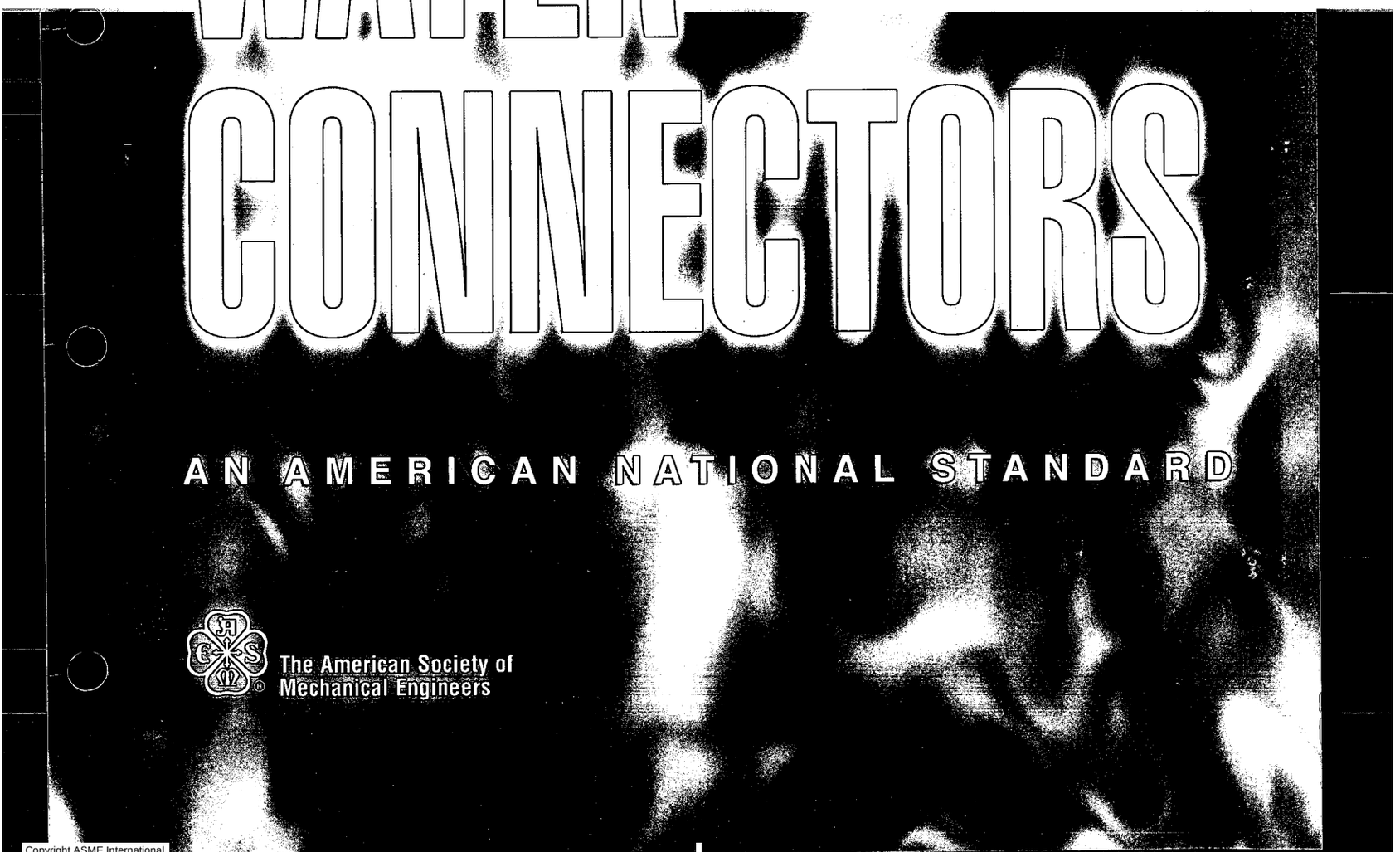
ASME A112.18.6-2003
(Revision of ASME A112.18.6-1999)

FLEXIBLE WATER CONNECTORS



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FOREWORD

In 1995, The American Society of Mechanical Engineers received a request for the development of a standard for flexible water connectors for use in potable water supply systems under continuous pressure and in accessible locations only. The request was referred to the ASME A112 Main Committee and subsequently assigned to its Panel 18 for Plumbing Fittings.

