Summary of Substantive Changes
between the 2009 and 2021 editions of
ASSE 1012 "Backflow Preventers with an Intermediate Atmospheric Vent"

Presented to the IAPMO Standards Review Committee on February 7, 2022

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

- Revised multiple test procedures for clarification and updating the requirements to the most recent industry changes (see Sections 3.1 through 3.9, 3.11 through 3.14, Figures 1 through 6, and Tables 1 through 4)
- Added labeling options that complies with the requirements of UL 969, and requirements for including installation instructions (see Section 4.2)

Section 1.0, General: The following standards were added, revised, or removed as follows:

1.3 Reference ~~Standards~~ Documents

Referenced industry standards shall ~~mean the latest edition of the stanard~~ be to the revision stated below.

- *ANSI/ASME B1.20.1-~~83~~2013 (R2018), Pipe Threads, General Purpose, Inch*
- *ANSI/ASME B1.20.3-76 (R2018), Dryseal Pipe Threads, Inch*
- *CFR Title 21, Section 177, Food and Drugs: Indirect Food Additives: Polymers*
- *ASTM B258-18, Standard Specification for Standard Nominal Diameters and Cross-Sectional Areas of AWG Sizes of Solid Round Wires Used as Electrical Conductors*
- *ASTM B584-06a14, Standard Specification for Copper Alloy Sand Castings for General Applications*
- *ASTM B858-06(2018), Standard Test Method for Ammonia Vapor Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys*
- *ANSI/ISA 75.02.01-2008 (IEC 60534-2-3 Mod), Control Valve Capacity Test Procedures*
- *ISO 6509-1 2014, Corrosion of Metal and Alloys – Determination of Dezincification Resistance of Copper Alloys with Zinc – Part 1: Test Method*
- *ISO 6957-1988, Copper Alloys – Ammonia Test for Stress Corrosion Resistance*
- *NSF/ANSI/CAN 61-2020, Drinking Water System Components – Health Effects*
- *NSF/ANSI 372-2020, Drinking Water System Components – Lead Content*
- *UL 969-2017, Standard for Marking and Labeling Systems*

Section 2.0 Test Specimens: Revised sample requirements as follows:

2.1 Samples Submitted for Test

Three (3) devices of each type or size and model shall be submitted by the manufacturer. ~~Where more than one (1) installation orientation is recommended, the device shall also be tested to Section 3.9 and 3.10 in those alternate orientations.~~

2.2 Samples Tested

The testing agency shall select one (1) of each type or model for the full test. Tests shall be performed in the order listed on one (1) device of each model submitted.

Testing shall be performed with the device in the horizontal orientation. Section 3.10 shall be repeated with the device in the vertical-down orientation.

3.0 Performance Requirements and Compliance Testing: Revised multiple test procedures for clarification and updating the requirements to the most recent industry changes as follows:

3.1.2 Procedure

1. ***Install the device per Figure 1.***

2. Install the air purge valve(s) at the high points in the system for purging air while filling the lines.

3. Flow water at 60.0°F ± 10.0°F (15.6°C ± 5.5°C) through the device to purge it of air.
4. Close ~~the discharge~~ valves V13 and V12, then open V1 and pressurize the system to a hydrostatic pressure of 300.0 psi ± 5.0 psi (2068.4 kPa ± 34.5 kPa) or two (2) times the manufacturer's maximum rated working pressure, whichever is greater, at P1.
5. Hold the pressure for a period of five (5) minutes +10 /–0 seconds and examine the device for leaks.

3.2 Hydrostatic Test of Downstream Check
3.2.2 Procedure
~~Following the test of Section 3.1, drop the supply pressure to atmospheric, while holding the outlet pressure at 300.0 psi (2068.4 kPa) or two (2) times the manufacturer's maximum rated working pressure, whichever is greater, for five (5) minutes.~~
1. With the device installed per Figure 1,
2. Close valves V1 and V13,
3. Open valve V12 and apply a hydrostatic pressure of 300.0 psi ± 5.0 psi (2068.4 kPa ± 34.5 kPa) or twice the manufacturer's maximum rated working pressure, whichever is greater, at P3, for a minimum of 5 minutes.
4. Examine for leaks.

