ASSE Standard #1050
Issued: 1991
Revised: 2002

American Society of Sanitary Engineering

Performance Requirements for

Stack Air Admittance Valves for Sanitary Drainage Systems

General Information

No product may be said to be ASSE approved unless the manufacturer has applied to the ASSE, has had his product tested according to the applicable ASSE standards, and when the product has passed the test, displays the ASSE Seal on the product.

Instructions for receiving the authorization to display the ASSE Seal are available from ASSE's International Office. Organizations wishing to adopt or list any ASSE standard should print the ASSE standard number on the cover page first and in equal or larger type to that of the adopting or listing organization.

American Society of Sanitary Engineering
Westlake, Ohio

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

Air admittance valves open to the atmosphere when a negative pressure is created within the stack by flow of waste water, and are installed at the top of stacks to relieve the negative pressures in the DWV system. An air admittance valve is a one-way valve designed to allow air to enter the plumbing drainage system when a negative pressure develops in the piping. The device shall be closed at zero differential pressure and under conditions of positive internal pressure.

See ASSE Standard #1051-2002 for the performance requirements for Fixture and Branch Type Air Admittance Valves for Sanitary Drainage Systems. Prior to using air admittance valves, it is necessary to determine whether the applicable plumbing code accepts these devices as an alternate to the conventional venting system.

The working group which developed this standard revision, was set up within the framework of the Product Standards Committee of the American Society of Sanitary Engineering.

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

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

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

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).

2001-02 Product Standards Committee

Richard J. Prospal
Standards Committee Chairman
Reliance Mechanical
Cleveland, Ohio

Rand H. Ackroyd
Rand Engineering
Newburyport, Massachusetts

Michael Beckwith
State of Wisconsin DILHR
Madison, Wisconsin

Charles Caruana
Canadian Standards Association
Etobicoke, Ontario, Canada

Gunnar O. Collins
Collins Backflow Specialists, Inc.
Palatine, Illinois

Shannon M. Corcoran
ASSE Standards Coordinator
Westlake, Ohio

A. Richard Emmerson
Chicago Faucet Company
Des Plaines, Illinois

Dale Holloway
SGS United States Testing Company
Tulsa, Oklahoma

Michael Kobel
International Association of Plumbing and Mechanical Officials
Walnut, California

Valentine Lehr, P.E.
Lehr Associates
New York, New York

Peter Marzec
United Association of Plumbers and Pipefitters
Washington, D.C.

Doug Meyers
Carter Burgess, Inc.
Houston, Texas

Shabbir Rawalpindiwala
Kohler Company
Kohler, Wisconsin

Lynne Simnick
Building Officials and Code Administrators, Inc.
Country Club Hills, Illinois

Jack Vilendre
Precision Plumbing Products, Inc.
Portland, Oregon

David Viola
Plumbing Manufacturers Institute
Schaumberg, Illinois

Joseph C. Zaffuto, P.E.
ASSE Staff Engineer
Westlake, Ohio

AAV Working Group

Joseph Fugelo
Working Group Chairman
The Labov Company
Philadelphia, Pennsylvania

Julius Ballanco, PE
JB Engineering and Code Consulting
Munster, Indiana

Thomas Beckey, PE
Cherne Industries / Oatey Company
Edina, Minnesota

Jack Beuschel
Studor, Inc.
Dunedin, Florida

Craig Compton
Durgo, Inc.
Naples, Florida

Gary Duren
Dureco
Keystone Heights, Florida

John E. Engelberger, PE
ENERJEE Ltd.
Morrisville, Pennsylvania

Sture Ericksen
Studor Trading Ltd.
Schilde, Belguim

Henry Gohlke
Rectorseal
Houston, Texas

John Gronewold
NSF International
Ann Arbor, Michigan

Ian F. Johnston
Frajon International, Ltd.
Naples, Florida

Bengt Arne Perssen
Avonni AB
Djurlsholn, Sweden

Russell Wyman
Dallas, Texas

Joseph C. Zaffuto, P.E.
ASSE Staff Engineer
Westlake, Ohio

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Performance Requirements for Stack Air Admittance Valves for Sanitary Drainage Systems