IAPMO's (International Association of Plumbing and Mechanical Officials) proposed PS 74-95, Reinforced Flexible Water Connectors, was used as a base document for the development of this Standard. While in the development stage, another IAPMO standard, PS 14-89, Flexible Metallic Water Connectors, was also used and the requirements incorporated into this ASME Standard. The first edition of this Standard was approved as an American National Standard on January 28, 1999

In December 1999 a request was approved by the A112 Main Committee to consider the effects of chloramine on elastomers and if necessary, develop some requirements. This request was referred to a newly created Project Team on Chloramine Resistance (PT CRT). After several meetings and lengthy discussion, the Project Team developed language to be incorporated in this Standard to which it would be relevant in the form of a nonmandatory appendix. The recommendation of the Project Team was subsequently approved by the Main Committee. This revision implements that decision.

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

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

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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.

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FLEXIBLE WATER CONNECTORS

1 GENERAL

1.1 Scope

This Standard establishes requirements for flexible water connectors used in potable water systems under continuous pressure and in accessible locations only. It covers physical and performance requirements, test methods, materials, connections, and other significant properties, in addition to a general description of materials used. Certain features of construction of the finished product are given, together with the method of marking and identification.

The provisions of this Standard are not intended to prevent the use of any alternate material or method of construction, provided any such alternate meets the intent of this Standard.

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.

2 REFERENCES

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

ANSI/ISA S75.02, Control Valve Capacity Test Procedure

Publisher: Instrument Society of America (ISA), 67 Alexander Drive, P.O. Box 12277, Research Triangle Park, NC 27709

ANSI/NSF 14, Plastics Piping Components and Related Materials

ANSI/NSF 61, Drinking Water System Components — Health Effects

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

ANSI/SAE J512, Automotive Tube Fittings

Publisher: Society of Automotive Engineers (SAE), 400 Commonwealth Drive, Warrendale, PA 15096-0001

ASME A112.19.5, Trim for Water-Closet Bowls, Tanks, and Urinals

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

ASME B1.20.3, Dryseal Pipe Threads (Inch)

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

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

ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

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

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

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

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

ASTM B 604, Specification for Electrodeposited Coatings of Copper/Nickel/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

3 GENERAL REQUIREMENTS

3.1 Material Evaluation

Plastic materials coming into contact with potable water shall comply with the applicable sections of ANSI/NSF 14-90. Flexible connectors for delivery of drinking water shall comply with ANSI/NSF 61. Solder and fluxes containing lead in excess of 0.2% shall not be used. Metal alloys shall not exceed 8% lead content.

3.1.1 Copper alloy components used with the assembled connector shall contain not less than 58% copper.

3.1.2 Steel parts not in contact with water are permitted if protected from corrosion.

3.1.3 Nonmandatory Appendix A may be useful in evaluating the chloramine resistance of elastomers.

3.2 Coatings

3.2.1 Electrodeposited Coatings (Exposed Surfaces)

(a) Electrodeposited metallic coatings on metallic base materials shall meet the performance requirements

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for visual defects, adhesion, and corrosion testing of the product requirements of ASTM B 456, Service Condition #2. ASTM G 85 shall also be an acceptable method for corrosion.

(b) Electrodeposited metallic coatings on plastic base materials shall meet the performance requirements for appearance, thermal cycle testing, and adhesion of the product requirements of ASTM B 604, Service Condition #2.

3.2.2 Organic Coatings (Exposed Surfaces). 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, Service Condition #2, and corrosion tests for plastic substrates in accordance with ASTM B 604, Service Condition #2.

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

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

(1) ammonium hydroxide (6 Normal)

(2) sodium hydroxide (6 Normal)

(3) methanol (100%)

(4) surfactant (nonionic; 100% octylphenoxy-polyethanol or nonylphenoxypolyethanol)

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

(d) Failure Criteria for (a), (b), and (c) Above. There shall be no visible degradation of the coating, such as 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 12.7 qt. (12 L) 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.

3.2.3 Electrodeposited Coatings (Wetted Surfaces). Plated components in contact with water shall be such that they shall withstand for 4 hr a salt spray test in accordance with ASTM B 368. There shall be no pitting.

3.3 Connections

3.3.1 Pipe Threads. Tapered pipe threads shall conform to the L1 gauge requirements of ASME B1.20.1 or ASME B1.20.3 using a tolerance of ±1 turn. Other pipe threads shall comply with ASME B1.20.1.

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

3.3.3 Ballcock Threads. Ballcock threads shall conform to ASME A112.19.5, with the exception that ballcock nut threads may be Class 2B.

