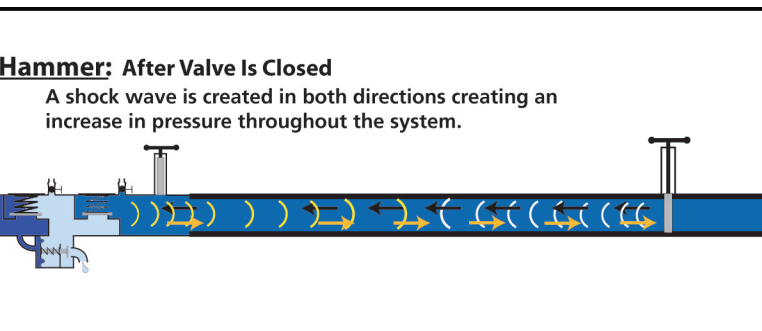


the system. This may increase the pressure throughout the system up to several times the normal water pressure. This is enough

to cause significant damage in equipment and water fixtures. In a mathematical model, water flowing at 15 feet per second through pipe generated an increase in pressure of over 900 pounds per square inch (psi), when a downstream valve was closed instantaneously.



Water hammer can be a great concern by itself, but there are certain conditions, which can multiply the problems created by a water hammer. One example occurred at a large industrial complex. Foundation engineers were called in to investigate the tremendous shaking of pipes throughout the facility, which started occurring shortly after a backflow preventer was installed. The pipes did not shake and stop, but they would begin shaking and continue shaking for several minutes at a time. To add to this



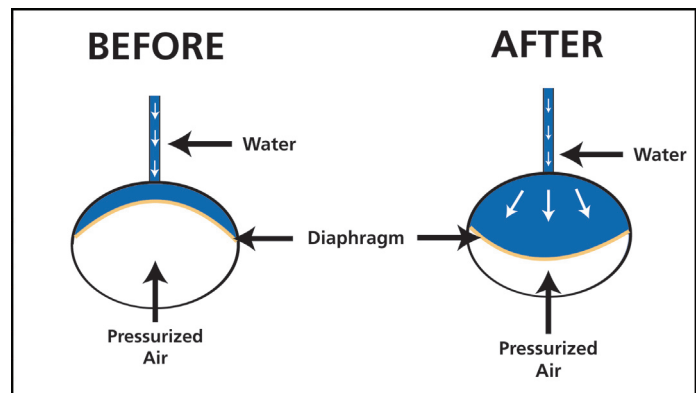
problem, some of the pipes were located in the ceiling area of the computer room, which housed all of the computers for the facility.

After some investigation it was discovered that a storage tank at the facility was filled through a solenoid valve, which closed very quickly. When the valve closed, a water hammer was created sending waves hundreds of feet to the No. two check valve of a reduced pressure principle assembly. Since the backflow preventer had been installed the water hammer could not dissipate and the shock wave was sent back into the facility. Under normal circumstances the wave would soon dissipate. However, in this particular case the frequency of the water hammer waved matched the resonance frequency of the system.

Any system or structure has a natural frequency of vibration called the resonance frequency. When the system is exposed to this frequency, the system itself will begin to vibrate. In some cases, this can cause tremendous damage. The most well known example of this was the Tacoma Narrows Bridge that was exposed to its resonance frequency via the winds blowing through the canyon. The bridge vibrated violently and then collapsed.

In the industrial complex case, the water hammer generated by the solenoid valve caused pipes throughout the complex to vibrate. Fortunately, the solution was discovered before any permanent damage had been done.

What can be done to prevent damage in a system subjected to either water hammer or thermal expansion?



Expansion Tank

Under the thermal expansion situation described above, the system could be protected by the installation of an expansion tank. An expansion tank is attached to the water system and may be pressurized with air on one side of a diaphragm within the tank. When the water pressure increases due to thermal expansion, the tank begins to fill with water pressurizing the air on the other side of the diaphragm. Water is not compressible, so when the water begins to expand due to

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A New Look

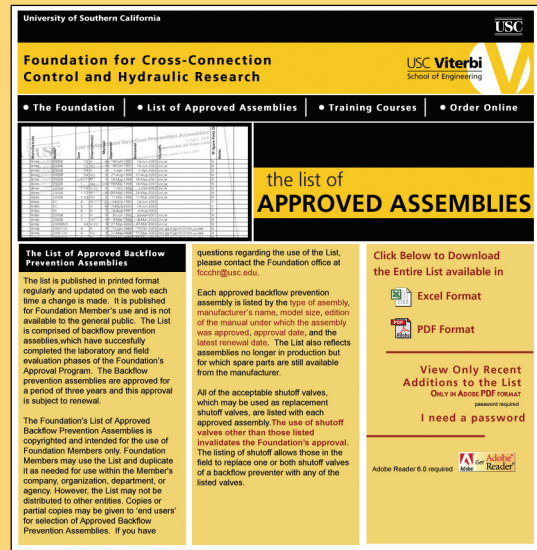
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prevention or cross-connection control. The new look is designed to further help visitors navigate and seek out particular information in a more effective manner.

The Foundation has been broken-down to particular topics on the site. Members will find topics including; services, tools, information and research projects to help navigate their way through the website. The website continues to make available the List of Approved Assemblies to its members, any changes to the list are immediately reflected on the List available on the website. And, the 'Approval Process' section of the website is a must for those interested in having a backflow prevention assembly approved by the Foundation. All manufacturer information and submittal forms for approval are available on the website. In addition, those customers who have questions can submit them directly to the laboratory from the website.