Section I

1.0 General

1.1 Application

Stack Air Admittance Valves for Sanitary Drainage Systems (herein referred to as "device") are devices used as vent terminals for stacks in plumbing drainage systems. These devices shall not be used to relieve back pressure, but only to allow air to enter the system. When these devices are installed in a building, there shall be at least one (1) open vent terminal which extends to atmosphere outside of the building serving the building drain on which these devices are installed. These devices are designed to be installed on stacks where branches on multiple floors are connected.

1.2 Scope

1.2.1 Description

These devices consist of a one-way valve designed to allow air to enter the plumbing drainage system when a pressure less than atmospheric develops. The device closes and seals by gravity under zero (0) differential pressure (static or no flow condition) and under positive pressure. These devices prevent sewer gases from entering a building. The device consists of a hooded or shielded body which contains a movable guided diaphragm which seats and seals air flow when closed and allows air to enter when open.

1.2.2 Temperature Range

These devices shall function at temperatures from -40.0 °C to 65.6 °C (-40.0 °F to 150.0 °F).

1.2.3 Flow Capacity

These devices shall, at a minimum, pass the required volume of air according to Table 1 at -25.4 mm (-1.0 inch) water column.

1.3 Construction

1.3.1 Air Inlet Shields

Air inlets of the device shall be shielded to prevent inlet fouling. Air inlet shields shall extend down the body of the device, over the sealing membrane, to the lowest portion of the sealing membrane,

and shall maintain a minimum of 1.5 mm (1/16 inch) clearance between the inner lower edge of the shield and the lowest surface of the air opening of the sealing membrane.

1.3.2 Function
The device shall open when the pressure in the plumbing drainage system is lower than atmospheric and close by gravity at a pressure equal to and higher than atmospheric.

1.3.3 Leakage
The device and joining methods shall not permit air leakage when pressurized up to 762.0 mm (30.0 inches) water column, as described in Section 3.1 of this standard.

1.3.4 Interference
The end connection of the device shall be designed so that when installed, the joint shall not interfere with any moving parts of the device or restrict air passageways.

1.3.5 Materials
Materials used in all the device types shall conform to the requirements of this standard. References to industry standards shall mean the latest edition.

1.3.5.1 Dissimilar Metals
Where different metals are used in the construction of these devices, materials, which are close to each other on the electroactive scale, shall be used to reduce the corrosion potential.

1.3.5.2 Internal Metallic Parts
Internal parts of metallic construction shall be of material having a corrosion resistance at least equal to stainless steel series 300 or greater.

1.3.5.3 Non-Metallic Parts
Valve discs, seat facings or other nonmetallic parts shall be designed at the rated operating temperature of the device without change in physical characteristics which would prevent the full compliance with all requirements of this standard.

1.3.6 Connections

1.3.6.1 Threads for Air Admittance Valves
For all plastic devices having taper pipe threads for connection to the drainage system, threads shall conform to the requirement of ASTM Specification F 1498. Metallic threads shall conform to the requirements of ASME B1.20.1.

1.3.6.2 Hubless Connectors
Hubless connectors shall comply with ASTM C-564, CSA B602, or FM 1680.

1.3.6.3 Dimensions and Tolerances for Air Admittance Valve Sockets
Sockets on the device shall conform to applicable material requirements. Devices having sockets made from ABS material shall conform to the requirements of ASTM Specification D 2661, Table A1.1 with the exception of wall thickness. Devices having sockets and made from PVC material shall conform to the requirements of ASTM Specification D 2665, Table 1 with the exception of wall thickness.

1.3.6.4 Other Connections
Where types of connections other than connections specified in Sections 1.3.6.1, 1.3.6.2, and 1.3.6.3 are provided with the device, the connection shall conform to the applicable material requirements and the total assembly shall comply with the performance tests in this standard.

