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ASME A112.1.3-2000

# AIR GAP FITTINGS FOR USE WITH PLUMBING FIXTURES, APPLIANCES, AND APPURTENANCES

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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# FOREWORD

Industry has often incorporated air gaps into commercial fittings to provide back siphonage and backflow protection for the water supply systems to which the fittings are connected. Designers of such fittings took guidance from documents such as ASME A112.1.2, but there was not a national standard specifically directed toward fittings that included air gaps. In response to requests to modify ASME A112.1.2 to specifically cover fittings with air gaps, the ASME A112 Main Committee determined that the better course was to develop a separate standard for this purpose. A Project Team was created, and this Standard is the result of that work.

Suggestions for improvement of this Standard are welcomed. They should be sent to The American Society of Mechanical Engineers; Attn: Secretary, A112 Main Committee; Three Park Avenue, New York, NY 10016.

This Standard was approved as an American National Standard on July 5, 2000.



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# Standardization of Plumbing Materials and Equipment

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# AIR GAP FITTINGS FOR USE WITH PLUMBING FIXTURES, APPLIANCES, AND APPURTENANCES

## 1 GENERAL

### 1.1 Scope

This Standard establishes physical requirements and methods of testing for air gap fittings for protecting against back siphonage and back pressure backflow.

### 1.2 Units of Measurement

Values are stated in U.S. Customary Units and the International System of Units (SI). The U.S. Customary Units shall be considered as the standard.

In this Standard, gallons (U.S. Liquid) per min is abbreviated gpm and liters (metric liquid) per min is abbreviated L/min.

## 2 REFERENCE STANDARDS

The following document forms a part of this Standard to the extent specified herein. The latest issue shall apply.

NSF 61, Drinking Water System Components–Health Effects

Publisher: National Sanitation Foundation (NSF International), 3475 Plymouth Road, Ann Arbor, MI 48105

## 3 DEFINITIONS

The following definitions apply in this Standard.

*air gap:* a vertical distance through the atmosphere between the lowest potable water outlet and the highest level of the source of fluid contamination.

*air gap fitting:* a device with an integral air gap.

*critical level:* the location on an air gap fitting, determined by test, where presence of contaminated fluid not exceeding this elevation will not allow back siphoning.

*checking member:* a device intended to allow flow in one direction and to prevent flow in the opposite direction.

## 4 REQUIREMENTS

### 4.1 Performance Tests

The air gap fitting shall pass the performance tests as defined in Section 5 of this Standard with all checking members removed.

### 4.2 Materials

The component materials of the portions of air gap fittings designed for the delivery of water from sources that also supply water for human ingestion and are upstream from the air gap openings covered by the scope of NSF 61, section 9, shall conform to NSF 61, section 9 for endpoint devices. Joining and sealing materials used in these same portions of air gap fittings shall conform to NSF 61, section 6 for joining and sealing materials.

Solders and fluxes containing lead in excess of 0.2% by mass shall not be used where they will be in contact with potable water.

Metal alloys in contact with potable water shall not exceed 8% lead.

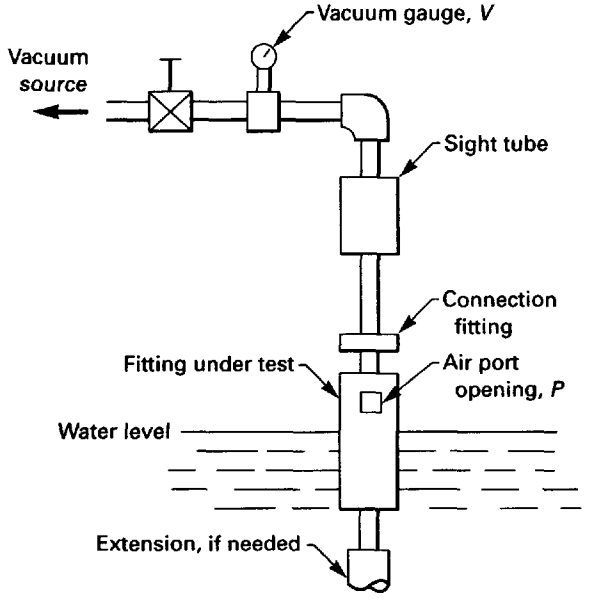
## 5 TESTING

### 5.1 Critical Level

**5.1.1** With the device installed in accordance with Fig. 1 and with the manufacturer's installation instructions, submerge the device for at least 1 min, agitating the device during submersion so that all of its openings and exterior and interior surfaces are thoroughly wetted and to remove entrained air.



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NOTES:

(1) The distance between the vacuum gauge, *V*, and the highest level of air port opening, *P*, shall be not more than 19.7 in. (0.5 m) including not more than 9.8 in. (0.25 m) of vertical distance.

(2) The interior cross sectional area of the conduit between the fitting under test and the vacuum gauge shall be at least as large as the minimum cross sectional area of the main flow path within the fitting but not less than 0.20 in.$^2$ (130 mm$^2$), except as permitted by Note 3.

(3) An air gap fitting with an integral inlet too small to be connected directly to a conduit of at least 0.20 in.$^2$ (130 mm$^2$) interior cross sectional area, and whose manufacturer's installation instructions recommend operational connection by conduit smaller than 0.20 in.$^2$ (130 mm$^2$), may connect that inlet to the rest of the test conduit (of at least 0.20 in.$^2$ (130 mm$^2$)) by a length of smaller conduit. This smaller conduit shall be no more than 5.9 in. (0.15 m) long and shall have the largest ID recommended by the manufacturer's installation instructions for operational use. Connection fittings used with such a smaller conduit must be the same as recommended by the manufacturer's installation instructions for regular installations.