The Foundation hopes you will find the new website accessible and informative for all your cross-connection needs. We will continue to update it as the need arises.

If you have any comments or suggestions about the new site, please e-mail us at fcchr@usc.edu.



Tenth Edition Clarification

A *Cross Talk* article in the Autumn 2003 issue of *Cross Talk* discussed some of the changes in field-test procedures expected in the *Tenth Edition* of the Manual. The article mentions that the 3.0 psid buffer will be removed and the, "first check reading shall be above the relief valve opening point, and a minimum of five psid."

Some have misinterpreted this statement to mean that the first check must hold at a reading of 5.0 psid above the relief valve opening point. In other words, a 5.0 psid buffer. This interpretation is incorrect. In the *Tenth Edition* field test procedures there will be two requirements for the first check of the reduced pressure principle assembly.

- First, the first check must hold at a value above the relief valve opening point.
- Second, the first check must hold at a value of at least 5.0 psid.

So, if the relief valve opened at 4.2 psid and the first check held at 5.0 psid, this would be acceptable since the first check is holding above the relief valve opening point and at a value of 5.0 psid or greater.

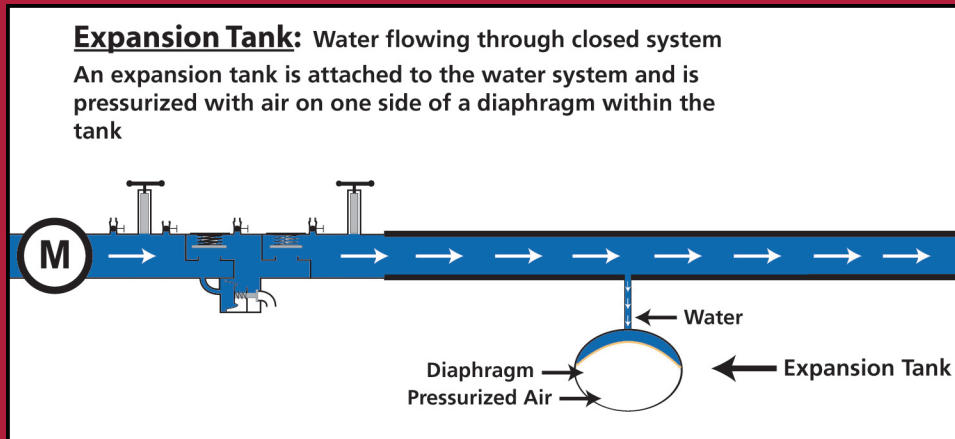
The 3.0 psid "buffer" was originally designed to reduce relief valve discharge during line pressure fluctuation.

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Thermal Expansion and Water Hammer

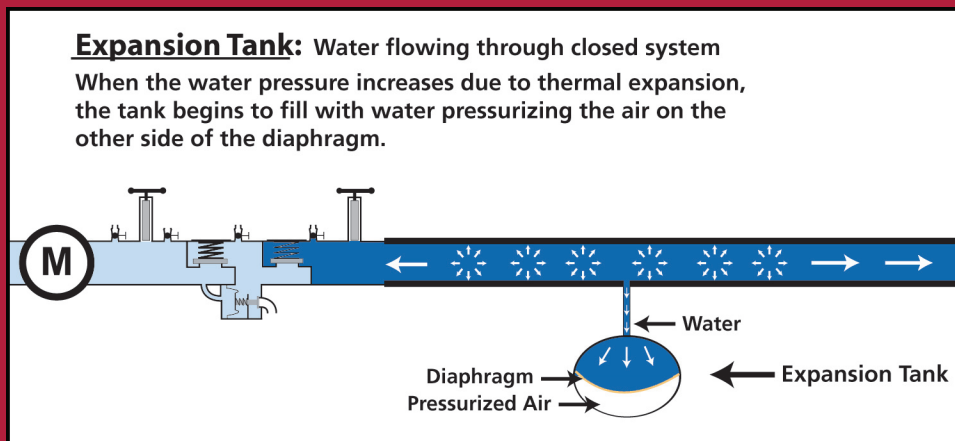
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heat, it needs to go somewhere. Air on the other hand is compressible. So, the expanded water goes into one side of the tank compressing the air on the other side. This



prevents any part of the system from giving way to the expanding water.

Although an expansion tank may help solve a thermal expansion problem, water hammer may be so powerful that an expansion tank won't take care of the problem. A water hammer arrester may be installed to reduce the effects of the water hammer. In some cases some re-engineering of the system may be necessary. For example, at the industrial complex, the solenoid valve was adjusted to close very slowly. So, instead of closing nearly instantaneously, the closure was very slow and thus, the water hammer was eliminated.



Tenth Edition Clarification

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uation. However, the requirement for the buffer does not have an impact on the ability of the assembly to prevent backflow; it was simply there to prevent the nuisance of a discharging relief valve.

There will still be the requirement for a 3.0 psid "buffer" in Section 10 of the Manual, which is the standard for backflow prevention assemblies. This will be part of the Approval process as it is under the *Ninth Edition*; however, it will not be part of the field test procedure.

Training Courses

Tester Course

Los Angeles, CA
16-20 May 2005

Los Angeles, CA
11-15 July 2005

Specialist Course

Incline Village, NV
7-11 March 2005

Los Angeles, CA
25-29 July 2005

Upcoming Events

Spokane Regional
Cross-Connection Control Committee
•Spokane Valley, WA
24 February 2005

Backflow Industry Product Fair
•Los Angeles, CA
22 March 2005

CA/NV AWWA
Spring Conference
•Industry Hills, CA
4-8 April 2005

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