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ASSE International

Performance Requirements for
Commercial and Food Service Water Treatment Equipment
Utilizing Drinking Water

Public Review Copy

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ASSE International
Mokena, Illinois

Foreword

This foreword shall not be considered a part of the standard; however, it is offered to provide background information.

ASSE standards are developed in the interest of consumer safety.

ASSE International considers product performance standards to be of great value in the development of improved plumbing systems.

The working group that developed this standard was set up within the framework of the Product Standards Committee of ASSE International.

Recognition is made of the time volunteered by members of this working group and of the support of manufacturers who also participated in meetings for this standard.

This standard does not imply ASSE International's endorsement of a product which conforms to these requirements.

Compliance with this standard does not imply acceptance by any code body.

The contaminant reduction and structural integrity requirements for commercial modular systems are covered by NSF/ANSI 42 and NSF/ANSI 53 as appropriate. This standard covers the other plumbing aspects that are not otherwise addressed in those and other standards.

It is recommended that these devices be installed consistent with local codes by qualified and trained professionals.

This standard was promulgated in accordance with procedures developed by the American National Standards Institute (ANSI).

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Performance Requirements for Commercial and Food Service Water Treatment Equipment

1. General

1.1 Application

Commercial water treatment equipment is used in point-of-entry and point-of-use applications connected to building plumbing to improve the water quality characteristics of potable water. This standard includes testing requirements for components and complete systems. Electrical compliance is not covered by the standard.

1.2 Scope

1.2.1 Description

Plumbed water treatment units include any device or component, point-of-entry and point-of-use that is used in building to improve the quality of the water. This standard covers all water treatment products that are connected to the building's plumbing system for potable water. This standard is not intended to cover water treatment products used for process water or wastewater applications. Examples of water treatment equipment include: Deionization, Filters, Softeners, Physical Devices, Reverse Osmosis, UV, Ozone, and Distillation.

Tests verifying claims regarding changes to water chemistry, microbiology, and aesthetics (i.e. smell, taste, appearance, etc.) are not included in this standard. Devices may claim such performance via other standards or test protocols.

1.2.2 Connections

Pipe threads and other connections shall conform to the applicable standards.

- Tapered pipe threads shall comply with ASME B1.20.1.
- Dry seal pipe threads shall comply with ASME B1.20.3.
- Compression assemblies shall be compatible with SAE J 512.
- Soldered connections shall comply with ASME B16.18 or ASME B16.22.
- Push fit connections shall comply with ASSE 1061.
- Press connections shall comply with ASME B16.51.

1.2.3 Temperature Range

Devices intended for cold water applications shall have a maximum working temperature of 100 °F (38°C)

Devices intended for commercial hot water applications shall have a maximum working temperature of 180°F (82 °C).

ASSE 1085 – 201x

Performance Requirements for instantaneous electric water heaters for emergency equipment.

Devices intended for domestic hot water applications shall have a maximum working temperature of 140°F (60 °C).

1.2.4 Pressure Range

Devices shall have a working pressure range of 30 – 100 psi (103 - 689 kPa).

1.2.5 Commercial Modular Systems

Devices classified as commercial modular systems per NSF 330 are defined as:

> *A system consisting of multiple components attached to a manifold, produced specifically for food service applications, installed by an authorized plumber or authorized agent of the manufacturer, and not intended for use in residential applications.*

Commercial modular systems with specified flow rates of <4.0gpm (15.14 L/min) are considered POU devices within ASSE 1087.

1.3 Reference Documents

Referenced industry standards shall be to the revision stated below.

