ASME A112.18.1M-1996
(Revision of ASME A112.18.1M-1994)

PLUMBING FIXTURE FITTINGS

AN AMERICAN NATIONAL STANDARD

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Date of Issuance: May 29, 1996

This Standard will be revised when the Society approves the issuance of a new edition. There will be no addenda or written interpretations of the requirements of this Standard issued to this edition.

The American Society of Mechanical Engineers
345 East 47th Street New York, NY 10017

FOREWORD

(This Foreword is not part of ASME A112.18.1M-1996.)

This Standard has its origin in work undertaken by the Sanitary Brass Institute and the Tubular Plumbing Goods Institute in 1946. These groups combined in 1954 to form the Plumbing Brass Institute and developed a recommended performance standard for finished and rough brass fixture fittings and 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, and after numerous changes was approved by the American National Institute in December 1969 as an American National Standard and 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 in the revision approved on October 2, 1975.

The Plumbing Manufacturers Institute recommended maximum flow rates for lavatory kitchen sinks and shower heads for water conservation. Their proposal and others on materials and plating were approved in the November 16, 1979, revision of the standard.

In 1983, the Plumbing Manufacturers Institute recommended intermittent shock, high temperature extreme, and organic coating requirements. 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. A nonremovable flow restrictor requirement 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 current revision deletes the technical requirements for backflow protection and refers 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.

Suggestions for improvement of this Standard will be welcomed. They should be sent to The American Society of Mechanical Engineers; Attn: Secretary, A112 Main Committee; 345 East 47th Street; New York, NY 10017.

This revision was approved as an American National Standard on April 4, 1996.

ASME STANDARDS COMMITTEE A112
STANDARDIZATION OF PLUMBING MATERIALS AND EQUIPMENT

(The following is the roster of the Committee at the time of approval of this Standard.)

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CONTENTS

Figures

Tables

Appendices

PLUMBING FIXTURE FITTINGS

1 SCOPE

This Standard covers general performance requirements and test methods for plumbing fixture fittings, other terminal fittings, supply stops, wastes, and traps. This Standard does not cover conventional fittings such as nipples, elbows, tees, etc.

2 PURPOSE

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.

3 REFERENCE STANDARDS

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

ASME Standards (Approved as American National Standards)[1]

A112.1.2	Air Gaps in Plumbing Systems
A112.18.3M	Performance Requirements for Backflow Protection Devices and Systems in Plumbing Fixture Fittings
A112.19.1M	Enameled Cast Iron Plumbing Fixtures
A112.19.2M	Vitreous China Plumbing Fixtures
A112.19.3M	Stainless Steel Plumbing Fixtures (Designed for Residential Use)
A112.19.4M	Porcelain Enameled Formed Steel Plumbing Fixtures
B1.20.1	Pipe Threads, General Purpose (Inch)
B1.20.7	Hose Coupling Screw Threads (Inch)
B16.18	Cast Copper Alloy Solder Joint Pressure Fittings
B16.22	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
B16.26	Cast Copper Alloy Fittings for Flared Copper Tubes
PTC 19.2	Instruments and Apparatus: Part 2 Pressure Measurement
PTC 19.5	Application, Part II of Fluid Meters: Interim Supplement on Instruments and Apparatus

ASSE Standards (Approved as American National Standards)[2]

1016	Individual Shower Control Valves, Anti-Scald
1019	Vacuum Breaker Wall Hydrants, Frost Resistant Automatic Draining Type

ASTM Standards[3]

B 456	Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium
B 604	Decorative Electroplated Coatings of Copper/Nickel/Chromium on Plastic
D 968	Abrasion Resistance of Organic Coatings by Falling Abrasive
D 3359	Measuring Adhesion by Tape Test
G 85	Annex Salt Spray Test

National Sanitation Foundation Standard[4]

NSF 14	Plastics Piping Components and Related Materials

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

[1]Available from ASME Order Department, 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300; also available from ANSI, 11 West 42nd Street, New York, NY 10036.

[2]Available from the American Society of Sanitary Engineering, P.O. Box 40362, Bay Village, OH 44140; also available from ANSI.

[3]Available from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

[4]Available from the National Sanitation Foundation, 3475 Plymouth Road, Ann Arbor, MI 48106.

that, when removed, will not prevent the fitting from fulfilling its primary function. Examples are aerators, hand held 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 flood level rim of the receptor (see Fig. 1)

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 negative pressure in the supply pipe

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 100 mm (4 in.) centers

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

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 negative pressure in the supply line when the water control valve is wide or fully open

deck mounted fitting — fitting that mounts on a horizontal surface

effective opening — minimum cross-sectional area at the point of water supply discharge, measured or expressed in terms of (1) the diameter of a circle, or (2) if the opening is not circular, the diameter of a circle of equivalent cross-sectional area.