3.3.4 Solder Connections. The dimensions of solder joint ends for connection to copper tube or copper tube fittings shall conform with respect to length and diameter of the joint section to the dimensions given in ASME B16.18 or ASME B16.22. Flexible connectors intended to be soldered to the water distribution system shall not contain soldered assemblies.

3.3.5 Flare Connections. Flare connections shall be compatible to ASME B16.26.

3.3.6 Compression Connections. Compression connections shall be compatible with ANSI/SAE J512.

3.3.7 Alternate Connections. Connections other than those cited above shall meet the performance requirements of this Standard.

3.4 Water Heater Connectors

Metallic water heater connector tubes shall be 300 series stainless steel, 0.010 in. (0.25 mm) minimum wall thickness, or copper, 0.026 in. (0.7 mm) minimum wall thickness.

3.5 Working Pressures

Flexible water connectors shall be designed to function at water working pressures up to 125 psig (860 kPa gage) and intermittent impulse pressures up to 180 psig (1240 kPa gage).

3.6 Working Temperatures

Flexible water connectors shall be designed to function at supply temperatures from 40°F (4°C) to 150°F (65°C) and shall withstand 180°F (82°C) for 0.5 hr without failure of the pressure envelope.

4 PERFORMANCE TESTS

4.1 Samples

Samples representative of each nominal diameter, assembly connections, and material combination shall be tested. Separate samples shall be used for each of the following tests.

4.2 Impulse Testing

Flexible water connectors shall withstand 100,000 impulse cycles at 180°F (82°C). The impulse testing is to be conducted as follows:

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Table 1 Maximum Pressure Drop

Applications	Typical Connections	Flow Rate gpm (L/s)	Max. Pressure Drop, psi (kPa)	Mandrel Size, in. (mm)
Ice maker	1/4 in. (6.4 mm) Outside diameter tube	1.0 (0.06)	16.0 (110.3)	5.0 (127.0)
Faucet, dishwasher	3/8–1/2 in. (9.5–12.7 mm) Outside diameter tube	2.0 (0.13)	15.0 (103.4)	5.0 (127.0)
Clothes washer	3/4 in. (19.1 mm) Hose thread	4.0 (0.25)	25.0 (172.4)	5.0 (127.0)
Water heater	5/8–7/8 in. (15.9–22.2 mm) Outside diameter tube or 3/4 in. (19.1 mm) pipe	10.0 (0.63)	4.0 (27.6)	5.0 (127.0)
Fill valve	3/8–1/2 in. (9.5–12.7 mm) Outside diameter tube	2.0 (0.13)	10.0 (69.0)	5.0 (127.0)
General connector	1 in. (25.4 mm) pipe	25.0 (1.6)	2.0 (13.8)	12 (304.8)
General connector	1.25 in. (31.8 mm) pipe	30.0 (1.9)	2.0 (13.8)	15.0 (381.0)
General connector	1.5 in. (38.1 mm) pipe	30.0 (1.9)	2.0 (13.8)	18.0 (457.2)
General connector	2 in. (50.8 mm) pipe	40.0 (2.5)	2.0 (13.8)	24.0 (609.6)

4.2.1 Hot water shall be supplied to the flexible water connector at 180 ±5°F (82 ±3°C) such that the flowing pressure upstream of the connector is a maximum of 75 psig (517 kPa gage) and the flow rate is 2 ±0.4 gpm (0.126 ±0.016 L/s).

4.2.2 For each cycle, the flow shall be stopped and the pressure shall be increased from a maximum of 75 psig (517 kPa gage) to 180 ±5 psig (1241 ±34 kPa gage). The pressure shall not exceed 185 psig (1275 kPa gage).

4.2.3 The connector shall be cycled at a rate of 3 ±1 sec at 75 psig (517 kPa gage) maximum, 3 ±1 sec at 180 ±5 psig (1241 ±34 kPa gage) for a minimum of 7 cycles/minute for 100,000 cycles.

4.2.4 The test sample shall be considered to have failed if it leaks.

4.3 Hydrostatic Burst Test

4.3.1 Connector shall be filled with water at 180 ±5°F (82 ±3°C). Connector shall then be submerged in a constant temperature bath maintained at 180 ±5°F (82 ±3°C). Specimen shall then be pressurized at 250 ±5 psig (1724 ±34 kPa gage) and held at that pressure and temperature for 0.5 hr. The connector shall then be removed from bath and inspected for leaks while still subjected to the test pressure.

