

Testing the RP

The Direction of Flow Test for the Second Check

The field test procedures for the reduced pressure principle backflow prevention assembly (RP) found in the Ninth Edition of the *Manual of Cross-Connection*

included in the Appendix of the Ninth Edition as an optional test. This allows each administrative authority to decide whether or not they would like to have the direction of flow test

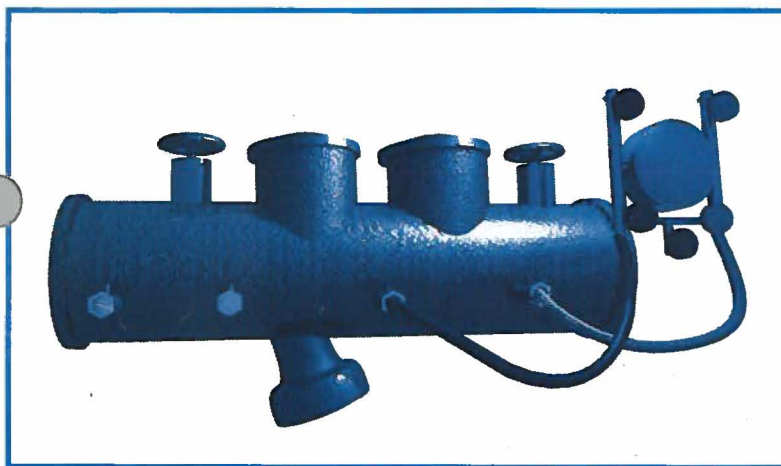
as a requirement in their area of jurisdiction.



Questions & Answers

The Foundation receives many questions on a regular basis. Often the Member needs clarification on an Approval or the understanding of specific uses of backflow preventers. The following are typical of the questions most frequently fielded by the Foundation's Staff. The questions listed are limited to those related to the Approval Program and the *List of Approved Backflow Prevention Assemblies*.

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Control were not published without controversy. One question which arises about the Ninth Edition field test procedures is, "why is a direction of flow test not used on the second check valve?"

This question was raised in the Manual Review Committee for the Ninth Edition and many hours of discussion ensued. There were those who wanted to include the direction of flow test for the second check as a requirement, and others who didn't. The final result, of which many are unaware, is that the direction of flow test is

Why use the direction of flow test?

The direction of flow test on the second check valve of the reduced pressure principle backflow prevention assembly provides the tester with more information than the backpressure test. The design criterion for the second check valve of the RP requires that the second check valve hold one pound per square inch (psi) in the direction of flow:

Requirement: No. 2 check valve shall be drip-tight in the

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Highlights

- **What is "Spare Parts Only?"**
- **"N" and "Z" configurations**
- **Rotating Assemblies on their Axes**

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The Foundation Staff would like to welcome the following new Members to the Membership Program. Remember all Members are welcome to contact the Foundation Office with any questions regarding cross-connection control. Also, Members are granted discounts on Courses, Manuals and Training Tools. We trust your Foundation Membership will be a great benefit to you in your cross-connection control efforts.

