Foundation for Cross-Connection Control and Hydraulic Research

USC

inside: **direction of flow / disc compression / member rates... and more**

Cross Talk

Summer 2008

The **Approval**Program

Proper operating backflow prevention assemblies are the goal of the Foundation's approval program. It is for this reason the Foundation's approval program requires backflow prevention assemblies to pass a rigorous laboratory and field evaluation. The field evaluation phase of the approval program is the most critical, since no amount of laboratory testing can simulate actual field conditions. The thorough program helps ensure the health of the water using public.

Once the assembly begins the laboratory testing it can complete the laboratory phase in less than 30 days. However, this overall time frame will be affected by the assembly's ability to successfully complete all of the individual laboratory tests. Should the assembly fail to pass one of the tests, the Foundation engineering staff will attempt to determine the cause of the failure and communicate it to the manufacturer. This helps the manufacturer to make design improvements so that the assembly may be resubmitted and the laboratory testing start over again. This can be very time consuming depending upon the complexity of adjustments or redesign necessary.

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Large cycle test being performed on a backflow preventer

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USC **Viterbi**
School of Engineering

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* with access to the up-to-the-minute version on the Foundation's website.

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:

A-ACES

CH2M HILL OMI

East Quincy Services District

H2O Resources Engineering

Inaba Engineering, Inc.

Joe Green Plumbing

K Ramos 2

Kirkwood Community College

Lancaster, City of

Last Chance Handyman Service

Marty Reis

Niking Corp.

Radford, City of

Ty Thompson

Virginia Backflow Service

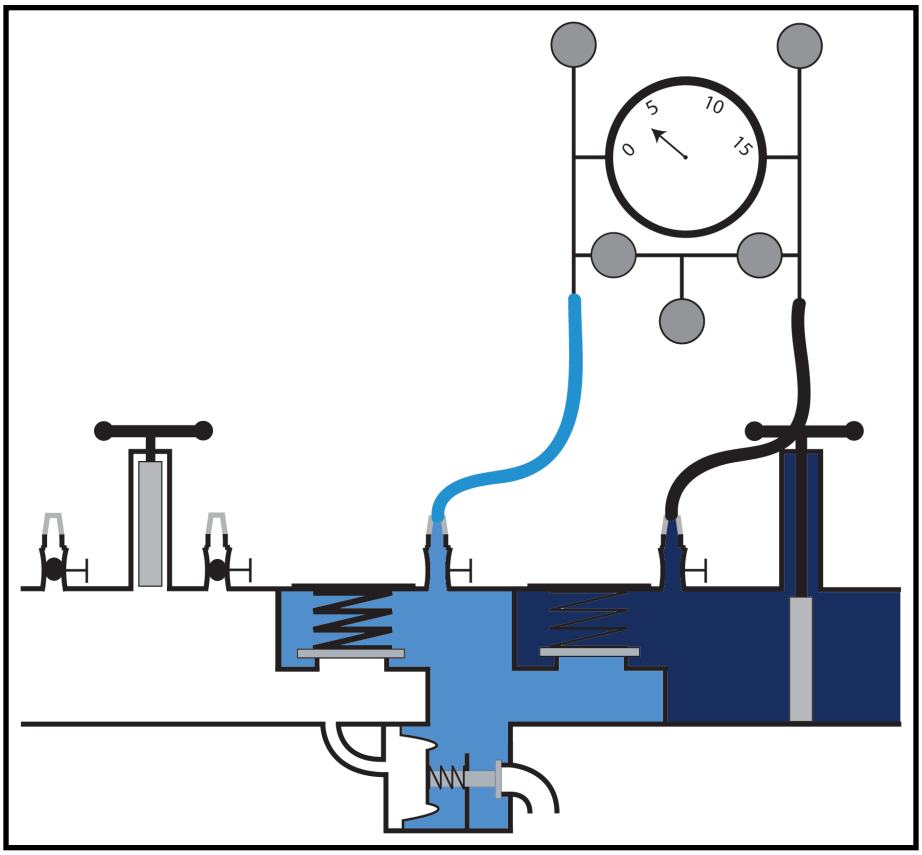
Western Municipal Water Distribution

Cross Talk is published by the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California for Foundation Members. Limited additional copies are available to Members upon request.

