

ASME A112.18.1-2003
(Revision of ASME A112.18.1-2000)

PLUMBING FIXTURE FITTINGS

AN AMERICAN NATIONAL STANDARD



The American Society of
Mechanical Engineers



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Mechanical Engineers

A N A M E R I C A N N A T I O N A L S T A N D A R D

PLUMBING FIXTURE FITTINGS

ASME A112.18.1-2003
(Revision of ASME A112.18.1-2000)

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*In memory of, and dedicated to the life of,
our dear friend, colleague, and long-standing leader,
Patrick J. Higgins.*

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FOREWORD

The purpose of this Standard is to establish a nationally recognized standard for plumbing fixture fittings for the guidance of manufacturers, distributors, and purchasers to promote better understanding between suppliers and users, and to serve as a basis for fair competition in furnishing plumbing fixture fittings which meet the minimum life, functional, and appearance demands of the trade.

This Standard originates from the work undertaken by the Sanitary Brass Institute and the Tubular Plumbing Goods Institute in 1946. The two groups combined in 1954 to form the Plumbing Brass Institute and developed recommended performance criteria for finished and rough brass fixture fittings as well as tubular plumbing goods. The work was submitted to the National Bureau of Standards in 1964 to be published as a commercial standard.

The 1969 edition of this Standard was submitted to Panel 18 of the American National Standards Committee A112. After numerous changes, the American National Institute approved a revised standard in December 1969 as an American National Standard, designated ANSI A112.18.1-1969.

The revision approved on March 31, 1971, deleted tubular fittings. At the request of the Plumbing Brass Institute, tubular brass fittings were included again in the revision approved on October 2, 1975.

The 1979 revision of the Standard included the Plumbing Manufacturers Institute recommended maximum flow rates for lavatory, kitchen sinks, and shower heads for water conservation as well as their proposal and others for materials and plating. These were approved on November 16, 1979.

The Plumbing Manufacturers Institute recommended intermittent shock, high temperature extreme, and organic coating requirements in 1983. These recommendations led to the revision of other tests to include methods applicable to single-handle faucets. Organizational changes separated the performance requirements and performance tests. The requirement of a non-removable flow restrictor for shower heads was added. These changes were adopted in the January 18, 1989 revision of the Standard. Labeling, flow rates, and spout leakage were addressed in the revision approved on July 8, 1994.

The technical requirements for backflow protection were deleted from the 1994 Standard and reference was made to ASME A112.18.3M-1996, Performance Requirements for Backflow Protection Devices and Systems in Plumbing Fixture Fittings, for the alternative methods that may be used to protect public health. This revision was approved as an American National Standard on April 4, 1996.

The performance requirements and tests for fittings that incorporate electrical features were added in the 2000 Standard. The materials toxicity requirement was updated to include NSF Standard 61. The performance requirements and tests for coatings, bending strength, thread torque strength, and swing spout tests were revised. These changes were adopted as an American National Standard on January 27, 2000.

The current revision adds criteria and testing methods for PVD coatings. The requirements for fixture waste fittings now covered by ASME A112.18.2-2002 were deleted from this Standard.

Suggestions for improvement of this Standard will be welcome. They should be sent to The American Society of Mechanical Engineers; Attn.: Secretary, A112 Main Committee; Three Park Avenue, New York, NY 10016-5990.

This revision was approved as an American National Standard on February 20, 2003.

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Secretary, A112 Standards Committee
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The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the edition, the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation. When appropriate, proposals should be submitted using the A112 Project Initiation Request Form.

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The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his/her request in the following format:

Subject: Cite the applicable paragraph number(s) and the topic of the inquiry.
Edition: Cite the applicable edition of the Standard for which the interpretation is being requested.
Question: Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in this format will be rewritten in this format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

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PLUMBING FIXTURE FITTINGS

1 GENERAL

1.1 Scope

This Standard establishes general performance requirements and test methods for plumbing fixture fittings, accessories, other terminal fittings, and supply stops. It does not apply to conventional fittings such as nipples, elbows, tees, etc.

1.2 Units of Measurement

Values are stated in U.S. Customary units and in 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 minute* is abbreviated *gpm* and *liters (Metric Liquid) per minute* is abbreviated *L/min*.

1.3 References

The following is a list of publications referenced in this Standard.

ASME A112.1.2, Air Gaps in Plumbing Systems

ASME A112.18.3M, Performance Requirements for Backflow Devices and Systems in Plumbing Fixture Fittings

ASME A112.19.1M, Enameled Cast Iron Plumbing Fixtures

ASME A112.19.2M, Vitreous China Plumbing Fixtures

ASME A112.19.3, Stainless Steel Plumbing Fixtures (Designed for Residential Use)

ASME A112.19.4M, Porcelain Enameled Formed Steel Plumbing Fixtures

ASME B1.20.1, Pipe Threads, General Purpose (Inch)

ASME B1.20.7, Hose Coupling Screw Threads (Inch)

ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings

ASME B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes

ASME PTC 19.2, Instruments and Apparatus: Part 2 — Pressure Measurement

ASME PTC 19.5, Application, Part II of Fluid Meters: Interim Supplement on Instruments and Apparatus

Publisher: The American Society of Mechanical Engineers (ASME International), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300

ASSE 1016, Individual Thermostatic, Pressure Balancing and Combination Pressure Balancing and Thermostatic Control Valves for Individual Fixtures Fittings

ASSE 1019, Vacuum Breaker Wall Hydrants, Freeze-Resistant, Automatic Draining Type

Publisher: American Society of Sanitary Engineering (ASSE), 901 Canterbury Suite A, Westlake, OH 44145

ASTM B 117, Operating Salt Spray (Fog) Apparatus

ASTM B 287, Acetic Acid-Salt Spray (Fog) Testing

ASTM B 368, Copper-Accelerated Acetic Acid-Salt Spray (Fog) Testing (CASS Test)

ASTM B 380, Corrosion Testing of Decorative Electrodeposited Coatings by the Corrodokote Procedure

ASTM B 456, Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium

ASTM B 571, Qualitative Adhesion Testing of Metallic Coatings

ASTM B 604, Decorative Electroplated Coatings of Copper Plus Nickel Plus Chromium on Plastics

ASTM D 968, Abrasion Resistance of Organic Coatings by Falling Abrasive

ASTM D 3359, Measuring Adhesion by Tape Test

ASTM G 85, Modified Salt Spray (Fog) Testing

Publisher: American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959

CSA C22.2, No. 223, Power Supplies With Extra-Low-Voltage Class 2 Outputs

Publisher: Canadian Standards Association (CSA), 5060 Spectrum Way, Mississauga, Ontario L4W 5N6, Canada

ISA S75.02, Control Valve Capacity Test Procedure¹

Publisher: Instrument Society of America (ISA), 67 Alexander Drive, Research Triangle Park, NC 27709

NSF 61, Drinking Water System Components — Health Effects

Publisher: NSF International, 789 North Dixboro Road, P.O. Box 130140, Ann Arbor, MI 48113-0140

SAE J512, Fittings, Automotive Tube¹

Publisher: Society of Automotive Engineers (SAE), 400 Commonwealth Drive, Warrendale, PA 15096

UL 1310, Transformer Units, Direct Plug-In¹

UL 1585, Transformers, Class 2 and Class 3¹

UL 1951, Electrical Plumbing Accessories¹

¹ May also be obtained from the American National Standards Institute (ANSI), 25 West 43rd Street, New York, NY 10036.

