Summary of Substantive Changes between the 2018 and 2020 edition of

ANSI/CAN/ASSE/IAPMO 1055

"Performance Requirements for Chemical Dispensers with Integral Backflow Protection"

Presented to the IAPMO Standards Review Committee on February 8, 2021

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

- The standard has been revised to designate it as a National Standard of Canada (NSC)
- Revised the scope to ensure the compliance with nationally recognized Standards for backflow protection of all kinds allowed in the Standard (see Section 1.2)
- Added a mechanical function Section to clarify the use of different types of backflow protection and where they are used (see Section 1.3)
- Added an exception for dispensers that include backflow protection devices already complying with a list of nationally approved Standards to be tested for the same performance requirements in Sections 3.4, 3.5, 3.6, and 3.7 (see Section 2.5)
- Revised the test procedure to operate under 80 psi or the manufacturer's maximum rated pressure instead of 187.5 psi or 150% of manufacturer's maximum rated pressure, also clarified the performance requirements to state that atmospheric vent leaks are not a cause for failure (see Section 3.2)
- Added exceptions for hand-held devices in Tipping testing (see Section 3.1)
- Added requirements for hand held devices in Backpressure testing (see Section 3.4)
- Added an air inlet valve opening test (see Section 3.5)
- Revised the backsiphonage test to be applied to devices utilizing elastomer gaps only (see Section 3.6)
- Added an air passage for comparative areas test (see Section 3.7)
- Removed the AVB valve marking requirements, and added another marking requirement for the type of backflow prevention used (see Section 4.1)

Section 1.0, General: Revised the scope to ensure the compliance with nationally recognized Standards for backflow protection of all kinds allowed in the Standard, and added a mechanical function Section to clarify the use of different types of backflow protection and where they are used as follows:

1.1 Application

Chemical dispensing systems ~~with integral backflow protection~~ (herein referred to as the "device") provide a means of mixing potable water with chemicals to provide the user with a chemical solution which is ready for use. The amount of dilution shall be fixed or adjustable. Devices covered by this standard are intended for stationary installations, mobile devices where the orientations are fixed, and handheld devices.

1.2 Scope

1.2.1 Description

This standard applies to those devices classified as chemical dispensing systems ~~having integral backflow protection~~ and shall be protected by an air gap complying to ASME A112.1.3-2000 (R2015), an integral elastomer gap, or an Atmospheric Vacuum Breaker (AVB). If an AVB is used as its method of backflow protection, it must conform with ASSE 1001 or CSA B64.1.1.

1.2.2 Pressure Range

Devices ~~shall be~~ covered by this standard are designed to withstand a water supply pressure of at least 861.9 kPa (125.0 psi)~~. The device shall~~ and operate within the full pressure range as indicated by the manufacturer.

1.2.3 Temperature Range

Cold water devices ~~shall~~ covered by this standard are designed to withstand temperatures up to 48.9 °C (120 °F) and ~~shall~~ operate within the full temperature range as indicated by the manufacturer.
Hot water devices ~~shall~~ covered by this standard are designed to withstand temperatures up to 82.2°C (180 °F) and ~~shall~~ operate within the full temperature range as indicated by the manufacturer.

1.3 Mechanical Function

1.3.1 Elastomeric Gap

The elastomeric gap shall be loaded to a normally closed position under static conditions.

1.3.2 Air Inlet

The air inlet shall be force loaded (biased) to a normally open position when the line pressure is atmospheric. It shall be located above the pipeline so that water can drain from it by gravity.

1.3.3 Locations

Devices shall have an air inlet that opens to atmosphere. The air inlet and the atmospheric vent shall be located at or downstream of the air gap or integral elastomer gap and upstream of the outlet so that water can drain from the vent by gravity.

Section 1.4, Referenced publications and definitions: The referenced standards were added, deleted, or revised as follows:

ASME A112.1.3-2000 (R2015), Air Gap Fittings for Use with Plumbing Fixtures, Appliances, and Appurtenances

ASSE 1001-~~2008~~2017, Performance Requirements for Atmospheric Type Vacuum Breakers
ASSE 1011-~~2004~~2017, Performance Requirements for Hose Connection Vacuum Breakers
ASSE 1013-2011, Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers
ASSE 1020-2020, Performance Requirements for Pressure Vacuum Breaker Assemblies
ASSE 1056-2013, Performance Requirements for Spill Resistant Vacuum Breaker Assemblies