printed on **recycled paper**

RP: Direction of Flow Test

Educating the backflow prevention assembly tester continues to be a priority of the Foundation. Field-testing procedures for backflow prevention assemblies undergo updates and changes as each edition of the Manual of Cross-Connection Control is published. And, it is important that the Foundation explains and addresses any issue the tester might have. A common enquiry testers have has to do with the No.2 check valve direction of flow test, for the reduced pressure principle assembly (RP), found in the appendix portion of the Manual of Cross-Connection Control, Ninth Edition (Appendix A.2.2), and why it is not part of the RP field test procedure.



RP: Check Valve No. 2 Test-Direction of Flow (Appendix A.2.2)

The RP field testing procedure, found in the Manual, requires three tests; the relief valve opening point, tightness of No.2 check valve against backpressure and the holding point of the No.1 check valve in the direction of flow. The results would provide a numerical value in PSID (pounds per square inch differential) for the relief valve opening point and the first check value. However, the second check is recorded only as "holding tight" or "leaked" since a numerical value is not obtained. It is that lack of a numerical value that stumps testers and begs the question, "why not a numerical value?"

After serious consideration the 9th Edition of the Manual Review Committee (MRC) decided that recording the second check's numerical value was not necessary to determine the assembly's ability to prevent backflow. However, some administrative authorities would like to have a value for the second check valve. A procedure which provides this information can be found in the Appendix portion of the 9th edition of the Manual. Appendix A.2.2 provides all of the details needed to perform this direction of flow test on the second check of an RP. It is important to note that in order to acquire an accurate numerical value for the second check it is necessary for the RP to have a drip tight No.2 shutoff valve.

Consequently, any RP without a drip tight No.2 shutoff valve would automatically require the repair or replacement of the No. 2 shutoff valve before an accurate test on the second check could be performed. The MRC felt that this would be an undue burden on the owner of the assembly, since the backpressure test would not require the replacement or repair of the shutoff valve and yet would provide an adequate test to determine if the assembly is preventing backflow.

The standard field test, found in Section 9 of the Manual can handle a second shutoff valve leak, while still providing accurate field test results. The MRC took this into consideration

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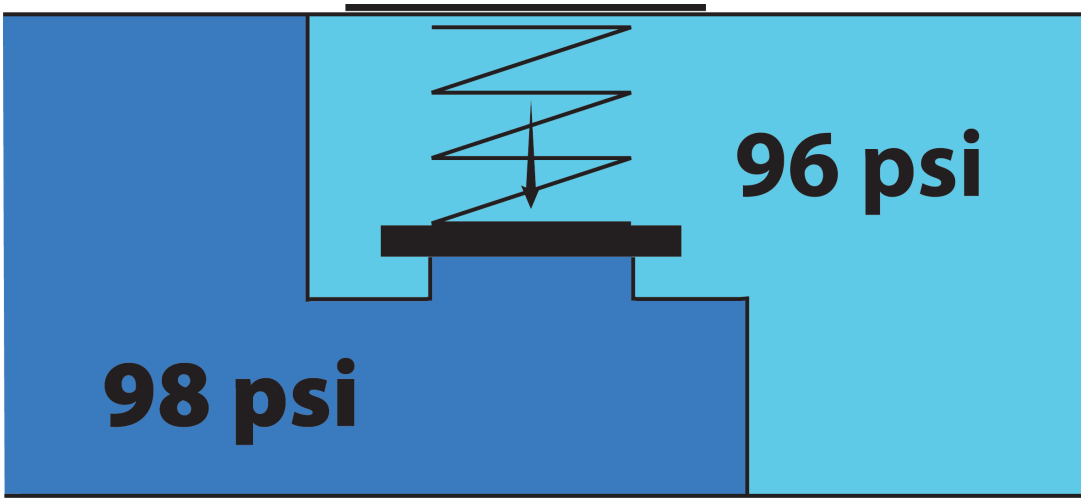
What is **Disc**Compression?