4.3.2 The connector shall be considered to have failed the hydrostatic burst test if it leaks.

4.4 Pressure Drop Test

Flexible water connectors shall have a pressure drop of no more than the values specified in Table 1.

4.4.1 Water shall be supplied at the rate given in Table 1 for at least 30 sec, after which the pressure drop across the connector shall be measured.

4.4.2 A test sample shall be considered to have failed if the pressure drop exceeds the maximum value in Table 1.

4.4.3 The flow test system configuration shall conform to the requirements outlined in ANSI/ISA S75.02, Part 3: Test System. The test specimen shall consist of the flexible water connector bent 180 deg around a mandrel specified in Table 1.

5 MARKING AND IDENTIFICATION

Each flexible water connector shall be marked as follows. 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.

(a) manufacturer's name or trademark

(b) statement "For Use With Water In Accessible Locations Only"

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NONMANDATORY APPENDIX A
EVALUATING THE CHLORAMINE RESISTANCE OF ELASTOMERS

Accelerated life-cycle testing and anecdotal evidence have shown that exposure to aqueous chloramine can have deleterious effects to some elastomers. ASTM D 6284, Standard Test Method for Rubber Property–Effect of Aqueous Solutions with Available Chlorine and Chloramine,[1] may be useful in evaluating the chloramine resistance of elastomers.

[1] ASTM standards may be obtained from the American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

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ASME STANDARDS RELATED TO PLUMBING

Air Gaps in Plumbing Systems ..... A112.1.2-1991(R2002)
Air Gap Fittings for Use With Plumbing Fixtures, Appliances, and Appurtenances A112.1.3-2000
Performance Standard and Installation Procedures for Stainless Steel Drainage Systems for Sanitary, Storm, and Chemical Applications, Above and Below Ground A112.3.1-1993
Macerating Toilet Systems and Related Components A112.3.4-2000
Water Heater Relief Valve Drain Tubes ..... A112.4.1-1993(R2002)
Water Closet Personal Hygiene Devices A112.4.2-2003
Plastic Fittings for Connecting Water Closets to the Sanitary Drainage System A112.4.3-1999
Point of Use and Branch Water Submetering Systems A112.4.7-2002
Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use ..... A112.6.1M-1997(R2002)
Framing-Affixed Supports for Off-the-Floor Water Closets With Concealed Tanks A112.6.2-2000
Floor and Trench Drains A112.6.3-2001
Roof, Deck, and Balcony Drains A112.6.4-2003
Enameled and Epoxy Coated Cast Iron and PVC Plastic Sanitary Floor Sinks A112.6.7-2001
Backwater Valves ..... A112.14.1-1975(R1998)
Grease Interceptors A112.14.3-2000
Grease Removal Devices A112.4.4-2001
Plumbing Fixture Fittings A112.18.1-2003
Plumbing Fixture Waste Fittings A112.18.2-2002
Performance Requirements for Backflow Protection Devices and Systems in Plumbing Fixture Fittings A112.18.3-2002
Flexible Water Connectors A112.18.6-2003
Deck-Mounted Bath/Shower Transfer Valves With Integral Backflow Protection A112.18.7-1999
Enameled Cast Iron Plumbing Fixtures ..... A112.19.1M-1994(R1999)
Vitreous China Plumbing Fixtures A112.19.2M-1998
Stainless Steel Plumbing Fixtures (Designed for Residential Use) A112.19.3-2000
Porcelain Enameled Formed Steel Plumbing Fixtures ..... A112.19.4M-1994(R1999)
Trim for Water-Closet Bowls, Tanks, and Urinals A112.19.5-1999
Hydraulic Performance Requirements for Water Closets and Urinals A112.19.6-1995
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(R1996)
Non-Vitreous Ceramic Plumbing Fixtures ..... A112.19.9M-1991(R2002)
Dual Flush Devices for Water Closets A112.19.10-2003
Wall Mounted and Pedestal Mounted, Adjustable and Pivoting Lavatory and Sink Carrier Systems A112.19.12-2000
Electrohydraulic Water Closets A112.19.13-2001
Six-Liter Water Closets Equipped With a Dual Flushing Device A112.19.14-2001
Bathtub/Whirlpool Bathtubs With Pressure Sealed Doors A112.19.15-2001
Manufactured Safety Vacuum Release Systems (SVRS) for Residential and Commercial Swimming Pool, Spa, Hot Tub, and Wading Pool Suction Systems A112.19.17-2002
Floor Drains ..... A112.21.1M-1991(R1998)
Roof Drains A112.21.2M-1983
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