

School of Engineering

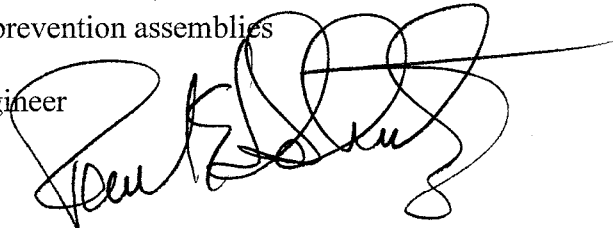
Foundation for
Cross-Connection
Control and
Hydraulic Research

To: Manufacturers of backflow prevention assemblies

From: Paul Schwartz, Chief Engineer

Date: 29 October 2004

Subject: Evaluation Policy 04-001
Cycle Test Failure Criteria



This memo is to notify the manufacturers of backflow prevention assemblies that the Foundation Engineering Staff will be implementing a modification of the cycle tests performed on double check valve assemblies (DC) and reduced pressure principle assemblies (RP). Inquiries have been received from the manufacturers to consider the early implementation of the performance base failure criteria developed by the Manual Review Committee for the Standards in the 10th Edition. The current cycle tests (Sections 10.2.2.3.11 and 10.2.3.3.6 of the 9th Edition) state that damage or permanent deformation shall be cause for rejection. The proposed 10th Edition cycle tests have been developed with performance tests (i.e., direction of flow, one psi backpressure, and 150 psi backpressure) as more objective causes of rejection.

The Staff reviewed the results of cycle tests performed over the last two years and concluded that the additional performance based failure criteria provides satisfactory results. In addition, it had been anticipated that the 10th Edition would have been published by the end of 2004, but that target date will not be met.

Therefore, the attached performance based failure criteria, Evaluation Policy 04-001, will be implemented starting 1 November 2004 .

Should you require any additional information, please contact our Laboratory Staff.

**Foundation for Cross-Connection Control and Hydraulic Research
University of Southern California**

Manual of Cross-Connection Control - 9th Edition

**Evaluation Policy 04-001
Issued 1 November 2004**

**Standards
for
Reduced Pressure Principle Assemblies (Section 10.2.2)**

Double Check Valve Assemblies (Section 10.2.3)

Section 10.2.2 - Reduced Pressure Principle Assembly

10.2.2.3.11

Purpose: To determine if the assembly sustains any damage, permanent deformation, or impairment of operation following the specified cycles.

Requirement: The assembly shall withstand the specified cycle without leakage, damage, permanent deformation, or impairment of operation.

Steps:

- a. Install assembly into suitable test line which can generate the following parameters:

Rated flow of assembly under test (per Table 10-1)

Line pressure of 60 psi \pm 10 psi (414 KPa \pm 69 KPa)

Temperature of 110°F ^{+30/-0} °F (43°C. ^{+17/-0} °C)

Backpressure of 150psi \pm 10 psi (1034 KPa \pm 69 KPa)

Control valves capable of closing/opening within five (5) seconds *.

**(Resulting rise of pressure shall not exceed MWWP of the assembly.)*

- b. With Valve #3 (Valve #3A open and Valve #3B closed) and Valve #4 (see Figure 10.3) in the closed position, and Valve #1 and Valve #2 in the open position, and testcock No. 3 partially open (i.e., pressure at testcock #3 shall reduce to atmospheric during step 'e' below), establish flow through the assembly equal to 25 percent of the rated flow per Table 10-1.
- c. Maintain the flow through the assembly for a minimum of six (6) seconds. Close Valve #1.
- d. After five (5) seconds, close Valve #2
- e. After three (3) seconds, open Valve #4.
- f. After three (3) seconds, open Valve #3. Maintain Valve #3 open for six (6) seconds. Close Valve #3.