Section II

2.0 Test Specimens

2.1 Samples Submitted

Three (3) devices of each size and model shall be submitted by the manufacturer. Tests shall be performed in the order listed on one (1) device of each size submitted.

2.2 Samples Tested

The testing agency shall select one (1) of each type or model and size for full test.

2.3 Drawings

Assembly drawings and other data which are needed to enable a testing agency to determine compliance with this standard, together with installation drawings, shall accompany devices when submitted for examination and performance tests under this standard.

2.4 Rejection

Failure of one (1) device shall result in the rejection of that type or model and size until the manufacturer has corrected the fault and submitted new devices for testing.

Section III

3.0 Performance Requirements and Compliance Testing

3.1 Pressure Test of Complete Device

3.1.1 Purpose

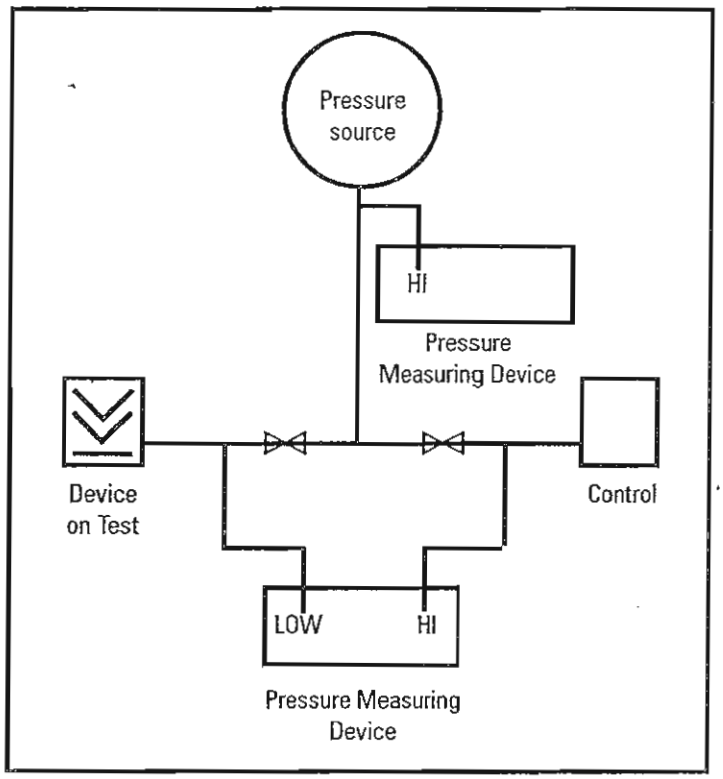
The purpose of this test is to determine if any pressure loss is evident during the pressure test.

3.1.2 Procedure

The device shall be mounted in its normal working position on a pipe having a length equal to 2.45 m (8 feet). Installation shall be in accordance with the manufacturers' required installation instructions that comply with Section 4.2.3 of this standard. When a device is designed to accommodate multiple pipe sizes, the device shall be installed on the largest nominal pipe size for which it is designed. The inlet shall be connected to an air supply capable of creating pressures from a 6.4 mm (1/4 inch) water column up to 762.0 mm (30.0 inches). Additionally, a secondary sealed system shall be constructed (See Figure 1 of this standard) using the same pipe length and diameter as used for the device under test to compensate for changing environmental conditions. A pressure measuring device shall be part of the test apparatus also as shown in Figure 1 of this standard. The ambient temperature of the testing area shall remain constant within ± 1.1 °C (± 2.0 °F). Use a pressure measuring device of 25.4 mm (1-inch) full-scale with ± 5% full-scale accuracy to perform the 6.4 mm (1/4 inch) and 19.0 mm (3/4 inch) pressure tests. Use a pressure measuring device of 1270.0 mm (50 inches) with a ± 5% full-scale accuracy to perform the 762.0 mm (30.0 inches) pressure test. The device shall be mounted in the test fixture at least two (2) hours prior to performing the test.

