Summary of Substantive Changes
Between the 2011 and the 2021 Editions of
ASSE 1013 "Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies"

Presented to the IAPMO Standards Review Committee on January 10, 2022

General: The changes to this standard may have an impact on currently listed products. The significant changes are:

- Revised the scope to remove reduced pressure principal fire protection backflow prevention devices throughout the Standard
- Revised multiple test procedures for clarification and updated performance requirements (see Sections 3.2, 3.3, 3.4, 3.5, 3.6, 3.8, 3.9, 3.10, 3.11, and 3.12)

The title of the standard was revised as follows:
Performance Requirements for Reduced Pressure Principle Backflow ~~Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers~~ Prevention Assemblies

Section I: Revised the scope to remove reduced pressure principal fire protection backflow prevention devices as follows:

1.0 General

1.1 Application

The purpose of ~~a~~ Reduced Pressure Principle Backflow ~~Preventer~~ Prevention Assemblies (RP) ~~and a Reduced Pressure Principle Fire Protection Backflow Preventer (RPF)~~ (herein referred to as the "assembly") is to keep contaminated water from flowing back into a potable water distribution system when some abnormality in the system causes the pressure to be temporarily higher in the contaminated part of the system than in the potable water supply piping.

1.2 Scope

1.2.1. Description

~~This standard applies to two types of backflow prevention assemblies identified as:~~
~~(a) Reduced Pressure Principle Backflow Preventers (RP); and~~
~~(b) Reduced Pressure Principle Fire Protection Backflow Preventers (RPF).~~

These assemblies consist of two (2) independently-acting check valves, internally force loaded to a normally closed position and separated by an intermediate chamber (or zone) in which there is a hydraulically operated relief means for venting to atmosphere, internally force loaded to a normally open position. These assemblies are designed to operate under continuous pressure conditions. The assembly shall include ~~two (2)~~2 properly located, tightly closing shut-off valves per Section 1.3.2.~~7~~8; and properly located test cocks per Section 1.3.2.~~5~~6.

~~This standard also applies to Manifold Reduced Pressure Principle Backflow Assemblies consisting of two or more complete Reduced Pressure Principle Backflow Preventers in parallel. The assemblies do not need to be of the same pipe size. The manifold size shall be identified by the single inlet and outlet of the manifold reduced pressure principal backflow assembly. Manifold Reduced Pressure Principle Backflow Assemblies shall include line-sized shut-off valves on each inlet and outlet of the assemblies making up the manifold.~~

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1.2.3 Pressure Range

The maximum working pressure shall be at least 175 psi (1206.6 kPa).
~~1.2.3.1 An RP assembly shall be designed for a working pressure of at least 150.0 psi (1034.2 kPa).~~
~~1.2.3.2 An RPF assembly shall be designed for a working pressure of at least 175.0 psi (1206.6 kPa).~~

1.2.4 Temperature Range

~~The a~~Assemblies for cold water applications shall be designed for a minimum temperature range of 33.0°F to 140.0°F (0.6°C to 60.0°C).
Assemblies for hot water applications shall be designed for a minimum temperature range of 33.0°F to 180.0°F (0.6°C to 82.2°C).

1.3 Limitations on Design

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1.3.2.5 Test Cock Location

Test cocks shall be provided in the following locations:
a) On the supply side of the inlet shut-off valve. ~~(not required on any sizes of type RPF assemblies)~~
b) Between the inlet shut-off valve and the first check valve.
c) Between the check valves.
d) Between the second check valve and the outlet shut-off valve.

1.3.2.6 Test Cock Size Inlet and Outlet Connection

~~For assemblies up to and including 1 inch (25 mm) pipe size, a minimum inlet and outlet thread on the test cocks shall be ⅛ NPT or SAE J513 ¼. For assemblies 1¼ inch – 2 inch (32 mm – 50 mm), a minimum inlet and outlet thread on the test cocks shall be ¼ NPT. For assemblies 2½ inch – 4 inch (65 mm – 100 mm), a minimum inlet and outlet thread on the test cocks shall be ½ NPT. For assemblies 6 inch (150 mm) and larger, a minimum inlet and outlet thread on the test cocks shall be ¾ NPT. Test cock waterways shall be full port. Protective caps shall be provided on SAE test cocks to protect male outlet threads.~~
The minimum inlet and outlet thread on the test cocks shall be per Table 2. Test cock waterways shall be full port. Protective caps shall be provided on SAE test cocks to protect male outlet threads.