To illustrate the practical use of the term *effective opening*, refer to Fig. 1. With ordinary plumbing fittings, the minimum cross-sectional area occurs at the seat of the control valve *B*, but in other cases it may be at the point of discharge (spout) or at the inlet to the control valve *X*.

If two or more lines supply one outlet, the effective opening shall be the sum of the cross-sectional areas of the individual lines or the area of the one outlet, whichever is the smaller.

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

fixture — receptor for water or waterborne wastes that discharges into a drainage system

fixture fitting — fitting that is attached to or accessible from a fixture, and that controls the volume and/or direction of flow of water to, or conveys water from, that fixture

fixture fitting with hose connected outlet — fixture fitting with only a primary outlet, which is connected to an outlet attachment by a hose

flood level rim — tip edge of a receptor over which water would overflow (see Fig. 1)

hot water — for test purposes, water at a temperature of 54 to 82°C (130 to 180°F)

may — when used, indicates an alternate requirement or option

metering faucet — faucet that, when turned on, will gradually shut itself off over a period of three seconds to several minutes. It may or may not be adjustable for cycle duration.

mixing valve, single control — fitting with a single control that shall serve to turn water on and off, and to change volume and temperature of discharge flow

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

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

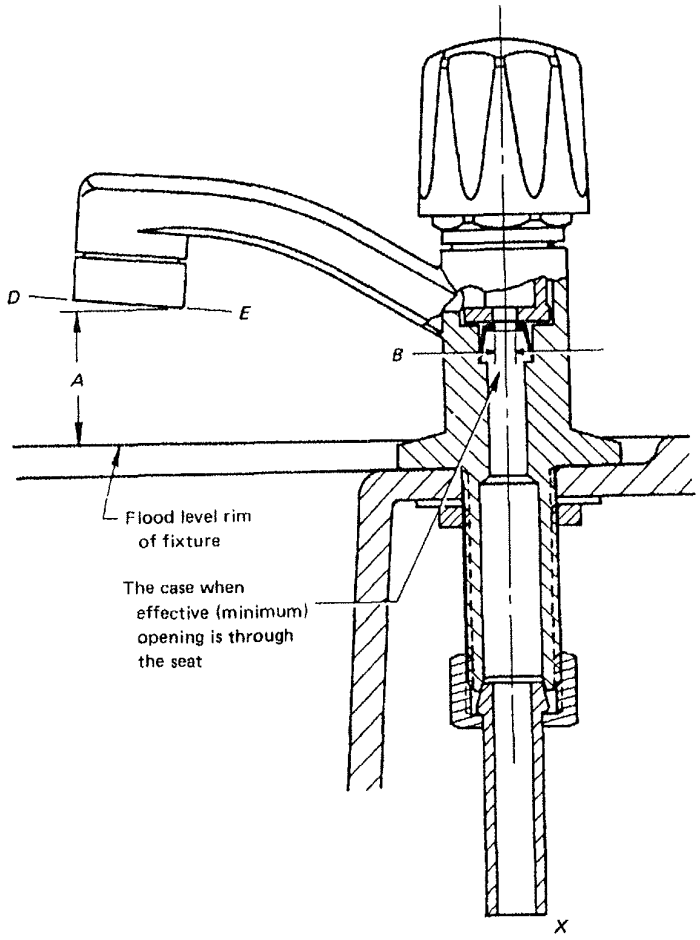


FIG. 1 EXAMPLE OF AIR GAP AND EFFECTIVE OPENING

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 exposed to walk-in traffic

seat disk — disk or washer that, when compressed against the seat, provides a watertight joint

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 spoil 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 fitting — fitting connected to the supply side of the fixture

supply stop — valve, either integral or separate, that is placed ahead of a terminal fitting to shut off the supply to that terminal fitting in order that it may be serviced or replaced

terminal fitting — last valve before atmospheric discharge

trap — combination of fittings that conveys liquid sanitary waste and is a gas seal between the fixture and the drainage pipes

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

waste — combination of fittings that conveys liquid sanitary waste on single or multiple type fixtures from the outlet of the bowls to the trap

5 GENERAL REQUIREMENTS

5.1 Toxicity Evaluation

All plastic materials coming into contact with potable water shall comply with the applicable sections of NSF 14, exclusive of the sections pertaining to taste and odor.

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

5.2 Coatings

5.2.1 Electrodeposited Coatings

(a) Electrodeposited metallic coatings on fittings manufactured from metallic base materials shall meet the performance requirements for visual defects, adhesion, ductility, and corrosion testing of the product requirements of ASTM B 456. Fittings shall meet the corrosion requirements under the service conditions specified in para. 5.2.3. ASTM G 85 shall also be an acceptable method.