Slowly apply pressure equal to 6.4 mm (1/4 inch) water column. Close the shut-off valves for five (5) minutes, and then slowly increase the pressure to 19.0 mm (3/4 inch) water column. Close the shut-off valve, hold for five (5) minutes, then increase to 762.0 mm (30.0 inches) water column. Close the shut-off valve for five (5) minutes.

Figure 1



3.1.3 Criteria

Any pressure loss during the five (5) minute intervals for pressures of 6.4 mm (1/4 inch) water column and 19.0 mm (3/4 inch) water column in excess of 1.25 mm (0.05 inches) water column shall result in a rejection of the device. Any pressure loss during the five (5) minute interval for a pressure of 762.0 mm (30.0 inches) water column in excess of 63.5 mm (2-1/2 inches) water column shall result in a rejection of the device.

3.1.4

Repeat the test procedures in Section 3.1.2 with the device installed at a 15° orientation from the vertical position. The test criteria in Section 3.1.3 shall apply for the acceptability of the device to this test variation.

3.2 Air Tightness Test

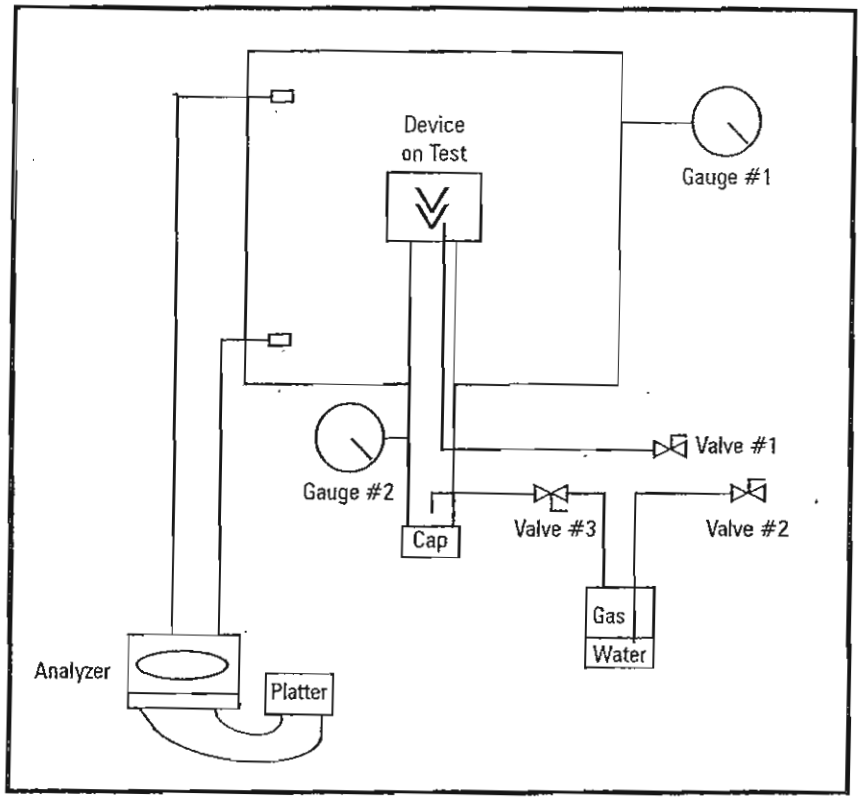
3.2.1 Purpose

The purpose of this test is to determine that the device is air tight at static and very low pressures.

3.2.2 Procedure

The device shall be mounted in its normal (upright) position on a pipe having a length equal to ten (10) times its inside diameter, and in a container as shown in Figure 2. All joints shall be sealed air tight. With the pressure inside of the container at 0 kPa (0 psig) as indicated by gauge #1, open valves #1 and #2. Gauge #1 shall read 0 kPa (0 psig) throughout the test. Open valve #3 to force NO_2 into the pipe and the device until the gas is emitted from valve #1. Close valves #3, #2 and #1 in that order. Use valve #1 and/or valve #2 to adjust the internal pressure in the device to 0 kPa (0 psig) as indicated on gauge #2. Close valves #1 and #2 when gauge #2 is at 0 kPa (0 psig). Maintain an internal pressure in the device of 0 kPa (0 psig) for five (5) minutes.