Table 2
Test cock size of inlet and outlet threads

Assembly connection size		***Test cock size***	
in	*mm*	*NPT (in)*	*SAE J513 (in)*
≤ 1 in	*≤ 25*	*⅛*	*¼*
1 ¼ - 2	*32 – 50*	*¼*	*n/a*
2 ½ - 4	*65 – 100*	*½*	*n/a*
≥ 6	*≥ 150*	*¾*	*n/a*

1.3.2.7 Shut-off Valves

a) Shut-off valves shall be provided at the inlet and outlet of the assembly.
b) Shut-off valves shall be resilient seated.
~~(c) For type RPF assemblies, the shut-off valves shall be UL or FM listed or approved for use in fire protection systems.~~
~~d~~c) The #1 shut-off is located at the inlet side of the assembly.
~~e~~d) The #2 shut-off is located at the outlet side of the assembly.

1.4 Reference Standards

- *ASME A112.1.3-2000 (~~R2010~~ R2019), Air Gap Fittings for Use with Plumbing Fixtures, Appliances and Appurtenances*
- *ASME B16.24-~~2006~~ 2016, Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 400, 600, 900, 1500 and 2500*
- *ASME B1.20.1-~~1983~~ 2013 (~~R2006~~ R2018), Pipe Threads, General Purpose (Inch)*
- *ASME B1.20.3-1976 (~~R2008~~ R2018), Dryseal Pipe Threads (Inch)*
- *ASSE 1060-~~2006~~ 2017, Performance Requirements for Outdoor Enclosures for Fluid Conveying Components*
- *ASSE Series 5000-~~2009~~ 2015, Cross-Connection Control Professional Qualification Standard*
- *ASTM A 126-04 (~~2009~~ 2019), Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings*
- *ASTM A 536-84 (~~2009~~ 2019), Standard Specification for Ductile Iron Castings*
- *AWWA C606-~~06~~ 15, Grooved and Shouldered Joints*
- *CFR Title 21, Section 177-2016, Food and Drugs: Indirect Food Additives: Polymers*
- *SAE J513-~~1999~~ 2019, Refrigeration Tube Fittings – General Specifications*
- *UL 312-~~2010~~ 2018, Check Valves for Fire-Protection Service*

****All contact information for referenced standard promulgators has been deleted***

2.0 Test Specimens

2.1 Samples Submitted for Test

~~Three (3) assemblies of each type and model for sizes ¼ inch – 2 inch (6 mm – 50 mm), and one (1) assembly sized 2½ inch (65 mm) and larger shall be submitted by the manufacturer to the testing laboratory for evaluation.~~

Tests shall be performed in the order listed on one (1) assembly of each size submitted.

2.1.1 *For alternate orientations, additional samples shall be submitted. Once the primary orientation assembly has completed and passed all Section III tests, ~~the additional samples for an~~ each alternate orientation(s) shall be tested for each alternate orientation to all of the following sections:*

(a) 3.1, Independence of Components; and

(b) 3.5, Allowable Pressure Loss ~~at Rated Flow.~~

2.1.2 *If the orientation of either of the checks changes from the primary to an alternate orientation, the assembly shall also be tested to all of the following sections:*

(a) 3.4, Hydrostatic Backpressure Test of Checks;

(b) 3.8, Drip Tightness of First Check; and

(c) 3.9, Drip Tightness of Second Check.

2.1.3 *If the orientation of the relief valve changes from the primary to an alternate orientation, the assembly shall also be tested to all of the following sections:*

a) 3.6, Relief Valve Opening Test

b) 3.7, Sensitivity of Differential Pressure Relief Valve Test

c) 3.10, Relief Valve Discharge Test with Atmospheric Supply Pressure

d) 3.11, Relief Valve Discharge with Positive Supply Pressure

e) 3.12, Backpressure/Backsiphonage Test

~~(f) 3.13, Relief Valve vs. Supply Fluctuation Test for Type RPF Assemblies.~~

~~2.5 Manifold Assembly~~

~~A manifold assembly shall be tested per Sections 3.2, Hydrostatic Test of Complete Assembly, and 3.5, Allowable Pressure Loss at Rated Flow. The individual assemblies that make up the manifold shall meet all of the test sections of the standard in their intended orientation based on the nominal pipe size for each individual assembly.~~

Section 3, Performance Requirements and Compliance Testing: Revised multiple test procedures for clarification and updated performance requirements as follows:

3.0 Performance Requirements and Compliance Testing

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3.2 Hydrostatic Test of Complete Assembly

3.2.1 Purpose

The purpose of this test is to determine if the assembly withstands pressures of ~~two (2)~~ 2 times the manufacturer's maximum ~~rated~~ working pressure without leakage or damage to the assembly.