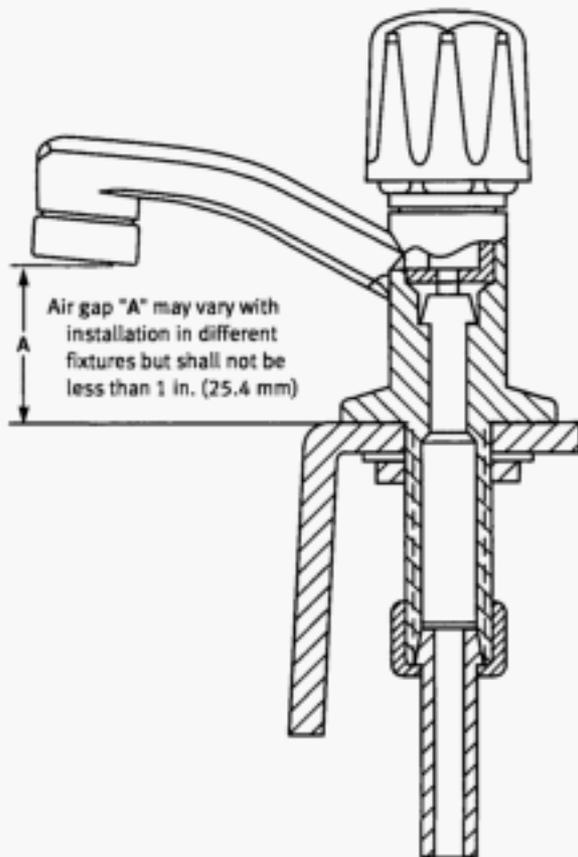


Fig. 1 Example of Air Gap

Publisher: Underwriters Laboratories (UL), 33 Pfingsten Road, Northbrook, IL 60062-2096

1.4 DEFINITIONS

The following definitions apply in this Standard.

accessory: a component that can, at the discretion of the user, be readily added, removed, or replaced, and that, when removed, will not prevent the fitting from fulfilling its primary function. Examples are aerators, handheld shower assemblies, and in-line flow controls.

air gap: unobstructed vertical distance (dimension A) through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture, or other device and the mounting surface of the fitting (see Fig. 1). For testing purposes, the mounting surface of the horizontally mounted fitting shall be considered as being equal to the flood level rim of the receptor.

backflow: the flow of water or other liquids, mixtures, or substances into the distributing pipes of a potable supply of water from any source or sources other than its intended source. Back siphonage and back pressure are types of backflow.

backflow prevention device: any mechanical device, whether used singly or in combination with other controls, designed to automatically prevent an unintentional reversal of water flow, due to either back pressure and/or back siphonage, in a potable water system.

back pressure: a pressure higher at the downstream, or outlet/end of a water distribution system than at a point upstream.

back siphonage: the flowing back of used, contaminated, or polluted water or fluids from a plumbing fixture, appliance, or receptor into a potable water supply pipe or fixture fitting due to a pressure below atmospheric in the supply pipe.

blister: a dome-shaped imperfection or defect resulting from loss of adhesion between a layer(s) and/or the substrate.

built-in fitting: fitting, the body of which is concealed behind the finished wall or is otherwise inaccessible.

centerset fitting: an exposed combination supply fitting for mounting to the top or deck of a fixture with 4 in. (100 mm) centers.

cold water: for test purposes, water at a temperature of 40°F to 70°F (4°C to 21°C).

combination fitting: a supply fitting with more than one supply inlet delivering water through a single spout.

concealed fitting: a fitting with body mounted beneath or behind the fixture.

critical level: level at which polluted water, entering through an outlet of the supply fitting, will flow back to the supply lines by gravity and/or any pressure below atmospheric in the supply line when the water control valve is wide or fully open.

deck mounted fitting: fitting that mounts on a horizontal surface.

diverter: a device integral to a fitting used to direct the flow of water from a primary outlet to a secondary outlet.

drinking water: potable water intended for human ingestion.

exposed fitting: fitting where the body is mounted above or in front of the deck or shelf of the fixture.

faucet: terminal fitting.

fitting: device designed to control and/or guide the flow of water.

fitting with pull-out spout: a deck mounted fitting with a primary movable outlet connected to the body of the faucet through a flexible hose.

flood level rim: tip edge of a receptor over which water would overflow.

low voltage: a circuit involving a peak open-circuit potential of not more than 42.2 V supplied by a primary

battery, by a Class 2 transformer, or by a combination of a transformer and fixed impedance that as a unit, complies with all performance requirements for a Class 2 transformer. A circuit derived from a line-voltage circuit by connecting a resistance in series with the supply circuit as a means of limiting the voltage and current, is not considered to be a low-voltage circuit.

may: when used, indicates an alternate requirement or option.

metering faucet: a faucet that, after actuation, dispenses water for a predetermined volume or period of time. Fixed or adjustable cycle duration or volume are allowable.

mixing valve, single control: fitting with a single control that shall serve to turn water on and off, and to change volume and temperature by means of a single handle.

mixing valve, single-handle: fitting that, when supplied with both hot and cold water, changes the discharge water temperature by means of a single handle.

mixing valve, single-handle, cycling type: single-handle mixing valve that rotates from off, through cold and mix to hot, and then in reverse to shut off.

mixing valve, two-handle: a combination fitting with separate hot and cold water control valves.

nonpotable water: contaminated water, not suitable for human or animal consumption, or water contained in any receptor.

permanent mark or label: a mark or a label that is intended to remain in the applied position for the lifetime of the fitting under conditions of normal use.

physical vapor deposition (PVD): a family of coating processes in which the surface layer is formed by the deposition of individual atoms or molecules of a material that is vaporized from a solid or liquid source, transported through a low pressure gaseous or plasma environment, and condensed on a substrate surface.

pit: a small depression or cavity.

potable water: water that is satisfactory for drinking, culinary, and domestic purposes, and meets the requirements of the health authority having jurisdiction.

pressure envelope: outside part of the fitting that withstands and contains the water pressure.

primary outlet: outlet from the fitting on the discharge side of the control valve through which water will discharge unless diverted to another outlet.

public lavatory fittings: fixture fittings designed to be installed in nonresidential bathrooms that are open to public access.

rigid waterway: any cross section of a waterway that is capable of transmitting a damaging load to the body of the fitting.

seat disk: disk or washer that, when compressed against the seat, provides a watertight seal.

secondary outlet: the outlet from the fitting, other than the primary outlet on the discharge side of the valve, through which water may be discharged.

self-closing faucet: faucet that is designed to close itself immediately upon release of the handle.

shall: where used, indicates a mandatory requirement.

significant surface: exposed surface that, if marred, would detract from the appearance of the fitting.

standard tools: tools, such as a screwdriver, key wrench, flat jawed wrench, and pliers, which are normally carried by plumbers for the installation and maintenance of plumbing.

stop: valve for the purpose of controlling the flow of water.

supply stop: valve, either integral or separate, that is placed ahead of a terminal fitting to shut off the supply to that terminal fitting.

surface defect: any pit, blister, crack, peeling, or discoloration.

terminal fitting: last valve before atmospheric discharge.

valve: fitting by which the flow may be started, stopped, and regulated by a movable part that opens and/or obstructs one or more passages.

2 GENERAL REQUIREMENTS

2.1 Toxicity Evaluation

All materials or products that come into contact with drinking water shall comply with NSF 61. Supply fittings covered by the scope of NSF 61 shall comply with the requirements of that standard.

Solder and fluxes containing lead in excess of 0.2% shall not be used in contact with potable water. Metal alloys in contact with potable water shall not exceed 8% lead content.

2.2 Coatings

2.2.1 Electrodeposited Coatings on Metals

(a) *Appearance*. The significant surfaces of the plated article shall be free of surface defects, roughness, and uncoated areas, and shall not be stained.