- ASME A112.1.2-2012, Air Gaps in Plumbing Systems (for Plumbing Fixtures and Water-Connected Receptors)
- ASME A112.1.3-2000 (R2010), Air gap Fittings for use with Plumbing Fixtures, Appliances, and Appurtenances
- ASME B1.20.1-2013, Pipe Threads, General Purpose (Inch)
- ASME B1.20.3-1976 (R2013), Dryseal Pipe Threads (Inch)
- ASME B16.18-2012, Cast Copper Alloy Solder Joint Pressure Fittings
- ASME B16.22-2013, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
- ASME B16.51-2013, Copper and Copper Alloy Press-Connect Pressure Fittings
- ASSE 1061-2015, Performance Requirements for Push-Fit Fittings
- NSF/ANSI 42-2016, Drinking Water Treatment Units - Aesthetic Effects
- NSF/ANSI 44-2016, Residential Cation Exchange Water Softeners
- NSF/ANSI 53-2016, Water Treatment Product - Health Effects
- NSF/ANSI 55-2016, Ultraviolet Microbiological Water Treatment Systems
- NSF/ANSI 58-2016, Reverse Osmosis Drinking Water Treatment Systems
- NSF/ANSI 60-2015, Drinking Water Treatment Chemicals - Health Effects
- NSF/ANSI 61-2016a, Drinking Water System Components - Health Effects
- NSF/ANSI 62-2016, Drinking Water Distillation Systems
- NSF/ANSI 177-2014, Shower Filtration Systems - Aesthetic Effects
- SAE J 512-1997, Automotive Tube Fittings
- UL 969-2001, Marking and Labeling Systems

2. Test Specimens and Test Laboratory

2.1 Bracketing

Products or components of similar design may be bracketed.

2.2 Samples Submitted

A unique sample may be submitted by the manufacturer for each of the required tests. The manufacturer may request for samples to be re-used unless the integrity of the samples are jeopardized.

NOTE: for some components, a mock system will need to be created for submittal to conduct testing.

2.3 Samples Tested

When a single sample is to be shared amongst different tests, the tests shall be performed in the order listed in this standard. Requirements in section 4 may be tested before section 3.

2.4 System Test Plan

When a system uses components whose performance have been previously evaluated to this standard or other referenced standards per section 1.3, complete system testing may not be required.
Not all sections of this standard are applicable for a particular system.

3. Performance Requirements and Compliance Testing

3.1 Service Flow Capacity

3.1.1 Purpose

Packaged tank and valve type systems (i.e. water softeners and filters), shall meet the advertised flow rate for a given pressure drop. Components and reverse osmosis systems are exempt from these requirements.

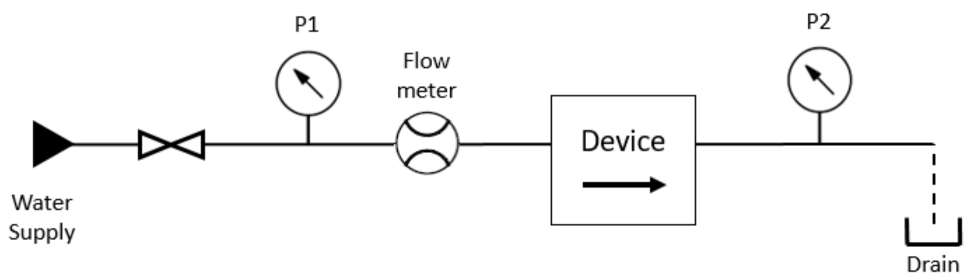

Figure 1 – Flow capacity test setup

3.1.2 Procedure

Install the device per Figure 1 and manufacturer's instructions.

a. Open water supply flow. Adjust flow to the manufacturer's stated maximum flow. Begin recording flow rate and pressure differential between P1 and P2.
b. Allow the device to flow for 5 min. Record the average flow rate and average pressure differential.
c. Adjust flow such that the pressure differential between P2 and P1 is 15 ± 2 psi (103.4 ± 13.9 kPa).
d. Allow the device to flow for 5 min. Record the average flow rate and average pressure differential.

Calculate the tested service flow capacities per equation 1:

$$C_v = \frac{Average\ Flow\ Rate\ (gpm)}{\sqrt{Average\ Pressure\ (psi)}} \qquad eq1$$

Calculate the stated service flow capacity per the specification sheet.

3.1.3 Criteria

The tested maximum service flow capacity shall be greater than the maximum service flow capacity as derived from the manufacturer's specification sheet.

3.2 Flow Capacity – POE System

3.2.1 Purpose

Test is conducted to determine the point-of-entry (POE) system's pressure drop when flowing at the service and maximum flow rates. Ice maker filters and reverse osmosis systems are exempt for the flow test.