ASTM B258-18, Standard Specification for Standard Nominal Diameters and Cross-Sectional Areas of AWG Sizes of Solid Round Wires Used as Electrical Conductors

CSA B64 Series-11 (R2016), Backflow Preventers and Vacuum Breakers

CSA C22.2 No. 0.15-15, Adhesive Labels

IAPMO PS-104-~~97~~2019, Material and Property Standard for Pressure Relief Connection for Dispensing Equipment

UL 969-2017, Marking and Labeling Systems

Section 2.0, Test Specimens: Added an exception for dispensers that include backflow protection devices already complying with a list of nationally approved Standards to be tested for Sections 3.4, 3.5, 3.6, and 3.7 as follows:

2.5 Backflow Subassemblies

Chemical dispensers that include backflow assemblies conforming to the following standards are exempted from sections 3.4, 3.5, 3.6, and 3.7:

a) ASME A112.1.3
b) ASSE 1013
c) ASSE 1020
d) ASSE 1056
e) CSA B64.1.2
f) CSA B64.1.3
g) CSA B64.1.4
h) CSA B64.4

Section 3.1, Tipping: Clarified the purpose to state that hand-held devices are exempt from this Section as follows:

3.1 Tipping

3.1.1 Purpose

The purpose of this test is to determine the stability of a free-standing device. This includes devices mounted to a mobile cart. Hand-held devices are exempt from this section.

Section 3.2, Pressure Tests: Revised the test procedure to operate under 80 psi or the manufacturer's maximum rated pressure instead of 187.5 psi or 150% of manufacturer's maximum rated pressure, also clarified the performance requirements to state that atmospheric vent leaks are not a cause for failure as follows:

~~3.3.1~~3.2.1 Purpose

The purpose of this test is to determine the ability of the device to withstand a ~~pressure of 187.5 psig (1292.8 kPa) or 150% of the manufacturer's~~ maximum ~~rated~~ flowing pressure~~, whichever is greater,~~ without leakage or damage to the device.

~~3.3.2~~3.2.2 **Procedure**

a) ~~Devices that incorporate shut off valve(s) shall be installed~~ Install the device in accordance with the manufacturer's installation instructions with the inlet connected to a water supply.

b) Purge the device ~~shall be purged~~ of air. ~~Close the shut off valve(s) and apply a hydrostatic pressure as specified in Section 3.3.1at the inlet using water at ambient temperature.~~

c) Remove any hoses, tubes, or other removable connections downstream of the mixing chamber.

d) Seal the chemical concentrate inlet orifice.

e) Open all shut off valve(s) if present.

f) Apply a flowing pressure of 552±13.8 kPa (80±2 psi), or the manufacturer's maximum rated flowing pressure, whichever is greater, as measured at the inlet using water at ambient temperature.

g) ~~Hold~~ Flow for a period of ~~(five)~~ 5 minutes and examine for leaks or damage.

~~3.3.3~~3.2.3 **Criteria**

Leaks from atmospheric vents are acceptable. Damage or any other leaks shall result in a rejection of the device.

Section 3.3, Deterioration at Extremes of Manufacturer's Rated Temperature and Pressure Ranges and Endurance Test: Clarified the test procedure and added tolerance values for all temperature and pressure requirements as follows:

~~3.2~~3.3 **Deterioration at Extremes of Manufacturer's Rated Temperature and Pressure Ranges and Endurance Test**

~~3.2.1~~3.3.1 **Purpose**

The purpose of this test is to determine the ability of the device to:

a) Withstand 82.2 +0/-5.6 °C (180 +0/-10 °F) for hot water devices or 48.9 +0/-5.6 °C (120 +0/-10 °F) for cold water devices, and 861.9 ± 34.5 kPa (125.0 ± 5.0 psig) or the manufacturer's maximum rated temperature and pressure, whichever is greater, without leakage or deformation of components; and

b) Provide service over time without deterioration of performance.

~~3.2.2~~3.3.2 **Procedure**

a) Install the device according to the manufacturer's installation instructions.

b) Cycle the device ~~5000 times~~ using water at the temperatures and pressure specified in Section ~~3.2.1a~~3.3.1.a). One 1 cycle consists of operating the device to allow flow (on time) and then stop flow (off time). The "on" time shall not be less than ~~(five)~~ 5 seconds, and the "off" time shall not exceed ~~(thirty)~~ 30 seconds.

~~b) Check the device for any failures.~~

c) ~~Immediately after checking the device, operate the device to allow it to flow for eight~~ Perform 5000 cycles in less than 80 hrs total over a period of 2 calendar weeks. (Example: 8 hrs per day for ~~4~~10 days at 63 cycles per hour.)

d) Check the device for any failures.