(b) *Adhesion*. The electrodeposited metallic coated parts shall meet the performance requirements by conformance to one of the following adhesion tests as defined in ASTM B 571:

- (1) burnishing test
- (2) file test
- (3) grind-saw test
- (4) heat quench test

(c) *Corrosion Test*. Electrodeposited coatings shall be subjected to the corrosion test of ASTM B 456 for the

applicable service condition as defined in para. 2.2.4. ASTM G 85, Test Method Annex A1, shall also be an acceptable method instead of ASTM B 287. After exposure, there shall not be more than one surface defect per 1 in.² (645 mm²) of the significant surface area. Surface defects shall not be more than 0.03 in. (0.8 mm) in any dimension.

2.2.2 Electrodeposited Coatings on Plastics

(a) *Appearance.* The significant surfaces of the plated article shall be free of surface defects, roughness, and uncoated areas, and shall not be stained. Except as noted in para. 2.2.3, fittings that are wholly or partially nonmetallic shall meet the following requirements when tested in accordance with para. 2.2.2(b).

(1) No surface defects shall be present on significant surfaces.

(2) Nonsignificant surfaces, gates, and parting lines may have minor cracks no longer than 1/4 in. (6 mm) provided there is no loss of adhesion between the base material and the coating.

(3) Blisters not exceeding 0.01 in.² (6 mm²) in area shall be acceptable within 1/4 in. (6 mm) of an injection point. In the case of an injection point being within 1/4 in. (6 mm) of a significant surface, para. 2.2.2(a) shall apply.

(4) Warpage shall be permitted only where it does not affect the performance of the part.

(b) *Thermal Cycling.* Under dry conditions, fittings shall be subjected to temperatures of 69.8°F (21°C) and -40°F (-40°C) consecutively for three complete cycles, with 1 hr exposure at each temperature for each cycle. No temperature stabilization period shall be allowed when changing from one temperature environment to the other.

Between 12 hr and 48 hr after completing the test described above, the fitting shall be alternately dipped in water baths maintained at 174.2°F ± 1°F (79.0°C ± 0.5°C) and 70.7°F ± 1°F (21.5°C ± 0.5°C), for 450 cycles. Fittings shall be totally immersed in each bath for 40 sec and no stabilization period shall be allowed when switching from one bath to the other. For plastic components of sink strainer assemblies, the dwell time in each bath shall be 2 min instead of 40 sec.

(c) *Corrosion Test.* Electrodeposited coatings shall be subjected to the corrosion test of ASTM B 604 for the applicable service condition as defined in para. 2.2.4. After exposure, there shall not be more than one surface defect per 1 in.² (645 mm²) of the significant surface area, or up to three surface defects on a 1 in. (25 mm) length of parting line, or exposure of the substrate. Surface defects shall not be more than 0.03 in. (0.8 mm) in any dimension.

2.2.3 Decorative Organic Coatings. Fittings, or parts of fittings, that have a decorative organic finish, regardless of substrate material, and are designed to be

mounted on a fixture or otherwise installed above the deck (this excludes flexible supply stops and risers) need not comply with para. 2.2.2(b) and instead shall meet the following requirements:

(a) When tested in accordance with paras. 2.2.3.1, 2.2.3.2, and 2.2.3.3 using separate test specimens. After exposure, there shall not be more than one surface defect per 1 in.² (645 mm²) of the significant surface area. Surface defects shall not be more than 0.03 in. (0.8 mm) in any direction.

(b) The finish shall have an adhesion rating of 3A or better when tested in accordance with para. 2.2.3.4.

(c) The finish shall not erode to the point of exposing the surface directly beneath when tested in accordance with para. 2.2.3.5.

2.2.3.1 Corrosion. Test specimens shall be tested in accordance with ASTM B 456 to Service Condition #2. ASTM G 85, Test Method Annex A1 shall also be an acceptable method instead of ASTM B 287.

2.2.3.2 Water Degradation. Test specimens shall be immersed in distilled water maintained at 100°F ± 2°F (38°C ± 1°C) for 24 ± 0.5 hr in a corrosion-proof container and then removed and examined.

2.2.3.3 Soap and Cleaner Effects. Two drops (0.10 ml) of each of the following solutions shall be applied to the organic coating (preferably on a flat surface) and allowed to remain there for 16 hr.

(a) ammonium hydroxide (6N);

(b) sodium hydroxide (6N);

(c) methanol (100%); and

(d) surfactant (100% polyethylene oxyethanol)²

At the end of this period, the excess liquid shall be removed and the coating examined.

2.2.3.4 Adhesion. Test specimen shall be tested in accordance with Method A of ASTM D 3359.

2.2.3.5 Abrasion Resistance. Test specimen shall be tested in accordance with Method A of ASTM D 968, using 12 L of silica sand on a relatively flat surface of the specimen.

2.2.4 Service Conditions. Exposed fittings and exposed parts of concealed fittings shall be tested to the requirements of Service Condition #2 (SC-2). All other fittings shall be tested to the requirements of Service Condition #1 (SC-1).

2.2.5 Physical Vapor Deposition (PVD) Coatings³

(a) *Adhesion.* The PVD coating and the separate layers of multi-layer coatings shall meet the applicable performance requirements defined in para. 2.2.5.1 or 2.2.5.2.

² Nonionic surfactants meeting the specification include GAF Igepal CO and Igepal CA, and Shell Triton X-100.

³ If more than one test method is specified, the purchaser shall specify which method shall be used. ASTM D 4060, Abrasion Resistance of Organic Coatings by the Taber Abraser, using a CS-10 abrasion wheel with a 1,000 g load may be used on sample panels for comparative evaluation of suppliers, products, or processes.

(b) *Corrosion Testing.* PVD coatings shall be subjected to one of the corrosion tests of para. 2.2.5.3 for metallic basis, or the corrosion test of para. 2.2.5.4 for plastic basis material. Exposed fittings and exposed parts of concealed fittings shall be tested to the requirements of Service Condition #2 (SC-2). All other fittings shall be tested to the requirements of Service Condition #1 (SC-1).

2.5.1 Metallic Basis Material. The coating shall be tested in accordance with, and meet the performance requirements of either ASTM B 571, Grind Saw Test (para. 8) or Heat Quench Test (para. 9).

2.2.5.2 Plastic Basis Material. The coating shall be tested in accordance with para. 2.2.2(b) and meet the requirements of para. 2.2.2(a).

2.2.5.3 Metallic Basis Material Test Specimens. Metallic basis material test specimens shall be tested in accordance with one of the methods shown below. After exposure, there shall not be more than one surface defect per 1 in.² (645 mm²) of the significant surface area. Surface defects shall not be more than 0.03 in. (0.8 mm) in any dimension. It is to be understood that occasional widely scattered, small corrosion defects may be observed after the testing period. In general, "acceptable resistance" shall mean that such defects are not, when viewed critically, significantly defacing or otherwise deleterious to the function of the coated part.

(a) *ASTM B 368 (CASS).* The test duration shall be 4 hr for SC-2. This test cannot be used to qualify SC-1, either para. 2.2.5.3(b) or 2.2.5.3(c) are acceptable tests for SC-1.

(b) *ASTM G 85 Annex A1 (Acetic Acid).* The test duration shall be 24 hr for SC-2 and 8 hr for SC-1.

(c) *ASTM B 117 (Neutral Salt).* The test duration shall be 96 hr for SC-2 and 32 hr for SC-1.

(d) *ASTM B 380 (Corrodokote).* The test duration shall be 4 hr for SC-2. This test cannot be used to qualify SC-1; either para. (b) or (c) are acceptable tests for SC-1.

