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Foundation for
Cross-Connection
Control and
Hydraulic Research

W i n t e r , 1 9 9 7

Why Does the Relief Valve Open?

Regularly, the Foundation staff receive calls regarding the activation of the relief valve of a reduced pressure principle assembly (RP). Often it is either the owner or maintenance person at a facility which has recently installed a reduced pressure principle assembly. The statement may be something like, “we just installed this valve and it doesn’t work” or, “we just installed this valve and it’s leaking.” Many Foundation Members may receive similar calls. First of all, it is important to define what is occurring, then we can determine if it is a problem and what the solution may be.

Many people have never heard of a backflow preventer until they were required to install one. So, the person complaining about the leaking RP may not have any concept of what it is the RP does. They simply see water coming out of the relief valve and think there is a problem. It is not always possible to determine what the problem is over the telephone, but some problems can be eliminated this way.

The actual activation of the relief valve should be clarified. Is the relief valve stuck in an open position and releasing large quantities of water? Does the relief valve have a constant steady drip or slight stream discharging from the port? Does the relief valve activate periodically spitting water?

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Tenth Edition of the Manual

Although it seems like the Ninth Edition of the *Manual of Cross-Connection Control* was just published, it has already been three years. It is now time to begin the process all over again for the Tenth Edition. The Manual Review Committee (MRC) will begin meeting early this year. In addition to the regular meetings, the Manual Review Committee will be opening certain meetings for public comment, suggestions, etc. Those wishing to address the Manual Review Committee will need to request time on the agenda. Foundation Members will be notified of the dates of the open meetings.

Those wishing to make suggestions, yet not able to attend these meetings are encouraged to send their suggestions to the Manual Review Committee care of the Foundation Office. It is always better to get suggestions in early so that the committee has enough time to address the concerns submitted.

The Foundation will maintain a page on the Foundation’s web site which will keep everyone abreast of the proposals and discussions taking place in the MRC. This will also provide an opportunity for Members to submit comments to the Manual Review Committee via the World Wide Web. Comments will also be accepted through the mail or phone calls.

I n s i d e C r o s s T a l k

Flipping the Disc • Tenth Edition of the Manual • Cross Talk Changes Spitting Relief Valves • Foundation Produces New Video

Foundation Membership

The Foundation's Membership Program provides many benefits to the Members of the Foundation. These include: twenty percent discounts 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 may also call the Foundation at any time with technical questions they may have. The Foundation's Engineering Staff is available to assist Members with the various aspects of field testing backflow preventers, installing backflow preventers, administering their cross-connection control program.

Accurate Backflow, IN
Craig Adams
Ahlee Backflow Service
Amundson Engineering
Australian Backflow
Prevention Services
CH2M - Hill
Correct Flow, Inc.
Gary Verholtz
Kaiser Permanente PTSM
City of Norfolk
City of Northglenn
Town of Parker
Steve Herres Construction
Triangle & Leahy, Inc.
Universal Studios Hollywood
University of Colorado
University of Idaho
White Rock Utilities Limited
Mel Zinberg

Cross Talk's New Look

Cross Talk, as is quite evident, has taken on a new look. With some recent advances in printing technology, it is possible for the Foundation to print *Cross Talk* in full color at a cost just a bit less than the previous two color version. This gives us the ability to include color photographs and graphics, making *Cross Talk* more informative and enjoyable to read. Color photographs provide an effective way of communicating information. Some good examples are shown in the article on *Flipping the Disc*.

You will also notice that the old water drop logo is no longer being used. As mentioned in the April issue of *Cross Talk*, the University of Southern California has undergone a major change of logo and the Foundation, along with all University departments, are using the new University logo.

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Why Does the Relief Valve Open?

Discharging large quantities of water

If it can be determined that the relief valve is discharging large quantities of water, there may be a problem which requires immediate attention. The relief valve could be stuck in the open position due to debris, or the first check of the RP could be stuck in the open position for the same reason. This could also be caused by a ruptured diaphragm in the relief valve. Another possibility is that the second check could be stuck open with a backpressure condition. No matter what is causing the problem, the assembly will need to be tested to determine the condition of the check valves and relief valve.

The relief valve discharges a constant stream or drip.

If the relief valve is discharging a continuous drip or stream, all of the same conditions as noted above may exist, but not to the same degree. The most common problem is a fouled first check. If the first check is not seating properly, for any reason, this will cause the relief valve to discharge under non-flowing conditions. The amount of water discharging out of the relief valve directly relates to the size of the fouling of the check. A slight drip may indicate a fine piece of sand or debris on the sealing surface of the check valve. A stream of water is an indication of something larger. If there is a constant flow of water through the assembly, this problem wouldn't appear until the flow of water is

stopped, such as to test the backflow preventer. When the water flows through the assembly, the pressure drop across the first check valve increases and, therefore, keeps the relief valve from leaking. When, however, the water stops flowing the check valve leaks causing the relief valve to leak, as well.