3.2.2 Procedure

1. Seal the inlet and the outlet of the assembly.

2. Fully open the assembly's #1 and #2 shut-off valves.

3. Slowly pressurize the assembly through test cock #1 or #2, purge the assembly of air, ~~and~~ then hold a pressure of ~~two (2)~~ 2 times the manufacturer's maximum working pressure, or 350 psi (2413 kPa), whichever is greater, for ~~ten (10~~) 10 minutes. ~~The assembly's shut-off valves shall be in the full open position.~~

4. Isolate pressure source and open test cock #4 to relieve pressure.

3.2.3 Criteria

Any ~~external leaks~~ leakage or damage which prevents full compliance with the remainder of this standard shall result in a rejection of the assembly.

3.3 Seat Leakage Test for Shut-off Valves

3.3.1 Purpose

The purpose of this test is to determine the shut-off valves' capability to withstand a test pressure of 2 times the manufacturer's ~~rated~~ working pressure in the closed position without leaking.

3.3.2 Procedure

~~NOTE: Non-integral shut-off valves shall be removed for this test.~~

3.3.2.1. Procedure for the #1 Shut-off Valve

~~With the #1 shut-off valve in the closed position, slowly increase the pressure during a one (1) minute period on the inlet side from zero (0) psi to twice the manufacturer's maximum rated pressure of the assembly. Hold the pressure for ten (10) minutes. Observe for leakage. Repeat the test, pressurizing the outlet side from zero (0) psi to twice the manufacturer's maximum rated pressure of the assembly.~~

1. Close #1 shut-off valve.

2. Remove access cover(s) to remove check valves.

3. Slowly increase the pressure during a 1 minute period on the inlet side of the assembly from 0 psi to twice the manufacturer's maximum working pressure of the assembly. Hold the pressure for 10 minutes.

4. With full view of #1 shut-off valve sealing member, observe for leakage into the assembly.

3.3.2.2 Procedure for the #2 Shut-off Valve

~~If the sealing mechanism is different between the #1 shut-off valve and the #2 shut-off valve, repeat Section 3.3.2.1 on the #2 shut-off valve.~~

1. Close #2 shut-off valve.

2. Slowly increase pressure during a 1 minute period on the outlet side of the assembly from 0 psi to twice the manufacturer's maximum working pressure of the assembly.

3. Hold pressure for 10 minutes. With full view of #2 shut-off sealing member, observe for leakage into the assembly.

3.3.3 Criteria

Any evidence of leakage during the test shall result in a rejection of the assembly.

3.4 Hydrostatic Backpressure Test of Check Valves

3.4.1 Purpose

The purpose of this test is to determine if the check valves withstand pressures of ~~two (2)~~ 2 times the manufacturer's maximum working pressure without leaking or damage to the assembly.

3.4.2 Procedure – First Check Valve

~~Seal the outlet of the assembly. Pressurize the assembly through test cock #4 and hold a pressure of two (2) times the manufacturer's maximum rated pressure for ten (10) minutes. Record if there is any leakage from the relief valve. Repeat the test, pressuring through test cock #3 with test cock #2 open and the relief valve mechanically held closed or isolated from the assembly. Record if there is any leakage at the inlet or the #2 test cock.~~

1. *Seal the inlet and outlet of the assembly.*
2. *Mechanically hold closed or isolate the relief valve.*
3. *Fully open both the #1 and #2 shut-off valves. Verify all test cocks are closed.*
4. *Pressurize and purge the assembly of air. Install a sight glass to test cock #2.*
5. *Open test cock #2 to the sight glass to fill to a height of 6.0 inches (152mm) above the top of the assembly.*
6. *Close supply of water.*
7. *Connect the water supply to test cock #3 and open test cock #3.*
8. *Raise the pressure at test cock #3 to twice the manufacturer's maximum working pressure or 350 psi (2413 kPa), whichever is greater.*
9. *Hold the pressure for 10 minutes while observing water level in the sight glass.*
10. *Isolate the assembly from pressure source. Close test cock #2.*

