

## "Hands-On" Testing

Backflow Prevention Assembly Testers are critical to a strong cross-connection control program. If the annual tests performed on backflow preventers are not performed correctly, the assembly may not be providing adequate protection. This is why it is critical to insist that those testers certified to test backflow prevention assemblies, not only take a written exam to show they understand the various concepts involved; but, they also must be able to adequately perform the field test on the reduced pressure principle assembly, the double check valve assembly, and the pressure vacuum breaker.

Effective certification programs require a performance exam. During this exam the candidate must perform the field test on each of the assemblies mentioned above with a proctor observing the procedure. The candidate must also be able to determine what is wrong, or could be wrong, with each type of assembly.

A candidate testing the double check valve assembly (DC) should be able to determine if any of the following conditions is occurring:

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## Is the Assembly Approved Yet?

The Foundation receives calls almost daily regarding the status of a particular backflow prevention assembly. In many cases the caller knows that the assembly is not yet Approved, but would like to know when the assembly will be Approved. Perhaps a sales person from a manufacturing company told them, although the assembly does not appear on the Foundation's latest *List of Approved Backflow Prevention Assemblies*, it will be Approved by a certain date. This type of information can never be certain.




The reason it is not possible for a manufacturer, or even a member of the Foundation's Engineering staff, to predict the Approval date of a backflow preventer, is simple. The assemblies are not Approved until the field evaluation is complete **and** a final inspection has taken place which shows the assembly has not had any problems occur, while under field evaluation, which may prevent it from operating properly. As an example an assembly may be due to complete the field evaluation on a certain date. However, when the anniversary date rolls around, each of the three assemblies on field evaluation are disassembled and inspected. At this point it may be discovered that certain components deteriorated, discs were cut because of a sharp seating surface, elastomers dissolved, or any of a number of other problems occurred. The manufacturer is then notified that there are problems in

the field which must be rectified. This means the assembly will need to begin the field evaluation clock again, once the proposed modifications have been re-evaluated in the laboratory.

The new field evaluation would require at least another year. But, in addition to this, the manufacturer may take several months working on re-designing parts of the backflow preventer or re-formulating materials. Realistically it could be several months before the assembly is ready to be re-introduced into the laboratory for re-evaluation; then, it must undergo the entire one year field evaluation. Not until the assembly successfully completes the both the Laboratory and Field Phases of the Foundation's Approval Program again is it Approved. If the Local Authority had been persuaded to accept a backflow preventer for installation based on

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### Highlights

-  Approval Process
-  PVBs in California
-  Manual Update

# 2 Welcome! ...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.

AGS Plumbing and Sewer Service  
American Backflow Control and  
Testing  
Arkansas Plumbing Inspectors  
Association  
Bender Plumbing  
BCA  
Baxter Home Corporation  
Bouchey Plumbing  
Carson City Water Utilities  
Coast Pump & Supply Co.  
City of Colonial Heights  
Contra Costa Water District

Earth Industries  
Ecolab  
Folsom State Prison  
Georgetown Divide P.U.D.  
Hydro Systems Co.  
City of Kissimmee  
Doug Moore  
Motorola, Inc.  
North Iowa Area Community  
College  
Oliver Plumbing, Heating, & Air  
Conditioning  
City of Orrville

City of South Lake Tahoe  
Larry St. Marie  
University of Nevada, Las Vegas  
Water Purification Consultants,  
Inc.  
Yosemite Park and Curry Co.

