

American Society of Sanitary Engineering

Performance Requirements for
**Individual and Branch
Type Air Admittance
Valves for Sanitary
Drainage Systems**

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American Society of Sanitary Engineering
Westlake, Ohio
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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.

This standard focuses on devices known as air admittance valves. These devices are intended as an alternative to vents for individual fixtures and branches in the plumbing drainage system.

These general areas evaluate the performance and longevity of air admittance valves, approaching that of the piping materials to which they are connected.

Prior to considering the use of air admittance valves, it is recommended that local plumbing codes be consulted regarding the acceptance and use of these devices.

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).

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Performance Requirements for Individual and Branch Type Air Admittance Valves for Sanitary Drainage Systems

Section I

1.0 General

1.1 Application

Individual and Branch Type Air Admittance Valves for Sanitary Drainage Systems (AAV's) (herein referred to as "device") are devices used as vent terminals for individual and branch fixtures in plumbing drainage systems. These devices shall not be used to relieve back pressure, but only to allow air to enter the system. When the 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 same building drain on which these devices are installed. These devices are designed to be used for individual fixtures or for a branch serving multiple fixtures.

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 (0) differential pressure (static or no flow condition) and under positive pressure. These devices prevent sewer gases from entering the 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 Rating

These devices shall be rated to pass the air rate indicated in Table 1 without exceeding a pressure drop greater than 25.4 mm (1.0 inch) of water column.

1.2.3 Temperature

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

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 1.6 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 Leakage

The device and joining methods shall not permit air leakage when pressurized up to 762.0 mm (30 inches) water column, as described in Section 3.1 of this standard.

1.3.3 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.

1.3.4 Materials

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

1.3.4.1 Dissimilar Metals

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

1.3.4.2 Internal Metallic Parts

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

1.3.4.3 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.

1.3.5 Connections

1.3.5.1 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.

1.3.5.2 Hubless Connectors

Hubless connectors shall comply with ASTM C-564(3), CSA B602(4), or FM 168(5).

1.3.5.3 Dimensions and Tolerances for Air Admittance Valve Sockets

Sockets on the device shall conform to the applicable material requirements. Devices having sockets for connection 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 made from PVC material shall conform to the requirements of ASTM Specification D 2665, Table 1 with the exception of wall thickness.

1.3.5.4 Other Connections

Where types of connections other than connections specified in Sections 1.3.5.1, 1.3.5.2, and 1.3.5.3 are provided with the device, the connection shall meet 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

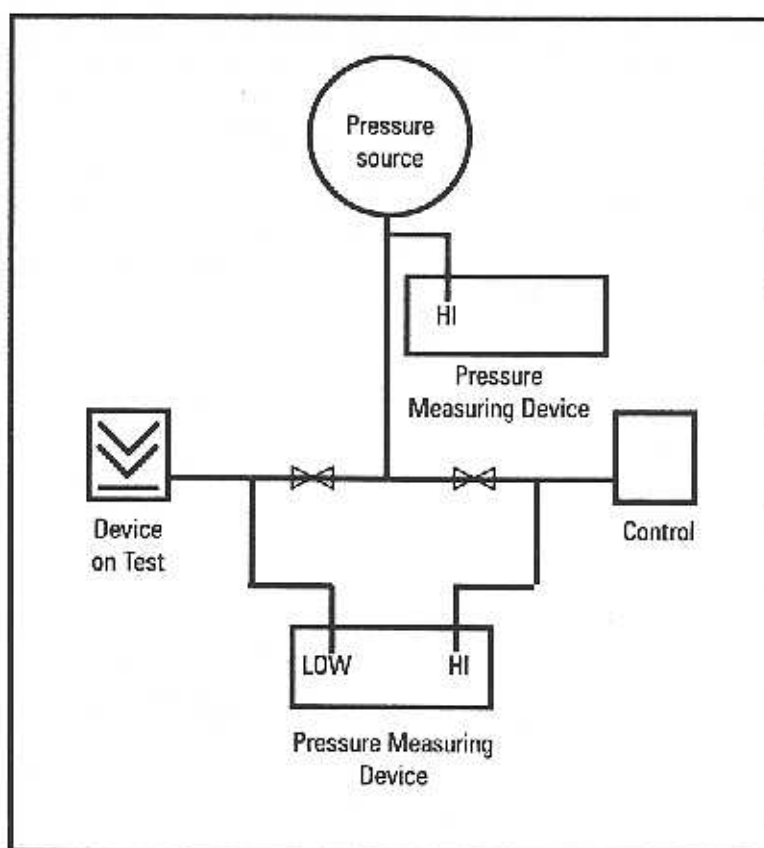
The purpose of this test is to determine if any pressure loss is evident during the pressure test.

