Volume 9 / Number 2 / April 1991

Double Check Disc Compression

In a past issue of *Cross Talk*, a discussion of disc compression during the field test procedure of a reduced pressure principle backflow prevention assembly was detailed. In this article, the part played by disc compression in the field testing of the double check valve assembly is discussed.

During the initial test of the check valve being tested (**Manual of Cross-Connection Control,** Eighth Edition, Section 9.3 Test No. 1, Step f), the tester is attempting to lower the pressure in front of the check valve two pounds per square inch (psi) below the pressure behind (or downstream of) the check valve. While bleeding pressure off through the high side needle valve of the duplex gage, the high side needle will normally drop below the low side without the low side ever moving. (See Figure 1.) If the gage maintains this reverse pressure differential, then the check valve is assessed as holding tight. Should the needles on the gage come back together or should they never separate, then the check valve may be leaking. The confirmation test (steps h through k) would then be necessary to confirm the leak.

However, a situation may exist where a good check valve may exhibit a reaction on the gage which appears to be a leak. This takes place in some, (but not all) double check valve assemblies. Testers unaware of this phenomena may

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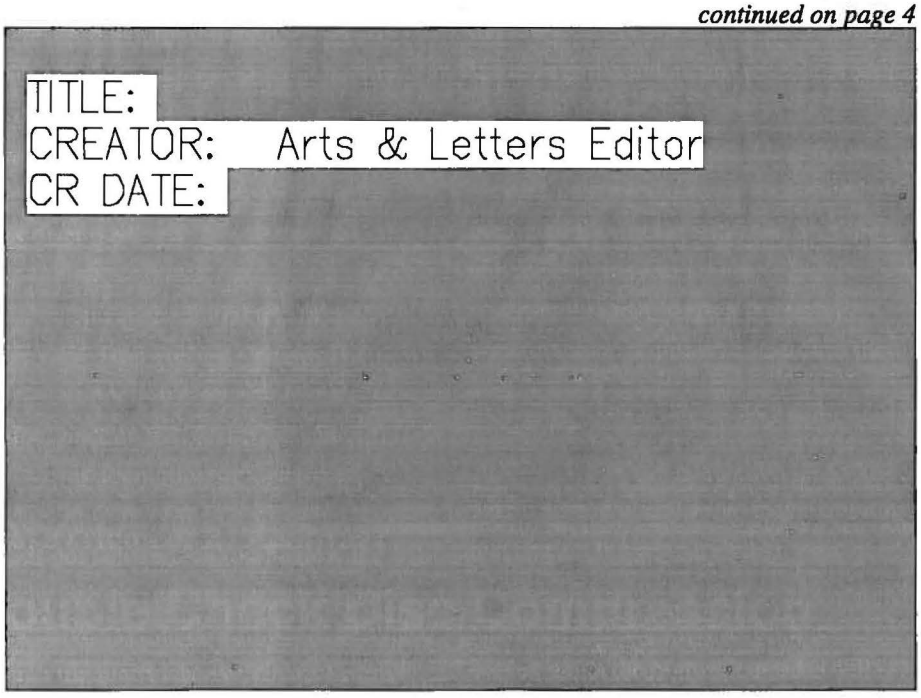

Highlights

- Disc Compression
- Irrigation Systems
- Bill Whiteside Scholarship Fund
- RP Testing

Water Damage Due to Annual Field Tests?

Most backflow prevention assembly testers are conscientious people, however, even the more experienced testers can run into problems.

Let's say that a certified backflow prevention assembly tester has arranged to perform the annual field test on a reduced pressure principle assembly (RP) at the local mortuary. The tester is given permission to shut off the water to test the RP. The tester performs the field test and finds the RP performing acceptably.

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NEW MEMBERS

The Foundation continues to see a growth in Membership. This growth allows the Foundation to provide better service while maintaining the Membership fee schedule. Following is a list of the most recent additions to the Foundation's Membership Program. Thank you for your support of the Foundation and welcome to the Membership Program.