2.2.5.4 Plastic Basis Material Test Specimens. Plastic basis material test specimens shall be tested in accordance with ASTM B 368 (CASS) for a duration of 8 hr for SC-2. This test cannot be used to qualify SC-1, either ASTM G 85 for 8 hr or ASTM B 117 for 32 hr are acceptable tests. After exposure, there shall not be more than one surface defect per 1 in.² (645 mm²) of the significant surface area or more than three surface defects on a 1 in. (25 mm) length of parting line. Surface defects shall not be more than 0.03 in. (0.8 mm) in any dimension. It is to be understood that occasional widely scattered corrosion defects may be observed after the testing period. In general "acceptable resistance" shall mean that such defects are not, when viewed critically, significantly defacing or otherwise deleterious to the function of the coated part.

2.3 Working Pressures

Fittings shall be designed to function at water working gage pressures between 20 psi (140 kPa) and 125 psi (860 kPa). Kitchen, laundry, and lawn fittings shall be designed for intermittent shock gage pressures up to 180 psi (1,240 kPa).

2.4 Working Temperatures

Fittings shall be designed to function at supply temperatures from 40°F (4°C) to 150°F (66°C) and shall withstand 180°F (82°C) for 0.5 hr without failure of the pressure envelope.

2.5 Installation

(a) All fittings shall be provided with suitable means to connect to a type of supply line in common use.

(b) Provision shall be made that the fitting may be connected and mounted without marring the finish or otherwise damaging the fitting or surface on which it is to be mounted.

(c) Means shall be provided to securely mount the fitting to withstand loading normally encountered in service.

(d) Provision shall be made for a method of sealing between the fitting and the fixture to which it is fastened.

2.6 Threads

2.6.1 Pipe Threads. Pipe threads shall conform to ASME B1.20.1.

2.6.2 Hose End Threads. Hose end threads shall conform to ASME B1.20.7.

2.7 Solder Connections

The dimensions of solder joint end for connection to copper tube or copper tube fittings, except factory assembled parts, shall conform with respect to length and diameter of the joint section to the dimensions given in ASME B16.18 or ASME B16.22.

2.8 Other Supply Connection Standards

(a) Flare connections shall be designed to conform with ASME B16.26.

(b) Compression connections shall be compatible with SAE J512.

2.9 Packing

(a) Packing shall be of such design and quality as to ensure leakproof joints and be capable of providing satisfactory field service.

(b) Swing spouts designed to use adjustable packing in the joint between the spout and the body shall be constructed so that the adjustments can be made without removing the spout.

2.10 Replacement Parts

(a) The design of supply fittings shall be such that, after installation, replacements of all wearing parts may be accomplished without disconnecting the fitting from the supply pipe or fixtures.

(b) Joints, which may have to be taken apart to replace worn parts after the fitting is installed, shall be designed so that they may be disassembled and reassembled without damaging or marring the significant surface on which the fitting is installed.

2.11 Renewable Seats

All concealed bath and/or shower fittings, except concealed stops, shall have renewable seats and seals, which can be replaced after installation without removing the body from the piping.

2.12 Seat Disks

The seat disk arrangement shall be made so that it will neither vibrate nor loosen in service and so that it can be replaced.

2.13 Backflow Prevention Devices

Plumbing fixture fittings shall be designed to prevent backflow as required by ASME A112.18.3M or through an air gap in accordance with ASME A112.1.2. For the purpose of compliance with this Standard, the air gap shall be measured from the mounting base of the fitting.

2.14 Temperature and Pressure Compensating Shower Mixing Valves

Thermostatic, pressure balance, and thermostatic/pressure balance shower mixing valves, for use in shower applications, shall conform to ASSE 1016.

3 TESTING

3.1 Selection of Test Samples

Two samples shall be selected at random from a lot of five production fittings and shall be tested in accordance with Table 1 and the sequence shown.

3.2 Strength Test

3.2.1 Burst Strength Test. Fittings shall withstand a hydrostatic test, as described below, without permanent distortion or failure of the pressure envelope.

(a) Fittings, except stop valves and supply stops, shall withstand a hydrostatic gage pressure of 500 psi (3,445 kPa) for 1 min. The pressure shall be applied to the inlet with the valve(s) closed. Fittings may be of the pressure relieving type, provided that the relief occurs at a gage pressure above 150 psi (1,035 kPa) and the relief discharge is into the fixture.

(b) Stop valves and supply stops shall withstand a hydrostatic gage pressure of 500 psi (3,445 kPa) for 1

min. The pressure shall be applied to the inlet with the outlet blocked and the valve open.

3.2.2 Bending Loads on Fittings. No cross section of a rigid waterway on the pressure side of a terminal fitting or on both sides of a non-terminal fitting shall be damaged when tested in accordance with the following: The force shall be applied not closer to the cross section being tested than twice the major diameter of that section. The bending moment shall be as specified in Table 2. This requirement shall not apply to waterways through a solder joint or equivalent.

3.2.3 Thread Torque Strength Test. IPS metal threaded connections shall be tested with a torque wrench to apply torque load specified in Table 3 without showing evidence of cracking or separation.

Torque measurements shall be made with torque wrenches having a maximum allowable inaccuracy of 3% of the full scale reading.

3.2.4 Spout Strength Test

(a) Spouts shall withstand a minimum bending moment of 175 in.-lbf (19.7 N·m) at the centerline of the joint between the spout and the body.

(b) The faucet shall be mounted in accordance with the manufacturer's instructions. The angle of the spout outlet shall be measured from the vertical. Sufficient weight shall be applied to the centerline of the spout outlet to generate a 175 in.-lbf (19.7 N·m) bending moment at the centerline of the spout/body joint for 3 min.

(c) *Failure Criteria.* 0.5 hr after the weight has been removed, the spout outlet angle shall be measured. The faucet shall have failed the test if the angle has changed by more than 15 deg from the angle measured prior to loading.

3.3 Handle Security Test

(a) The handle shall be secured in such a manner that it can be removed in service using standard tools.

(b) The handle shall be loaded by an applied torque or force in the same manner required to close the valve to an amount three (3) times that listed in Table 4. Failure shall be fracture of the handle or stem.

(c) The handle of a wall-mounted tub or shower valve shall not fracture or pull off under an axial static load of 150 lbf (667 N).

3.4 Valve Operating Test

When closed, valves intended to control the flow of water shall not leak at any test gage pressure between 20 psi (140 kPa) and 125 psi (860 kPa) applied to the inlet for 5 min. The torque or force required to open or close a manually activated valve shall not exceed either the operating torque or linear force listed in Table 4. The force shall be applied at the extreme end of the handle.

Table 1 Inspection Performance Test Requirements

Test	Fitting Type									
	Paragraph	Kitchen	Laundry [Note (1)]	Lavatory and Bar	Bidet	Bathtub/ Shower	Hand Shower/ Shower Head	Lawn	Stops	Metering Self-Closing
Sample # 1										
Handle security	3.3	X	X	X	X	X	...	X	X	X
Flow capacity	3.5	X	X	X	X	X	...	X	X	X
Bending load	3.2.2	X	X	X	X	X	...	X	X	X
Thread torque	3.2.3	X	X	X	X	X	...	X	X	X
High temperature, extreme	3.7	X	X	X	X	X	...	...	X	X
Intermittent shock	3.8	X	X	...	...	...	...	X	...	...
Sample # 2										
Backflow [Note (2)]	2.13	X	X	X	X	X	...	X	...	X
Valve operating	3.4	X	X	X	X	X	...	X	X	X
Life [Note (3)]	3.6.3(a) and (c)	X	X	X	X	X	...	X	X	X
Backflow [Note (2)]	2.13	X	X	X	X	X	...	...	...	X
Swing spout strength	3.6.3(b)	X	X	X [Note (4)]	...	...	...	...	...	...
Spout strength	3.2.4	X	X	X [Note (4)]	...	...	...	...	...	...
Burst strength	3.2.1	X	X	X	X	X	...	X	X	X

NOTES:

- (1) Includes service sink fittings.
- (2) Fittings with a secondary outlet or not protected by an air gap.
- (3) Paragraph 3.6.3(c) is only applicable to tub/shower diverters.
- (4) Applicable to swing spouts only.