3.2.2 Procedure

a. Install the system under test per Figure 1. Ensure that the plumbing connections on the test assembly are of equal size to the inlet and outlet of the system under test.
b. Set the influent dynamic water pressure to 30 ± 5 psi (207 ± 34.4 kPa) and temperature to 60 – 85°F (15.6 – 29.4 °C).
c. Purge the air from the system.
d. Increase the flow rate such that the pressure drop across P1 and P2 is 15 ± 1 psi (103 ± 6.9 kPa). Record the flow rate.
e. Repeat 3.2.2.d at pressure drops of 20 ± 1 psi (138 ± 6.9 kPa) and again at 25 ± 1 psi (172 ± 6.9 kPa).

3.2.3 Criteria

The flow rates at 15psi (103 kPa) and 25 psi (172 kPa) pressure drops shall not be less than the manufacturer's stated flow rate at those pressure drops.

3.3 Flow Capacity – POU System

3.3.1 Purpose

Test is conducted to determine the point-of-use (POU) system's pressure drop when flowing at the service and maximum flow rates. POU systems shall have a minimum flow rate of no less than 0.4 gpm. Ice maker filters and reverse osmosis systems are exempt for the flow test.

3.3.2 Procedure

1. Repeat sections 3.2.2.a - c.
2. Increase the flow rate to the service flow rate as published by the manufacturer. Record the pressure drop.

3.3.3 Criteria

The minimum flow rate shall be 0.4 gpm (1.5 L/min). The maximum pressure drop shall be 15psi (103.4 kPa).

3.4 Backsiphonage during System Regeneration

3.4.1 Purpose

Regeneration systems use a secondary vessel or chamber to regenerate a system that loses its ability to treat influent water over time. This section applies to regeneration systems that are able to dispense treated water and to regenerate its method of treatment. During these functions, the potable water source shall be protected from a backflow condition.

Devices which include an integral backflow prevention device that conforms with standards listed in Appendix A are exempt.

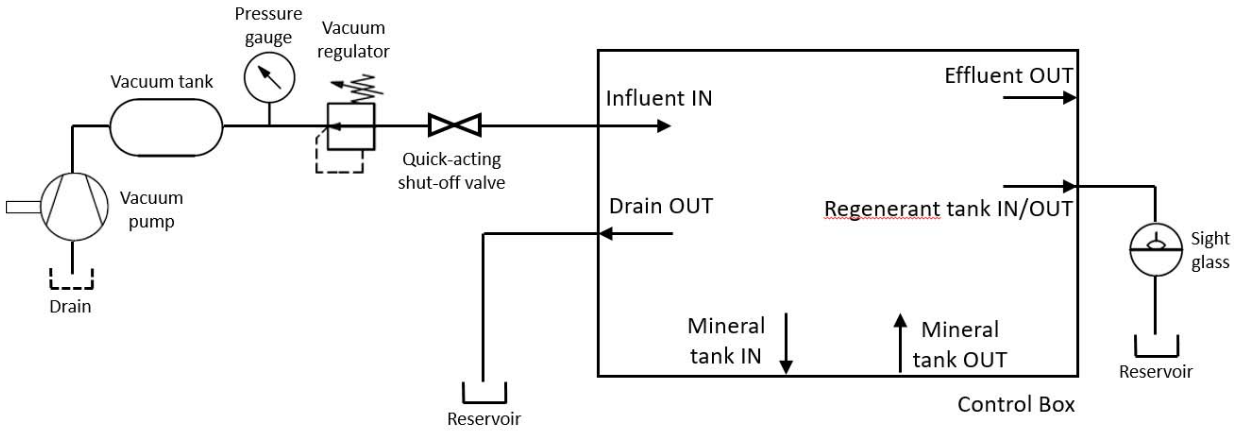

Figure 2 - Backflow test assembly setup. The sight glass has an internal diameter of 0.5in (12.7mm).

3.4.2 Procedure

a. Disconnect the mineral tank and regenerant tank from the control box. If this is not possible, install the system per the manufacturer's instructions and set up the system to be able to dispense treated water.
b. Connect the system as per Figure 2.
c. Set the control box such that it would be filling the mineral tank with untreated influent water.
d. Apply slowly and hold a vacuum of 12.1psig (635 mm-Hg) for 5 minutes, then reduce the vacuum from 12.1 to 0psig (635 to 0 mm-Hg) over 1 minute.
e. Close the quick-acting valve. Increase the vacuum upstream of the valve to 12.1psig (635 mm-Hg).
f. Create a surge effect by quickly opening and closing the valve once. During the test, the vacuum shall range between 12.1 to 0psig (635 to 0 mm-Hg).