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Testing the RP

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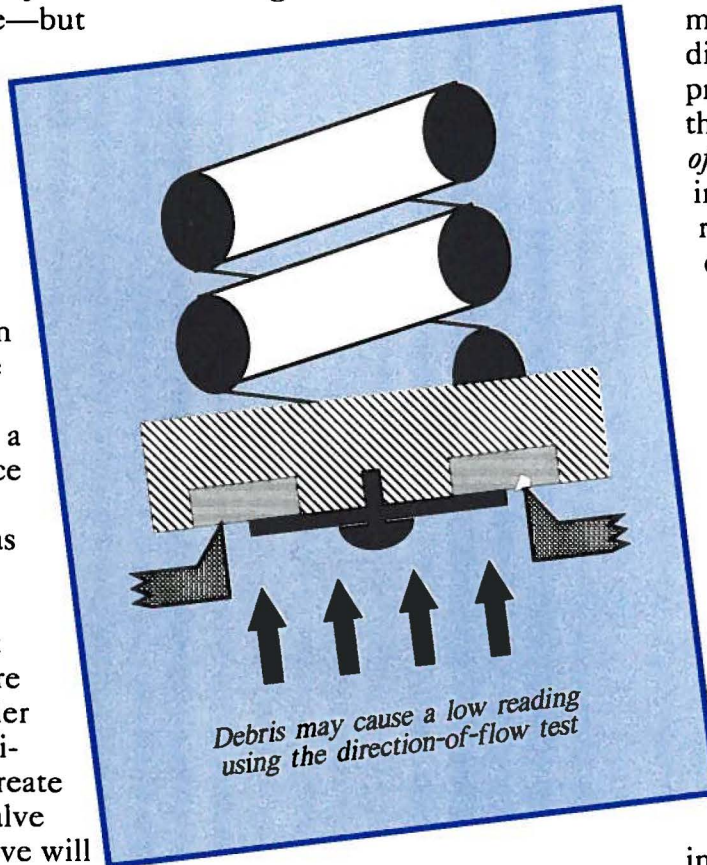
normal direction of flow with the inlet pressure at least 1 psi and the outlet pressure at atmospheric.

When the field test is performed, the tester may not only be able to determine if the backflow preventer is preventing backflow—when subjected to a slight backpressure—but also, using the direction of flow test, the tester may determine whether the assembly is currently meeting the design criterion. This is similar to the argument for using the direction of flow test on the double check valve assembly. Thus the direction of flow test is a higher level of assurance that the assembly is operating the way it was designed to operate.

Another argument against the backpressure test is the fact that under certain laboratory conditions, it is possible to create a leak across a check valve such that the check valve will pass the backpressure test and yet fail the direction of flow test. This is done by fouling the check valve just slightly—perhaps using an object with a high degree elasticity like a rubber band. During the direction of flow test the reading may be lower than the one psi requirement if the loading of the check valve is not high enough to force the check valve to close against the “debris.” With the backpressure test, however, the force exerted on the back side of

the check valve may actually force the check valve to seal around the debris or fouling object.

It is normally assumed that if the check valve holds in the direction of flow, it would also hold against a



backpressure. This is true unless the backpressure is high enough to force a leak through the elastomer disc or actually damage the disc. This, however, is highly unlikely because of the laboratory tests performed on the assemblies before they are ever Approved or even released to the field evaluation phase of the Approval Program. One of the laboratory tests (*Manual of Cross-Connection Control*, Section 10.2.2.3.1) requires the second

check valve to be subjected to a backpressure of twice the working water pressure of the assembly without any damage, permanent deformation or impairment of operation. Any evidence of leakage is cause for rejection.

The arguments given above make one wonder why the direction of flow test is not presented as a mandatory test in the Ninth Edition of the *Manual of Cross-Connection Control*. It is important to understand the reasons for not requiring the direction of flow test.

Why Not Use the Direction of Flow Test?

The field test procedures published by the Foundation are just that, **field** test procedures.

Therefore, it is important to take into account what is actually occurring in the field as opposed to a laboratory setting. Probably the most common problem which arises for the field tester is a leaking shutoff valve. In the field, the tester must be able to perform the test on the backflow preventer realizing that shutoff valves may be leaking. The tester, therefore, either has to repair the leak or compensate for the leak in such a manner that allows for an accurate field test.

When testing the reduced pressure principle assembly, the tester may come across a leaking No. 2 shutoff valve. If the leak

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The *List of Approved Backflow Prevention Assemblies* is published exclusively for the Membership of the Foundation. The List is published and printed quarterly. There is an electronic version of the list available on the World Wide Web for Members with Internet access. This version of the List is updated as soon as any change



is made to the List. If you have internet access, but don't yet have access to the List on the Web, please complete the form at the web site: <http://www.usc.edu/dept/fccchr/list/> to receive your password.