3.4.3 Procedure – Second Check Valve

1. *Depressurize the assembly to atmospheric pressure by opening and closing test cocks #2, #3, and #4.*
2. *Mechanically hold closed or isolate the relief valve.*
3. *Install the sight glass to test cock #3. Open test cock #3 to fill to a height of 6.0 inches (152mm) above the top of the assembly.*
4. *Connect the water supply to test cock #4 and open test cock #4.*
5. *Raise the pressure at test cock #4 to twice the manufacturer's maximum working pressure or 350 psi (2413 kPa), whichever is greater.*
6. *Hold the pressure for 10 minutes while observing the water level in the sight glass.*
7. *Isolate assembly from pressure and depressurize assembly through test cock #4.*
8. *Open or remove isolation from relief valve.*

~~3.4.3~~3.4.4 Criteria

Any evidence of leakage at the sight glass, or indications of damage which prevents full compliance with the remainder of this standard shall result in a rejection of the assembly.

3.5 Allowable Pressure Loss ~~at Rated Flow~~

3.5.1. Purpose

The purpose of this test is to determine the maximum pressure loss through the assembly at any flow from 0 gpm to the rated flow. ~~In addition, for RPF assemblies only, the purpose of this test is to determine if the pressure drop through the assembly generally increases from zero (0) flow to a flow of 50.00 GPM (3.15 L/s).~~

3.5.2. Procedure

1. *Install the assembly per Figure 1 with a manometer or differential pressure gauge at gauge connections P1 and P2.*
2. *The supply source shall be capable of supplying a volume of water adequate to meet the flow requirements of the size of assembly on test and maintain an inlet pressure of at least 10 psi (68.9 kPa) greater than the allowable pressure loss in Table 1.*
3. *The pressure loss through the piping between the shut-off valves of the assembly on test and the gauges at P1 and P2 shall be subtracted from the differential pressure reading at P1 and P2.*
4. *Pressurize and purge the system of air. Gradually increase the flow of water through the assembly until the required rated flow of water is achieved per Table 1. Record maximum pressure loss observed as well as pressure loss at rated flow.*
5. *Increase the flow to 150% of the rated flow shown in Table 1 and record the differential pressure.*
6. *Increase the flow to 200% of the rated flow shown in Table 1 and hold for 5 minutes; then record the differential pressure.*
7. *Gradually decrease the flow of water to 0 gpm.*

~~***3.5.2.1 RP Assemblies***~~

~~*Install the assembly per Figure 1 with a manometer or differential pressure gauge at gauge connections #1 and #2. These shall connect to ring piezometers per ISA 75.02. The supply source shall be capable of supplying a volume of water adequate to meet the flow requirements of the size of assembly on test and maintain an inlet pressure of at least 10.0 psi (68.9 kPa) greater than the allowable pressure loss at rated flow. The pressure loss through the piping between the shut-off valves of the assembly on test and the gauges at gauge connection #1 and #2 shall be subtracted from the differential pressure reading at gauge connection #1 and #2. Purge the system of air, then gradually increase the flow of water through the assembly until the required rated flow of water is achieved, per Table 1. Gradually decrease the flow of water to zero (0).*~~

~~***3.5.2.2 RPF Assemblies***~~

~~*Install the assembly per Figure 1 with a manometer or differential pressure gauge at gauge connections #1 and #2. These shall connect to ring piezometers per ISA 75.02. The supply source shall be capable of supplying a volume of water adequate to meet the flow requirements of the size of assembly on test and maintain an inlet pressure of at least 10.0 psi (68.9 kPa) greater than the allowable pressure loss at rated flow. The pressure loss through the piping between the shut-off valves of the assembly on test and the gauges at gauge connection #1 and #2 shall be subtracted from the differential pressure reading at gauge connection #1 and #2. Purge the system of air. The pressure loss at flow shall be measured at increments of 5.00 GPM (0.32 L/s), starting at zero (0) flow up to 50.00 GPM (3.15 L/s). Gradually increase the flow of water through the assembly until the required rated flow of water is achieved, per Table 1. Increase the flow to 150% of the rated flow shown in Table 1 and record the differential pressure. Increase the flow to 200% of the rated flow shown in Table 1 and hold for five (5) minutes; then record the differential pressure. Gradually decrease the flow of water to zero (0).*~~