Section 3.4, Backpressure: Added requirements for hand-held devices to repeat the test in different setups, and added tolerance values for pressure requirements as follows:

3.4 Backpressure

3.4.2 Procedure

Install the device with a transparent tube connected to the inlet of the device. The dispensing hose of the device shall be filled with colored water, and the outlet shall be pressurized to produce backpressure equal to 1.5 ± 0.15 kPa (6 ± 0.6 inches of water column). Hold for five (5) minutes and observe for the presence of colored water in the transparent tube at the inlet.

Repeat the test with the pressure increased in increments of 6.0 kPa (24 inches of water column) until a pressure equal to the backpressure created by the maximum possible height of the dispensing hose of the device is reached.

For hand-held devices, repeat this section with the elastomer seal in the horizontal, vertical-up, and vertical-down orientations.

Section 3.5, Air Inlet Valve Opening Test: Added an air inlet valve opening test as follows:

3.5 Air Inlet Valve Opening Test

3.5.1 Purpose

The purpose of this test is to determine if the air inlet valve opens before the upstream line pressure reaches 6.9 kPa (1.0 psi) and is fully open when water drains from the body. This section only applies to devices that incorporate an elastomer gap.

3.5.2 Procedure

a) Install the device as shown in Figure 1 and per the manufacturer's instructions. The open end of the discharge tube from the device shall be completely submerged in the reservoir water to a depth of not less than 30.5 cm (12 in).

b) Close valve V2 and fully open valve V1 to purge all air from the system.

c) Throttle down valve V1 such that the upstream pressure at P1 is 68.9±3.4 kPa (10±0.5 psi) static.

d) Slowly open valve V2. Record the pressure at P1 once the discharge tube starts to drain or water discharge from the device's air vents, or a bubble appears in the discharge tube. This is the point at which the air vent has opened.

e) Repeat steps b through d twice more.

3.5.3 Criteria

The air vent shall start to open before the pressure reaches 6.9 kPa (28.0 inches of water column) in all 3 trials.

Section 3.6, Backsiphonage: Revised the backsiphonage test to be applied to devices utilizing elastomer gaps only as follows:

~~3.5~~3.6 Backsiphonage

~~3.5.1~~3.6.1 Purpose

The purpose of this test is to determine if any contaminated water can be siphoned back into the potable water system for devices utilizing an elastomer gap.

3.6.2 Procedure

~~The water inlet of the device under test shall be connected to a three-way valve which can provide a rapid switch from water input to a vacuum. See Figure 1. The vacuum source shall have the capacity to maintain a minimum of 25 inches of mercury (84.7 kPa) vacuum for five (5) minutes of test. A water separator or a sight glass shall be installed in the piping as shown in Figure 1 as a means of detecting backflow. All check members shall be held open to create a water flow path that at least equals the area of the smallest orifice downstream of the check member. A coloring agent shall be used to simulate chemicals in the water. The device shall be held in the open mode to dispense used solution and the dispensing hose, if used, shall be submerged in heavily colored water.~~

a) Install the device per Figure 2.

b) Foul all elastomer seals using a 20 AWG wire (0.81mm, 0.032in) per ASTM B258. The wire material shall be of sufficient hardness so as to not noticeably change in cross-sectional area after undergoing the test.

c) Place the wire as shown in Figure 3.

d) Connect a tube to the concentrated solution inlet. Connect another tube to the dispensed solution outlet of the device. Immerse the other ends of the tubes to colored water.

e) Activate the device to dispense solution.

f) Turn the three-way valve to connect the potable water to the device. Open the shut-off valve. Activate the device until all air is out of the system.

g) Turn the three-way valve to connect the device to the vacuum source for 5 minutes. The vacuum shall be at least 84.7 kPa (25 inches of mercury).

h) Repeat step f) 3 times.

i) Repeat steps b) through g) for each dispensing path of the device.

j) For hand-held devices, repeat section 3.6.2 with the elastomer seal in the horizontal, vertical up, and vertical-down orientations.

Section 3.7, Air Passage Comparative Areas: Added an air passage for comparative areas test as follows:

3.7 Air Passage Comparative Areas

3.7.1 Purpose

The purpose of this test is to compare the effective throughway area from the water inlet to outlet relative to the effective throughway area of the air inlet. In the event of a backsiphonage event, this prevents a vacuum from forming in the dispensing tube. This section shall not be performed for devices that incorporate an air gap as backflow protection.