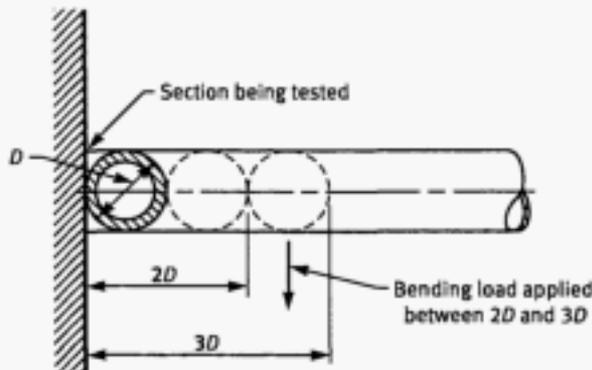


Table 2 Bending Loads on Fittings

Nominal Size, in.	Bending Moment, ft-lb (N-m)	
	Metal	Plastic
3/8	30 (40)	30 (40)
1/2	44 (60)	30 (40)
3/4	60 (80)	30 (40)
1	74 (100)	30 (40)

To meet the requirements of Section 309.4 of ANSI/ICC A117.1, the maximum force required to open or close a manually activated fitting, shall not exceed 5 lb. (22 N) at 80 psi (550 kPa) static.

Table 3 Thread Assembling Torques

Fitting Size (IPS)	Torque	
	ft-lb	N-m
3/8	32	43
1/2	45	61
3/4	65	88
1	95	129

3.5 Flow Capacity Test Procedure

(a) The plumbing fitting shall be connected to smooth interior pipe or tubing at least 20 inside diameters long at the inlet(s) and at the outlet, if the fitting does not discharge to atmosphere. The fittings to be tested shall be connected to pipe or tubing of the same nominal pipe size as the fitting inlet. Recommended test setups are shown in Fig. 2. For testing to comply with the maximum flow rates specified in Table 5, standard accessories shall be included. For compliance with the minimum flow rates specified in Table 5, standard accessories shall be removed. Accessories, when supplied separately, shall be tested as separate devices on a pipe or tube size used to connect commercially available fittings that will accept the accessory.

(b) The test for shower heads shall be made with water at 100°F ± 10°F (38°C ± 5.5°C). The test for all other fittings shall be made with water between 40°F

Table 4 Valve Operating Requirements

Valve Application	Rotary Motion (Torque)		Linear Normal Motion (Force)	
	in.-lb	N-m	lb	N
Sink, lavatory, bath, laundry tray	15	1.7	10	44.5
Lawn and sediment	15	1.7	10	44.5
Supply stops	15	1.7	15	66.75
Self-closing [Note (1)]	15	1.7	10	44.5

NOTE:

(1) The specified torque and force apply to a valve opening operation.

(4°C) and 150°F (65°C) as per the intended end use. The test gage pressure for minimum shall be 20 psi (138 kPa), except for shower heads, which shall be 80 psi (550 kPa) at the inlet when water is flowing. The test gage pressure for maximum shall be 60 psi (413 kPa) for faucets and 80 psi (550 kPa) for shower heads at the inlet when water is flowing. All fittings shall be tested at the maximum flow setting, if adjustable, with both hot and cold water valves open on combination fittings. Volume control shower heads shall be set at minimum flow setting when testing for minimum flow requirements.

(c) The fitting shall be thoroughly flushed before measuring the flow rate.

(d) The upstream pressure tap(s) and downstream pressure tap (if required) shall be located as shown in Fig. 2. Pressure tap size and configuration shall conform with ASME PTC 19.2 or ISA S75.02.

(e) If a fluid meter is used to measure flow rate, the installation shall be in accordance with ASME PTC Supplement 19.5. The minimum and maximum rates of flow shall meet the requirements listed in Table 5 at the flowing supply pressure(s) stated in (b) above.

(f) If time/volume method is used, the container shall be of sufficient size to be able to hold a volume of water collected for a minimum of 1 min.

3.6 Life Test

3.6.1 General. Fittings with moving parts subject to wear shall be subjected to the life test for the number of cycles of operation listed in Table 6.

3.6.2 Accept/Reject Criteria

(a) *Valve.* After completion of the life test, the valve must control the flow of water at test pressure with an application of force or torque to the lever or knob not to exceed 50% more than the valve force or torque specified in Table 4.

(b) *Swing Spout.* The swing spout shall:

(1) hold a hydrostatic gage pressure of 125 psi (860 kPa) for 1 min after 25,000 cycles with the original seal in place; and

(2) hold a hydrostatic gage pressure of 125 psi (860 kPa) for 1 min after 50,000 cycles. The seal may be

replaced to pass this once during this test.

(c) *Tub/Shower Diverter.* The diverter shall be considered to have failed if the leakage through the tub spout when tested at 20 psi and 60 psi (140 kPa and 410 kPa) flowing gage pressure is greater than:

- (1) 0.1 gpm (0.38 L/min) in the new condition; and
- (2) 0.3 gpm (1.14 L/min) after 15,000 cycles.

Additionally, an automatic diverter shall be rejected if it does not remain functional and reset itself to the tub position after 15,000 cycles.

3.6.3 Test Procedure

(a) *Valve*

(1) The cold water supply shall be at ambient temperature and the hot water supply at 140°F ± 10°F (60°C ± 5°C). Both supplies shall be at the same flowing gage pressure of 50 ± 5 psi (350 ± 35 kPa). Manually operated fittings shall be operated from full off to three-eighths of a turn open, but not to exceed three-fourths of the maximum amount of turning from fully closed to fully open, and back to full off (one cycle) at the rate of 1,500 cycles per hour (minimum). Adjustable metering fittings shall be set to run for approximately five seconds after actuation. Non-adjustable metering faucets shall be operated at their maximum run duration.

The test apparatus shall apply sufficient load to close the valve throughout the test, but shall in no case exceed 50% greater than the load in Table 4.

(2) Single-handle cycling type mixing valves and two-handle mixing valves shall be tested with cold water only to the supplies for 18 hr, alternating with a 6 hr period of hot water only to the supplies. More rapidly alternating cold to hot shall be permitted to be used in the same 3:1 ratio, with a minimum duration of 6 min cold and 2 min hot.

(3) Single control mixing valves shall be cycled alternately from off to full hot and back for 30 cycles, and from off to full cold and back for 30 cycles.

(b) *Swing Spouts.* The fitting shall be mounted on the life test apparatus with the axis about which the spout turns in line with the axis of the drive spindle. The forked end of the drive adapter shall be fitted loosely over the spout; the drive adapter shall be free to move vertically and shall be so weighed that a bending torque