(b) Electrodeposited metallic coatings on fittings manufactured from plastic base materials shall meet the performance requirements for appearance, ductility, thermal cycle testing, and adhesion of the product requirements of ASTM B 604. Fittings shall meet the corrosion requirements under the service conditions specified in para. 5.2.3.

5.2.2 Organic Coatings. Organic coatings on fittings of all substrates shall be tested according to all of the test procedures outlined below.

(a) Corrosion. Corrosion tests for organic coating on metal substrates shall be conducted in accordance with ASTM B 456, and corrosion tests for plastic substrates in accordance with ASTM B 604. The service condition and selected test method are to be as specified in para. 5.2.3.

(b) Water Degradation. The coated components of the fitting shall be immersed in distilled water maintained at 38 + 1°C (100 + 2°F) in a corrosion-proof container for 24 h.

(c) Soap and Cleaner Effects. Apply approximately two drops of each of the following solutions to the surface of the organic coating on the fitting. If possible, a flat surface of the part should be used for this test. Allow the cleaners to remain for a total of 16 h. At the end of the 16 h, remove the excess liquids.

(1) ammonium hydroxide (6 Normal)

(2) sodium hydroxide (6 Normal)

(3) methanol (100%)

(4) surfactant (nonionic; 100% octylphenoxypolyethanol or nonylphenoxypolyethanol)[5]

(d) Failure Criteria for (a), (b), and (c) Above. There shall be no visible degradation of the coating, such as

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

blistering, wrinkling, or peeling, or corrosion of the substrate when the tests are performed on separate samples.

(e) Adhesion. The coating shall be tested according to ASTM D 3359, using Method A. The coating shall have an adhesion rating of 3A or greater.

(f) Abrasion Resistance. Using the method described in ASTM D 968, pour 12 L (12.7 qt) of sand on a relatively flat surface of the coated product at an angle of incidence of 45 deg. The coating shall have failed this test if the coating has been eroded to the point of exposing the surface directly beneath the coating.

5.2.3 Service Conditions. Exposed fittings and exposed parts of concealed fittings shall meet the requirements of Service Condition #2 (SC-2) in ASTM B 456 and all other fittings shall meet the requirements of Service Condition #1 (SC-1) in ASTM B 456 for any finish specification that specifies service conditions.

5.3 Working Pressures

Supply fittings shall be designed to function at water working pressures up to 860 kPa gage (125 psig), and intermittent shock pressures up to 1,240 kPa gage (180 psig). Waste fittings shall be designed to function at water working pressures of 140 kPa gage (20 psig).

5.4 Working Temperatures

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

5.5 Installation

(a) All fittings shall be provided with suitable means to connect to a type of supply line, trap, or waste 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.

5.6 Threads

5.6.1 Pipe Threads. Pipe threads shall conform to ANSI/ASME B1.20.1.

5.6.2 Hose End Threads. Hose end threads shall conform to ANSI B1.20.7.

5.7 Solder Connections

The dimensions of solder joint ends 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 ANSI B16.18 or ASME B16.22.

5.8 Other Supply Connection Standards — Flare Connections

Flare connections shall be designed to conform with ASME/ANSI B16.26.

5.9 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.

5.10 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.

5.11 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.

5.12 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.

5.13 Backflow Prevention Devices

5.13.1 General. 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.

5.14 Temperature and Pressure Compensating Mixing Valves

Thermostatic, pressure balance, and thermostatic/pressure balance mixing valves shall conform to ASSE 1016.

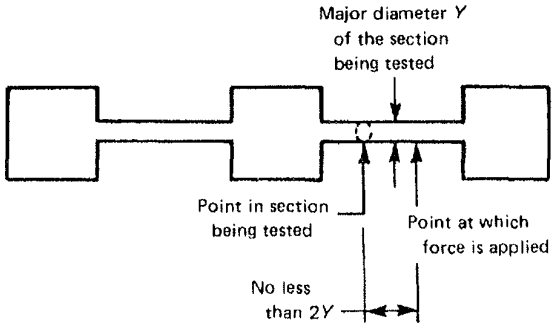


FIG. 2 CASTING BENDING TEST

6 PERFORMANCE TEST REQUIREMENTS

6.1 Selection of Test Samples

To comply with this Standard, two samples shall be selected at random from a lot of five production fittings.

(a) The first sample shall be subjected to and pass the following test sequence: dimensional requirements, handle security (para. 6.3), flow capacity (para. 6.5), bending strength (para. 6.2.2), thread torque strength (para. 6.2.3), high temperature extreme (para. 6.7), and intermittent shock (para. 6.8).

(b) The second sample shall be subjected to and pass the following test sequence: valve closure (para. 6.4), life on valve only [para. 6.6.3(a)], life on spout only [para. 6.6.3(b)], spout strength (para. 6.2.4), and burst strength (para. 6.2.1).