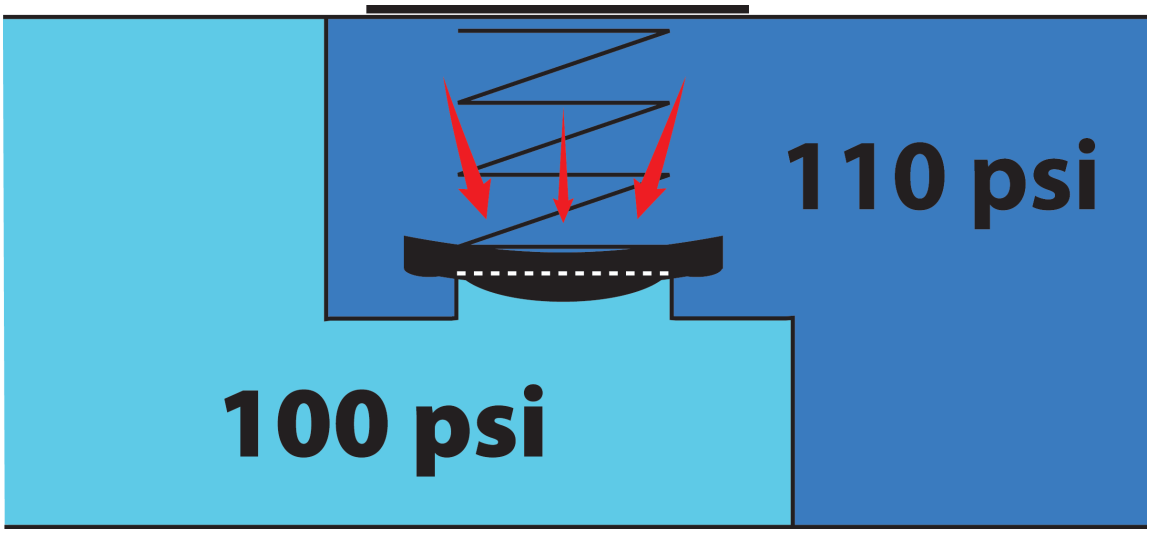
Many testers use the term, "disc compression." Although testers use the term and most understand that disc compression may be the cause of varied or false readings, many do not understand what disc compression is and how it can affect gage readings.



Pressure on the upstream of the check valve is slightly higher than that of the downstream

One point that is important to understand when discussing disc compression is the fact that (at constant temperatures) pressure and volume are inversely proportional in ideal fluids. This means that as the pressure increases the volume decreases. If the pressure decreases, the volume increases. (NOTE: Although water is considered an incompressible fluid, for the purposes of backflow prevention assembly testing it does act as if it is compressible. This is due to tiny pockets or bubbles of air within the various regions of the backflow preventer. The air is actually compressing, giving the water the effects of compressing.)

One of the most common observances of disc compression in the field test procedure is during the second check valve test on the reduced pressure principle assembly (RP). During this test high pressure is taken from the No. 2 test cock, bypassed through the gage and inserted behind the second check valve through the No. 4 test cock. This pressure can force the second check valve disc, which is made of an elastomer material, onto the seat of the second check valve. As the seat imbeds, the portion of the disc within the seat protrudes into the region between the two check valves. As this elastomer disc takes up more of the region between the check valves, the water "compresses," or is reduced in volume. This, in turn, causes the pressure to increase.



