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ANSI/AWWA C502-14
(Revision of ANSI/AWWA C502-05)

AWWA Standard

Dry-Barrel Fire Hydrants

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American Water Works Association STANDARD Since 1881

Approved American National Standard ANSI

AWWA Standard

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All AWWA standards follow the general format indicated subsequently. Some variations from this format may be found in a particular standard.

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Foreword

This foreword is for information only and is not a part of ANSI/AWWA C502.*

I. Introduction.

I.A. *Background.* This standard covers dry-barrel fire hydrants that are intended for use in water supply systems in all climates, including those where freezing temperatures occur. Wet-barrel fire hydrants, which are intended for use only in areas where the climate is mild and freezing temperatures do not occur, are covered in ANSI/AWWA C503, Wet-Barrel Fire Hydrants.

I.B. *History.* The first edition of this standard was approved on June 24, 1913, as Standard Specifications for Hydrants and Valves. Subsequent revisions to ANSI/AWWA C502 were approved by the AWWA Board of Directors in 1916, 1937, 1938, 1940, 1943, 1953, 1964, 1973, 1980, 1985, 1994, and 2005. This edition of C502 was approved on June 8, 2014.

I.C. *Acceptance.* In May 1985, the US Environmental Protection Agency (USEPA) entered into a cooperative agreement with a consortium led by NSF International (NSF) to develop voluntary third-party consensus standards and a certification program for direct and indirect drinking water additives. Other members of the original consortium included the Water Research Foundation (formerly AwwaRF) and the Conference of State Health and Environmental Managers (COSHEM). The American Water Works Association (AWWA) and the Association of State Drinking Water Administrators (ASDWA) joined later.

In the United States, authority to regulate products for use in, or contact with, drinking water rests with individual states.† Local agencies may choose to impose requirements more stringent than those required by the state. To evaluate the health effects of products and drinking water additives from such products, state and local agencies may use various references, including

1. An advisory program formerly administered by USEPA, Office of Drinking Water, discontinued on Apr. 7, 1990.
2. Specific policies of the state or local agency.

* American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
† Persons outside the United States should contact the appropriate authority having jurisdiction.

3. Two standards developed under the direction of NSF International (NSF), NSF*/ANSI 60, Drinking Water Treatment Chemicals—Health Effects, and NSF/ANSI 61, Drinking Water System Components—Health Effects.

4. Other references, including AWWA standards, *Food Chemicals Codex*, *Water Chemicals Codex*,† and other standards considered appropriate by the state or local agency.

Various certification organizations may be involved in certifying products in accordance with NSF/ANSI 61. Individual states or local agencies have authority to accept or accredit certification organizations within their jurisdictions. Accreditation of certification organizations may vary from jurisdiction to jurisdiction.

Annex A, "Toxicology Review and Evaluation Procedures," to NSF/ANSI 61 does not stipulate a maximum allowable level (MAL) of a contaminant for substances not regulated by a USEPA final maximum contaminant level (MCL). The MALs of an unspecified list of "unregulated contaminants" are based on toxicity testing guidelines (noncarcinogens) and risk characterization methodology (carcinogens). Use of Annex A procedures may not always be identical, depending on the certifier.

ANSI/AWWA C502 does not address additives requirements. Users of this standard should consult the appropriate state or local agency having jurisdiction in order to

1. Determine additives requirements, including applicable standards.
2. Determine the status of certifications by parties offering to certify products for contact with, or treatment of, drinking water.
3. Determine current information on product certification.

II. Special Issues.

II.A. *Ownership, Use, and Maintenance.* A fire hydrant is usually a unit of a water utility's property that is provided for public fire-protection service. However, during fire emergencies it is operated by members of the fire department rather than by water utility personnel.

The use of fire hydrants as a source of water for street cleaning, construction projects, or any purpose other than firefighting is beyond the primary purpose for which the unit is installed. The use of hydrants in this manner should be rigidly restricted and controlled in the interest of maintaining the equipment in satisfactory working condition for use at times of fire emergencies.