## Special Announcement

Foundation Staff  
Members Paul Schwartz,  
and Henry Chang are  
scheduled to speak at the  
upcoming National Confer-  
ence of the American  
Backflow Prevention Asso-  
ciation in Hyannis, MA (26-  
29 April 1992). The presen-  
tations will include: *The  
USC Approval Process,*  
*Training Courses,* and *An  
Update of Activities.*



### Tester Course

#### The Foundation Laboratory

11 - 15 May 1992  
13 - 17 July 1992  
5 - 9 October 1992

#### Incline Village, NV

3 - 7 August 1992

#### Las Vegas, NV

3 - 7 February 1992

**Non-Members \$750.00**  
**Members \$600.00**

### Program Specialist Course

#### USC Campus

13 - 17 January 1992  
20 - 24 July 1992

#### Incline Village, NV

23 - 27 March 1992

**Non-Members \$800.00**  
**Members \$640.00**

Courses may be added throughout. Please contact the Foundation office for information on courses in your area or for an application for the next USC Training Course. You may also 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

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# The Approval Process

The Foundation Approval process for backflow prevention assemblies is an extensive procedure. During early development the manufacturer of the assembly typically submits drawings to the Foundation for review. At this point the Foundation Engineering Staff checks the general design and makes recommendations for improvements or modifications based on past experience. This generally helps the manufacturer to build a prototype which has a much greater probability of success as it undergoes the evaluation process. Once the design is completed and ready for submittal, The Foundation selects one or more assemblies at random from the manufacturers stock for the laboratory evaluation.

First, the assembly is examined to assure that basic design and material specifications are met. This includes examining the waterways, markings, repairability, material conformation, interdependence of components, clearances, testcocks, shut-off valves, etc. If there are no immediate problems with these items the assembly begins the Laboratory Evaluation Phase of the Foundation's Approval Program. There is a different set of laboratory tests to be performed on each type of backflow preventer (i.e., reduced pressure principle backflow prevention assembly, reduced pressure principle detector assembly, double check valve assembly, double check detector assembly, pressure vacuum breaker assembly, and the atmospheric vacuum breaker assembly). In general the assemblies are inspected and evaluated as follows:

- Conformance to the general design and material requirements.
- Pressure loss characteristics for flow rates up to the rated conditions.
- Hydrostatic tests - the test assembly is subjected to twice the rated pressure of the assembly (typically 350 psi) for ten minutes.
- Thermal Test - the assembly is evaluated at the rated working temperature and pressure.
- The assembly is evaluated for effectiveness when simultaneous backsiphonage and backpressure conditions are applied.
- Tolerance to sand, scale and other interfering materials is determined.
- Ease of operation, inspection, test and repair is determined.

Details for each of these procedures is taken from the Manual of Cross-Connection Control, Section 10.

Once the assembly has successfully  
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## **Cross-Connection Control Informational Brochures**

The informational brochure entitled *Working Together for Safe Water* is designed for distribution to the water user. It can be used to explain the basic concepts of cross-connection control, helping the water user understand why they may need to install a backflow preventer or comply with periodic testing requirements. The brochures come with the name, address and telephone number of the ordering agency. This enables you to distribute these brochures to your customers. When they have questions regarding cross-connection control, they can contact you directly for more information. To request a sample of the brochure with an order form contact the Foundation office at: (213) 740-2032 or you may FAX your request to (213) 740-8399


## Approved Assemblies

*Continued from page 1*

information provided, which implied the assembly would be

### ***the Local Authority would now be stuck with an un-Approved assembly in its water system***

Approved by a certain date, the agency would now be stuck with an un-Approved assembly in its system. Additionally, it has no assurance that the assembly will be granted Approval at the end of the new field evaluation. Even if the assembly is Approved following the second field evaluation, the Approved assembly would not be the same as the assembly which was sold to the Local Authority the previous year. Therefore, the Local Authority would still have an un-Approved assembly in their system.

There are occasions when an assembly is Approved just after the publication date of the *List of Approved Backflow Prevention Assemblies*. If this is the case, the Foundation office may be contacted to verify the Approval status of any assembly. In all other cases the latest edition of the *List* is the only published documentation from the Foundation which shows the current Approval status of any assembly. If there is any doubt regarding the status of an assembly, please contact the Foundation office. 