3.4.3 Criteria

A rise of water in the sight glass, including the bowing of the meniscus, exceeding 3.0 inches (76mm) above the water in the reservoir shall result in rejection of the device.

3.4.4 Chemicals in Effluent

Chemicals that are intended to remain in the effluent water as a result of treatment shall be certified to NSF/ANSI 60.

3.5 Bypass Flow Capacity during System Regeneration

3.5.1 Purpose

For devices that use a regeneration system, the device shall be able to pass untreated water in order to allow for continuous downstream use while the system is regenerating.

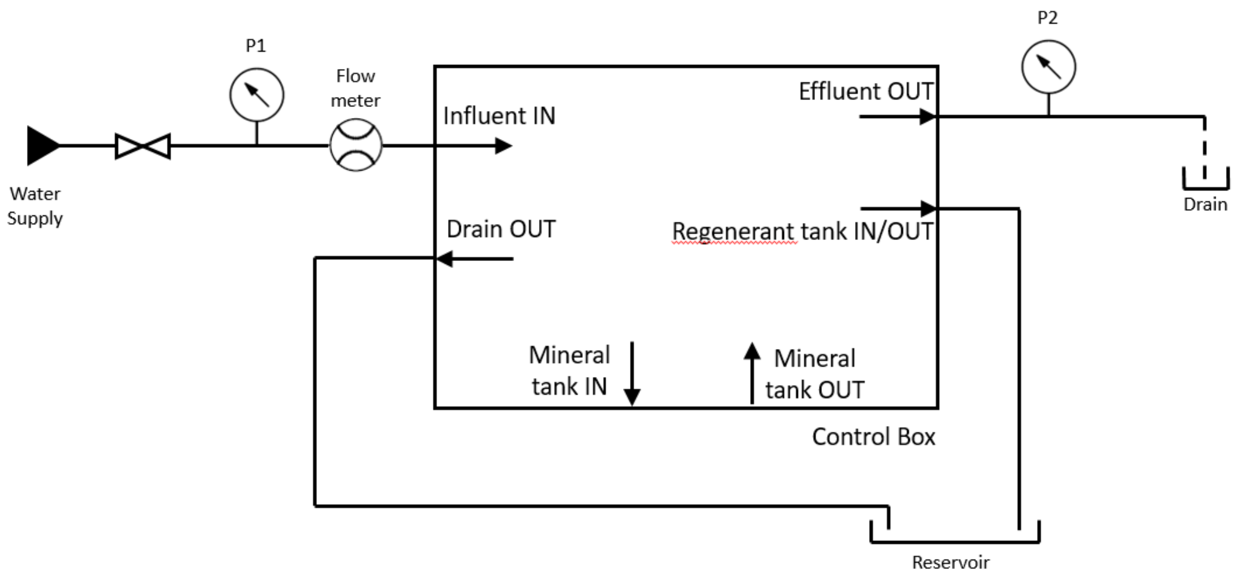

Figure 3 – Bypass flow capacity test setup

3.5.2 Procedure

Install the device per Figure 3. Reservoir shall be open to atmosphere, with regenerant line opening submerged for entirety of test. Disable any pressure regulators.

a. Set the device to regeneration mode.
b. Open water supply flow. Adjust flow such that the pressure differential between P2 and P1 is 15 ± 2 psi (103.4 ± 13.9 kPa). Begin recording flow rate and pressure differential.
c. Allow device to complete one full regeneration cycle.
d. Record the maximum and minimum flow rates during the cycle, the corresponding pressure differentials, and the durations. Record the average flow rate and pressure differential during the cycle.

Calculate the tested bypass flow capacity per equation 1.
Calculate the stated bypass flow capacity per the specification sheet.

3.5.3 Criteria

The tested bypass flow capacity shall be greater than the bypass flow capacity as derived from the manufacturer's specification sheet. The tested bypass flow capacity shall be no less than 50% of the service flow capacity at 15psi (103.4kPa) as tested in section 3.1.2.d. The flow rate shall not be reduced to zero at any time.

3.6 24-hour Pressure Loss

3.6.1 Purpose

The purpose of this test to ensure that the device's seals, joints, and connections continue to maintain the static working pressure.