Figure 2



Increase the internal pressure in the device to 0.28 kPa (0.04 psig) by using valves #2 and #3. Maintain an internal pressure in the device of 0.28 kPa (0.04 psig) for five (5) minutes.

Increase the internal pressure in the device to 0.55 kPa (0.08 psig) by using valves #2 and #3. Maintain an internal pressure in the device of 0.55 kPa (0.08 psig) for five (5) minutes.

Increase the internal pressure in the device to 1.10 kPa (0.16 psig) by using valves #2 and #3. Maintain an internal pressure in the device of 1.10 kPa (0.16 psig) for five (5) minutes.

3.2.3 Criteria

Any detected concentration of NO_2 in the container exceeding ten (10) parts per million shall result in a rejection of the device.

3.3 Rating Test

3.3.1 Purpose

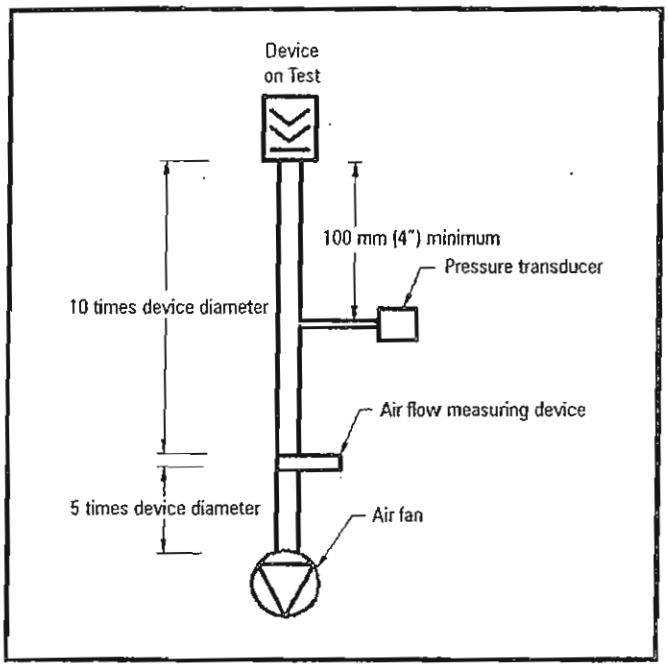
The test shall rate the device for capacity to serve as the vent terminal of a vent pipe for a drain pipe of a specific size and fixture unit value. The rating shall establish the maximum fixture unit value for specific drain pipe sizes.

3.3.2 Procedure

Install the device in accordance with the manufacturers' required installation instructions that comply with Section 4.2.3 of this standard in a test assembly as shown in Figure 3. The assembly shall have an airflow measuring device to measure the airflow rate in the piping and a pressure transducer for measuring the pressure change in the piping system. The air flow measuring device

shall be capable of measuring 50 cfm full scale with ± 5% full-scale accuracy. The pressure transducer shall be 25.4 mm (1 inch) full-scale with a ± 5% full scale accuracy. The pressure transducer shall be located 101.6 mm (4.0 inches) below the device. There shall be a minimum length of ten (10) times the pipe diameter straight undisturbed pipe above the air flow meter and a minimum length of five (5) times the pipe diameter straight undisturbed pipe below the air flow meter. The fan shall be capable of delivering the air flow within the capacity range of the device.

Figure 3



Activate the fan and slowly increase the speed of the fan until the device opens. Record the value of the pressure at the instant the device opens. This value shall be designated as the opening pressure. Increase the airflow rate until the pressure reaches -25.4 mm ± 1.1 mm (-1.0 inch ± 0.05 inch). Record the air flow rate. This value shall be designated as the determined airflow capacity. The temperature shall be maintained during the test at 22.2 °C ± 1.1 °C (72.0 °F ± 2.0 °F).

3.3.3 Criteria

A maximum opening pressure value of more than 7.6 mm (0.3 inches) water column shall result in a rejection of the device.