In this example, 110 psi backpressure forces a portion of the disc to protrude into the region upstream of the check valve increasing the pressure from 98 to 100 psi

As the pressure in the region between the two check valves increases, this increases the

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During the laboratory testing phase of the approval program, a cycle system is used to perform a specific set of operating conditions such as: pressurization, flow through the assembly, depressurization, backpressure and re-pressurization. This cycle occurs 1250 times at 25%, 50%, 75% and 100% of rated flow bringing the total number of cycles to 5000. The cycle test has assisted in discovering problems which otherwise would not have been found until the field evaluation.

Inside the Foundation's Laboratory

It is important that the manufacturers begin looking for possible field locations as early as possible. Potential sites can be submitted and accepted prior to the completion of the laboratory evaluation phase, thus the assembly can immediately begin the field evaluation phase of the approval program once it successfully completes the laboratory evaluation phase.

During the field evaluation phase of the approval program, the manufacturer places at least three of each model and size of backflow prevention assembly in acceptable field locations. The field evaluation phase of the approval program allows the field units to be tested under realistic conditions where assemblies may be subjected to a variety of hydraulic conditions such as backsiphonage, backpressure, water hammer, continual cycling and a variety of water quality conditions. A crew of the Foundation's Engineering Staff tests these assemblies on a nominal thirty-day schedule.

After twelve consecutive months of simultaneous satisfactory field operation for a minimum of three assemblies of each size and model, they are disassembled in the field to determine whether there has been any undue wear, corrosion, deterioration of parts or other problems, which may render the assembly unsuitable for backflow prevention. It is not until this final inspection is complete that the Foundation's Engineering Staff is able to determine if the assembly has indeed passed the field evaluation.

Should a problem be encountered in the field evaluation phase, which requires design or material modifications, the assembly will need to go back through the laboratory evaluation phase of the evaluation program, before being released to the field again. At that point the one-year field clock will start all over again.

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in the decision not to include the direction of flow test as part of the normal field test for the RP. The backpressure test on the No. 2 check valve provides the information needed to determine if the assembly is preventing backflow. This test will provide accurate results, allowing for compensation of most leaks through the No.2 shutoff valve. This is, therefore, the test that was chosen to be included in the Field Test Procedure in Section 9 of the Manual.

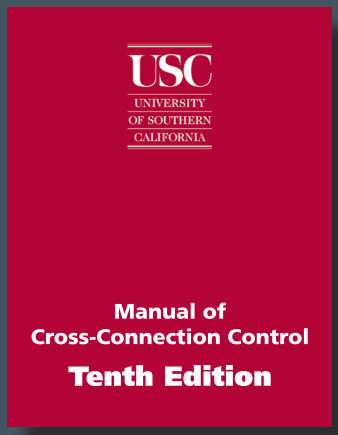
The current draft of the 10th edition of the Manual will continue to maintain this information in the Appendix with the following information:

LIMITATION: A direction of flow value may be obtained for check valve No.2 as long as the shutoff valve No. 2 is drip tight. Any leak in shutoff valve No.2 will invalidate the direction of flow value. If shutoff valve No. 2 is drip tight and the direction of flow value for check valve No. 2 is below 1.0 psid, but greater than 0.0. psid, then the ability of the assembly to adequately prevent backflow is not affected. ■

New MemberRates

For the last 23 years the Foundation membership rates have remained constant. The overwhelming support of its members has allowed the Foundation to become one of the nation's leading authorities in cross-connection control. Unfortunately, because of increasing costs to the Foundation it will be necessary for a slight rate adjustment.

Beginning with all new members immediately and with current members in 2009, the Foundation is increasing its membership rates. Company member rates will increase twenty dollars to $120. New membership rates for water purveyors are the following; less than 2,400 service connection ($120), more than 20,000 service connections ($1,000) and more than 2,400 service connection, but less than 20,000 ($0.05 per connection). State, federal and county agencies membership rate will remain the same ($500.00).