3.3 Shock (Water Hammer) Test of the Device
3.3.2 Procedure
With the device installed per Figure 1, a suitable flow shall be established through the device which, in combination with a quick closing shut-off valve downstream of the device, V11, will produce a shock wave measured at P3 ~~the outlet of the device~~ equal to 300.0 psi ± 5.0 psi (2068.4 kPa ± 34.5 kPa) or ~~two~~ 2 times the manufacturer's maximum rated working pressure of the device, whichever is greater. The test shall be repeated ~~four (~~4~~)~~ times. Electronic pressure recorders shall be used in the performance of this test.

3.4 Reseating Tightness of the Downstream Check
3.4.2 Procedure
~~Install the device per Figure 1. The upstream check valve shall be held partially open and the atmospheric vent closed. With atmospheric pressure downstream of the check valve, pressurize the upstream side to a minimum of42.0 inches (1066.8 mm) in the sight glass measured from the center of the pipe line (horizontal mounting) or the center of the disc face (vertical mounting). Close the supply valve. The filling or supply valve shall be closed tightly and held for not less than five (5) minutes.~~
1. Install the device per Figure 1.
2. Hold the upstream check valve partially open, and the atmospheric vent of the device plugged.
3. Fully open valve V7.
4. Open discharge valve V13 to atmosphere and pressurize the upstream side to a minimum of 42.0 inches (1066.8 mm) in the sight glass measured from the center of the pipeline (horizontal mounting) or the center of the disc face (vertical mounting).
5. Tightly close valve V5.
6. Wait 5 minutes.

3.5 Reseating Tightness of the Upstream Check
3.5.2 Procedure
~~The device shall be installed per Figure 1. By suitable means, hold the downstream check valve partially open (fully clear of its seat) and the atmospheric vent closed. The device shall be purged of air. Open the discharge valve to atmosphere and pressurize the inlet of the device to a water column of at least 42.0 inches (1066.8 mm)) measured from the center of the pipe line (horizontal mounting) or the center of the disc face (vertical mounting). The filling or supply valve shall be closed tightly and held for not less than five (5) minutes.~~
1. Install the device per Figure 1.
2. By suitable means, hold the downstream check valve partially open (fully clear of its seat) and the atmospheric vent of the device plugged.
3. Purge the device of air via the air purge valve.

4. Fully open valve V7.
5. Open discharge valve V13 to atmosphere and pressurize the inlet of the device to a water column of at least 42.0 inches (1066.8 mm)) measured from the center of the pipeline (horizontal mounting) or the center of the disc face (vertical mounting).
6. Tightly close valve V5.
7. Wait 5 minutes while observing the level in the sight glass.

3.6 Atmospheric Vent Valve Leakage

3.6.2 Procedure

~~*The device shall be installed per Figure 1, with a means for accurately measuring the rate of flow through the device. A pressure of 10.0 psi ± 0.5 psi (68.9 kPa ± 3.4 kPa) shall be maintained upstream of the supply valve. With the discharge valve open slightly, open the supply valve very slowly until the pressure in the inlet of the device is at full supply pressure.*~~

1. Install the device per Figure 1.
2. Fully open V1, V3, V4, and V5. Close all other valves.
3. Fully open the discharge valve (V13).
4. With V13 open, adjust PRV1 to set the flow rate through the device in accordance with Table 2.
5. Close V13 at 25% increments to fully closed.
6. Continually check the atmospheric vent for leakage.

3.6.3 Criteria

Any leakage from the vent port ~~*when the supply valve in the pipe line is opened to admit water to the system through the device regardless of the rate at which the supply valve is opened*~~ *shall result in a rejection of the device.* ~~*Any leakage at any flow rate up to the manufacturer's maximum flow rating of the device shall result in a rejection of the device.*~~

3.7 Backflow Through the Upstream Check

3.7.2 Procedure

~~*By suitable means, hold the downstream check valve in a partially open position and seal the vent outlet closed. Install the device per Figure 2 with the reservoir filled with colored water. Gradually raise the pressure at the outlet of the reservoir until the pressure equals 6.0 inch (152.4 mm) water column. Hold for five (5) minutes. Observe for the appearance of colored water in the inlet of the device. Repeat with a pressure of 15.0 psi (103.4 kPa) and then with a pressure equal to the manufacturer's maximum rated working pressure of the device.*~~

1. Hold the downstream check valve in a partially open position and seal the vent outlet closed.
2. Install the device per Figure 2 with the accumulator filled with colored water.
3. Gradually raise the pressure at the outlet of the accumulator until the pressure equals 6.0 ± 0.1 inch (152.4 ± 2.5 mm) water column. Hold for five (5) minutes.
4. Observe for the appearance of colored water in the inlet of the device.
5. Repeat with a pressure of 15.0 ± 1 psi (103.4 ± 6.9 kPa) and then with a pressure equal to the manufacturer's maximum rated working pressure of the device.