3.7.2 Procedure

a) Install the device as shown in Figure 4 in the normal operating position. Seal the outlet. Remove any hoses, tubes, or other removable connections downstream of the mixing chamber.

b) Connect the inlet of the device by means of 305 mm (12 inch) length of the same size or larger size pipe to a quick opening valve of the same size or larger which in turn is connected to a vacuum tank capable of providing at least 10 seconds of air flow during the test.

c) Dissipate the vacuum in the tank from 84.4 ± 1.7 kPa to 16.9 ± 1.7 kPa (25.0 ± 0.5 inches of Hg to 5.0 ± 0.5 inches Hg) by operating the quick opening valve that fully opens in less than 1 second.

d) Record the time it takes to dissipate the vacuum through the air vent.

e) Seal air valve and open the outlet. Repeat 3.7.2.c. Record the time it takes to dissipate the vacuum through the outlet.

3.7.3 Criteria

The time for the evacuation described in Section 3.7.2.c through the vent shall be equal to or faster than the evacuation described in Section 3.7.2.e through the outlet based on the average result of at least 3 test runs.

Section 4.0, Detailed Requirements: Removed the AVB valve marking requirements, and added the type of backflow prevention used as follows:

4.1 Markings

Each device shall have the following information marked on it. The information shall be visible after the device has been installed:

…….

~~*f) A device that has an atmospheric vacuum breaker (AVB) conforming to ASSE 1001 as its method of backflow protection shall indicate the critical level of the AVB at least 1in (25.4mm) below the actual critical level. Text near the critical level mark shall read "Outlet shall be no higher than critical level." Both mark and text shall be visible after installation on the outside of the device.*~~

~~*g*~~*f) The direction of flow, if part of the outlet uses an NHT hose thread ~~per ASME B1.20.1~~.*

g) Type of backflow prevention used.

The markings shall be either cast, etched, stamped or engraved on the device or on a permanent label complying with UL 969 or on a permanent type B label conforming with CSA C22.2 No. 0.15 securely attached to the device.

4.2 Instructions

Complete instructions for installation and operation shall be packaged with the device *or shall be made electronically available*. Drawings or schematic sketches which would be useful to the installer shall be part of these instructions.

For devices other than hand-held devices, the instructions shall state that "Devices shall be installed in a vertical orientation."

Instructions shall state:

"A plumbed, dedicated line is preferred for installation. When a dedicated line is not available, installation shall ensure that no cross-connections between hot and cold water are created, and that atmospheric vacuum breakers integrated into the building water supply are not negatively affected by being under pressure for over 12 continuous hours."

~~*4.4 Installation for Devices Plumbed to a Faucet with a Vacuum Breaker*~~

~~*In cases where an installation involves a water source coming from a faucet with an integrated vacuum breaker device conforming to ASSE 1001 or ASSE 1011, a pressure bleed device conforming to IAPMO PS 104 shall be used to protect the vacuum breaker device.*~~

~~*The purpose is so that continuous pressure does not adversely affect the vacuum breaker device upstream of the pressure bleed device. This also protects against a cross-connection between hot and cold water migration by encouraging the user to turn off the water supply at the faucet.*~~

Section 5.0, Definitions: Added Definitions for clarification as follows:

Definitions not found in this section are located in the Plumbing Dictionary (Sixth Edition) published by ASSE International.

~~***Check Member***~~

~~*A check member is a valve designed to stop the flow of liquid in one or more directions of flow*~~

Elastomer Gap

A device comprised of an air inlet whose elastomer seal is controlled by the elongation or compression of elastomeric material. Note: the elastomer seal is typically an elastomeric sleeve or a rolling diaphragm.

Free-Standing Device

A free-standing device is a dispensing system which includes a supporting structure for resting on the floor.

Hand-held Device

Devices that are able to be manually lifted, transported, and operated at various orientations while being connected to the potable water supply.

Mixing Chamber

The volume of space in the device where the potable water and chemical concentrate first mix.

Figure 1, *Air inlet valve opening test setup*: New figure was added.

Figure ~~1~~2, *Backsiphonage Test Setup. The vacuum tank and pump source shall have the capacity to maintain a minimum of 84.7 kPa (25 inches of mercury) vacuum for 5 min.:* Figure Title was added.

Figure 3a and Figure 3b, *Location of fouling wire for two example elastomer gap designs:* New figures were added.

Figure 4, *Test setup for comparing air passage areas*.: New figure was added.