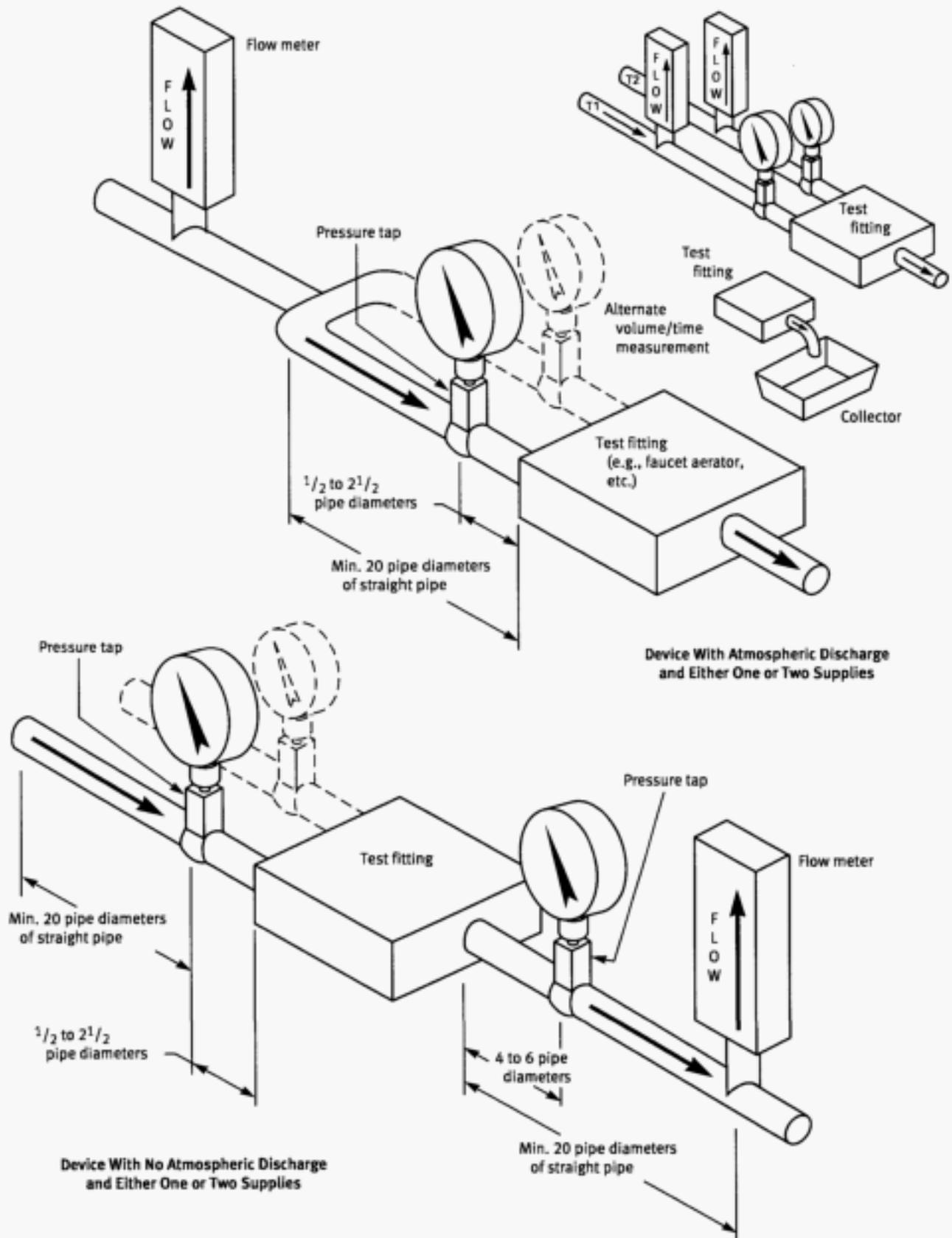


Fig. 2 Discharge Capacity Test Schematics

Table 5 Minimum and Maximum Flow Rates

Fittings	Min.		Max.	
	gpm	L/min	gpm	L/min
Bidet faucet	2.4	9.0	None	None
Lavatory faucet	None	None	2.2	8.3
Public lavatory faucet (other than metering)	None	None	0.5	1.9
Metering faucet	None	None	0.25 gal/cycle	0.95 L/cycle
Sink faucet	None	None	2.2	8.3
Shower head [Notes (1) and (2)]	0.5	1.9	2.5	9.5
Bathub/shower faucets —				
Single-handle	2.4	9.0	None	None
Two-handle	4.0	15.0	None	None
Utility faucets —				
Service sink	4.0	15.0	None	None
Lawn and sediment	4.0	15.0	None	None
Laundry tray	4.0	15.0	None	None
Supply stops — [Note (3)]				
$\frac{3}{8}$ (pipe)	5.5	21.0	None	None
$\frac{3}{8}$ (compression)	4.0	15.0	None	None
$\frac{1}{2}$ (compression)	5.5	21.0	None	None
$\frac{1}{2}$ (pipe)	9.5	36.0	None	None

NOTES:

- (1) Includes hand-held shower heads.
- (2) Safety shower heads are exempt from these maximum flow rate requirements.
- (3) Supply stop flow rate sizing shall be based on the nominal size for the outlet as indicated in the manufacturer's supporting literature.

Table 6 Life Test

Fitting	Component	Cycles
Bidet	Valve	50,000
Lavatory	Valve	500,000
Sink	Valve	500,000
	Swing spout	50,000
Laundry	Valve	250,000
	Swing spout	50,000
Tub and/or shower	Valve	250,000
Tub/shower	Diverter	15,000
Supply stops	Valve	2,000
Lawn and drain	Valve	150,000
Self-closing	Valve	150,000
Metering	Valve	150,000

of 5 in.-lbf (0.6 N·m) shall be applied at the base of the spout; the apparatus shall be adjusted to turn the spout through a 90 deg arc, 45 deg to each side of center. The turning mechanism shall be loaded to apply a static torque of 24 in.-lbf (2.7 N·m) to the centerline of the base of the spout. Cycle speed shall be 1,500 cycles per hour, and hot and cold water alternated every 6,000 cycles. Hot and cold water temperatures and pressures are to be as in the valve test.

(c) Tub/Shower Diverter

(1) Install a shower head in compliance with this Standard at the outlet of the diverter. The piping or hose shall not exceed 72 in. (2 m). The water supply to the

shower head shall be set at $110^{\circ}\text{F} \pm 10^{\circ}\text{F}$ ($43^{\circ}\text{C} \pm 5^{\circ}\text{C}$) with the flowing gage pressure, measured at the inlet to the valve, set at a 20 ± 5 psi (140 ± 50 kPa) while the diverter is in the shower position.

(2) The diverter shall be mechanically activated to deliver full flow through the shower head. The flow of water shall then be shut off by means of a bath/shower supply fitting valve or a control valve installed upstream of the fitting under test. Diverter shall be reset to the tub position mechanically except for automatic diverters which are intended to reset themselves to the tub position.

A cycle is defined as water flowing through the tub spout, activation of the diverter, flow of water through the shower head, and resetting of the diverter.

3.7 High Temperature Extreme Test

3.7.1 General. The supply fitting shall withstand a water temperature of 180°F (82°C) for 0.5 hr without failure of the pressure envelope.

3.7.2 Test Procedure. The fitting shall be connected to a hot water supply of 180°F (82°C). The cold water inlet shall be blocked. A shutoff valve shall be connected to the outlet and the hot water bled through it to maintain $180^{\circ}\text{F} \pm 5^{\circ}\text{F}$ ($82^{\circ}\text{C} \pm 3^{\circ}\text{C}$) within the fitting for 0.5 hr at a gage pressure of 125 psi (860 kPa).

3.7.3 Accept/Reject Criteria. The fitting shall be considered to have failed if it leaks after the test when a

gage pressure of 125 psi (860 kPa) is applied with the valve in a closed position.

3.8 Intermittent Shock Test

3.8.1 General. Kitchen, laundry, and lawn fittings, except those with pull-out spouts or integral water treatment device, shall withstand an intermittent shock gage pressure to 180 psi (1,240 kPa) from a simulated apparatus connected to the spout outlet as described below.

3.8.2 Test Procedure

(a) Water supply to the hot side of the fitting shall be at $140^{\circ}\text{F} \pm 10^{\circ}\text{F}$ ($60^{\circ}\text{C} \pm 5^{\circ}\text{C}$) such that the flow gage pressure is 125 psi at 2.0 ± 0.24 gpm (860 kPa at 7.6 ± 0.95 L/min) with the fitting in the full hot position. The cold side inlet shall be at a gage pressure of 125 psi (860 kPa) static and at ambient cold water temperature.