The membership program helps fund the day-to-day operations of the Foundation and it will continue to strive to provide the best possible services to Foundation Members in the future. The increase will ensure the continuous development of cross-connection control information that has become so vital to those involved in cross-connection control.

The membership will continue to include a complimentary copy of the latest edition of the Manual for Cross-Connection Control, access to the List of Approved Backflow Prevention Assemblies, quarterly editions of Cross Talk and discounts on all training tools and courses offered by the Foundation. All members will receive a complimentary copy of the Tenth Edition of the Manual when it becomes available.

Members of the Foundation are encouraged to call the Foundation's engineering staff with any technical questions that they have regarding cross-connection control. ■

The **Approval**Program: continued

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On average, the queue to begin the Foundation's approval program can range between two to four weeks. Once a backflow prevention assembly begins the laboratory testing an assembly may be approved in thirteen months or less. However, many assemblies take longer to gain approval. When problems are encountered, in the laboratory evaluation phase, adjustments are made and the assembly is re-evaluated.

The time taken for a model and size of backflow prevention assembly to become approved varies widely. This depends upon the ability of the original design to successfully complete both the laboratory and field evaluation phases of the approval program. Although it is possible for the approval program to take years, assemblies may be approved in a little over one year. ■

What is **Disc**Compression?: continued

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pressure at the No. 3 test cock. During the entire test of the RP the high side of the gage is attached to the No. 2 test cock and the low side of the gage is attached to the No. 3 test cock and the gage is reading the difference of pressure between the two. When pressure at the No. 3 test cock increases, this brings the pressure at the No. 3 test cock closer to the pressure at the No. 2 test cock. The difference between the two decreases, causing the gage reading to drop.

Normally the drop in the gage reading is not significant, however, it is possible that the gage reading drops to the relief valve opening point. This is why it is necessary to bleed the low side of the gage again, even if the reading drops to the relief valve opening point. Bleeding the low side of the gage releases the pressure added by disc compression. Once the gage reading settles again, the gage reading is indicating the actual static pressure drop across the No. 1 check valve because the tester has compensated for disc compression. ■

A **Brief**Note: **Certification** at Foundation**Courses**

Enrolling in a Foundation Tester and Specialist course is the first step anyone interested in cross-connection control can take. The Foundation's courses are designed to inform and train students in the essentials of backflow and running a cross-connection control program. It is important to note that the Foundation courses are for training purposes only. All certification must be done through the appropriate administrative authority like water, health or licensing agencies.

After a student successfully completes a Foundation course they are given a certificate stating just that. The Foundation is **NOT** a certifying agency. Students at the course are informed to seek out local agencies for certification. Organizations like the American Backflow Prevention Association (ABPA) and the CA/NV Section–American Water Works Association (AWWA) also offer certifications for Tester and Specialist.

At the present time the Foundation does not offer any certification exams for its Tester Training Course. However, students taking the Foundation's Specialist Training course have the option of either taking the USC Foundation exam, ABPA Cross-Connection Control Specialist Certification exam or the CA/NV Section AWWA Cross-Connection Control Program Specialist Certification exam. Note that opting to take either the ABPA or CA/NV AWWA Specialist exam requires a Tester certification. Contact the organization for more information.

If you have any questions concerning certification feel free to contact the Foundation office. ■

USC

Training Courses

Tester Course

Los Angeles, CA
6-10 October 2008

Redwood City, CA
3-7 November 2008

Los Angeles, CA
26-30 January 2009

Specialist Course

Los Angeles, CA
5-9 January 2009

Baton Rouge, LA
2-6 March 2009

Upcoming Events

Inland Counties Backflow Group Annual Conference
San Bernardino, CA
10 September 2008

ABPA Western Regional Backflow Conference
Las Vegas, NV
22-23 September 2008

AWWA CA-NV Fall Conference
Reno, NV
20-23 October 2008

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