6.2 Strength Tests

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

(a) Supply fittings, except stop valves and supply stops, shall withstand a hydrostatic pressure of 3,445 kPa gage (500 psig) 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 pressures above 1,035 kPa gage (150 psig) and the relief discharge is into the fixture.

(b) Stop valves and supply stops shall withstand a hydrostatic pressure of 3,440 kPa gage (500 psig) for 1 min. The pressure shall be applied to the inlet with the outlet blocked and the valve open.

(c) Trap, waste, and accessory fittings shall withstand, either separately or assembled, a hydrostatic pressure of 172 kPa gage (25 psig) for 1 h minimum.

6.2.2 Bending Strength Test. Any cross section of the waterway of a cast fitting shall withstand a bending moment of 88 N·m (65 ft–lbf) without fracture. The force shall be applied not closer to the cross section being tested than twice the major diameter of that section. See Fig. 2.

6.2.3 Thread Torque Strength Test. Metal threaded connections shall be tested with a torque wrench to apply torque load specified in Table 1 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.

6.2.4 Spout Strength Test

(a) Spouts shall withstand a minimum torque of 19.7 N·m (175 in.–lbf) at the centerline of the joint between the spout and the body. The torque is to be applied by suspending a weight from the centerline of the outlet of the spout for 3 min.

(b) The faucet shall be mounted in accordance with the manufacturer's instructions. The water discharge angle shall be measured from the vertical axis with the valve(s) full open and the water supply at 310 kPa gage (45 psig) flowing. The water shall then be shut off and sufficient weight applied to the centerline of the spout outlet to generate a 19.6 N·m (175 in.–lbf) torque at the centerline of the spout/body joint for 3 min.

(c) Failure Criteria. 0.5 h after the weight has been removed, the water shall be turned on again and the discharge angle measured. The faucet shall have failed the test if the discharge angle has changed by more than 15 deg from the vertical axis.

TABLE 1 THREAD ASSEMBLING TORQUES

Fitting Size (Iron Pipe Size)	Torque	
	N·m	ft-lbf
3/8	43	32
1/2	61	45
1 1/4	40	30
1 1/2	40	30

6.3 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 times that listed in Table 2. 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 667 N (150 lbf).

6.4 Valve Closure Test

When closed, valves intended to control the flow of water shall not leak at any test pressure up to 860 kPa gage (125 psig) applied to the inlet for 5 min. The force required to close the valve shall not exceed the closing torque or axial force listed in Table 2.

6.5 Flow Capacity Test

6.5.1 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. 3. For testing to comply with the maximum flow rates specified in Table 3, standard accessories shall be included. For compliance with the minimum flow rates specified in Table 3, 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 may be made with between 4°C (40°F) and 66°C (150°F) water as per the intended end use of the fitting. The test pressure for minimum shall be 138 kPa gage (20 psig) at the inlet when water is flowing. The test pressure for maximum shall be 413 kPa gage (60 psig) for faucets and 550 kPa gage (80 psig) for showerheads 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.

(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. 3. Pressure tap size and configuration shall conform with ASME PTC 19.2. Transducers or gauges shall be calibrated in accordance with PTC 19.2.

(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 3 at the flowing supply pressure(s) stated in (b) above.

6.6 Life Test

6.6.1 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 4.

6.6.2 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 to the lever or knob not to exceed 50% more than the valve closure force specified in Table 2.

(b) Swing Spout. The swing spout shall be considered to have failed the life cycle test if:

(1) the spout will not hold a hydrostatic pressure of 860 kPa gage (125 psig) for 1 min after 24,000 cycles with the original seal in place; or

(2) the spout will not hold a hydrostatic pressure of 860 kPa gage (125 psig) for 1 min after 48,000 cycles. The seal may be replaced to pass this test.

6.6.3 Test Procedure

(a) Valve

(1) The cold water supply shall be at ambient temperature and the hot water supply at 60 + 6°C (140 + 10°F). Both supplies shall be at the same flowing pressure of 350 + 35 kPa gage (50 + 5 psig). 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). Metering fittings shall be set to run for approximately five seconds after actuation.

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 2.