A & D Plumbing
Abbott Plumbing
Alpine Water Users Association
Andersen Technical
Blue Grass Cross-Connection Prevention Association
Carpenter's Plumbing, Inc.
City of Corcoran
Cypress-Fairbanks School District
City of Delano
ELTEC Industrial Systems
City of Fort Bragg
Gonzalez Utilities Association
Harrison Enterprises
Hydro-Designs, Inc.
Incline Village General Improvement District
La Cresta Enterprises
Lindley Construction
City of Moscow
North Georgia Consulting
City of Ojai
Operator Training Committee of Ohio
PAMCAH-UA Local 675
City of Page
Park Water Company & Subsidiaries
Pipe Trades Training Center
Purdue University
R & R Plumbing Heating & Air Conditioning
San Jose Water Company
City of Scottsdale
Service Engineering Group
Triangle Plumbing and Heating
W. C. Service Company
Westcott's Plumbing
Winona Technical Institute
Young's Landscaping

Tester Course

The Foundation Laboratory
13 - 17 May 1991
15 - 19 July 1991
7 - 11 October 1991

Las Vegas, NV
6 - 10 May 1991

Incline Village, NV
5 - 9 August 1991

Non-Members $750.00
Members $600.00

Specialist Course

Las Vegas, NV
10 - 14 June 1991

USC Campus
22 - 26 July 1991

Non-Members $800.00
Members $640.00

Additional courses may be added throughout the year. Please contact the Foundation office for information on courses in your area. Contact the Foundation office for an application for the next USC Training Course or send a hard copy of a purchase order or a check to the Foundation office to reserve a space.

Foundation for Cross-Connection Control
and Hydraulic Research
University of Southern California
KAP-200 University Park MC-2531
Los Angeles, California 90089-2531

A Purchase Order may also be sent via FAX to the Foundation office at (213) 740-8399

USC RECYCLED PAPER

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(213) 740-2032

Irrigation Systems

To maintain our beautiful lawns and flower gardens it is essential that adequate water is available. However, while supplying water for this use, the potential for backflow exists. Take, for example, the sprinkler head used in a typical lawn irrigation system. When originally installed it may have been above the surrounding grade, but as the grass grows thicker or the heads are pushed down due to foot traffic, a pool or cup forms around each sprinkler head. What happens to that water which pools around the sprinkler head? It is most likely contaminated due to fertilizers or weed killers broadcasted on the lawn, a contaminate being a hazard to health (Manual of Cross-Connection Control-Eighth Edition, p. 11, definition 4.12). The lawn may also become contaminated due to animals in the area.

When the sprinkler system has been running for some period of time, water may accumulate around the sprinkler head. Should a backsiphonage condition develop in the potable water line leading to the irrigation system, then the contaminated material could enter the sprinkler head and be carried back into the potable supply, *unless* the appropriate type of backflow protection is properly utilized.

Due to the hazard being a contaminant, the choices of mechanical backflow prevention assemblies are:

- ❑ The AVB (Atmospheric Vacuum Breaker)
- ❑ The PVB (Pressure Vacuum Breaker)
- ❑ The RP (Reduced Pressure Principle Backflow Prevention Assembly)

The vacuum breakers may only be used where a backsiphonage potential exists. Should any source of backpressure be present (for example, if a sprinkler line extends up a hill above the potable supply line or if an injection pump is used) then the AVB and PVB will not provide adequate protection. The only type of assembly which can provide protection against backsiphonage and/or backpressure of a contaminant is the RP.

For most "simple" irrigation systems the AVB and PVB can be used as long as they are properly installed. That is, at the proper elevation (6" and 12" respectively above *all* downstream piping and outlets). These assemblies must not be subject to flooding and the AVB may not be used under continuous pressure. The AVB must not have any downstream shut-off valves which may cause it to remain under continuous pressure. Should there be any questions, the Foundation's Engineering Staff may be contacted at (213) 740-2032.