~~***3.5.3 Procedure - Reduced Pressure Manifold Assemblies***~~

~~*The rated flow for a manifold assembly shall be per Table 1; the inlet and the outlet of the manifold shall identify its size. During the flow test, while still at 200% of the rated flow per Table 1, alternately close and open shut-off valve #2 of each of the assemblies in the manifold, causing the flow to pass through each assembly in the manifold individually for five (5) minutes.*~~

~~***3.5.3.1 Manifold RP Assemblies***~~

~~*Install the assembly per Figure 1 with a manometer or differential pressure gauge at gauge connections #1 and #2. These shall connect to ring piezometers per ISA 75.02. The supply source shall be capable of supplying a volume of water adequate to meet the flow requirements of the size of assembly on test and maintain an inlet pressure of at least 10.0 psi (68.9 kPa) greater than the allowable pressure loss at rated flow. The pressure loss through the piping between the shut-off valves of the assembly on test and the*~~

~~*gauges at gauge connections #1 and #2 shall be subtracted from the differential pressure reading at gauge connections #1 and #2. Purge the system of air, then gradually increase the flow of water through the assembly until the required rated flow of water is achieved, per Table 1. Increase the flow to 150% of the rated flow shown in Table 1 and record the differential pressure. Increase the flow to 200% of the rated flow shown in Table 1 and hold for five (5) minutes; then record the differential pressure. Gradually decrease the flow of water to zero (0).*~~

~~***3.5.3.2 Manifold RPF Assemblies***~~

~~*Install the assembly per Figure 1 with a manometer or differential pressure gauge at gauge connections #1 and #2. These shall connect to ring piezometers per ISA 75.02. The supply source shall be capable of supplying a volume of water adequate to meet the flow requirements of the size of assembly on test and maintain an inlet pressure of at least 10.0 psi (68.9 kPa) greater than the allowable pressure loss at rated flow. The pressure loss through the piping between the shut-off valves of the assembly on test and the gauges at gauge connections #1 and #2 shall be subtracted from the differential pressure reading at gauge connections #1 and #2. Purge the system of air. The pressure loss at flow shall be measured at increments of 5.00 GPM (0.32 L/s), starting at zero (0) flow up to 50.00 GPM (3.15 L/s). Gradually increase the flow of water through the assembly until the required rated flow of water is achieved, per Table 1. Increase the flow to 150% of the rated flow shown in Table 1 and record the differential pressure. Increase the flow to 200% of the rated flow shown in Table 1 and hold for five (5) minutes; then record the differential pressure. Gradually decrease the flow of water to zero (0).*~~

~~***3.5.4***~~ ***3.5.3 Criteria***

a) The occurrence of pressure loss greater than those shown in Table 1 at flows from ~~zero (0)~~ 0 gpm to rated flow (both ascending and descending) shall result in a rejection of the assembly.

b) Any relief valve discharge during the flow test shall result in a rejection of the assembly.

~~*(c) Failure of the pressure drop through the RPF assembly to generally increase from static up to a flow of 50.00 GPM (3.15 L/s) with a maximum total downward deviation of 10% from the highest previous value at any point shall result in a rejection of the assembly.*~~

~~d~~c) Any damage or permanent deformation of the internal components shall result in a rejection of the assembly.

3.6 Relief Valve Opening Test

3.6.1 Purpose

The purpose of this test is to verify that the differential pressure relief valve starts to open when the pressure in the intermediate chamber (or zone) is at least 2~~.0~~ psi (13.8 kPa) lower than the pressure in the inlet of the assembly.

3.6.2 Procedure

1. Install the assembly as in Figure 1, including a bypass line with a needle valve and differential pressure gauge between test cock~~s~~ #2 and #3.

2. Open V1 and V2 to pressurize and ~~P~~purge the ~~system~~ assembly of air.

3. Close V2 and pressurize the system to approximately 20 psi (137.9 kPa).

4. ~~Slightly~~ Slowly open the needle valve until the gauge shows a decreasing differential pressure. ~~Observe and note~~ Record the differential pressure when the first drop of water comes out of the relief valve.

5. Close the needle valve ~~and open the supply valve to restore the inlet pressure~~. The relief valve shall re-close tightly.

6. Flow a ~~small~~ sufficient amount of water through the assembly to restore a differential pressure drop across the first check valve. Return the assembly to a static condition ~~and record the first check's differential pressure~~.

7. Repeat the test increasing the supply pressure in 10~~.0~~ psi (68.9 kPa) increments up to the manufacturer's maximum working pressure of the assembly.