# The Approval Process

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fully completed the Laboratory Evaluation, a minimum of three of each size and model are placed in field locations on different water systems. These locations are found by the manufacturer and accepted by the Foundation. These assemblies are under actual operating conditions for the field evaluation period of twelve months. Every month each assembly is field tested (using the field test procedures detailed in Section 9 of the **Manual**) to determine if they are operating satisfactorily. Should a problem occur, the assembly is disassembled in the field to determine what the cause may be. If the problem is caused by debris in the water, or something not related to the assembly itself, the problem is corrected and the assembly is placed back in operation without the field evaluation being affected.

If, however, the field test failure is due to a problem with the materials or design of the assembly, the field clock is stopped. At this point the manufacturer must make whatever changes may be necessary to correct the problem. Once the corrections have been made, the assembly undergoes the Laboratory Evaluation again in order to assure that the laboratory requirements are still met

with the modified assembly. If there are no problems in the Laboratory, the field assemblies are either modified so they match the new design, or they are replaced completely with the new modified model. At this point the Field Evaluation Phase begins again. If the monthly field tests give the Foundation Engineering staff no reason to disassemble the assembly it remains in operation until the final inspection day.

Once the assemblies have successfully completed the twelve monthly field tests, they are disassembled to determine if there are any problems which have occurred which may prevent the assemblies from operating properly. If no problems are found, the assembly is placed on the Foundation's *List of Approved Backflow Prevention Assemblies*. If, however, a problem is discovered, it may be necessary to make modifications which will require a new laboratory and field evaluation.

At any point in the evaluation process the assembly may need to be redesigned, and thus, brought back to the original laboratory evaluation. From there it would proceed to the field evaluation again. Because of the

## 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 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

Manuals may also be ordered by sending a Purchase Order via FAX to the Foundation office at (213) 740-8399. All Manual orders are processed within 3 days of receipt. There is an extra charge should UPS Blue Label, or Next Day Air shipment be required.

thoroughness of the Foundation's Approval Program it is generally considered the most stringent Approval Program for backflow preventers. This thoroughness assures the quality of those assemblies which are Approved by the Foundation.

Assemblies which are Approved by the Foundation, are Approved for a period of three years. After the three year period, the Foundation may require assemblies to be submitted to the Foundation Laboratory for a review. If there is no indication that the materials, design, or manufacturing processes have changed, then the Approval will be renewed. However, if there are indications that changes have been made since the original Approval was granted, the assembly's Approval will likely be rescinded.

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## Video

### Working Together for Safe Water

#### VHS Video:

Non-Members \$80.00  
 Members \$60.00

#### 16mm Film:

Non-Members \$200.00  
 Members \$150.00

Contact the Foundation office for an order form or send a hard copy of a purchase order or a check to the Foundation office to receive a copy of the Film/Video. California residents must add appropriate sales tax.

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## Ninth Edition Update

Progress continues with the new edition of the *Manual of Cross-Connection Control*. Many changes have been considered by the Manual Review Committee, and many more are scheduled for upcoming meetings.

One of the issues which will be of interest to many is the issue of test gauge equipment and its proper use. As mentioned in earlier editions of *Cross Talk* it is being proposed that the Ninth Edition include specifications for test gauge equipment. To give the certified backflow prevention assembly tester better gauges for their specialized work, the Manual Review Committee has laid out some basic requirements for the differential pressure gauge. Accuracy, usability, and durability are of prime concern. In concert with the new specifications for gauges, the field test

procedures are also under scrutiny. A general reworking of the field test procedures for the reduced pressure principle assembly and the pressure vacuum breaker assembly are being prepared. All attempts are being made to make the procedures more precise, and easier for the tester. Additional diagrams are being added to complement the test steps, and provide more troubleshooting information.

The field test procedures for the Double Check Valve Assembly will probably be changed from the current backpressure test with a duplex pressure gauge to a direction of flow test utilizing the differential gauge. This test would be similar to that of the check valve of a Pressure Vacuum Breaker. More details will be available in our next edition of *Cross Talk*. 💧

## The Approval Process

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If the Foundation discovers prior to the end of a three year Approval period that changes have been made to an assembly, the Foundation may, at that point, request a current production line assembly be submitted to the Foundation Laboratory for detailed review. This is normally done only when the Foundation receives complaints from field personnel about a specific model of backflow preventer. Again, should problems be discovered, it is possible to rescind Foundation Approval at that point. All of this is done to assure that an assembly which is Approved by the Foundation is not modified at some point later in time. The Evaluation process is the same for every backflow preventer. Each size and model must meet all of the Approval requirements. For example, if Model ABC in the 8" size is Approved, it is not implied that the 10" size of Model ABC is also Approved or will be Approved at some later date.