Manual

The Eighth Edition of the Manual of Cross-Connection Control is available for order. The prices are as follows for each copy of the Manual.

Non-Member - $37.00 each
Non-Member (in quantities of 10 or more) - $29.60 each
Member - $27.75 each

California residents must add appropriate sales tax. To order the Manual please send a check or a hard copy of a purchase order to:

Foundation for Cross-Connection Control
and Hydraulic Research
University of Southern California
KAP-200 University Park MC-2531
Los Angeles, California 90089-2531

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Damage Due to Testing

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Once finished with the test the tester begins to turn the No. 2 shut-off valve back on to restore pressure to the customer. Being an experienced and careful tester, he turns the No. 2 shut-off valve on slowly so as not to cause a surge or water hammer inside the customer's water system. He listens to the water flowing slowly as he puts away his gage and tools.

After a few minutes the water is still slowly running and the tester thinks perhaps somebody inside the building had flushed a toilet or two while the RP was being tested, and now the toilets were refilling. Not wanting to wait around all day for the line to repressurize he returns the No. 2 shut-off valve of the RP to its fully open position. Being done with the test he moves on to his next job.

Ten minutes after the tester leaves, the office personnel at the mortuary notice water flowing down the hall from one of the examination rooms. What may have happened? Could the Tester have prevented this?

Inside the examination room there is a pressure vacuum breaker (PVB) installed on the water line leading to the examination table containing water generated aspirators. (Many plumbing codes require this type of internal protection.) When the No. 2 shut-off valve of the RP was shut off to perform the field test on the RP, the flow of water to the premises stopped. If the customer's water pressure dropped

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Damage Due to Testing

DC Disc Compression

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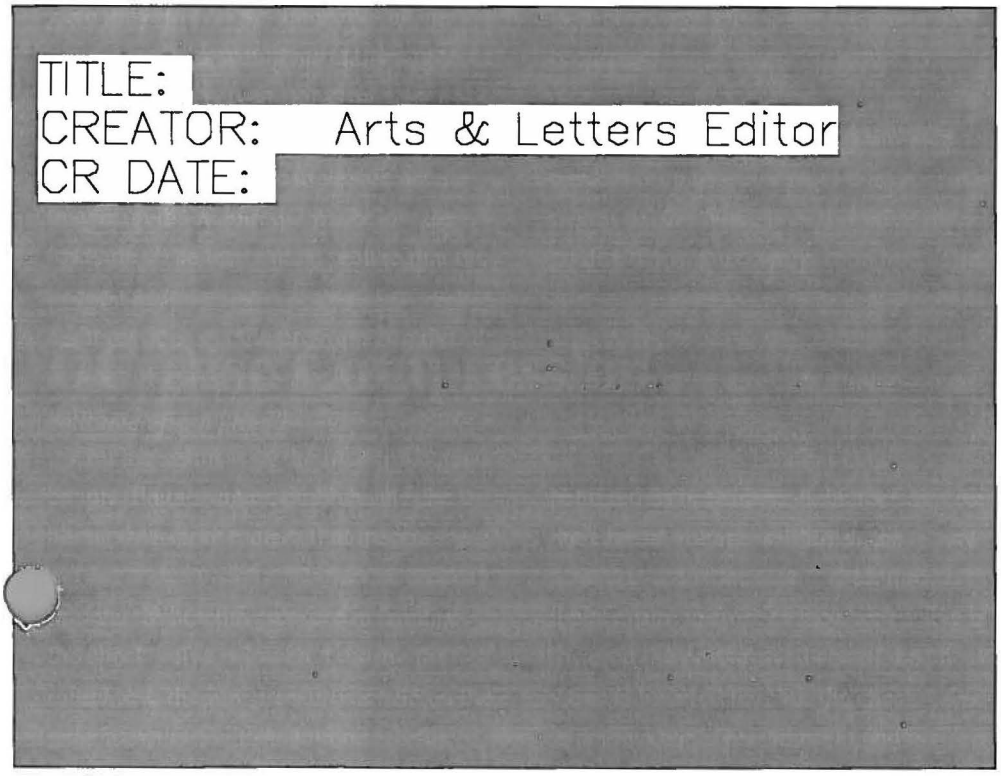
be mis-diagnosing assemblies and be attempting more repairs than necessary.