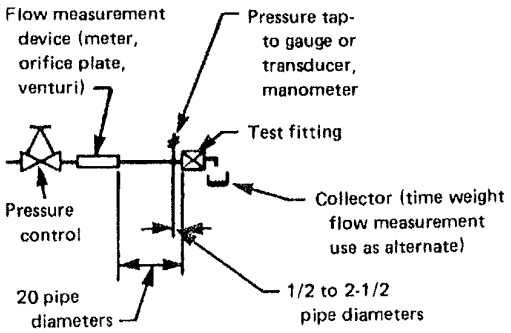
TABLE 2 VALVE CLOSING TORQUE

Valve Application	Rotary Motion (Torque)		Axial or Normal Motion (Force)	
	N·m	in.-lbf	N	lbf
Sink, lavatory, bath, laundry tray	1.7	15	44.5	10
Lawn and sediment	1.7	15	44.5	10
Supply stops	1.7	15	66.75	15
Self-closing	Self-closing		Self-closing	

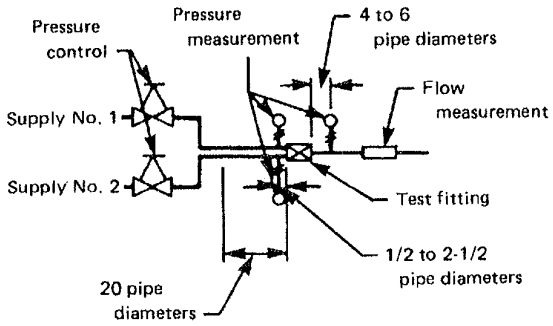
TABLE 3 MINIMUM AND MAXIMUM FLOW RATES

Fittings	Minimum		Maximum	
	L/min	gpm	L/min	gpm
Lavatory faucet	None	None	8.4	2.2
Public lavatory faucet (other than metering)	None	None	1.92	0.5
Metering faucet	None	None	0.946 L/cycle	0.25 gal/cycle
Sink faucet	None	None	8.4	2.2
Shower head[1]	None	None	9.6	2.5
Bathtub/shower faucets				
Single-handle	9.0	2.4	None	None
Two-handle	15.0	4.0	None	None
Utility faucets —				
Service sink	15.0	4.0	None	None
Lawn and sediment	15.0	4.0	None	None
Laundry tray	15.0	4.0	None	None
Supply stops[2] —				
$^3/_8$ (pipe)	21.0	5.5	None	None
$^3/_8$ (compression)	15.0	4.0	None	None
$^1/_2$ (pipe)	36.0	9.5	None	None

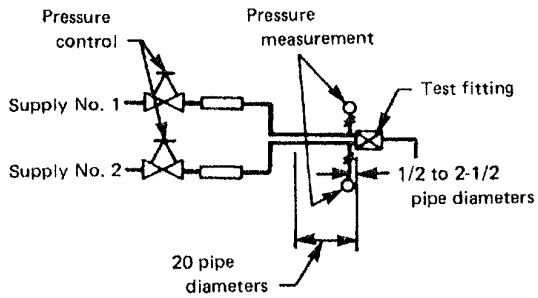
NOTES:
(1) Includes hand-held sprays.
(2) Supply stop flow rate sizing shall be based on the nominal size for the model as indicated in the manufacturer's supporting literature.



(a) Device That Has One Supply



(b) Device With Two Supplies – No Discharge to Atmosphere



(c) Device With Two Supplies – With Discharge to Atmosphere

FIG. 3 DISCHARGE CAPACITY TEST SCHEMATICS

TABLE 4 LIFE TEST

Fitting	Component	Cycles
Lavatory	Valve	500,000
Sink	Valve	500,000
	Swing spout	48,000
Laundry tray	Valve	250,000
	Swing spout	48,000
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

(2) Single-handle cycling type mixing valves and two-handle mixing valves shall be tested with cold water only to the supplies for 18 h, alternating with a 6 h 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 of 0.6 N·m (5 in.–lbf) 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 2.7 N·m (24 in.–lbf) 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.

6.7 High Temperature Extreme Test

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

6.7.2 Test Procedure. The fitting shall be connected to a hot water supply of 82°C (180°F). 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 82 ± 3°C (180 ± 5°F) within the fitting for 0.5 h at a pressure of 860 kPa gage (125 psig).

6.7.3 Accept/Reject Criteria. The fitting shall be considered to have failed if it leaks after the test when 860 kPa gage (125 psig) is applied with the valve in a closed position.

6.8 Intermittent Shock Test

6.8.1 General. The supply fitting shall withstand an intermittent shock pressure to 1,240 kPa gage (180 psig) from a simulated apparatus connected to the spout outlet as described below.

6.8.2 Test Procedure

(a) Water supply to the hot side of the fitting shall be at 60 ± 6°C (140 ± 10°F) such that the flow pressure is 860 kPa gage at 7.6 ± 0.95 L/m (125 psig at 2.0 ± 0.25 gpm) with the fitting in the full hot position. The cold side inlet shall be at 860 kPa gage (125 psig) static and at ambient cold water temperature.

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

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

6.8.3 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.

7 SPECIAL REQUIREMENTS

7.1 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/ANSI A112.19.3M, and ASME A112.19.4M.