The List shows those assemblies which are currently Approved by the Foundation. There are, however, some questions which often arise concerning the List. One question is:

Does the model number on the assembly have to match the model number on the List exactly?

The answer to this question is pretty simple—Yes! Backflow prevention assembly manufacturers may offer a number of variations from the backflow

prevention assemblies which were tested and Approved by the Foundation. This is why they may have several assemblies which are Approved by the Foundation, yet similar assemblies which are not. Some of the internal materials or components may be different. The assemblies may be shipped less shutoff valves. For each modification, there should be a corresponding change in model number. This is why it is important to match the model number exactly to assure the assembly is Approved. One may see advertisements which state that a “series” of backflow preventers are Approved.

(For example, the Series 100 may be used to represent model 101, 102, 103, etc. in several different sizes.) Although, in this type of situation, all of the series may be Approved, it is important to realize that Approvals are not granted for a “family” or “series” of assemblies. Each individual size and model are Approved separately. Therefore, one must make sure that the specific model number and size are Approved. This can be done by comparing the exact model number on the name tag with the model number and size on the List.

If an assembly is Approved in the horizontal orientation, is it also Approved vertically, or visa versa?

This is one of the most common questions received by

the Foundation staff. The backflow prevention assemblies Approved by the Foundation are Approved for a specific orientation. If the Assemblies are

Assemblies Approved by the Foundation are Approved for a specific Orientation ...Installation in any other orientation will invalidate the Approval.

tested in the horizontal orientation, then they are Approved in the horizontal orientation. Installation in any other orientation will invalidate the Approval. The assemblies listed on the *List of Approved Backflow Prevention Assemblies*, are Approved in the Horizontal orientation, unless specifically noted. One may note many assemblies listed on the List are accompanied by an illustration to clarify any acceptable installation orientations.

Is it OK to rotate an assembly on its axis?

For the same reasons this is not acceptable. Assemblies are only Approved for installation in the orientation under which they were evaluated.

Is it OK to use any of the shutoff valves listed at the beginning of the list with any Approved assembly?

No, this is not acceptable. Shutoff valves shown on the List are listed as a key to the codes which accompany each

Questions and Answers

assembly. Each Approved backflow preventer has been evaluated with a specific set of shutoff valves as an integral part of the assembly. The code which accompanies the assembly in parentheses is the shutoff valve which was submitted with the assembly for Approval. The other codes accompanying the assembly listing are other acceptable shutoff valves for that specific assembly. Only the shutoff valves listed for the specific size and model of assembly are acceptable for use with that particular size and model. Should different shutoff valves be used, the assembly's Approval is invalidated.

A manufacturer's representative told me an assembly is Approved, but I don't see it on the List. How can I be sure if it is Approved?

The printed version of the List is published every quarter. So, it is possible for an assembly to be Approved after the latest printing of the List. Whatever the case, Members may always call the Foundation office to

determine if Approval has been granted to an assembly. As soon as the official Approval has been granted the

List of Approved Backflow Prevention Assemblies published on the World Wide Web is updated. As a matter of fact, the WWW version of the List is the most recent version available. This is the version the Foundation staff will use to confirm the Approval of an assembly. If a Member doesn't have Web access, a phone call to the Foundation will always work.

Can you tell me when a certain assembly will be Approved?

The Foundation's evaluation program includes a one year field evaluation. During the one year field evaluation three of each size and model of assembly under evaluation are placed in actual field locations. These assemblies are tested each month for one year. If any problems occur in the field test the cause of the problem is determined and proper action is taken. This could be the discontinuance of the field evaluation until modifications to the design are made, in which case the field evaluation begins again after a laboratory evaluation. The assembly could simply be fouled by some debris. In this case, the field engineering crew would clean the assembly and proceed with the test.