3.1.2 Procedure

The device shall be mounted in its normal working (upright) position on a pipe having a length equal to ten (10) times its inside diameter. Installation shall be in accordance with manufacturers' required installation instructions that comply with Section 4.2.3 of this standard. When a device is designed to accommodate multiple 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 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 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 internal air volume of the control shall be equal to the internal air volume of the test device. The ambient temperature of the testing area shall remain constant within $\pm 1.1^{\circ}\text{C}$ ($\pm 2.0^{\circ}\text{F}$). Use a pressure measuring device of 25.4 mm (1 inch) full-scale with $\pm 5\%$ 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 mm (50 inches) with a $\pm 5\%$ 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

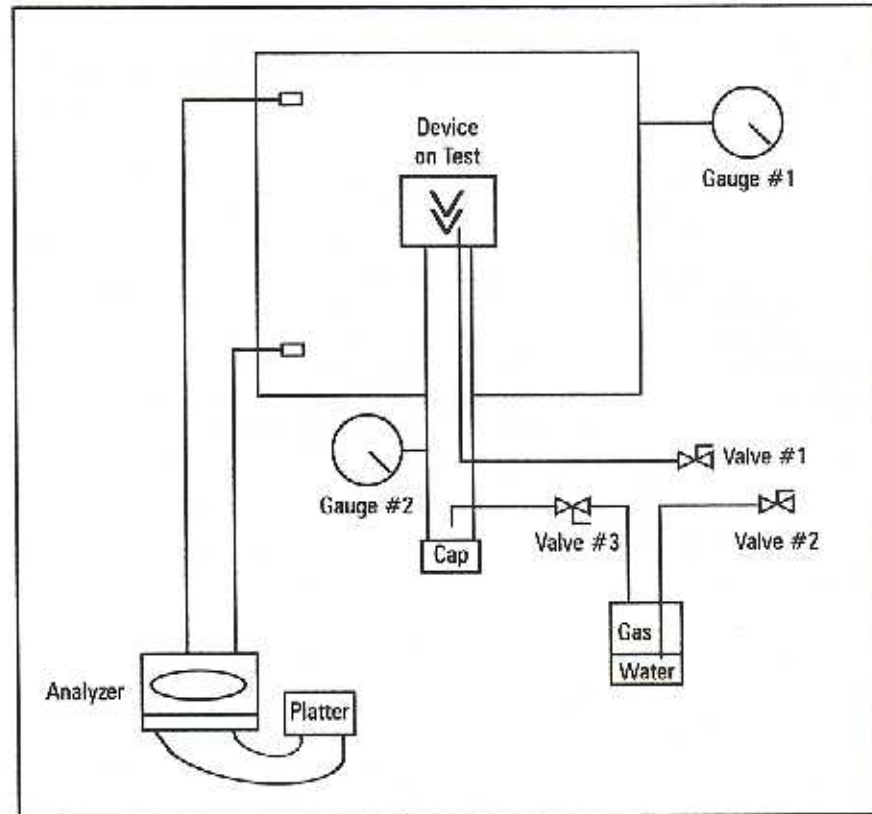
The purpose of this test is to determine that the device is air tight at static and very low pressures.

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. Installation shall be in accordance with manufacturers' required installation instructions that comply with Section 4.2.3 of this standard. When a device is designed to accommodate multiple sizes, the device shall be installed on the largest nominal pipe size for which it is designed. 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 NO₂ 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 NO₂ in the container exceeding ten (10) parts per million shall result in a rejection of the device.