7.2 Lavatory Fittings

7.2.1 Inlets. All lavatory fittings which will be designed for a $^1/_2$-in. NPSM shank to mate with a standard $^1/_2$-in. coupling nut and tailpiece shall be designed to meet dimensions as shown in Fig. 4. Designs for other common connections are permissible. Shank lengths are recommended to be not less than 45 mm ($1^3/_4$ in.).

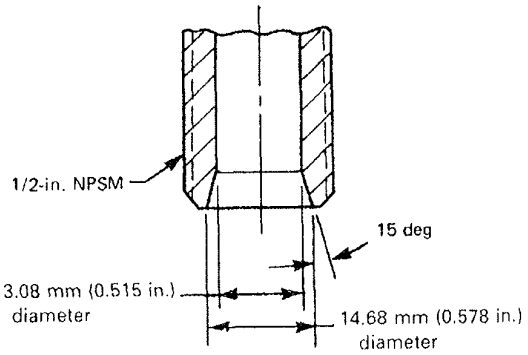


FIG. 4 STANDARD SHANK INLET DIMENSIONS

7.2.2 Flange or Cover Plate. The outside diameter of the flange or cover plate shall not be less than 45 mm ($1^3/_4$ in.).

7.2.3 Fixture Trap and Wastes. Fixture trap and wastes shall be provided with a minimum 32 mm ($1^1/_4$ in.) nominal O.D. outlets. Traps shall have a minimum of 50 mm (2 in.) water seal. The term *water seal* refers to the vertical distance in a pipe trap between water level at the point of overflow and the lowest level that prevents the passage of any gas or air through the trap.

7.3 Sink Fittings

(a) The width of the flange or cover plate shall not be less than 45 mm ($1^3/_4$ in.).

(b) Sink traps and wastes shall be provided with a minimum of 38 mm ($1^1/_2$ in.) nominal O.D. outlets.

7.4 Bath and Shower Fittings

7.4.1 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.

7.4.2 Tub/Shower Diverters. The leakage rate out of the tub spout for diverting tub spouts, or push button or rotary type in wall diverters, when in the shower position shall not exceed 0.38 L/m (0.1 gpm) [when measured at 138 kPa gage (20 psig) flowing and when measured at 413 kPa gage (60 psig) flowing] when new. Leakage after 15,000 cycles of diverting shall not exceed 1.14 L/m (0.3 gpm).

7.4.3 Test Procedure

(a) Install a shower head in compliance with this Standard at the outlet of the diverter. The piping or hose shall not exceed 2 m (72 in.). The water supply to the shower head shall be set at 43 ± 6°C (110 ± 10°F) with the flowing pressure, measured at the inlet to the valve, set at 138 ± 50 kPa gage (20 ± 5 psig) while the diverter is in the shower position.

(b) 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. Diverters 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.

(c) Accept/Reject Criteria. The diverter shall be considered to have failed if the leakage through the tub spout when tested at 138 kPa gage and 413 kPa gage (20 psig and 60 psig) flowing pressure is greater than:

(1) 0.38 L/m (0.1 gpm) in the new condition

(2) 1.14 L/m (0.3 gpm) 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.

7.4.4 Shower Heads

(a) When used as a component part of the unit, the flow restricting inserts shall be mechanically retained at the point of manufacture. Mechanically retained shall mean that a pushing or pulling force of 36 N (8 lbf) 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.

7.5 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 1,220 mm (4 ft) length of standard weight pipe of the same nominal diameter as the inlet of the faucet, when installed with a slope of 1 mm/m ($^1/_8$ in./ft) toward the faucet.

7.6 Frostproof Lawn Faucets

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

7.7 Pop-Up Drain Mechanisms

7.7.1 General. The mechanism shall be designed to give sufficient lift to the stopper and shall be constructed to withstand the usage to which it is likely to be subjected. Unless designed for a specific lavatory, the mechanism shall be adjustable.

7.7.2 Leakage

(a) Leakage by the stopper, when closed, shall not be more than 3.78 L/h (1.0 gph) at a pressure of 152 mm (6 in.) water column.

(b) The joint at the entry of the operating rod into the drain body shall not leak at a pressure produced by a 508 mm (20 in.) head of water above the entry to the drain when the drain is in the open position.

8 MARKING REQUIREMENTS

8.1 Product

(a) Each fitting 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. Such marking shall be located where it can be seen after installation.

(b) Each shower head, sink faucet, and lavatory faucet shall be marked "A112.18.1M" to demonstrate compliance with this Standard. The marking shall be by means of either a permanent mark on the product, a label on the product, or a tag attached to the product.

(c) Each shower head, sink faucet, lavatory faucet, or flow control device (e.g., aerators and flow straighteners) shall be permanently and legibly marked with the actual flow rate or the maximum flow rate allowed by Table 3.

8.2 Package

(a) The package shall be marked with the manufacturer's name and model number.