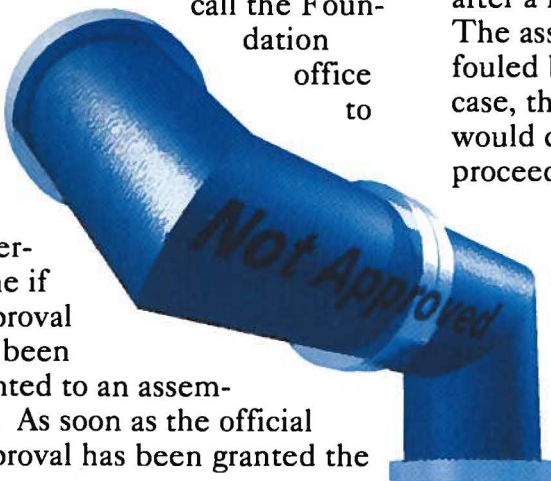
Once all three assemblies in the field complete twelve months of simultaneous trouble free service, the assemblies are disassembled and inspected to deter-

mine if there are any problems which would render the assembly unsuitable for backflow protection. Because of the final inspection it is impossible for the Foundation's engineering staff to predict the Approval date of an assembly. If an assembly completes a full year of acceptable tests, and yet fails to pass the final inspection, the assembly may begin the entire evaluation program over. Therefore, the Foundation's staff will never predict whether an assembly will become Approved by a specific date.

What does it mean when an assembly is listed with the "spare parts only" symbol?

As backflow prevention assembly manufacturers continue to design new products to replace older backflow preventers, the older assemblies are phased out. At some point in time the manufacturer decides not to produce the old assemblies any longer. However, there may be thousands of the assemblies in the field which may need replacement parts at some point in time. It is typical of the manufacturer to continue manufacturing spare parts for the assemblies even though the assemblies themselves are no longer available. In this case the assembly is still listed on the Approved List indicating it is Approved, however, the assembly itself is no longer manufactured, but spare parts are available from the original manufacturer.

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is slight, the tester may be able to perform the field test by compensating for the leak. However, if the tester is utilizing the direction of flow test for the second check valve, it is necessary to

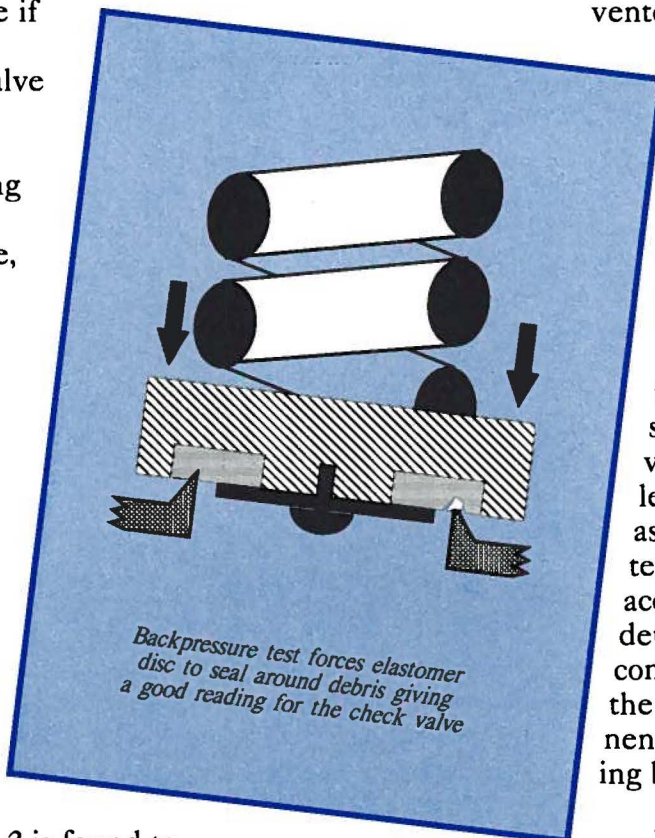
determine if the No. 2 shutoff valve is leaking before performing the test. Otherwise, the test results could be false. Section A.2.2 of the *Manual of Cross-Connection Control* states, "If shut-off

valve No. 2 is found to be leaking this test cannot be performed accurately." A check valve which is leaking (i.e., 0.0 psid) at a static condition, may actually show an acceptable reading of 1.0 psid or greater should there be water flowing through the assembly.