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* NSF International, 789 N. Dixboro Road, Ann Arbor, MI 48105.

† Both publications available from National Academy of Sciences, 500 Fifth Street, NW, Washington, DC 20001.

The water utility, unless expressly relieved by the fire department in accordance with a written agreement, public ordinance, or other ownership, should schedule regular and sufficiently frequent inspections of hydrants to ensure they are in good working condition. AWWA Manual M17, *Installation, Field Testing, and Maintenance of Fire Hydrants*, provides an excellent guide for owners of fire hydrants.

II.B. *Advisory Information on Product Application.* Hydrants produced according to ANSI/AWWA C502 are designed to be operated by one person using a 15-in. (380-mm) wrench. The use of a longer wrench or an indefinite extender operated by two or more persons is not considered to be good practice. If one person cannot open and close a fire hydrant with a 15-in. (380-mm) wrench, the hydrant is not in proper working order and should be promptly repaired. Wrenches for fire hydrants should be constructed so that the openings can be readily reversed.

Hydrants produced according to ANSI/AWWA C502 are required to meet a test of 200 lbf·ft (270 N·m) torque applied at the operating nut in both opening and closing directions. This torque is considered to be fully adequate to operate a hydrant that is in good working condition. Hydrants with barrels longer than 5 ft (1.5 m) of bury may require special design.

Hydrants with a single 2½-in. (64-mm) outlet nozzle are not considered to be suitable for normal fire protection service.

If Table 5 of the standard does not show permissible loss of head for a particular flow rate, the manufacturer should be consulted on head losses at the particular flow rate for the products.

The physical and chemical properties of hydrant component materials should be considered when preparing a specification for fire hydrants. Material melting points, compatibility with treatment chemicals, and other properties can affect performance of a fire hydrant depending on criteria of an application.

III. Use of This Standard. It is the responsibility of the user of an AWWA standard to determine that the products described in that standard are suitable for use in the particular application being considered.

III.A. *Purchaser Options and Alternatives.* The following items should be provided by the purchaser:

1. Standard used—that is, ANSI/AWWA C502, Dry-Barrel Fire Hydrants, of latest revision.

2. Whether compliance with NSF/ANSI 61, Drinking Water System Components—Health Effects, is required, in addition to the requirements of the Safe Drinking Water Act.

3. Quantity required.

4. Number of outlet nozzles for hose and pumper.

5. Nominal inside diameter of the outlet nozzles, in inches (or millimeters).

6. Type of outlet-nozzle connection. Outlet-nozzle connections should conform to those in service in the system where the hydrant is to be installed. If the connections are to conform with National Fire Protection Association (NFPA)* 1963, Standard for Fire Hose Connections, reproduced in part in appendix A of this standard, this requirement should be specified.

If the connections are threaded and threads are not of this type, the following thread detail dimensions, with acceptable tolerance, should be specified (or a suitable sample supplied):

a. major diameter

b. minor diameter

c. pitch diameter

d. thread form

e. number of threads per inch.

7. Bury depth, the distance measured in feet and inches to the nearest 6 in. from the bottom of the connecting pipe to the ground line (trench depth) (See Section 3).

8. Details of other federal, state or provincial, and local requirements (Sec. 4.4.1).

9. Direction of rotation of the operating nut to open the hydrant; that is, left (counterclockwise) or right (clockwise). This direction should conform to the practice in the system where the hydrant is to be installed (Sec. 4.6.4.3).

10. Size and type of inlet connection and joint accessories, such as gaskets, bolts, or nuts, if any (Sec. 4.7).

11. Size of hydrant, designated by the nominal diameter of the main valve opening (Sec. 4.8.1.4).

12. Color and type of paint to be applied on the outside of the hydrant top section (Sec. 4.13.2).

13. Whether special markings are required (Sec. 6.1).

14. Location to which hydrants are to be shipped and any special shipping instructions or requirements (Sec. 6.2).

III.B. *Optional Information (if required by purchaser).*

1. Type of shutoff, if there is a preference (Sec. 1.1).

* National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

2. Catalog and maintenance data, net weight, and drawings. Specify whether drawings are to be accepted before the manufacture of the hydrants (Sec. 4.3).