Those assemblies Approved by the Foundation should be exactly the same in the future as they were the day they were Approved. The Foundation depends on its Members to inform the Foundation Office should specific problems be experienced with any size and model of backflow prevention assembly. 💧

### ***Corrections to the List***

The Current ***List of Approved Backflow Prevention Assemblies*** dated 2 January 1992 contains two omissions. The following assemblies were Approved on 26 November 1991 in accordance with the Specifications set forth in the Eighth Edition of the *Manual of Cross-Connection Control*:

#### **Wilkins**

**Model 950 2 1/2" Double Check Valve Assembly**

**Model 975 2 1/2" Reduced Pressure Principle Assembly**

The Foundation offers its apologies for any inconvenience this may cause the Members. These assemblies will appear on the next edition of the ***List of Approved Backflow Prevention Assemblies***.

# Tester Certification

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- First Check Leak
- Second Check Leak
- #1 Shut-off Leak
- #2 Shut-off Leak

Of course if everything is holding tightly, the candidate should be able to determine this also.

A candidate which is testing the reduced pressure principle assembly (RP) should be able to determine the following situations:

- First Check Leak
- Second Check Leak
- Bad Relief Valve
- #2 Shut-off Leak

Additionally, the candidate should also be able to determine if an assembly is operating properly. He/She should determine if the readings obtained while testing the RP are adequate readings. (Does the relief valve open above 2.0 psid? Does the first check hold at a value 3.0 psid greater than the relief valve opening point?)

A candidate testing the pressure vacuum breaker (PVB) should be able to determine each of the following:

- Check Leak
- Air Inlet Opening Low
- #1 Shut-off Leak
- #2 Shut-off Leak

The candidate should also be able to tell if the readings taken while testing the PVB are adequate. (Did the air inlet open above 1.0 psid? Did the check valve hold above 1.0 psid?)

The Foundation staff has observed in many situations that problems occur when the candidate does not properly understand the operation of the backflow prevention assembly being tested. In many cases the candidate will simply memorize which hose is attached to which testcock, and then which needle valve needs to be turned. Then, they take a reading which is written down on the test form. However, this may only work if the assembly is operating properly. This would be fine if every backflow prevention assembly in actual field operation worked perfectly all of the time, but this isn't the case. (If it was we wouldn't need testers anyway.)

It is often found that the candidate can attach the hoses correctly, and turn the correct needle valves on the gage. But, if there is any problem with the assembly, the candidate is stumped. Since these candidates may soon be testers of actual operating backflow preventers, they must be able to determine anything which may be wrong with the assembly. This is why it is so important to be sure that the tester can analyze every possible scenario. Of course, there may be complex and rare scenarios which occur because of an inoperative gage, etc. These types of scenarios will become easier to analyze as the tester gains experience.

However, for initial certification of testers, the candidate must be able to determine the basic conditions of each assembly as outlined above. 💧

# Training Aids

The Foundation currently offers several training and educational aids to its members. The *Manual of Cross-Connection Control* is used by agencies and training centers across the nation to educate those involved in cross-connection control.

Additionally, the video *Working Together for Safe Water* is used by many members to educate their employees, city councils, and customers on the basics of backflow

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*Working Together for Safe Water is used by many members to educate their employees, city councils, and customers on the basics of backflow*

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and what can be done to prevent incidents from occurring. This was designed to educate those which have no prior knowledge of backflow prevention or cross-connection control. Many use this to help their customers understand why they need to install backflow preventers. There is also a small brochure available by the same title which can be distributed to customers and employees alike to help them understand the basic concepts involved. These brochures are imprinted with the name, address, and telephone number of the ordering agency. This allows the customer to contact the agency directly for more information on the local cross-connection control program.