3.8 Atmospheric Vent Open Pressures

3.8.2 Procedure

~~*Install the device per Figure 1. Remove the downstream check valve or hold open by suitable means. Purge the system of air and pressurize the system to 25.0 psi ± 1.0 psi (172.4 kPa ± 6.9 kPa). Slowly bleed down the supply pressure until water discharge from the atmospheric vent is observed and record the pressure difference between supply and downstream pressure. Repeat the test at 75.0 psi (517.1 kPa) and 150.0 psi (1034.2 kPa).*~~

1. Install the device per Figure 1.
2. Remove the downstream check valve or hold open by suitable means.
3. Purge the system of air and pressurize the system to 25.0 psi ± 1.0 psi (172.4 kPa ± 6.9 kPa).
4. Observe and record the downstream pressure.
5. Slowly bleed down the supply pressure using V6 until water discharge from the atmospheric vent is observed and record the inlet pressure at which the leakage occurs.

6. Repeat the test at 75.0 ± 2 psi (517.1 ± 13.8 kPa) and 150.0 ± 5 psi (1034.2 ± 34.5 kPa).

3.8.3 Criteria

~~Under a back pressure condition, f~~Failure of the atmospheric vent to open when the ~~supply~~ pressures ~~is not less than 20% of the downstream~~ recorded in Step 5 are greater than or equal to 80% of the pressures recorded in Step 4 shall result in rejection of the device.

3.9 Backsiphonage

3.9.2 Procedure

~~The upstream check valve shall be fouled with an appropriate size fouling wire as shown in Table 1, in the location for the type of valve construction (see Figures 3, 4, 5), and the downstream check valve is held open by mechanical means. The device shall be installed per Figure 6. Test equipment shall be capable of developing a vacuum of at least 25.0 inches (635.0 mm) mercury column. Tests shall be conducted in sequence as follows:~~

~~(a) Apply and hold a vacuum of 25.0 inches (635.0 mm) at the inlet for not less than one (1) minute.~~

~~(b) Slowly raise the vacuum from 0 to 25.0 inches (0 to 635.0 mm) and then slowly reduce it from 25.0 to 0 inches (635.0 to 0 mm).~~

~~(c) By means of a quick acting valve, create a surge effect by quickly opening and closing the valve. During this test the vacuum must range between 25.0 to 0 inches (635.0 to 0 mm).~~

1. Foul the upstream check valve as shown in Table 1, in the location for the type of valve construction (see Figure 3), and the downstream check valve is held open by mechanical means.
2. The device shall be installed per Figure 4.
3. Test equipment shall be capable of developing a vacuum of at least 25.0 inches (635.0 mm) mercury column. Tests shall be conducted in sequence as follows:
   a) Apply and hold a vacuum of 25.0 ± 0.1 inches (635.0 ± 2.5 mm) at the inlet for not less than one (1) minute.
   b) Slowly raise the vacuum from 0 to 25.0 ± 0.1 inches (0 to 635.0 ± 2.5 mm) and then slowly reduce it from 25.0 to 0 inches (635.0 to 0 mm).
   c) By means of the solenoid valve, create a surge effect by quickly opening and closing the valve. During this test the vacuum shall drop from 25.0 to 0 inches (635.0 to 0 mm).

3.9.3 Criteria

Any rise in the water level of the sight glass shall result in a rejection of the device. The sight glass diameter shall be ~~1.0 inch (25.4 mm) minimum diameter~~ equal to or less than the connection size of the device. In any test in which there is an upward bowing of the meniscus of the water in sight glass, the crown of the meniscus shall not exceed a rise of 1/8 inch (3.2 mm) above the level of the water in the reservoir or basin.

3.10.2 Procedure

~~The upstream check valve shall be fouled with an appropriate size fouling wire as shown in Table 3 1 in the location for the type of valve construction (see Figures 3, 4, and 5). The device shall be installed per Figure 6, substituting a pressure connection for the sight glass and water reservoir, and adding a sight glass in the inlet connection. Use colored water in the pressurized line connected to the outlet of the device. Run the test with a backpressure of 15.0 psi (103.4 kPa), and again with a backpressure of 50.0 psi (344.8 kPa). Test equipment shall be capable of developing a vacuum of at least 25.0 inches (635.0 mm) mercury column. Tests shall be conducted in the sequence described in Section 3.9. Repeat the test with the downstream check valve fouled as above and the upstream check valve in its normal closed position.~~

1. Foul the upstream check valve as shown in Table 1 in the location for the type of valve construction (see Figure 3).
2. The device shall be installed per Figure 4, substituting a pressure connection for the sight glass and water reservoir, and adding a sight glass in the inlet connection. Use colored water in the pressurized line connected to the outlet of the device.
3. Run the test with a backpressure of 15.0 ± 1 psi (103.4 ± 6.9 kPa), and again with a backpressure of 50.0 ± 2 psi (344.7 ± 6.9 kPa).