- g. After two (2) seconds, close Valve #4.
- h. After three (3) seconds, open Valve #2.
- i. After two (2) seconds, open Valve #1.
- j. Repeat steps *c* through *i* 1250 times. The assembly shall be tested to determine if the assembly complies with 10.2.2.3.3 and 10.2.2.3.5 at line pressure only, and 10.2.2.3.6.
- k. Raise flow through the assembly to 50 percent of rated flow. Repeat steps *c* through *i* 1250 times. The assembly shall be tested to determine if the assembly complies with 10.2.2.3.3 and 10.2.2.3.5 at line pressure only, and 10.2.2.3.6.
 - 1. With the pressure between the two check valves at atmospheric pressure (i.e., test cock No. 3 open), raise pressure at test cock No. 4 from atmospheric pressure to 1 psi, and maintain for 10 minutes.
 - 2. Raise pressure at test cock No. 4 to 150 psi for 10 minutes. Lower pressure at test cock No. 4 to atmospheric pressure. Close test cocks No. 3 & No. 4.
 - 3. Raise pressure at the inlet of the assembly to 20 psi and maintain for 10 minutes.
 - 4. Raise pressure at the inlet of the assembly to maximum working water pressure (MWWP) and maintain for 10 minutes.
 - 5. Leakage during any of the above tests, 'k1' through 'k4', shall be cause for rejection
- l. Raise flow through the assembly to 75 percent of rated flow. Repeat steps *c* through *i* 1250 times. The assembly shall be tested to determine if the assembly complies with 10.2.2.3.3 and 10.2.2.3.5 at line pressure only, and 10.2.2.3.6.
- m. Raise flow through the assembly to 100 percent of rated flow. Repeat steps *c* through *i* 1250 times.
- n. After ~~a minimum~~ of 5000 total cycles the assembly shall be tested to determine if the assembly complies with 10.2.2.3.3 and 10.2.2.3.5 at line pressure only, and 10.2.2.3.6. Failure to comply with these tests shall be cause for rejection. Perform steps 'k1' through 'k5'.
- o. The assembly shall then be disassembled and inspected for any damage or permanent deformation to any component(s), other than the elastomer discs. Evidence of such shall be cause for rejection.

Section 10.2.3 - Double Check Valve Assembly**10.2.3.3.6**

Purpose: To determine if the assembly sustains any damage, permanent deformation, or impairment of operation following the specified cycles.

Requirement: The assembly shall withstand the specified cycle without leakage, damage, permanent deformation, or impairment of operation.

Steps:

- a. Install assembly into suitable test line which can generate the following parameters:

Rated flow of assembly under test (per Table 10-1)

Line pressure of 60 psi \pm 10 psi (414 KPa \pm 69 KPa)

Temperature of 110°F $^{+30}/_{-0}$ °F (43°C. $^{+17}/_{-0}$ °C)

Backpressure of 150psi \pm 10 psi (1034 KPa \pm 69 KPa)

Control valves capable of closing/opening within five (5) seconds *.

**(Resulting rise of pressure shall not exceed MWWP of the assembly.)*

- b. With Valve #3 (Valve #3A open and Valve #3B closed) and Valve #4 (see Figure 10.3) in the closed position, and Valve #1 and Valve #2 in the open position, and test cock No. 3 partially open (i.e., pressure at testcock #3 shall reduce to atmospheric during step 'e' below), establish flow through the assembly equal to 25 percent of the maximum rated flow per Table 10-1.
- c. Maintain the flow through the assembly for a minimum of six (6) seconds. Close Valve #1.
- d. After five (5) seconds, close Valve #2.
- e. After three (3) seconds, open Valve #4.
- f. After three (3) seconds, open Valve #3. Maintain Valve #3 open for six (6) seconds. Close Valve #3.
- g. After two (2) seconds, close Valve #4.
- h. After three (3) seconds, open Valve #2.
- i. After two (2) seconds, open Valve #1.
- j. Repeat steps *c* through *i* 1250 times. The assembly shall be tested to determine if the assembly complies with 10.2.3.3.3 and 10.2.3.3.4.
- k. Raise flow through the assembly to 50 percent of rated flow. Repeat steps *c* through *i* 1250 times. The assembly shall be tested to determine if the assembly complies with 10.2.3.3.3 and 10.2.3.3.4.

1. With the pressure between the two check valves at atmospheric pressure (i.e., test cock No. 3 open), raise pressure at test cock No. 4 from atmospheric pressure to 1 psi, and maintain for 10 minutes.
 2. Raise pressure at test cock No. 4 to 150 psi for 10 minutes. Lower pressure at test cock No. 4 to atmospheric pressure. Close test cock No. 4.
 3. With the pressure upstream of No. 1 check valve atmospheric pressure (i.e., test cock No. 2 open), raise pressure at test cock No. 3 from atmospheric pressure to 1 psi, and maintain for 10 minutes.
 4. Raise pressure at test cock No. 3 to 150 psi for 10 minutes. Lower pressure at test cocks No. 3 and No. 4 to atmospheric pressure. Close test cock No. 4 and maintain test cock No. 3 in the partially open position.
 5. Leakage during any of the above tests, 'k1' through 'k4', shall be cause for rejection
- l. Raise flow through the assembly to 75 percent of rated flow. Repeat steps *c* through *i* 1250 times. The assembly shall be tested to determine if the assembly complies with 10.2.3.3.3 and 10.2.3.3.4.
 - m. Raise flow through the assembly to 100 percent of rated flow. Repeat steps *c* through *i* 1250 times.
 - n. ~~After a minimum of~~ 5000 total cycles the assembly shall be tested to determine if the assembly complies with 10.2.3.3.3 and 10.2.3.3.4. Failure to comply with these tests shall be cause for rejection.
 - o. Perform steps 'k1' through 'k5'.
 - o p. The assembly shall then be disassembled and inspected for any damage or permanent deformation to any component(s), other than the elastomer discs. Evidence of such shall be cause for rejection.