3.3.4 Rating the Device

The rating of the device shall be based on the determined airflow capacity. Table 1 shall be used to establish the drainage pipe size for the device based on the determined airflow capacity.

Table 1

Stack AAV Capacity Requirements					
Drainage Stack Pipe Size		Maximum Allowable Pressure Loss		Minimum Air Flow Requirement	
mm	inches	mm of Water	inches of water	L/s	CFM
40	1 1/2	25	1	1.9	4
50	2	25	1	3.8	8
65	2 1/2	25	1	5.7	12
75	3	25	1	10.9	23
100	4	25	1	22.2	47

Note: The air flow rates are based on the maximum air flow determined by Dawson and Kalinske using a stack having a water flow of 7/24 diameter and an air flow of 17/24 diameter.

3.4 Endurance Test

3.4.1 Purpose

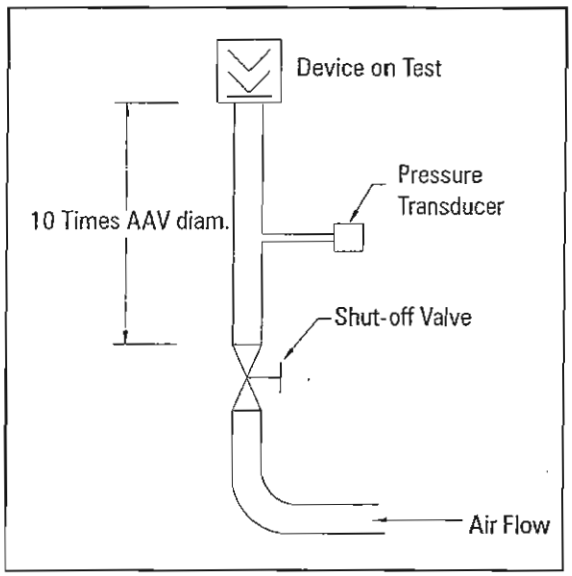
When exposed to air temperature between - 40.0 °C and 65.6 °C (- 40.0 °F and 150.0 °F), any material, whose characteristic is essential to the continued functioning of the device, shall not be adversely effected. This section of the standard tests the structural characteristics of the thermoplastics used in the manufacturing of the device by exposing the device to extreme temperatures and applying a mechanical load as it returns to a controlled temperature.

3.4.2 Procedure - High Temperature

Place the device in an environment where the temperature is maintained at 65.6 °C (150.0 °F) for a period of eight (8) hours. After eight (8) hours, remove the device, and immediately install the device on the test assembly as shown in Figure 4. After the device is installed, immediately subject the device to a vacuum of 0 to 50.8 mm (0 to 2.0 inches) water column (in order to open the device) for two hundred fifty thousand (250,000) cycles. A cycle shall be defined as two (2) seconds open and four (4) seconds closed. During the cycle test, the device shall return to the laboratory controlled temperature of 23.0 °C ± 2.0 °C (73.4 °F ± 3.6 °F). Upon completion of this test, the device shall be tested as prescribed in the Pressure Test of Complete Devices in Section 3.1.2.

Note: When installing the device to the test assembly, the manufacturer's installation instructions for exposure to subfreezing or elevated temperatures shall be followed.

Figure 4



3.4.3 Criteria for High Temperature

Failure to meet the criteria for the Pressure Test of Complete Device in Section 3.1.3 after the two hundred fifty thousand (250,000) cycles shall result in a rejection of the device.

3.4.4 Procedure - Low Temperature

Upon completion of the high temperature test in Section 3.4.2 of this standard, place the same device in an environment where the temperature is maintained at -40.0 °C (-40.0 °F). After eight (8) hours, remove the device, and immediately install the device on test assembly as shown in Figure 4. After the device is installed, immediately subject the device to a vacuum of 0 to 50.8 mm (0 to 2.0 inches) water column (in order to open the device) for two hundred fifty thousand (250,000) cycles. During the cycle test, the device shall return to the laboratory controlled temperature of 23.0 °C ± 2.0 °C (73.4 °F ± 3.6 °F). Upon completion of this test, the device shall be tested as prescribed in the Pressure Test of Complete Devices in section 3.1.2.