3.3 Rating Test

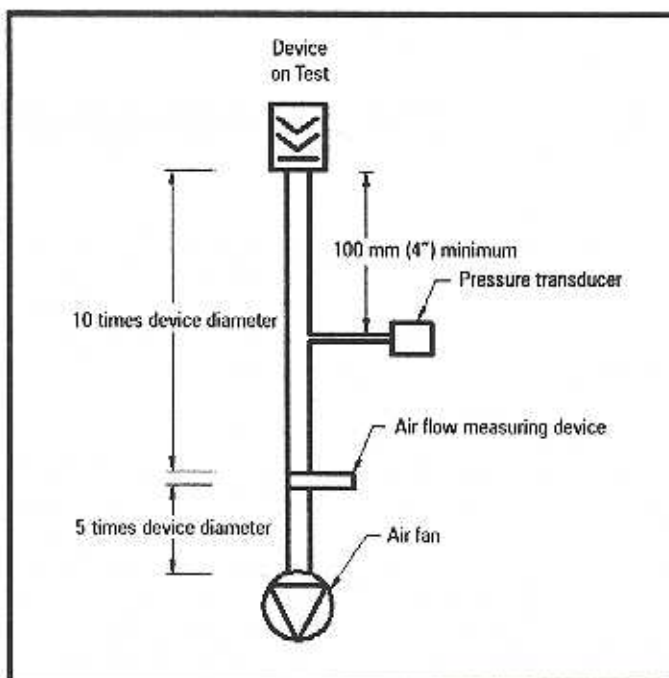
3.3.1 Purpose

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

Installation shall be in accordance with 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 $\pm 5\%$ full-scale accuracy. The pressure transducer shall be 25.4 mm (1 inch) full-scale with a $\pm 5\%$ full scale accuracy. The pressure transducer shall be located 101.6 mm (4 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 $-25.4 \text{ mm} \pm 1.25 \text{ mm}$ ($-1.0 \text{ inch} \pm 0.05 \text{ inch}$). Record the air flow rate. This value shall be designated as the determined airflow capacity. The temperature shall be maintained during the test at $22.2^\circ\text{C} \pm 1.1^\circ\text{C}$ ($72.0^\circ\text{F} \pm 2.0^\circ\text{F}$).

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

Drainage Pipe Size	Drainage Pipe Size	Maximum DFU's	Air Flow Rate	Air Flow Rate
DN	NPS		(cfm)	(L/s)
mm	(in)			
31.8	1-1/4	1	1	0.47
38.1	1-1/2	3	1	0.47
50.8	2.0	6	2	0.94
76.2	3.0	20	4	1.88
101.6	4.0	160	8	3.76

3.4 Endurance Test

3.4.1 Purpose

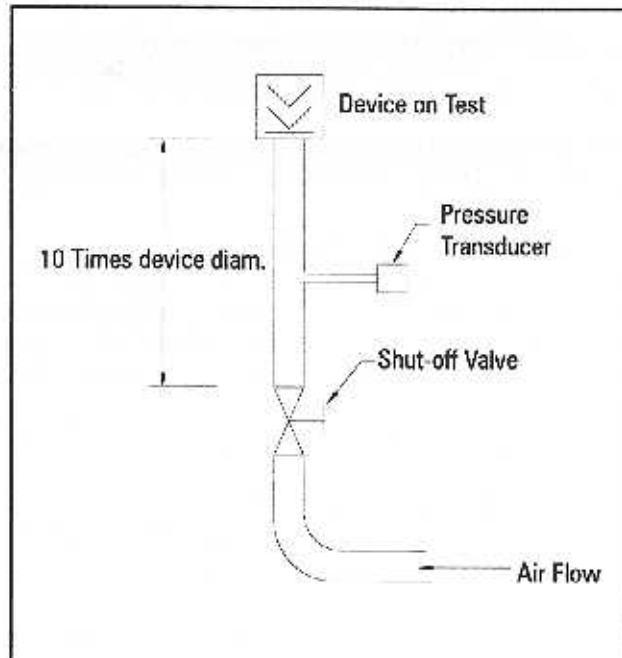
When exposed to air temperature between -40.0°C and 65.6°C (-40.0°F and 150.0°F), any material, whose characteristic is essential to the continued functioning of the device, shall not be adversely effected. This section of the standard tests the structural characteristics of the thermoplastics used in 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

Devices shall be placed in an environment where the temperature is maintained at 66°C (150°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) second open and four (4) seconds closed. During the cycle test, the device shall return to the laboratory controlled temperature of $23.0^{\circ}\text{C} \pm 2.0^{\circ}\text{C}$ ($73.4^{\circ}\text{F} \pm 3.6^{\circ}\text{F}$). 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 Section 3.3.2, the installation shall be in accordance with manufacturers' required installation instructions that comply with Section 4.2.3 of this standard 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 3.3.2 of this standard, place the same AAV 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 be returned to the laboratory controlled temperature of $23.0^{\circ}\text{C} \pm 2.0^{\circ}\text{C}$ ($73.4^{\circ}\text{F} \pm 3.6^{\circ}\text{F}$). 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 on the test assembly in the above section, the installation shall be in accordance with manufacturers' required installation instructions that comply with Section 4.2.3 of this standard 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.

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. The form of the material shall be as agreed upon between the seller and the purchaser in accordance with ASTM Specification D 3965. 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.

4.2.1.1 Optional Pressure Rating

The manufacturer shall have the option to mark the device with the maximum pressure rating attained when tested in Section 3.1.2.

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 capacity.

4.2.3 Installation Instructions

Instructions 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. The instructions shall demonstrate the proper method of venting where pumps or pressurized flushing devices are used, or where multiple floors are encountered; and a statement regarding the device is not a substitute for ALL conventional venting situations.

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 Code Requirements

The 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 of such device.

A minimum of one stack vent or vent stack 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 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 the ASSE.



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