(b) The package or any label attached to the package for shower heads, sink faucets, and lavatory faucets shall contain at least the following: "A112.18.1M" and "___ gpm." The flow rate values shall be the actual flow rate or the maximum values allowed by Table 3.

(c) For other products, it is recommended that the package or package label be marked with "A112.18.1M."

APPENDIX A
GOVERNMENT REQUIREMENTS

(This Appendix is not part of ASME A112.18.1M-1996 and is included for Federal Government use only.)

A1 SCOPE

This Appendix covers requirements of the Federal Government for the procurement of plumbing fixture fittings.

A2 APPLICABLE DOCUMENTS

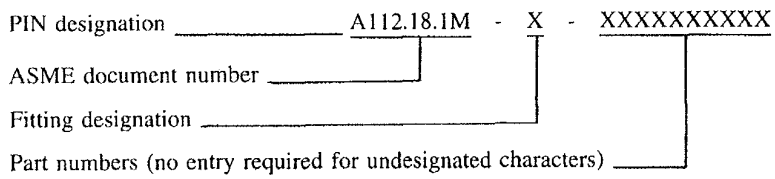
The following document, of the issues in effect on date of invitation for bids or request for proposal, forms a part of this Appendix to the extent specified herein.

ANSI/ASQC Z1.4[1] Sampling Procedures and Tables for Inspection by Attributes

A3 REQUIREMENTS

A3.1 Part or Identifying Number (PIN)

The plumbing fixture fittings covered by ASME A112.18.1M-1996 shall be identified by a PIN. This part number is intended for cataloging and ordering purposes (see para. 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

[1]ASQC standards are available from the American Society of Quality Control, 611 East Wisconsin Ave. Milwaukee, WI 53201.

(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 = 3⅜ 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 = ⅜-in. tubing (plain end)
- 2 = ⅜-in. tubing (with ½-in. IPS male adapter)
- 3 = ½-in. IPS male shank
- 4 = ½-in. IPS female shank

(g) Seventh character denotes spout (spout length as specified; see para. 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 = ¾-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 = 3⅜ 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 = $^3/_8$-in. tubing (plain end)
- B = $^3/_8$-in. tubing (with $^1/_2$-in. IPS male adapter)
- C = $^1/_2$-in. IPS male shank
- D = $^1/_2$-in. IPS female shank

(f) Sixth character denotes spout (spout length as specified; see para. 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 (nonmetallic)
- 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 = 1/2 in. (male)
- B = 1/2 in. (female)
- C = 3/4 in. (male)

D = $^3/_4$ in. (female)
E = $^1/_2$ in. (compression)
F = $^1/_2$ in. (sweat)

(d) Fourth character denotes outlet.
1 = $^3/_8$ in. (compression)
2 = $^3/_8$ in. (female)
3 = $^1/_2$ in. (compression)
4 = $^1/_2$ in. (female)
5 = $^3/_4$ 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 Standard Commercial Product

The fixture fittings shall, as a minimum, be in accordance with the requirements of ASME A112.18.1M-1996. Additional or better features which are not specifically prohibited by ASME A112.18.1M-1996, but which are a part of the manufacturer's standard commercial product, shall be included in the fixture fittings being furnished. A standard commercial product is a product which has been sold or is being currently offered for sale on the commercial market through advertisements, manufacturer's catalogs, or brochures, and represents the latest production model.

A3.3 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.

A3.4 Material

Except as indicated herein, materials shall be metallic.

A3.5 Automatic Fixture Fittings

Electrical components shall be Underwriters Laboratories (UL) listed, where applicable.

A4 QUALITY ASSURANCE PROVISIONS

A4.1 Responsibility for Inspection

The contractor shall be responsible for the performance of all inspection requirements as specified herein. The contractor may use his own or any other facilities suitable for the performance of the inspection requirements unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in ASME A112.18.1M-1996 where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

A4.2 Quality Conformance Inspection

When specified (see para. A6), a quality conformance inspection shall be required. The quality conformance inspection shall be performed on each sample selected (see para. A4.3) to determine compliance with ASME A112.18.1M-1996 and shall include the following.

(a) Examination. This element of inspection shall encompass all visual examination and dimensional measurements. Noncompliance with any specified requirements shall constitute one defect. Examination shall be based on inspection level S-4 and an Acceptable Quality Level (AQL) of 2.5% defective.

(b) Test. Each sampled fitting shall be tested in accordance with the applicable performance test in ASME A112.18.1M-1996 (see Section 6). Failure to pass any test constitutes one defect. Test shall be based on inspection level S-2 and an AQL of 4.0% defective.

(c) Preparation for Delivery Inspection. Preparation for delivery shall be inspected for compliance with the requirements of para. A5.