(b) A simulated apparatus such as rapid closing solenoid valve shall be connected downstream of the spout so as to create a shock gage pressure of 180 psi (1,240 kPa).

(c) The solenoid valve shall be cycled at a rate of 2 sec open, 2 sec closed for a duration of 30,000 cycles.

3.8.3 Accept/Reject Criteria. Any leakage shall be cause for rejection under the following conditions:

(a) at the end of the test, examine the pressure envelope while still at test pressure;

(b) turn off the valve(s), disconnect the simulated appliance from the spout outlet, and examine with pressure still applied to the inlet.

4 SPECIAL REQUIREMENTS

4.1 Compatibility With Fixture Standards

The requirements in this Section are set forth so that fittings meeting these requirements will match the standard hole locations in fixtures which are manufactured in accordance with ASME A112.19.1M, ASME A112.19.2M, ASME A112.19.3, and ASME A112.19.4M.

4.2 Lavatory Fittings

4.2.1 Inlets. All lavatory fittings with a $\frac{1}{2}$ in. NPSM shank designed to mate with a standard $\frac{1}{2}$ in. coupling nut and tailpiece shall meet dimensions as shown in Fig. 3. Designs for other common connections are permissible. Shank lengths of deck mounted fittings shall be at least $1\frac{3}{4}$ in. (45 mm).

4.2.2 Flange or Cover Plate. The outside diameter of the flange or cover plate shall not be less than $1\frac{3}{4}$ in. (45 mm).

4.3 Sink Fittings

4.3.1 Inlets. All sink fittings with a $\frac{1}{2}$ in. NPSM shank designed to mate with a standard $\frac{1}{2}$ in. coupling nut and tailpiece shall meet dimensions as shown in Fig. 3.

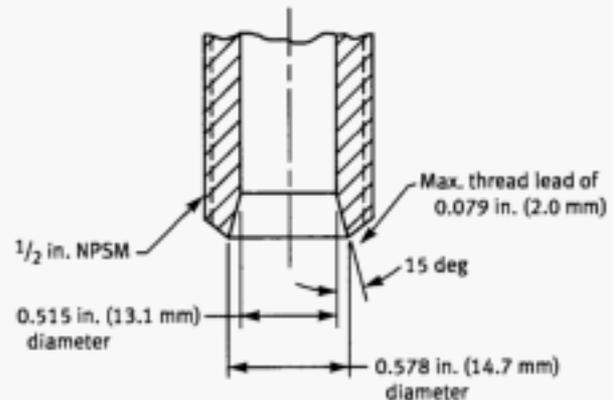


Fig. 3 Standard Shank Inlet Dimensions

Designs for other common connections are permissible. Shank lengths of deck mounted fittings shall be at least $1\frac{3}{4}$ in. (45 mm).

4.3.2 Flange or Cover Plate. The width of the flange or cover plate shall not be less than $1\frac{3}{4}$ in. (45 mm).

4.4 Bath and Shower Fittings

4.4.1 Servicing

(a) The construction of a built-in bath or shower fitting shall be such that all wearing parts can be replaced from in front of the finished wall in which the supply valve is mounted.

(b) The escutcheons shall be of sufficient size to cover the openings in the wall necessary to service the fitting.

4.4.2 Shower Heads

(a) All flow restricting inserts shall be mechanically retained at the point of manufacture. Mechanically retained shall mean that a pushing or pulling force of 8 lbf (36 N) or more is required to remove the flow restricting insert. This requirement shall not apply to shower heads which will cause water to leak significantly from areas other than the spray face, if the flow restricting insert were removed.

(b) Shower head volume controls, whether integral or separate, shall be designed so that they cannot completely shut off the water to the shower head and shall meet the minimum flow requirements of Table 5.

4.4.3 Temperature Identification. Each single-handle and single-control mixing bath and/or shower valve shall have identifiable temperature control settings, such as cold, warm, hot, numbers, or graphic identification.

4.5 Lawn (Sillcock) and Sediment Faucets

A lawn or sediment faucet shall drain at least 50% of the volume of the inlet shank and pipe when connected to a 4 ft (1.22 m) length of standard weight pipe of the same nominal diameter as the inlet of the faucet, when

installed with a downward slope of $\frac{1}{8}$ in./ft (10 mm/m) toward the faucet.

4.6 Frostproof Lawn Faucets

A frostproof lawn faucet shall meet the performance requirements of ASSE 1019.

4.7 Fittings Incorporating Electrical Features

4.7.1 General. Fittings incorporating electric features shall be supplied by:

- (a) a low voltage battery supply; or
- (b) a suitable Class 2 low voltage transformer complying with the requirements of UL 1310, UL 1585, or CSA C22.2 Number 223; or
- (c) shall comply with the requirements of UL 1951.

4.7.2 Testing. An electrical plumbing control, including solenoid valves, when used in conjunction with a plumbing fitting, shall be considered an integral component of the plumbing fitting and be tested with the fitting and comply with the requirements of para. 3.1. Replacement of a battery during the life testing shall not be considered a failure.

5 MARKING REQUIREMENTS

5.1 Product

(a) Each fitting and accessory shall bear permanent legible markings to identify the manufacturer. This

marking shall be the trade name, trademark, or other mark known to identify the manufacturer or in the case of private labeling, the name of the customer or trademark for whom the fixture fitting was manufactured. Such marking shall be located where it can be seen after installation. This marking shall be by means of either a permanent mark on the product, or a permanent label on the product.

(b) Permanent labels shall comply with the performance requirements of UL 969. Labels for products intended for indoor use only shall comply with the requirements for indoor use where exposed to high humidity or occasional exposure to water, and shall have a temperature rating of at least 176°F (80°C). Labels for products intended for outdoor use shall comply with the requirements for outdoor use where exposed to high humidity or occasional exposure to water, and shall have a temperature rating of at least 176°F (80°C).

5.2 Package

The package shall be marked with the manufacturer's name and model number or in the case of private labeling, the name of the customer or trademark for whom the fixture fitting was manufactured.

NONMANDATORY APPENDIX A GOVERNMENT REQUIREMENTS

A1 SCOPE

This Appendix is not part of ASME A112.18.1 and is included for Federal Government use only. It covers requirements of the Federal Government for the procurement of plumbing fixture fittings.

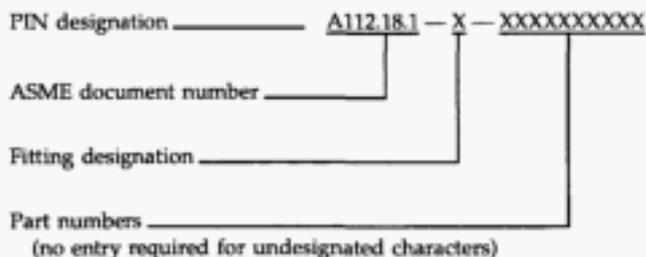
A2 APPLICABLE DOCUMENTS

The plumbing fixture fittings shall conform to ASME A112.18.1.

A3 REQUIREMENTS

A3.1 Part or Identifying Number (PIN)

The plumbing fixture fittings covered by ASME A112.18.1-2003 shall be identified by a PIN. This part number is intended for cataloging and ordering purposes (see Section A6) and not for surface marking on the product. The PIN shall be written as shown below:



A3.1.1 Part Numbers for Sink Faucet (Fitting Designation = 1)

- (a) First character denotes type.
- A = kitchen faucet with spray (3-hole fixture)
 - B = kitchen faucet with spray (4-hole fixture)
 - C = kitchen faucet without spray
 - D = laundry faucet
 - E = service sink faucet
 - F = bar sink faucet
- (b) Second character denotes mixing valve.
- 1 = single control valve
 - 2 = two handle valve
- (c) Third character denotes mounting.
- A = deck mount (exposed)
 - B = deck mount (concealed)
 - C = back/wall mount (exposed)
 - D = back/wall mount (concealed)

- (d) Fourth character denotes centers.