Most testers are quite aware of the fact that shutoff valves frequently leak, at least a small amount. It is desirable to obtain an acceptable field test in situations where one or both of the shutoff valves have slight leaks. If it is necessary to repair

each shutoff valve before proceeding with the testing of the backflow preventer, most testers would be spending most of their time repairing and replacing shutoff valves instead of testing and repairing backflow preventers. Since

the purpose of the shutoff valves is for testing and maintenance, it is acceptable for the shutoff valves to leak slightly as long as the tester can accurately determine the condition of the components preventing backflow.



Discussions similar to those above were raised in the Manual Review Committee Meetings. None of the field test procedures contained in the Manual require that the shutoff valves hold drip tight to perform an accurate field test. It was recognized that the direction of flow test for the second check of the RP can only be performed accurately if the No. 2 shutoff valve held drip tight. To possibly fail an RP due to a drip leak in a shutoff valve was not considered appropriate for a field test. A reasonable field test

must be capable of handling some degree of shutoff valve leak. The result was to include the backpressure test as part of the standard field test for the reduced pressure principle

A reasonable field test must be capable of handling some degree of shutoff valve leak.

assembly, since it is possible to ascertain a leaking No. 2 shutoff valve and compensate for the leak allowing an acceptable field test. However, realizing many administrative authorities will want to use the direction of flow test in order to get as much data as possible in order to ascertain the condition of the assembly; the direction of flow test was added in the Appendix of the Ninth Edition. The limitations of this field test are also noted. This allows each administrative authority to require the testing procedure they prefer. ♦

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The renewal date of an assembly shown on the list is more than three years old; is the assembly still Approved?

This is a good question. The Foundation's Approval is valid for a period of three years. It is the responsibility of the manufacturer to request the renewal of the Approval. It is possible, however, for a renewal to be granted shortly after the publication of the List. Let's say a List is published on the first of the month, but several assemblies' renewals expire on the second of the same month. The Foundation cannot issue a renewal before the expiration date of the original Approval or the latest renewal. Therefore, the List will not be modified until the next printing which is three months later. This does not mean the assemblies' Approvals have expired. These assemblies will likely show as renewed on the next edition of the List. The comparison should be made between the latest renewal date of the assembly and the date of the *List of Approved Backflow Prevention Assemblies*. If the Appro-

als or latest renewal dates are more than three years prior to the issue date of the list, then the Approvals have expired and the assemblies are no longer Approved. It should be noted

that the Renewal dates are not updated with each electronic version of the List. Renewals are updated with the printed version of the



List only.

Some Assemblies shown on the List have various configurations, such as the "N" and "Z" configurations; does this mean any configuration between the two is also acceptable?

Assemblies Approved in various orientations are Approved for those specific orientations. This means they should not be installed in various configurations "between" the Approved configurations. An assembly which can be rotated from an "N" configuration 180°

to a "Z" configuration cannot be rotated 90° to fit another situation.

If I test an Approved assembly in the field and one of the shutoff valves needs to be replaced, do I need to replace both shutoff valves?

The listing of shutoff valves on the List is to allow for replacement with acceptable shutoff valves when a replacement is needed. It is not necessary to replace both shutoff valves. The shutoff valves are used for testing and maintenance purposes on the backflow preventer. The field test procedures in the Ninth Edition of *the Manual of Cross-Connection Control* all allow for a slight leak through shutoff valves while still permitting the tester to obtain acceptable field test results. If, however, one or both of the shutoff valves leak to the point of not permitting the tester to obtain accurate tests, the shutoff valve(s) must be repaired or replaced. Each model and size of Approved backflow preventer has the acceptable shutoff valves shown with the listing on the Approved List. Any one of these acceptable shutoff valves may be used to replace one or both of the shutoff valves. ♦



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