3.6.3 Criteria

(a) A reading of less than 2~~.0~~ psi[d] (13.8 kPa) at the time of the opening of the relief valve shall result in a rejection of the assembly.

(b) Failure of the relief valve to close drip tight shall result in a rejection of the assembly.

3.7 Sensitivity of Differential Pressure Relief Valve Test

3.7.1 Purpose

The purpose of this test is to determine if the differential pressure relief valve will discharge when the test cocks are fully opened one at a time.

3.7.2 Procedure

[1.] Install the assembly in a suitable hydraulic test line which is capable of maintaining an inlet pressure equal to the manufacturer's maximum ~~rated~~ [working] pressure.

~~(a)~~[2.] Close the #2 shut-off valve while maintaining the #1 shut-off valve fully open.

~~(b)~~[3.] Slowly open (4 seconds ± 1 seconds) test cock #1 until fully open.

~~(c)~~[4.] Then slowly close (4 seconds ± 1 seconds) test cock #1.

~~(d)~~[5.] Flow water by opening the shut-off valve #2 to establish normal pressure gradient.

~~(e)~~[6.] Repeat steps (~~a~~[2]) through (~~d~~[5]) using test cocks #2, #3 and #4.

3.8 Drip Tightness of First Check Valve

3.8.1 Purpose

The purpose of this test is to determine if the static pressure drop across the first check valve is at least 3~~.0~~ psi[d] (20.7 kPa) greater than the differential pressure between the inlet line pressure and the zone pressure required to open the relief valve for all line pressures from 20 psi (137.9 kPa) up to the manufacturer's maximum working water pressure, but not less than ~~150~~ [175] psi (~~1034.2~~ [1206.6]kPa).

3.8.2 Procedure

[1.] Connect the high side hose of a differential pressure gauge to test cock #2 and the low side hose to test cock #3.

[2.] Open test cocks #2 and #3 and ~~bleed~~ [purge] air from the gauge.

[3.] Flow a sufficient amount of water through the #2 shut-off valve to re-establish the normal pressure gradient across the first check [valve].

[4.] When the differential pressure across the first check [valve] stabilizes, record the differential pressure.

[5.] Repeat for each 10~~.0~~ psi (68.9 kPa) increment between 20~~.0~~ psi (137.9 kPa) and the manufacturer's maximum ~~rated~~ [working] pressure, but not less than ~~150~~ [175] psi (~~1034.2~~ [1206.6]kPa).

3.9 Drip Tightness of Second Check Valve

3.9.1 Purpose

The purpose of this test is to determine if the second check valve prevents flow [with an inlet pressure] at 1~~.0~~ psi (6.9 kPa) [and the outlet pressure at atmospheric].

3.9.2 Procedure

~~Install a sight glass in test cocks #3 and #4. Purge the system of air and open the test cocks to the sight glasses. With the downstream gate on the assembly closed and test valve #2 open, pressurize the inlet of the assembly until there is water filling the sight glass column at test cock #3 to at least 42 inches (1069 mm) measured above the water level in the sight glass at test cock #4. Close the supply valve tightly. Wait for ten (10) minutes. When no further fall of water is observed in the sight glass at test cock #3, record the difference in the water levels between sight glasses at test cocks #3 and #4.~~

[1. Install the assembly per Figure 1.]

[2. Install sight glasses at both test cocks #3 and #4.]

[3. Purge the assembly of air and open the test cocks to the sight glasses.]

[4. Close shut-off valve #2.]

5. Adjust the inlet pressure of the assembly until there is water filling the sight glass column at test cock #3 to at least 42 inches (1067 mm) measured above the water level in the sight glass at test cock #4.
6. Close the supply valve tightly.
7. When no further fall of water is observed in the sight glass at test cock #3, record the difference in the water levels between sight glasses at test cocks #3 and #4.

3.9.3 Criteria

A height difference of less than 28 inches (711 mm) between the water level in the sight glasses shall result in a rejection of the assembly.

3.10 Relief Valve Discharge Test with Atmospheric Supply Pressure

3.10.1 Purpose

The purpose of this test is to verify that when there is backflow and the supply pressure is atmospheric, the relief valve shall discharge water from the intermediate chamber (or zone) to the atmosphere with the rate of discharge shown in Table ~~2~~3 with the pressure in the intermediate chamber (or zone) not exceeding 1.5 psi (10.3 kPa).