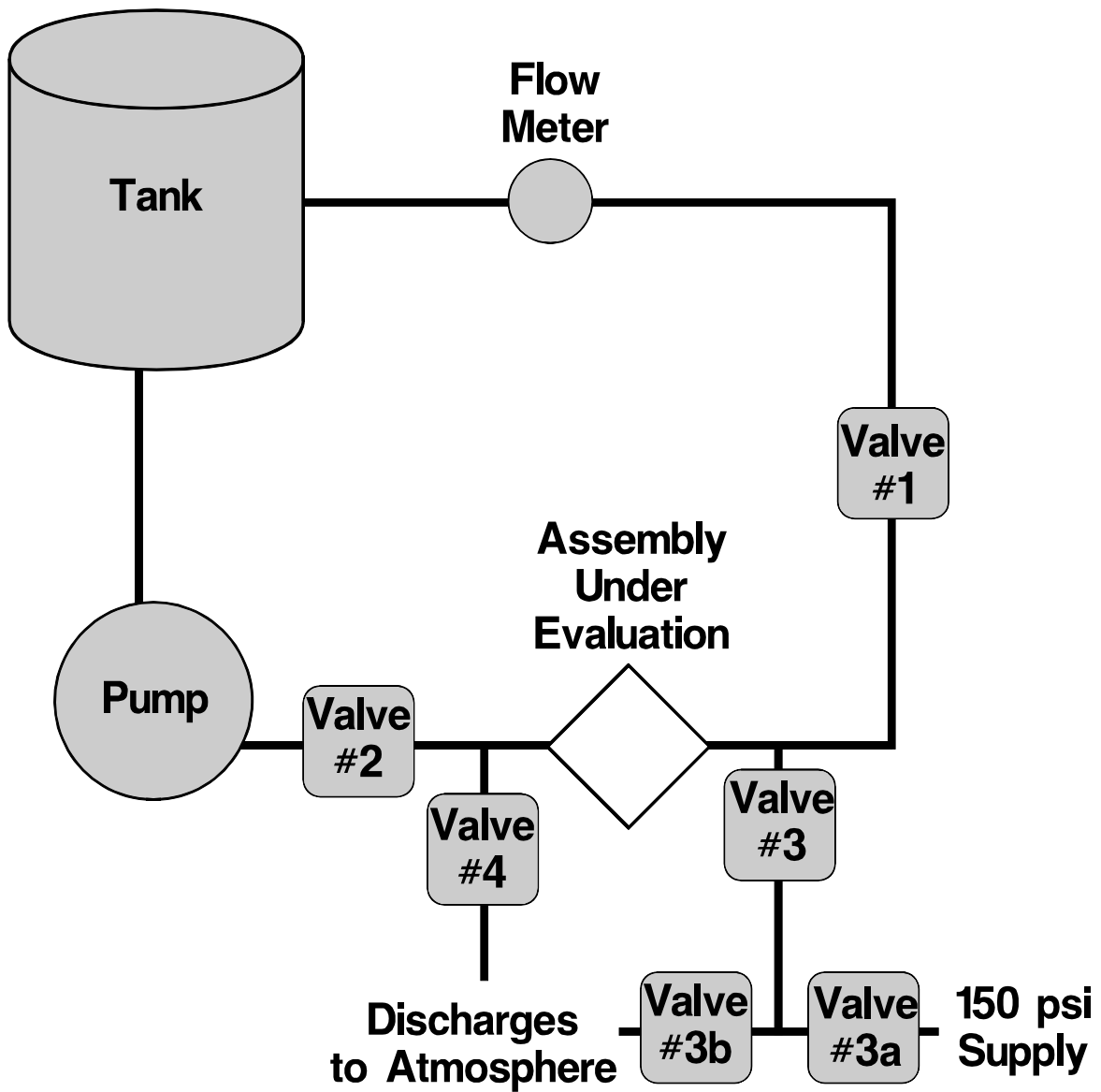


Fig. 10.3
Life cycle test system
 Diagrammatic sketch showing location of system components