Note: When installing the device to the test assembly in the above section, the manufacturer's installation instructions for exposure to subfreezing or elevated temperatures shall be followed.

3.4.5 Criteria for Low Temperature

Failure to meet the criteria for the Pressure Test of Complete Device in Section 3.1.3 after the two hundred fifty thousand (250,000) cycles shall result in a rejection of the device.

3.5 Frost Closure Test

3.5.1 Purpose

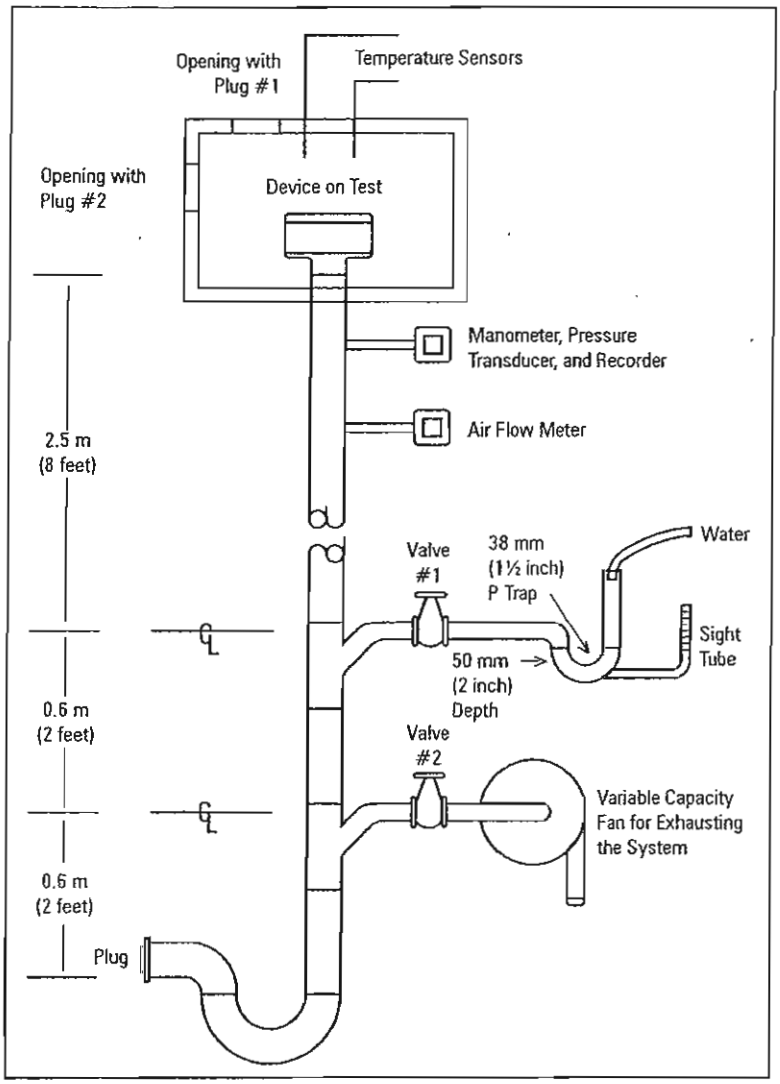
The purpose of this test is to verify the operation of the device in low temperatures.

3.5.2 Procedure

The device shall be placed in a freezer box able to produce a -23.3 °C (-10.0 °F) environment. A quantity of two (2) 101.6 mm (4.0 inches) open pipes shall penetrate the top side of the box. There shall be a means to open and close the 101.8 mm (4.0 inches) pipes. Two temperature sensors shall be located 50.8 mm (2.0 inches) above the top of the device.

The device shall be connected to a pipe as indicated by Table 1 per the manufacturers' required installation instructions that comply with Section 4.2.3 of this standard, the pipe extending through the bottom of the box, with the dimensions, fittings and connections arranged per Figure 5 of this standard.