- 1 = $3\frac{3}{8}$ in.
- 2 = 4 in.
- 3 = 6 in.
- 4 = 8 in.
- 5 = single hole
- 6 = adjustable

- (e) Fifth character denotes indexed valve handle.

- A = lever
- B = knob
- C = knob (nonmetallic)
- D = cross (4-arm)
- E = wrist blade (4-in.)
- F = elbow (6-in.)
- G = not applicable

- (f) Sixth character denotes inlet.

- 1 = $\frac{3}{8}$ in. tubing (plain end)
- 2 = $\frac{3}{8}$ in. tubing (with $\frac{1}{2}$ in. IPS male adapter)
- 3 = $\frac{1}{2}$ in. IPS male shank
- 4 = $\frac{1}{2}$ in. IPS female shank

- (g) Seventh character denotes spout (spout length as specified; see Section A6).

- A = rigid (cast)
- B = swing (round tubular)
- C = swing (shaped tube)
- D = swing (cast)
- E = rigid gooseneck
- F = swivel gooseneck
- G = with wall brace

- (h) Eighth character denotes spout outlet.

- 1 = aerator
- 2 = swivel aerator/spray
- 3 = spray
- 4 = streamformer
- 5 = $\frac{3}{4}$ -in. hose thread
- 6 = plain end

- (i) Ninth character denotes vacuum breaker.

- A = required
- B = not required

- (j) Tenth character denotes operation.

- 1 = compression (manual)
- 2 = noncompression (manual)
- 3 = automatic

A3.1.2 Part Numbers for Lavatory Faucet (Fitting Designation = 2)

- (a) First character denotes type.
- A = single control (mixing)

- B = single valve (nonmixing)
 C = two handle (mixing)
- (b) Second character denotes centers.
 1 = $3\frac{3}{8}$ in.
 2 = 4 in.
 3 = 6 in.
 4 = 8 in.
 5 = single hole
 6 = adjustable
- (c) Third character denotes mounting.
 A = deck mount (exposed)
 B = deck mount (concealed)
 C = back/wall mount (exposed)
 D = back/wall mount (concealed)
- (d) Fourth character denotes indexed valve handle.
 1 = lever
 2 = knob
 3 = knob (nonmetallic)
 4 = cross (4-arm)
 5 = wrist blade (4-in.)
 6 = elbow (6 in.)
 7 = push button
 8 = not applicable
- (e) Fifth character denotes inlet.
 A = $\frac{3}{8}$ in. tubing (plain end)
 B = $\frac{3}{8}$ in. tubing (with $\frac{1}{2}$ in. IPS male adapter)
 C = $\frac{1}{2}$ in. IPS male shank
 D = $\frac{1}{2}$ in. IPS female shank
- (f) Sixth character denotes spout (spout length as specified; see Section A6).
 1 = rigid
 2 = swing
 3 = rigid gooseneck
 4 = swivel gooseneck
- (g) Seventh character denotes spout outlet.
 A = aerator
 B = spray
 C = streamformer
 D = plain end
 E = spray (0.5 gpm)
- (h) Eighth character denotes operation.
 1 = compression (manual)
 2 = noncompression (manual)
 3 = automatic
 4 = self closing
 5 = metering
- (i) Ninth character denotes waste drain.
 A = not required
 B = pop-up drain
 C = stopper with chain
 D = grid drain
 E = lift and turn
- (j) Tenth character denotes tempering device.
 1 = mechanical
 2 = thermostatic

- 3 = pressure balance
 4 = not required

A3.1.3 Part Numbers for Bath and Shower Fitting (Fitting Designation = 3)

- (a) First character denotes valve type.
 A = single control mixing valve
 B = two handle mixing valve
 C = three handle mixing valve
 D = single handle thermostatic valve
 E = single handle pressure balance valve
 F = single handle thermostatic/pressure balance valve
- G = push button metering valve (nonmixing)
- (b) Second character denotes mounting.
 1 = exposed
 2 = concealed
- (c) Third character denotes indexed valve handle.
 A = lever
 B = knob
 C = knob (metallic)
 D = cross (4-arm)
 E = not applicable
- (d) Fourth character denotes diverter valve.
 1 = not required
 2 = required (integral with mixing valve)
 3 = required (not integral with mixing valve)
- (e) Fifth character denotes bathtub spout.
 A = spout with diverter
 B = spout without diverter
 C = spout with diverter (nonmetallic)
 D = spout without diverter (nonmetallic)
- (f) Sixth character denotes operation.
 1 = compression (manual)
 2 = noncompression (manual)
 3 = automatic
- (g) Seventh character denotes anti-scald device.
 A = required (integral with mixing valve)
 B = required (furnished as separate unit)
 C = not required
- (h) Eighth character denotes supply connections.
 1 = IPS
 2 = IPS (union)
 3 = sweat

A3.1.4 Part Numbers for Shower Head (Fitting Designation = 4)

- (a) First character denotes type.
 A = ball joint
 B = without ball joint
 C = ball joint and head integral with mounting flange
 D = shower head integral with mounting flange
 E = hand held (slide bar mounted)
 F = hand held (hook mounted)

- (b) Second character denotes spray pattern.
 - 1 = fixed
 - 2 = adjustable
- (c) Third character denotes integral volume control.
 - A = required
 - B = not required
- (d) Fourth character denotes head material.
 - 1 = metallic
 - 2 = nonmetallic
 - 3 = combined (metallic/nonmetallic)

A3.1.5 Part Numbers for Miscellaneous Fittings (Fitting Designation = 5)

- (a) First character denotes type.
 - A = supply stop
 - B = lawn faucet
 - C = sediment faucet
 - D = sillcock
- (b) Second character denotes style.
 - 1 = straight body
 - 2 = angle body
- (c) Third character denotes inlet.
 - A = $\frac{1}{2}$ in. (male)
 - B = $\frac{1}{2}$ in. (female)
 - C = $\frac{3}{4}$ in. (male)
 - D = $\frac{3}{4}$ in. (female)
 - E = $\frac{1}{2}$ in. (compression)
 - F = $\frac{1}{2}$ in. (sweat)
- (d) Fourth character denotes outlet.
 - 1 = $\frac{3}{8}$ in. (compression)
 - 2 = $\frac{3}{8}$ in. (female)
 - 3 = $\frac{1}{2}$ in. (compression)
 - 4 = $\frac{1}{2}$ in. (female)
 - 5 = $\frac{3}{4}$ in. (hose thread)
 - 6 = plain end
- (e) Fifth character denotes handle.
 - A = tee
 - B = wheel
 - C = cross

- D = loose key
- E = screwdriver

- (f) Sixth character denotes vacuum breaker.
 - 1 = required
 - 2 = not required

A3.2 Finish

Unless otherwise specified (see para. A6), all exposed parts, trim, and hardware shall be polished chrome plated; stainless steel shall be polished commercial finish.

A3.3 Material

Except as indicated herein, materials shall be metallic.

A4 QUALITY ASSURANCE PROVISIONS

The fixture fittings shall meet the government requirements specified herein, conform to producer's own drawings, specifications, standards, quality assurance practice, and be the same product offered for sale in the commercial market. The government reserves the right to require proof of such conformance.

A5 PREPARATION FOR DELIVERY

The packaging, packing, and marking shall be as specified in the contract or purchase order (see para. A6).

A6 ORDERING DATA

Acquisition documents should specify the following:

- (a) title, number, and date of the standard;
- (b) PIN designation (see para. A3.1);
- (c) spout length [see paras. A3.1.1(g) and A3.1.2(f)];
- (d) type of finish, if other than as specified (see para. A3.2);
- (e) preparation for delivery (see para. A5).

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