Many have requested that the Foundation provide additional training material. For example, a

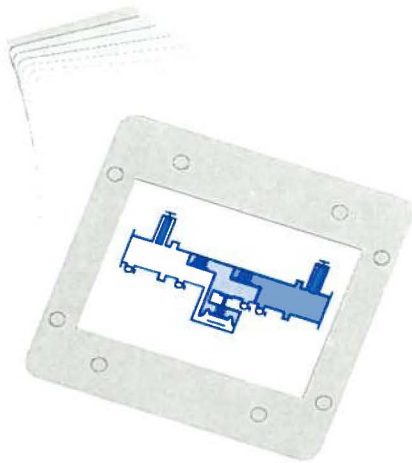
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## Training Aids

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slide presentation which covers the hydraulic concepts of backflow in a more technical manner is currently being developed. This will allow Members to give presentations to local groups which covers the topic in more detail. It may also be adapted to the specific interests of the group receiving the presentation.



Foundation Members will be notified as soon as this slide presentation package is available for distribution.

There are other training aids in the concept stages of development. If there are specific needs you have which can be met by the Foundation, please let us know as we look towards developing new tools for the Members to use in their cross-connection control programs. Please send your suggestions, or comments to the Foundation Office at:

**Foundation Office**  
**University of Southern California**  
**KAP-200 University Park MC-2531**  
**Los Angeles, CA 90089-2531**

**(213) 740-2032**  
**FAX (213) 740-8399**

## Pressure Vacuum Breakers as System Protection in CA

Title 17 of the California Code of Regulations governs cross-connection control regulations in the State of California. However, in reading through Title 17 it can be noticed that there is no mention of the use of pressure vacuum breaker assemblies. The reason for this is that Title 17 covers only *system protection*, that is, protection at the service connection or water meter. Internal protection of cross-connections is not governed by this legislation and pressure vacuum breakers are to be used only for internal protection in California.

There is one exception to the use of pressure vacuum breakers as system protection in California. This is the protection of irrigation systems on median strips. A policy statement from the California Department of Health Services regarding the use of pressure vacuum breaker assemblies states that the assemblies can provide adequate cross-connection control for median strip irrigation systems provided the system conforms to the following criteria:

- Water is used for irrigation purposes only.
- The PVB is installed at least 12 inches above the highest sprinkler head in the system, and adequate clearances are provided for testing and servicing the assembly.
- The system has no means of inducing a backpressure condition.
- The system is supplied from only one service connection.
- Injection of chemicals into the system is not practiced nor provided for.
- The system is only supplied with domestic water.

The policy statement also requires that such assemblies are tested at least annually and are maintained in proper working order. Additionally, the water supplier must maintain records on the installation in accordance with Title 17.

# Calendar of Events

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This calendar lists activities which the Foundation plans on participating in over the next few months. For more information contact the Foundation office.

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- 3 - 7 February 1992* - Tester Short Course, Las Vegas, NV
- 19 - 20 February 1992* - TREEO Cross-Connection Control Conference, Gainesville, FL
- 26 February 1992* - Western States Symposium Association, Albuquerque, NM
- 2 - 6 March 1992* - Program Specialist Short Course, San Diego, CA
- 11 March 1992* - Western States Symposium Association, Portland, OR
- 23 - 27 March 1992* - Program Specialist Short Course, Incline Village, NV
- 26 - 29 April 1992* - American Backflow Prevention Association National Conference, Hyannis, MA
- 20 May 1992* - Western States Symposium Association, Phoenix, AZ
- 13 - 17 July 1992* - Tester Short Course, Foundation Laboratory, Los Angeles, CA
- 20 - 24 July 1992* - Program Specialist Course, USC Campus, Los Angeles, CA
- 3 - 7 August 1992* - Tester Short Course, Incline Village, NV



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