

# Approval of Backflow Preventers

History | Standards | Approval Program

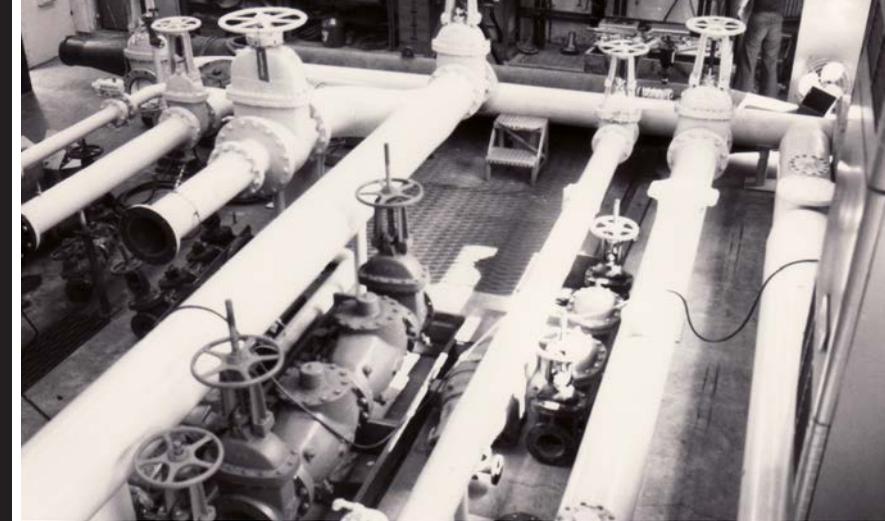


Foundation for Cross-Connection Control  
and Hydraulic Research

## Historical Perspective

After a cross-connection incident in the Los Angeles Harbor in 1943, a group of professionals became concerned that not much was being done to prevent backflow. Wanting to have this problem investigated by an unbiased entity without financial ties to the water products industry; these men approached the University of Southern California. Asking to remain anonymous, these men funded research to investigate this problem of backflow. In 1944 the Board of Trustees of the University of Southern California established the USC Foundation for Cross-Connection Control Research, now called the Foundation for Cross-Connection Control and Hydraulic Research. The USC Foundation began looking into methods of preventing backflow. In 1948 the first standards for backflow preventers were published by the USC Foundation, in a document entitled, "Paper No. 5." Over the years, the standards have been updated and upgraded. The current standards are published in the Manual of Cross-Connection Control, Tenth Edition.

*"...to have this problem investigated by  
an unbiased entity..."*



## How are the Standards Created?

Since the early days, the conviction of the Manual Review Committee (MRC) has been that the standards should be created so that the products resulting from the standard will meet the needs of the Water and Health agencies requiring these products; with the ultimate aim—the protection of drinking water supplies. With this in mind the manual review committees, which have created the standards over the years, have been comprised of Water and Health Agency Officials, Backflow Prevention Assembly Testers and USC Foundation Staff. Manufacturers of backflow prevention assemblies are not allowed to sit as a voting member on the MRC, although the MRC has always asked the manufacturers to offer comments on the Standards portion of the Manual. Presently, the Backflow Prevention Assembly Manufacturers Association may have a non-voting member participate in the Manual Review Committee meetings. This representative makes the MRC aware of the concerns of the Manufacturers that are members of the BPMA. In addition, all MRC actions are posted on the USC Foundation’s webpage for general input.

The Standard is considered a consensus standard, since each negative comment is resolved as the committee develops the Standard. Although this standard is considered a consensus standard, it cannot be an ANSI (American National Standards Institute) accredited standard. ANSI Standards require that the standard developing committees are comprised of users, general interest parties, and the product manufacturers. The USC Foundation, having the conviction that the Backflow Prevention Assembly standards should be created by those tasked with protecting the drinking water supplies, has not sought ANSI accreditation for this Standard.