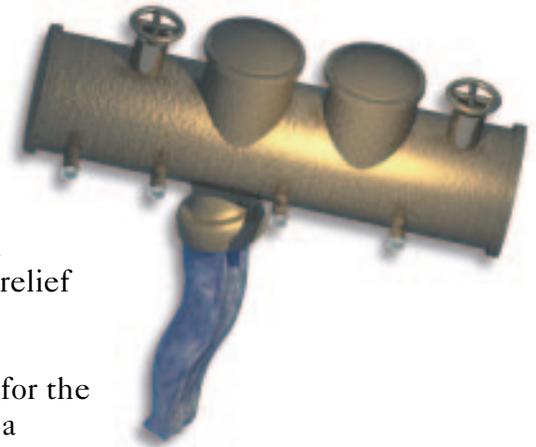
Another possible cause for the relief valve discharging a constant stream or drip is a fouled relief valve. Some debris could be caught on the relief valve disc, not allowing proper seating of the relief valve. In this situation, the discharge out of the relief valve would not be affected by the flow of water through the assembly.

There also remains the possibilities that the diaphragm has a small hole in it, or there is a leaking number two check valve with backpressure.

Intermittent discharges from the relief valve

In many cases the relief valve may be reported as discharging intermittently, or spitting. When this scenario arises, the RP is most likely doing exactly what it is designed to do. The differential pressure relief valve is designed in such a way that it is hydraulically dependent upon the differential across the first check valve. When the difference in pressure across

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Training Video in Production

Using computer animation, and live action the video will be able to, not only demonstrate the field test procedures, but also show the testers what is happening within the assembly...

Last year the Foundation sent a survey to the Members in order to determine which services or products would provide the most benefit to the Members. The survey showed that Members were most interested in a video detailing the field test procedures found in the Ninth Edition of the Manual of Cross-Connection Control. Because of the tremendous interest, the Foundation has begun production on a training video which will explain in detail the field test procedures.

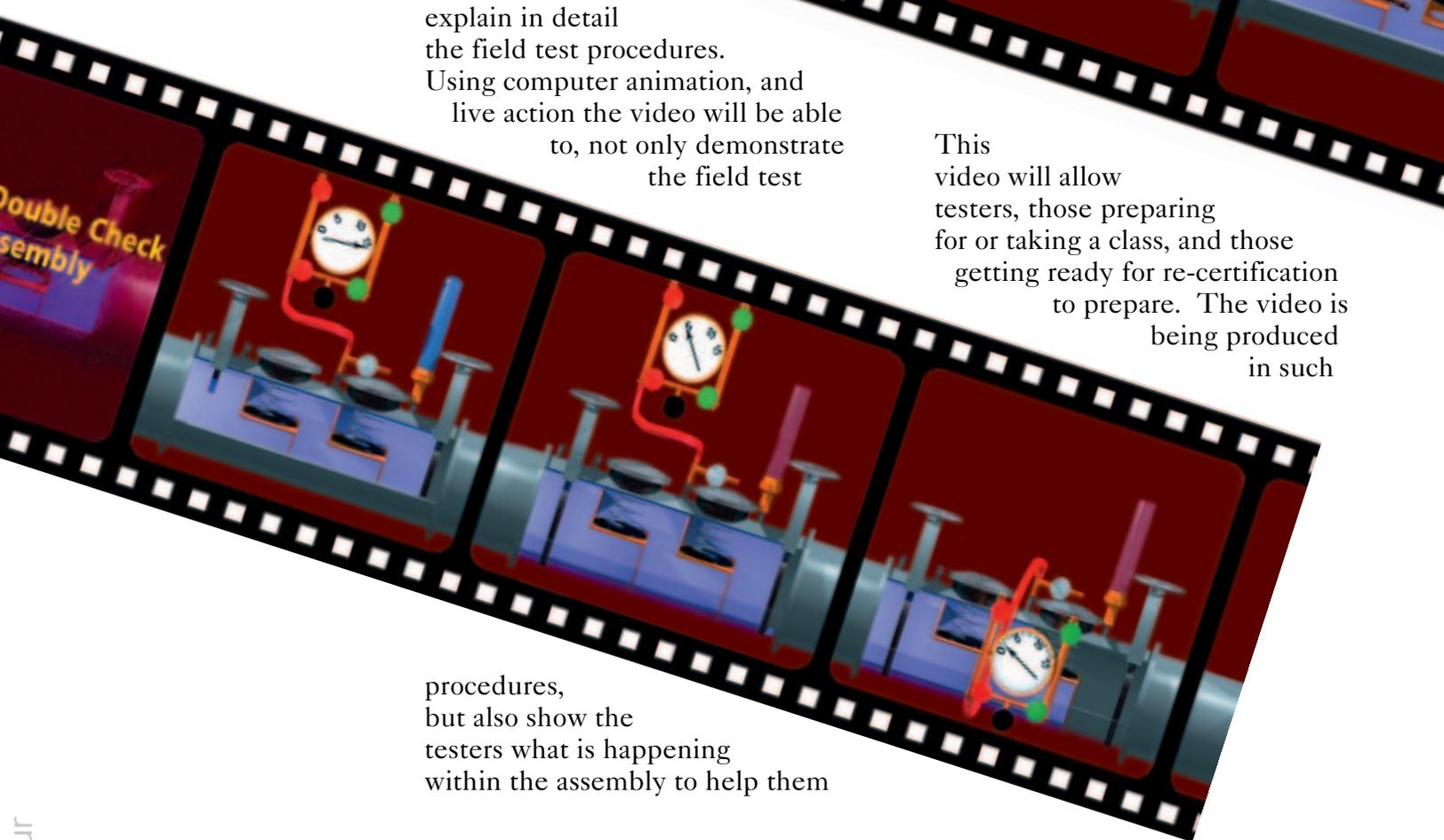
Using computer animation, and live action the video will be able to, not only demonstrate the field test