A4.3 Sampling

Sampling and inspection procedures shall be in accordance with ANSI/ASQC Z1.4. The unit of product shall be one complete fitting. All fittings of the same description offered for delivery at one time shall be considered a lot for the purpose of inspection. If an inspection lot is rejected, the contractor may rework it to correct the defects, or screen out the defective units, and resubmit for a complete inspection. Resubmitted lots shall be reinspected using tightened inspection. If the rejected lot was screened, reinspection shall be limited to the defect causing rejection. If the lot was reprocessed, reinspection shall be performed for all defects. Rejected lots shall be separate from new lots, and shall be clearly identified as reinspected lots.

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. A3.3);
(e) when a quality conformance inspection is required (see para. A4.2);
(f) preparation for delivery (see para. A5).

APPENDIX B
RELATED STANDARDS

(This Appendix is not part of ASME A112.18.1M-1996 and is included for information only.)

The following is a list of standards that cover materials and other subjects related to the products covered by ASME A112.18.1M-1996.

ASSE Standards

1028	Automatic Flow Controllers
1034	Fixed Flow Restrictors
1035	Laboratory Faucet Vacuum Breakers

ASTM Standards

B 16	Free-Cutting Brass Rod, Bar, and Shapes for Use in Screw Machines
B 21	Naval Brass Rod, Bar, and Shapes
B 36	Brass Plate, Sheet, Strip, and Rolled Bar
B 43	Seamless Red Brass Pipe, Standard Sizes
B 62	Composition Bronze or Ounce Metal Castings
B 75	Seamless Copper Tube
B 86	Zinc-Alloy Die Castings
B 88	Seamless Copper Water Tube
B 121	Leaded Brass Plate, Sheet, Strip, and Rolled Bar
B 124	Copper and Copper Alloy Forging Rod, Bar, and Shapes
B 127	Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip
B 135	Seamless Brass Tube
B 139	Phosphor Bronze Rod, Bar, and Shapes
B 140	Copper-Zinc-Lead (Leaded Red Brass or Hardware Bronze) Rod, Bar, and Shapes
B 164	Nickel-Copper Alloy Rod, Bar, and Wire
B 176	Copper Alloy Die Castings
B 282	Sintered Brass Structural Parts
B 371	Copper-Zinc-Silicon Alloy Rod
B 453	Copper-Zinc-Lead Alloy (Leaded Brass) Rod
B 584	Copper Alloy Sand Castings for General Applications
B 587	Welded Brass Tube
B 669	Zinc Alloys in Ingot Form for Foundry Castings

CABO Standard

A117.1	Accessible and Usable Buildings and Facilities

Publications of the following organizations appear on the above list:

ASSE	The American Society of Sanitary Engineering P. O. Box 40362, Bay Village, OH 44140
ASTM	The American Society for Testing and Materials 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959
CABO	Council of American Building Officials 5203 Leesburg Pike, Ste. 708, Falls Church, VA 22041

Publications appearing above which have been approved as American National Standards may be obtained from:

ANSI	American National Standards Institute 11 West 42nd Street, New York, NY 10036

ASME STANDARDS RELATED TO PLUMBING

Air Gaps in Plumbing Systems.....A112.1.2-1991
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
Supports for Off-the-Floor Plumbing Fixtures for Public Use.....A112.6.1M-1990
Backwater Valves.....A112.14.1-1975(R1990)
Plumbing Fixture Fittings.....A112.18.1M-1996
Performance Requirements for Backflow Protection Devices
and Systems in Plumbing Fixture Fittings.....A112.18.3M-1996
Enameled Cast Iron Plumbing Fixtures.....A112.19.1M-1994
Vitreous China Plumbing Fixtures.....A112.19.2M-1990
Stainless Steel Plumbing Fixtures (Designed for
Residential Use).....A112.19.3M-1987
Porcelain Enameled Formed Steel Plumbing Fixtures.....A112.19.4M-1994
Trim for Water-Closet Bowls, Tanks, and Urinals.....A112.19.5-1979(R1990)
Hydraulic Requirements for Water Closets and Urinals.....A112.19.6-1990
Whirlpool Bathtub Appliances.....A112.19.7M-1995
Suction Fittings for Use in Swimming Pools, Wading Pools,
Spas, Hot Tubs, and Whirlpool Bathtub Appliances.....A112.19.8M-1987
Non-vitreous Ceramic Plumbing Fixtures.....A112.19.9M-1991
Dual Flush Devices for Water Closets.....A112.19.10-1994
Floor Drains.....A112.21.1M-1991
Roof Drains.....A112.21.2M-1983
Hydrants for Utility and Maintenance Use.....A112.21.3M-1985
Water Hammer Arresters.....A112.26.1M-1984
Cleanouts.....A112.36.2M-1991

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