*“...standards should be created by those tasked with protecting the drinking water supplies...”*

## The Approval Process

The USC Foundation’s approval process is unique for several reasons. First of all, there is a required one-year field evaluation. Also, all evaluation work is done by USC Foundation Staff. The USC Foundation does not allow third parties to conduct the testing, keeping everything under the direct control of the USC Foundation. Manufacturers are permitted to observe the testing, but they are not permitted to participate in the evaluation process itself. ***Of the assemblies already listed by other listing agencies and subsequently submitted to the USC Foundation for evaluation, over 50% of them since 2009 have not passed their initial USC Laboratory Evaluation.***

## The Laboratory Evaluation

First, the working drawings of an assembly are submitted. These are reviewed to determine if there are any obvious areas that do not comply with the standard. Once these have been reviewed; the product is scheduled for evaluation in the laboratory. The laboratory phase of the evaluation process contains many tests. The tests will vary somewhat with the type of product. The USC Foundation has standards for the:

- Reduced pressure principle assembly
- Double check valve assembly
- Pressure vacuum breaker assembly
- Spill-resistant pressure vacuum breaker assembly
- Atmospheric vacuum breaker assembly
- Various detector assemblies.

One of the many laboratory tests performed is the pressure loss across the assembly, which is measured as a function of the flow rate through the assembly. Flow curves are then generated based on this data. The pressure loss must never exceed the maximum allowable for the size and type of assembly. This is true for all flows from static through rated flow.



*“Of the assemblies already listed by other listing agencies and subsequently submitted to the USC Foundation for evaluation, over 50% of them since 2009 have not passed their initial USC Laboratory Evaluation.”*

Assemblies are also subjected to a life cycle test where the assembly is pressurized, water flows through the assembly; it is subjected to backpressure, etc. The assemblies must go through a total of 5000 cycles. At the conclusion of the cycle test the assembly is tested to determine if there has been any damage or deformation to the assembly, which would prevent the assembly from functioning properly

## The Field Evaluation

Once an assembly passes the laboratory evaluation phase of the approval process it still must be determined if the assembly will operate properly in the field. Approximately 30% of the assemblies that pass the laboratory phase of the USC Approval Program do not pass the field evaluation phase the first time through. This is why the field evaluation is so critical and is required for any assembly to become approved by the USC Foundation.

For the field evaluation, three of each size, model and orientation of assembly are installed in three different water systems. These assemblies are field tested on a nominal 30-day schedule by USC Foundation staff. At the end of twelve months, the assemblies are disassembled and inspected. Again, there must be no deformation, damage or problems, which could cause the assembly to not perform properly.

### Rejection

Should an assembly fail to pass one of the tests in either the laboratory or field phases of the evaluation program, the manufacturer is notified. Modifications or corrections are then made to the design and/or materials of the assembly and it is resubmitted to the laboratory first and then to the field.

*“Approximately 30% of the assemblies that pass the USC laboratory phase of the approval program do not pass the field evaluation phase the first time through.”*



## Approval

Once an assembly is approved, it is listed on the USC Foundation's List of Approved Backflow Prevention Assemblies. The assemblies are approved for a period of three years, after which the approval may be renewed for additional three-year terms. The USC List of Approved Backflow Prevention Assemblies is available online and is updated each time an assembly is approved. A mobile web app is available at [usclist.com](http://usclist.com). An annual printed List of Approved Assemblies is published as well. This is distributed to USC Foundation Members and is available for purchase by non-members. The List includes all of the details about the assembly, such as:

- Edition of the Manual under which the assembly was approved
- Approval date and latest renewal date
- Specific shutoff valves which are acceptable to use with this assembly
- The orientation(s) in which each assembly is approved
- Water meters and bypass assemblies acceptable with each detector assembly
- Whether or not the assembly meets the  $\leq 0.25\%$  Lead requirement of some states and the Safe Drinking Water Act
- If the assembly has spare parts available, but is no longer being manufactured

The USC Foundation has been approving backflow prevention assemblies since the 1940's. The rigorous laboratory and field evaluations are designed to ensure that backflow preventers approved by USC meet the highest standards available.



Foundation for Cross-Connection Control  
and Hydraulic Research

University of Southern California  
Research Annex 219  
3716 South Hope Street  
Los Angeles, CA 90089-7700

Ph: 866 545-6340  
Fax: 213-740-8399  
Web: [fccchr.usc.edu](http://fccchr.usc.edu)  
Email: [fccchr@usc.edu](mailto:fccchr@usc.edu)  
Web App: [usclist.com](http://usclist.com)