better understand and learn the field test procedure.

The Foundation's Course for the Training of Backflow Prevention Assembly Testers offers detailed one-on-one instructions to help those attending the course retain the information. However, there is a tremendous amount of information for the attendees to comprehend in five days.

This video will allow testers, those preparing for or taking a class, and those getting ready for re-certification to prepare. The video is being produced in such

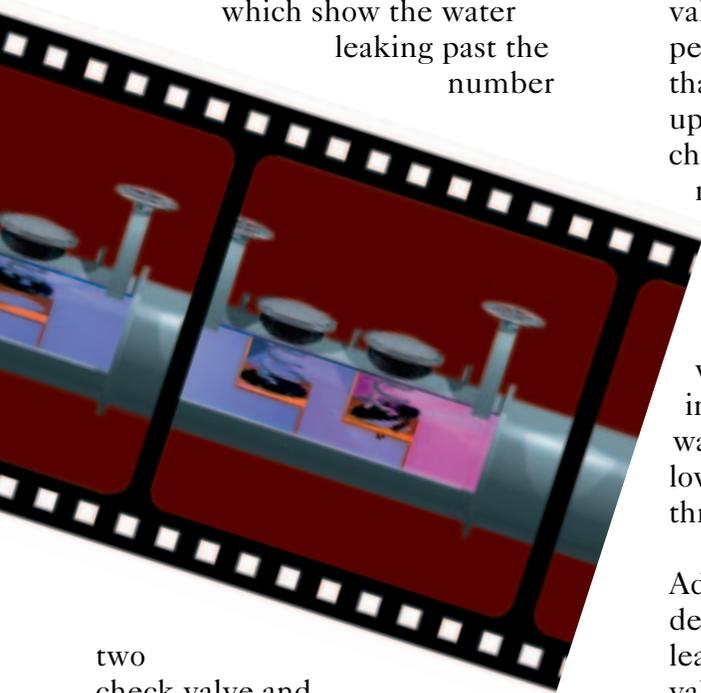
procedures, but also show the testers what is happening within the assembly to help them



The Video

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away to help the viewer understand exactly what is occurring internally when some external observations are made. For example, in testing the double check valve assembly, the tester may notice the water in the tube receding. In the video, the live scene will then fade to animation to show the water leaking through the number two check valve and the number two shutoff valve. When the tester observes the water level in the tube receding in the field, he or she will (hopefully) remember the images from the video which show the water leaking past the number



two check valve and shutoff valve.

Make sure to check the Foundation's web site to see a preview of the video, under Training Tools. As the video is being produced the Foundation is aiming for a low price that will allow individuals to easily purchase the video. Members will be informed as soon as the video is available. It is expected to be available later in the first quarter of 1997.

Why Does the Relief Valve Open?

the first check drops far enough the relief valve opens. This relieves the pressure in the zone between the check valves and keeps the pressure in that zone reduced lower than inlet pressure—thus, the name reduced pressure principle assembly. The assemblies are designed so that the relief valve will keep the pressure in the zone between the check valves at least two pounds per square inch (psi) less than the line pressure upstream of the first check valve. (This means the relief valve has an opening point of at least two psid.) This assures that, even with fouled check valves, the pressure between the two check valves will always remain less than inlet pressure. Since water always flows from high pressure to low, backflow will not occur through the RP.