3.10.2 Procedure

~~Close test valve #3. Disconnect the differential gauge from test cocks #2 and #3. Install a sight glass on test cock #3. Remove the second check or hold the second check wide open by mechanical means. Allow inlet pressure to fall to atmosphere via test cock #2. Open test valve #3 in the secondary water supply line slowly until the pressure in the intermediate chamber (or zone) is 1.5 psi (10.3 kPa) [i.e.: 42 inch (1069 mm) water column]; then record the relief valve discharge rate.~~
1. Install the assembly per Figure 1.
2. Install a sight glass on test cock #3.
3. Remove the second check valve moving member.
4. With #1 shut-off valve closed and #2 shut-off valve open, allow inlet pressure to fall to atmosphere by opening test cock #2.
5. Open V3, then slowly open valve and adjust V4 to hold the pressure of test cock #3 at 42 in-H2O (1067 mm-H2O) [1.5 psi (10.3 kPa)] above the centerline of the assembly.
6. Record the relief valve discharge rate from flow meter #2 or with a weight tank under the relief valve.

3.10.3 Criteria

A relief valve rate of discharge less than shown in Table ~~2~~3 shall result in a rejection of the assembly.

3.11 Relief Valve Discharge with Positive Supply Pressure

3.11.1 Purpose

The purpose of this test is to verify that when there is backflow and the supply pressure is ~~2.0~~ psi (13.8 kPa) or greater, the relief valve shall discharge water from the intermediate chamber (or zone) to the atmosphere at the rate of discharge shown in Table ~~2~~3 with the pressure in the intermediate chapter (or zone) at least 0.5 psi (3.4 kPa) below supply pressure.

3.11.2 Procedure

~~Install the assembly per Figure 1. Remove the second check or hold the second check wide open by mechanical means. Install a pressure gauge at test cock #4 and a differential gauge between test cock #2 and test cock #3. Open test cocks #2 and #3. Purge the air and pressurize the system to a minimum of 25.0 psi (172.4 kPa) inlet pressure. Close test valve #1 and test valve #2. Open test valve #3 in the secondary water supply, then slowly open test valve #4 until the intermediate chamber (or zone) pressure is 0.5 psi (3.4 kPa) below the supply pressure [i.e.: the differential gauge reads 0.5 psi (3.4 kPa)], or test valve #4 is fully open. Record the discharge rate from the relief valve.~~
1. Install the assembly per Figure 1.
2. Install a pressure gauge at test cock #2 and a differential pressure gauge between test cock #2 and test cock #3.

3. Open test cocks #2 and #3.
4. Open V1 and V2 to purge the air from the assembly.
5. Close V2 and pressurize the assembly to a minimum of 25 psi (172.4 kPa) inlet pressure.
6. Slowly Open V3 in the secondary water supply.
7. Slowly open V4 until the intermediate chamber (or zone) pressure is 0.5 psi (3.4 kPa) below the supply pressure, [i.e., the differential pressure gauge reads +0.5 psid (3.4 kPa) towards test cock #2], or valve V4 is fully open.
8. Record the discharge rate from the relief valve.

3.12 Backpressure/Backsiphonage Test
3.12.1 Purpose
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3.12.2 Procedure
Test the assembly per the University of Southern California Foundation for Cross-Connection Control & Hydraulic Research (USC FCCC&HR) backpressure/backsiphonage protocol as indicated in the USC Manual of Cross-Connection Control, section 10.1.2.2.3.9.
~~***3.13 Relief Valve vs. Supply Pressure Fluctuation Test for Type RPF Assemblies Only***~~
~~***3.13.1 Purpose***~~
~~*The purpose of this test is to verify that there is no discharge from the relief valve when the supply pressure fluctuates 15.0 psi (103.4 kPa) and the assembly is at static.*~~
~~***3.13.2 Procedure***~~
~~*With the assembly installed per Figure 1, pressurize from the inlet to 100.0 psi (689.5 kPa). Bleed all air from the system. While at static, increase the supply to 115.0 psi (792.9 kPa) taking five (5) seconds, and then reduce the supply to 100.0 psi (689.5 kPa) taking five (5) seconds.*~~
~~***3.13.3 Criteria***~~
~~*Any discharge from the relief valve shall result in a rejection of the assembly.*~~

Table 1 was revised to remove RPF Maximum Allowable Pressure Loss at Rated Flow.
Figure 1a was revised and relabeled as Figure 2.