3.6.2 Procedure

a. Connect the device per Figure 1 and flow water to remove all air from the system. The temperature of the water shall be ambient temperature.
b. Seal all outlets of the device
c. Increase the pressure of the incoming water supply to 50psi (344 kPa)
d. Close in the incoming shut-off valve.
e. Allow device to remain at the set pressure for 24 hours.
f. Verify inlet and outlet pressures.

3.6.3 Criteria

The maximum change of inlet or outlet pressure shall be 3psi (20 kPa).

3.7 Structural Integrity – Hydrostatic

3.7.1 Purpose

This test is performed to ensure the system or component will be able to withstand peak pressures found in a plumbing system when assembled into a complete water treatment system.

Commercial modular systems shall comply with the structural integrity test of NSF/ANSI 42 or NSF/ANSI 53 as appropriate, instead of Section 3.7.

3.7.2 Procedure

a. Install the device per manufacturer's instructions**Error! Reference source not found.**.
b. Set water temperature to 45 – 85°F (7.2 - 29.4 °C) for devices intended for use in cold water. Set the water temperature to 120 – 140 °F (48.9 – 60 °C) for devices intended for use in hot water.
c. Purge the system or component of air. Seal any ports to prevent leaking.
d. Pressurize the system or component to 3 times its stated working pressure or 300 psi (2068 kPa), whichever is greater.
    a. For systems greater than or equal to 18in (45.7cm) in diameter or larger, pressure shall be increased no faster than 10 psi (68.9 kPa) per second.
    b. For systems less than 18in (45.7cm) in diameter, pressure shall be increased no faster than 1 psi (6.89 kPa) per second.
e. Maintain pressure for 15 minutes.

3.7.3 Criteria

Breaks and cracks in the product causing spraying from the system or component shall constitute a failure. Drips do not constitute a failure.

3.8 Structural Integrity – Cycle Test

3.8.1 Purpose

This test is performed to ensure the system or component will be able to withstand repeated pressure cycling.

Commercial modular systems shall comply with the structural integrity test of NSF/ANSI 42 or NSF/ANSI 53 as appropriate, instead of Section 3.8.

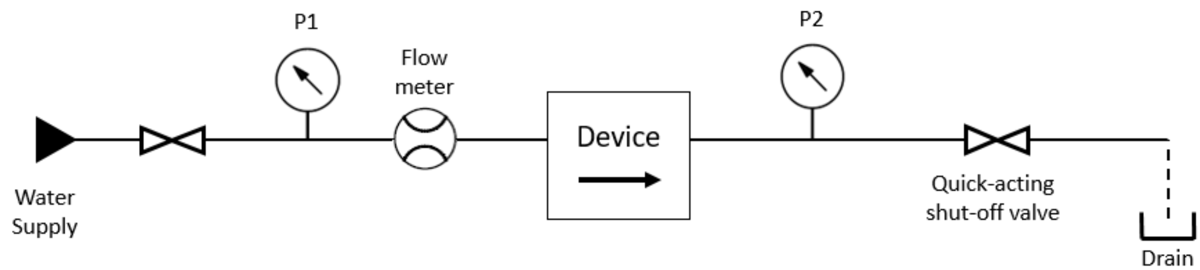

Figure 4 – Setup for pressure tests

3.8.2 Procedure

It is not recommended that the sample used in this section be the same sample used in section **Error! Reference source not found.**

a. Install the device per **Error! Reference source not found.**.
b. Set water temperature to 45 – 85°F (7.2 - 29.4 °C) for devices intended for use in cold water. Set the water temperature to 120 – 140 °F (48.9 – 60 °C) for devices intended for use in hot water.
c. Purge the system or component of air. Seal any ports to prevent leaking.
d. Pressurize the system or component to the stated maximum working pressure plus 10 psi (68.9 kPa) or 150 psi (1034 kPa) whichever is greater.
    a. For systems greater than or equal to 18 in (45.7cm) in diameter or larger, pressure shall be increased no faster than 10 psi (68.9 kPa) per second. Reduce the pressure to 10 psi (68.9kPa) within 10 seconds.
    b. For systems less than 18 in (45.7cm) in diameter, pressure shall be increased no faster than 50 psi (345 kPa) per second. Reduce the pressure to 10 psi (68.9kPa) within 3 seconds.
e. Repeat sections **Error! Reference source not found.**.**Error! Reference source not found.** - **Error! Reference source not found.** for 100,000 cycles.