**FIG. 1 ARRANGEMENT FOR CRITICAL LEVEL AND BACK SIPHON TESTING**

**5.1.2** Lower the water level so that it is no more than 0.12 in. (3 mm) below the highest level of air port opening, and apply a continuing vacuum of at least 25 in. Hg (85 kPa) while the water level is gradually lowered further. The elevation at which siphonage ceases shall be recorded. A continuing vacuum of 25 in. Hg (85 kPa) shall then be applied as the water level is gradually raised. The elevation at which back siphonage begins shall be recorded. The lower of the two elevations shall be considered the critical level.

**5.1.3** The manufacturer's critical level mark on the fitting shall be at or below the critical level determined by this test.

## 5.2 Back Siphonage

**5.2.1 Test Method.** The fitting shall be installed in accordance with Fig. 1 and with the manufacturer's instructions and submerged to the manufacturer's critical level mark. The following vacuum loads shall be applied in the sequence listed and the presence of water in the sight tube, if any, shall be noted:

*(a)* A vacuum of 25 in. Hg (85 kPa) shall be applied and held for a period of five (5) min.

*(b)* The vacuum shall be raised from 0 to 25 in. Hg (85 kPa), then shall be reduced to 0.

*(c)* A surge effect shall be created by operating a valve which travels between closed and fully open within 2 sec. The applied vacuum shall vary between 0 and at least 25 in. Hg (85 kPa).

*(d)* For devices with multiple water inlets, tests 5.2.1(a), (b), and (c) shall be conducted on the inlets individually. The conditions at the other inlets are to include: water flowing at the manufacturer's rated maximum, the inlet blocked, and the inlet open to atmosphere. The test matrix is to include these three conditions existing at all possible location combinations.

**5.2.2** Any entrance of water in the sight tube shall be cause for the rejection of the fitting.

## 5.3 Back Siphonage Cross Flow Test for Fittings With Multiple Inlets

**5.3.1 Test Method.** Each water inlet of a device with multiple water inlets is to be individually tested as follows. The inlet is to be connected to a vacuum source with a sight tube in accordance with the dimensions in Fig. 1 and a continuing vacuum of at least 25 in. Hg (85 kPa) applied while specific combinations of water flows are present at the other inlets. Test installation is to be in accordance with the manufacturer's instructions. The test matrix is to include all combinations of the water flow increments listed below, also including zero flow. These tests shall include the following increments of water flow: 0.031 gpm (0.117 L/min) for maximum rated flow of less than 1 gpm (3.785 L/min); 0.5 gpm (1.892 L/min) for maximum



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rated flow between 1 and 10 gpm (3.785 and 37.85 L/min); 2 gpm (7.570 L/min for flow rated from greater than 10 gpm (37.85 L/min) up to 20 gpm (75.70 L/min); and 5 gpm (18.92 L/min) for flow rated greater than 20 gpm (75.70 L/min).

**5.3.2** Any entrance of water into the sight tube shall be cause for rejection of the device.

### 5.4 Back Pressure Test

**5.4.1** This test shall be conducted on air gap fittings which are rated by their manufacturer to protect against backflow into the outlet of the fitting. With the fitting installed in accordance with the manufacturer's installation instructions, the manufacturer's maximum rated back pressure or backflow shall be applied. The flow shall be maintained at least 20 sec after the height of back flowing water stabilizes. Verify that during this test that the water does not rise above the manufacturer's critical level mark on the fitting.

**5.4.2** Water above the critical level mark shall be cause for rejection of the fitting.

## 6 MARKINGS

Air gap fittings shall be permanently marked with the following information:

*(a)* the manufacturer's name or trademark.

*(b)* the manufacturer's model number.

*(c)* the manufacturer's critical level mark.

*(d)* "inlet" or "outlet" or flow direction. If the fitting has multiple inlets, all inlets shall be marked.

## 7 INSTALLATION INSTRUCTIONS

Installation instructions that describe the proper installation of the fitting with respect to the critical level and to the orientation required for the fitting to comply with the performance tests of Section 5 shall be provided with the fitting. Manufacturer's literature shall include the maximum rated flow to the inlet(s) and any back pressure or back flow rating.



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## ASME STANDARDS RELATED TO PLUMBING

Air Gaps in Plumbing Systems ..... A112.1.2-1991(R1998)
Air Gap Fittings for Use With Plumbing Fixtures, Appliances, and Appurtenances ..... A112.1.3-2000
Performance Standard and Installation Procedures for
Stainless Steel Drainage Systems for Sanitary, Storm, and
Chemical Applications, Above and Below Ground ..... A112.3.1-1993
Water Heater Relief Valve Drain Tubes ..... A112.4.1-1993(R1998)
Plastic Fittings for Connecting Water Closets to the
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Public Use ..... A112.6.1M-1997
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Plumbing Fixture Fittings ..... A112.18.1-2000
Performance Requirements for Backflow Protection Devices
and Systems in Plumbing Fixture Fittings ..... A112.18.3M-1996
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Hydraulic Performance Requirements for Water Closets and Urinals ..... A112.19.6-1995
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