4. Test equipment shall be capable of developing a vacuum of at least 25.0 inches (635.0 mm) mercury column. Tests shall be conducted in the sequence described in Section 3.9.
5. Repeat the test with the downstream check valve fouled as above and the upstream check valve in its normal closed position.
6. Repeat section 3.10.2 with the device's check valves oriented in the vertical-down, vertical-down (VDVD) orientation per Figure 5.

3.11 Flow and Pressure Loss

3.11.2 Procedure

~~*The test system, as described in Figure 1, shall be equipped with means for accurately measuring the rate of flow through the device and indicating or recording pressures. Pressure gauges shall be located approximately five (5) pipe diameters (dimension "a") upstream and ten (10) pipe diameters (dimension "b") downstream of the device. The supply system shall be capable of supplying a volume of potable water adequate to meet the maximum flow requirements of the device on test while sustaining a steady inlet pressure of not less than 25% of the rated working pressure of the device.*~~

~~*Purge the air from the system, and then close the discharge valve. Open the supply valve fully, and then gradually open the discharge valve until the minimum required rate of flow is reached or the maximum allowable pressure loss is obtained and record the data observed. Adjust for pressure loss in the piping between the gauges and the device on test.*~~

1. The test system shall comply with Figure 1. Purge the air from the system. Close discharge valve V13.
2. Open supply valve V1 fully, and then gradually open discharge valve V13 until the minimum required rate of flow is reached or the maximum allowable pressure loss is obtained and record the data observed. Adjust for pressure loss in the piping between the pressure gauges and the device on test.

3.12 Flow with Low Supply Pressure

~~*The device shall be installed per Figure 1. Purge the system of air. Open the discharge valve fully, then slowly open the supply valve, gradually increasing the supply pressure while observing that the indicated flow rate equals 20% of the rated flow of the device. Adjustments shall be made for the pressure loss in the piping between the gauges and the device on test.*~~

Set upstream flowing pressure at 10psi ± 1 (68.9 ± 6.9 kPa). Repeat 3.11.2.1 and 3.11.2.2. Record the flow rate through the device.

3.12.3 Criteria

~~*Failure of the device to maintain a flow of not less than 20% of its rated capacity as stated in Table 2 with a supply pressure of 10.0 psi (69.0 68.9 kPa) shall result in a rejection of the device.*~~

Failure to achieve the minimum required flow rate as shown in Table 3 at or below the maximum allowable pressure loss shall result in a rejection of the device.

3.13 Deterioration at Extremes of Manufacturer's Temperature Range

3.13.2 Procedure

~~*The device shall be installed per Figure 7, with a heater capable of maintaining a temperature of 210.0 °F (98.9 °C), a reservoir located above the heater and a pump capable of circulating water as listed in Table 3, through the device continuously. The reservoir shall be closed but vented to atmosphere. Water shall be circulated through the device for eight (8) hours per day for a total of ten (10) days [total of eighty (80) hours]. The device and piping shall be insulated to maintain 210.0 °F (98.9 °C) through the device. The laboratory shall have the option to use a closed recirculation system in lieu of the vented reservoir. The outlet of this device shall be connected to a source of steam at a pressure of 15.0 psi (103.4 kPa), 250.0 °F (121.1 °C). The device shall be exposed to steam at a pressure of 15.0 psi (103.4 kPa) for one (1) hour.*~~

~~*Following the 80 hour test, run water at 40.0 °F (4.4 °C) through the device. After running water maintained at 40.0 °F (4.4 °C) through the device for at least one (1) hour, the device shall be retested per Sections 3.6, 3.7 and 3.10.*~~

1. The device shall be installed per Figure 6, with a reservoir located above the heater and a pump capable of circulating water as listed in Table 3, through the device continuously.
2. Water shall be circulated through the device for a total of 80 hours over no more than 12 days.