Figure 5



With the 101.8 mm (4.0 inches) pipes closed, the box temperature shall stabilize at a temperature between -23.3 °C to -28.9 °C (-10.0 °F to -20.0 °F). With valve #2 closed, valve #1 opened, and the plug opened, flow water at 43.3 °C (110.0 °F) at a rate of 0.15 L/s (2-1/2 GPM) into the P-trap for a period of five (5) minutes, allowing water to flow out at the plug.

After the temperature sensor stabilizes at a minimum of -23.3 °C (-10.0 °F) for a minimum of six (6) hours, the 101.8 mm (4.0 inches) pipes shall be opened and the exhaust fan shall start, then valve #2 shall be opened.

3.5.3 Criteria

Failure of the device to open and admit air or any trap seal loss exceeding 12.7 mm (1/2 inch) shall result in a rejection of the device.

Section IV

4.0 Detailed Requirements

4.1 Materials

4.1.1 ABS Material Specification

Virgin ABS plastic compound shall conform to the requirements prescribed in Specification D 3965 with a cell classification of 3-2-2-2-2. The form of the material shall be as agreed upon between the seller and the purchaser in accordance with ASTM Specification D3965. Plastic containing polymers or blends of polymers shall contain a minimum of 15% acrylonitrile, 6% butadiene, and 15% styrene or substituted styrene, or both. ABS plastic shall contain no more than 10% of other monomeric or polymeric components plus other necessary compounding ingredients.

4.1.2 PVC Material Specification

Virgin PVC plastic compound shall meet or exceed the requirements of cell classification of 12454 prescribed in ASTM Specification D 1784. This plastic contains stabilizers, lubricants and pigments.

4.1.3 Rework Material

The manufacturer shall use only his own clean rework material created at the original manufacturing location conforming to the cell class requirements for the applicable material. The devices produced shall meet all of the requirements of this specification.

4.1.4 Other Materials

Other materials such as metal, including cast iron, aluminum, etc., shall meet recognized plumbing industry standards.

4.2 Instructions for Marking and Installation

4.2.1 Marking of Devices

Each device shall have the following information marked on it by a suitable, permanent method where it will be visible after the device has been installed:

a) Name of manufacturer or trademark.
b) Model number or description of the device.

The markings shall be cast, etched, stamped or engraved on the body of the device or on a corrosion resisting plate securely attached to the device.

4.2.2 Packaging

Each device shall have the following information marked on the packaging:

a) Name of manufacturer or trademark;
b) Model number or description of the device;
c) Drainage pipe size and fixture unit rating.

4.2.3 Installation Instructions

Instruction for installation of the device shall be on the packaging or packaged with the device. The instructions shall contain installation limitations, including instructions for the device when exposed to subfreezing and elevated temperatures.

Instructions shall include how to install the device; where the device is permitted to be used; where the device is prohibited; location requirements, accessibility and sizing such device.

4.2.4 Installation Requirements

4.2.4.1 The device shall be installed in an accessible location, which shall permit the free (unobstructed) movement of air into the device.

4.2.4.2 The device shall be installed in a vertical and upright orientation with the deviation not to exceed fifteen (15) degrees from vertical plumb.

4.2.4.3 A minimum of one stack vent or vent shall extend outdoors to the open air to serve as the positive pressure relief for the drainage system.

4.2.4.4 The use of an air admittance valve to relieve positive pressure shall be prohibited.

4.2.4.5 Code Requirements
Installation shall be in accordance with manufacturer's installation instructions and local code requirements.

Section V

5.0 Definitions

Definitions not found in this section are located in the Plumbing Dictionary, latest edition, published by ASSE.

American Society of Sanitary Engineering
FOR PLUMBING AND SANITARY RESEARCH

901 Canterbury Rd., Suite A • Westlake, Ohio 44145
Phone (440) 835-3040 • Fax (440) 835-3488
E-Mail ASSE@IX.netcom.com • www.asse-plumbing.org