Additionally, the first check is designed to hold a differential of at least three psi above the relief valve opening point. So, in the case of a relief valve with an opening point of two psi, the first check, if working properly, will hold a differential of at least five psi (two psi relief valve opening point plus three psi buffer). The spitting or intermittent discharging occurs when the pressure fluctuates so much that the differential pressure across the first check valve drops to the relief valve opening point. This can occur



When the relief valve discharges intermittently, the RP is most likely doing exactly what it is designed to do.

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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 disk (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 (as shown on the opposite page) 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

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Discs subject to extreme backpressure conditions may become permanently deformed by the seat embedding into the elastomer disc.



Why Does the Relief Valve Open?

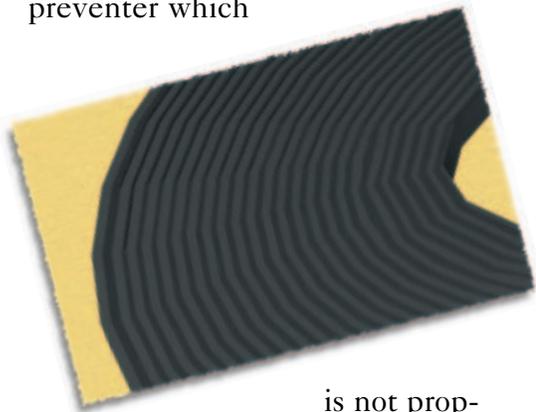
when the line pressure fluctuates more than three psi quickly.

If the assembly is located in a pressure region which has regular line fluctuations, the relief valve could intermittently discharge. Additionally, the discharging of the relief valve, in some cases, causes a slight shock wave to flow through the downstream piping system. The wave can travel through a closed system and “bounce” back to the RP excerpting pressure on the back side of the second check, which, in turn, causes the relief valve to spit. Some field conditions will actually set up a harmonic condition such that the RV continues to spit until the assembly is isolated (i.e., shutoff valve closed). This can be confusing to the person reviewing the situation since the assembly field tests just fine, and when the water is turned back on the RV doesn't discharge. However, once the pressure fluctuation sets off the condition again, the pressure starts bouncing back and forth in the water line and the RV spits.

Flipping the Disc

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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.

If the spitting relief valve is a problem, but the region is not subject to line pressure fluctuations, one needs to investigate other causes of the spitting. Once a backflow preventer is put onto a water system, the system becomes closed and pressure waves created by quick closing valves downstream of the backflow preventer can no longer dissipate into the water distribution system. In some cases, solenoid valves have sent shock waves through a water system to the number two check valve of an RP. The sudden shock against the second check causes the relief valve to discharge—which, in turn, may set up another wave traveling back through the system.

Once one discovers the cause of the intermittent relief valve discharging, a solution can be implemented. It has been reported, in many cases, that a single resilient seated check valve upstream or downstream (depending upon the source of the fluctuation) of an assembly will reduce the fluctuating pressure enough to stop the discharging of the relief valve. If the pressure fluctuation is caused by a solenoid valve downstream, it must be adjusted to close more slowly or a more slowly closing solenoid valve may be used. Other reported solutions include a pressure reducing valve or an expansion tank to dampen out any line fluctuations.

The solution to the problem may be unique to the given piping system and installation. It is important to gather all of the facts and investigate the problem before a solution can be implemented.

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Training Courses

Tester Course

Las Vegas, NV
3-7 February 1997

Los Angeles, CA
12-16 May 1997

Los Angeles, CA
14-18 July 1997

Incline Village, NV
4-8 August 1997

Charleston, SC
15-19 September 1997

Las Vegas, NV
17-21 November 1997

Specialist Course

Incline Village, NV
10-14 March 1997

Ft. Worth, TX
2-6 June 1997

Los Angeles, CA
21-25 July 1997

Upcoming Events

Utah Chapter American
Backflow Prevention Association (ABPA) Meeting
31 January 1997

CA/NV Section AWWA Tester
Refresher Course
-Ontario, CA
22 February 1997

Nebraska Chapter ABPA
Meeting
6 March 1997

CA/NV AWWA Conference
9-10 April 1997

ABPA National Conference
-Ashville, NC
27-30 April 1997

New Mexico Backflow Pre-
vention Society
28 May 1997



**Foundation for Cross-Connection
Control and Hydraulic Research
School of Engineering**

University of Southern California
Kaprielian Hall 200
Los Angeles, California 90089-2531