3. *Following the 80-hour test, the outlet of this device shall be connected to a source of steam at a pressure of 15.0 ± 1 psi (103.4 ± 6.9 kPa), 250.0 +0/-5 °F (121.1 +0/-2.8 °C). The device shall be exposed to steam at a pressure of 15.0 ± 1 psi (103.4 ± 6.9 kPa) for one (1) hour.*
4. *Following the steam test, run water at 40.0 ± 5 °F (4.4 ± 2.8 °C) through the device at the minimum flow rate for the device size listed in Table 4. After running water maintained at 40.0 ± 5 °F (4.4 ± 2.8 °C) through the device for at least one (1) hour.*
5. *The device shall be retested per Sections 3.6, 3.7 and 3.10.*

Section 4.0, Detailed Requirements: Updated the materials requirements as follows:

4.1 Materials

4.1.1 Material in Contact with Water

~~*Solder and fluxes containing lead in excess of 0.2% shall not be used in contact with potable water. Metal alloys in contact with potable water shall not exceed 8% lead.*~~

~~***4.1.1.2*** *All elastomers and polymers in contact with the water shall comply with the requirements of the United States Code of Federal Regulations (CFR) Title 21, 177 or the material shall be certified as non-toxic by an independent approved laboratory.*~~

~~***4.1.2*** *Non-Ferrous Cast Parts in Contact with Water*~~

~~*Non-ferrous cast parts shall have a corrosion resistance at least equal to ASTM B584 Alloy UNS #C84400.*~~

~~***4.1.3*** *Bodies and Internal Non-Cast Parts*~~

~~*Bodies and internal non-cast parts shall be of material having a corrosion resistance at least equal to a non-ferrous alloy of not less than 58% copper.*~~

~~***4.1.4*** *Springs*~~

~~*Springs in contact with the water flowing through the device shall have a corrosion resistance at least equal to stainless steel, Series 300.*~~

Devices where the water is intended for human consumption shall comply with NSF 372 and NSF 61.

Devices where the water is intended for human consumption through cooking only shall comply with NSF 372.

Note

Lead free means:

1. *Not containing more than 0.2 percent lead when used with respect to solder and flux; and*
2. *Not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures.*

Lead free requirement exemptions:

1. *The requirement does not apply to pipes, pipe fittings, plumbing fittings, or fixtures, including backflow preventers, that are used exclusively for non-potable services, such as manufacturing, industrial processing, irrigation, outdoor watering, or any other uses where the water is not anticipated to be used for human consumption.*
2. *The requirement does not apply to toilets, bidets, urinals, fill valves, flushometer valves, tub fillers, shower, valves, service saddles, or water distribution main gate valves 2 inches in diameter or larger.*

~~*4.1.7*~~ *4.1.4 Pipe Threads*

~~*4.1.7.1*~~ *4.1.4.1 Taper pipe threads except dryseal shall be in compliance with ANSI/ASME Standard B1.20.1.*

~~*4.1.7.2*~~ *4.1.4.2 Dryseal shall comply with ANSI/ASME Standard B1.20.3.*

~~*4.1.7.3 Other types of connection shall conform to appropriate standards*~~

Section 4.2, Markings: Added labeling options that complies with the requirements of UL 969, and requirements for including installation instructions as follows:

4.2 Markings

4.2.2 Application of Marking

The marking shall be either cast, etched, stamped, or engraved on the body of the device or on a durable metal plate securely attached to the device. Alternatively, labels shall be permanently affixed to the device per UL 969.

4.3 Installation Instructions

1. *Complete instructions for installation of the device shall be available.*

2. *Complete detailed instructions shall be available for devices capable of being maintained or repaired in the field.*
3. *The following language shall be part of the installation instructions: "The device shall not be installed in a concealed or inaccessible location or where the venting of water from the device during its normal functioning may be deemed objectionable."*
4. *The manufacturer shall state in the installation instructions the minimum working pressure of the device.*
5. *The manufacturer shall state whether the device is meant for potable water applications.*

The following Tables and Figures were Revised for clarification and updating the requirements to the most recent industry changes:

- Table 1 was revised.
- Table 2 "Flow rate and pressure loss across device" was revised.
- New Table 3 was added.
- Table 3" Minimum Hot Water Flow rate" was revised and renumbered to Table 4.
- Figure 1 was revised.
- Figure 2 was revised
- Figures 3, 4 and 5 were revised and combined to create Figure 3.
- Figure 6 was revised and renumbered as Figure 4.
- New Figure 5a and 5b were added
- Figure 7 was revised and renumbered to Figure 6.