When the pressure in front of the check valve is lowered during the initial test, the low pressure needle on the gage may drop at the same rate as the high side. This would normally suggest a leaking check valve. But if the tester continues to drop the high side pressure about 10 to 15 psi, the high side needle may drop the required 2 psi below the low side. The tester must realize that the unexpected reaction is due to disc compression. As the pressure is reduced in front of the check valve, the check valve is being squeezed closed. Depending on the softness of the rubber disc and the profile of the seat (i.e., sharp edge or blunt) there will be different magnitudes of disc compression. As the seat embeds into the disc (see figure 2) the volume behind the check valve is increasing. An increase of volume will lower the pressure in this location. Therefore, as the pressure in front of the check valve is lowered the pressure in back of the check valve is lowered too, but the check valve is not leaking. Disc compression is occurring.

Should the high and low side needles drop together more than approximately 10 to 15 psi, then it is advised to go directly to the confirmation test. The confirmation test will compensate for the effects of excessive disc compression, giving the tester a solid reading.

More information may be obtained from the Foundation's Engineering Staff at (213) 740-2032, should any specific questions arise.



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due to internal water use or inadvertent leaks, then the PVBs in the examination room may have depressurized and opened. When the No. 2 shut-off valve was opened following the test, water began to flow out through the air inlet port of the PVB.

The tester is usually not in a position to determine which type of water using equipment is in use throughout the premises. However, it is possible (and recommended) for the tester to notify the owner and occupant of the test to be performed. The owner/occupant should also understand that the water supply will be disrupted for a period of time. The owner may be aware of problems which may have occurred during previous tests and prevent reoccurrences.

If the property has parallel services or a dual service, this problem may not occur; the internal water system would be under continuous pressure even if one of the backflow preventers supplying the property is shut off for testing and/or repair. However, it is always advisable to notify the owner and occupant of the field test being performed.

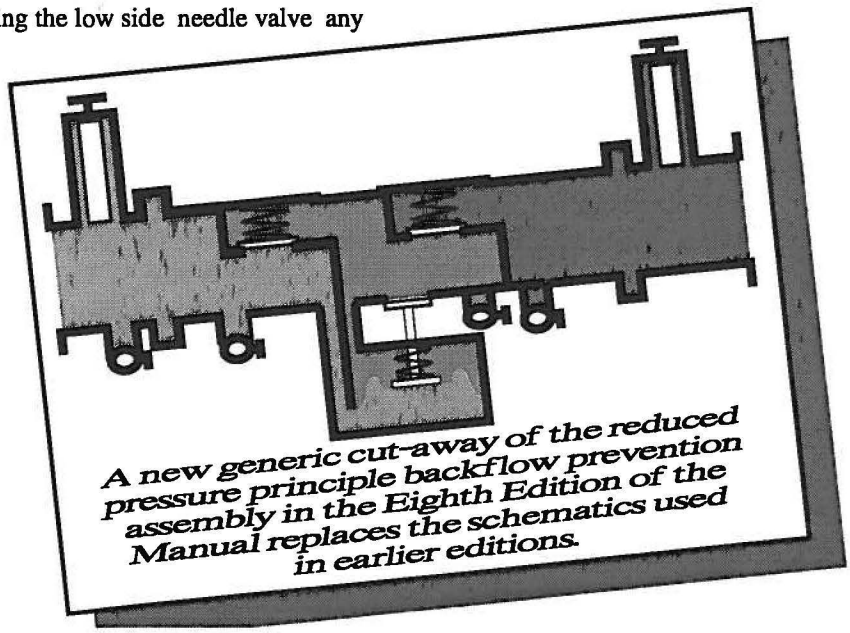
In some cases the owner of the premises may not be the occupant. It is important, not only that the owner be notified, but also those occupying the premises. The occupant may be in a better position to know what water using equipment is in use.