3.8.3 Procedure for when sub-assemblies include a booster pump

This section is applicable for when a portion of the system is normally operating above 150psi (kPa)

a. Test the system per section 3.2.2
b. Disconnect the pump and inlet sub-assembly from the system.
c. Connect the sub-assembly downstream of the pump per Figure 1.
d. Repeat sections 3.2.2.b through 3.2.2.f, except pressurize the sub-assembly to the maximum output setpoint of the pump.

Note: For example, in a given reverse osmosis system, if the user is able to adjust the inlet pressure to the membrane from 150 to 200psi, set the device to 200psi.

3.8.4 Criteria

Breaks and cracks in the product causing spraying from the system or component shall constitute a failure. Drips do not constitute a failure.

3.9 Pressure Shock (Water Hammer)

3.9.1 Purpose

The purpose of this test is to determine if the device, when subjected to a pressure of two times the manufacturer's maximum rated working pressure withstands the shock wave produced in downstream piping.

3.9.2 Procedure

The sample used in this section shall not be the same sample used in sections **Error! Reference source not found.** or **Error! Reference source not found.**.

a. Install the device per **Error! Reference source not found.**.
b. Open the flow and find a suitable flow such that when the quickly closing shut-off valve is activated, a pressure shock as measured at P2 is generated. The shock shall be two times the manufacturer's maximum rated working pressure of the device or 200psi (1379kPa), whichever is greater.
c. Apply the shock pressure using the quickly closing shut-off valve and repeat three times.

3.9.3 Criteria

Any indication of damage that impairs the intended function of the device shall result in rejection of the device.

4. Detailed Requirements

4.1 Materials

POU devices shall comply with NSF/ANSI 42, NSF/ANSI 53, or NSF/ANSI 58 as applicable. All other devices shall comply with the applicable requirements of NSF/ANSI 61. Testing will cover the wetted materials only. Materials and components that only touch reject, drain or brine water only shall not undergo materials evaluation.

Device shall comply with the applicable requirements of NSF/ANSI 372.

4.2 Installation and Maintenance Instructions

Instructions for installing, adjusting, and maintaining the device shall be included with each device.

The installation instructions for the device shall include the following information:

a. Inlet and outlet connection sizes
b. Manufacturer's maximum working pressure
c. Manufacturer's stated minimum and maximum flow rate
d. For devices that connect to a drain, the statement: "Connection to drain shall not pierce or damage existing pipes. Install an air gap fitting compliant with ASME A112.1.3 between this device and the drain connection."
e. System components that are designed to be replaced in the field shall be identified by component part number.
f. The statement: "The device shall be made accessible for replacement and repair."

4.3 Identification and Markings

Each device shall have the following information marked on the label or dataplate:

a. Name of manufacturer or trademark
b. Model number
c. Working temperature range
d. Working pressure range
e. Service flow rate at 15psi pressure drop or for POU devices, the service flow rate per the manufacturer's specification sheet.
f. For POE systems: flow rate at 25psi pressure drop

The inlet and outlet connections shall be clearly marked.

Labels shall comply with UL 969 for permanence.

5. Definitions

Definitions not located in this section are located in the Plumbing Dictionary, Sixth Edition, published by ASSE.

Bracketing – A technical review of product specifications to determine if families of products may share test data for compliance purposes. For purpose of this standard, it does not include any dimensioning requirements unless otherwise specified in referenced standards.

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Appendix A - List of accepted backflow prevention standards (Normative)

Refer to section 3.4 for more information.
Note: this requirement is for the incoming water supply.

Designation	Rev	Standard Title
ASSE 1001	2017	Atmospheric Type Vacuum Breakers
ASSE 1011	2017	Hose Connection Vacuum Breakers
ASSE 1012	2009	Backflow Preventers with Intermediate Atmospheric Vent
ASSE 1013	2011	Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers
ASSE 1015	2011	Double Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies
ASSE 1020	2004	Pressure Vacuum Breaker Assembly
ASSE 1024	2004	Dual Check Backflow Preventers
ASSE 1047	2011	Reduced Pressure Detector Fire Protection Backflow Prevention Assemblies
ASSE 1048	2011	Double Check Detector Fire Protection Backflow Prevention Assemblies
ASSE 1052	2016	Hose Connection Backflow Preventers
ASSE 1056	2013	Spill Resistant Vacuum Breaker