Testing the RP

The Eighth Edition of the Manual of Cross-Connection Control has several changes incorporated into it. Some of the changes take place in the testing procedures for the reduced pressure principle backflow prevention assembly. Although the main theory behind the testing remains the same, some subtle changes have been included in this latest edition.

The main modification in the testing procedure is in the testing of the relief valve opening point. During this portion of the test, the tester is to by-pass water from the upstream side of the number one check valve into the zone of reduced pressure. This is accomplished by opening the high side needle valve substantially and then opening the low side needle valve "slightly." The term "slightly" seemed quite ambiguous and many students in the Foundation's Short Courses would ask exactly how much the valve should be opened. Because of this the Foundation's Engineering Staff ran several tests with different gages at the Foundation Laboratory. It was determined that opening the low side needle valve any more than one quarter of a turn could lead to false readings on the gage due to the dynamic conditions inside the gage. Therefore, the Eighth Edition of the Manual specifically states that the low side needle valve should be opened no more than one quarter turn. If the needle valve is opened to one quarter turn and the differential pressure across the number one check valve does not drop, then a downstream shut-off valve leak is indicated and must be compensated for by an external by-pass hose. Testing according to the one-quarter turn procedure should eliminate a substantial number of false readings.

Aside from the subtle modifications in the testing procedures, a new drawing of the reduced pressure principle backflow prevention assembly has been added to help the reader more fully understand the operation of the assembly. As the drawing below shows, the old schematic has been replaced by a cut-away of a generic reduced pressure principle backflow prevention assembly.



A new generic cut-away of the reduced pressure principle backflow prevention assembly in the Eighth Edition of the Manual replaces the schematics used in earlier editions.

The William Whiteside Scholarship Fund has been established in memory of William Whiteside.

Mr. Whiteside was a member of the Foundation's Board of Directors and helped substantially to direct the course of the Foundation over the last thirty years.

The William Whiteside Fund is an endowment fund. This means that gifts toward this fund will be placed into an interest bearing account. The interest from this account will be used as scholarships for deserving undergraduate and graduate engineering students at the University of Southern California for years to come. Gifts to the William Whiteside Scholarship Fund may be sent to the Foundation at:

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University of Southern California
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Los Angeles, CA 90089-2531

Gifts should be clearly designated for the *William Whiteside Scholarship Fund.*

Calendar of Events

This calendar lists several activities which the Foundation plans on participating in over the next few months. For more information contact the Foundation office at (213) 740-2032.

12 April 1991 - Presentation to Virginia Cross-Connection Control Association, Norfolk, VA

16 - 18 April 1991 - American Water Works Association California/Nevada Section Spring Conference
Newport Beach, CA

22 - 24 April 1991 - Presentation at American Backflow Prevention Association National Conference
Salt Lake City, UT

6 - 10 May 1991 - Tester Short Course, Las Vegas, NV

13 - 17 May 1991 - Tester Short Course, Foundation Laboratory, Los Angeles, CA

10 - 14 June 1991- Program Specialist Course, Las Vegas, NV

15 - 19 July 1991- Tester Short Course, Foundation Laboratory, Los Angeles, CA

22 -26 July 1991- Program Specialist Course, USC Campus, Los Angeles, CA

5 - 9 August 1991 - Tester Short Course, Incline Village, NV

17 - 11 October 1991 - Tester Short Course, Foundation Laboratory, Los Angeles, CA