3. Alternative materials, if the water that will be used in the hydrants promotes corrosion (Sec. 4.4.2.5.3; also, consult manufacturers).

4. Special designs or features (Sec. 4.5 and Sec. 4.6).

5. Outlet-nozzle cap chains and cap gasket, if not desired (Sec. 4.6.3.2 and 4.6.3.4).

6. Operating nuts and threaded outlet-nozzle cap nuts, if different from those specified in this standard and if special protection of the operating nut is required (Sec. 4.6.4.5).

7. Harnessing lugs (Sec. 4.7.1).

8. Drain outlet, whether it is to be omitted or retained and tapped for drain pipe (Sec. 4.8.2).

9. Corrosion-resistant bolts and nuts (Sec. 4.11).

10. Records of production tests (Sec. 5.1).

11. Whether inspection is required (Sec. 5.3.1).

12. Affidavit of compliance (Sec. 6.3).

13. Manufacturer's Certification of Compliance to NSF/ANSI 61, Drinking Water System Components—Health Effects.

III.C. *Modification to Standard.* Any modification of the provisions, definitions, or terminology in this standard must be provided by the purchaser.

IV. Major Revisions. Major changes made to the standard in this revision include the following:

1. Added definition for *bury depth* in Section 3.

2. Added provision for nonthreaded connection (Sec. 4.6.3.3).

3. Deleted Sec. 4.6.4 Bury.

4. Revised Sec. 4.13.2 to provide for an inert, corrosion-resistant coating, such as epoxy.

5. Revised Sec. 4.13.3 to allow coating of hydrant inlet shoe with an inert, corrosion-resistant coating, such as epoxy.

6. Revised Sec. 4.13.4 to provide for an inert, corrosion-resistant coating, such as epoxy.

7. Table 5 expanded to include loss of head at 2,000-gpm flow rates.

8. Revise Maximum Permissible Loss of Head for Hydrants (Table 5).

V. **Comments.** If you have any comments or questions about this standard, please contact AWWA Engineering and Technical Services at 303.794.7711, FAX 303.795.7603, write to the department at 6666 West Quincy Avenue, Denver, CO 80235-3098, or email at standards@awwa.org.

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AWWA Standard

Dry-Barrel Fire Hydrants

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes post-type, dry-barrel fire hydrants with compression shutoff (opening against or with the pressure) or gate shutoff for use in fire protection service in all climates, including those where freezing occurs.

1.1.1 *Exceptions.* This standard does not cover the wet-barrel or flush-type of hydrants. (For wet-barrel type, see ANSI/AWWA C503. For flush-type, see AWWA Manual M17.) This standard, ANSI/AWWA C502, does not provide instructions for installation of fire hydrants. For installation information, see ANSI/AWWA C600 and AWWA Manual M17.

Sec. 1.2 Purpose

The purpose of this standard is to provide the minimum requirements for dry-barrel fire hydrants for fire-protection service, including materials, general design, and testing.

Sec. 1.3 Application

This standard can be referenced in specifications for purchasing and receiving dry-barrel fire hydrants for fire protection service and can be used as a guide for evaluating materials and designing, testing, and inspecting dry-barrel fire hydrants. The stipulations of this standard apply when this document has been referenced and then only to dry-barrel fire hydrants for water supply service.

SECTION 2: REFERENCES

This standard references the following documents. In their latest editions, they form a part of this standard to the extent specified within the standard. In any case of conflict, the requirements of this standard shall prevail.

SAE* AS568—Aerospace Size Standard for O-rings.

ANSI/AWWA C110/A21.10—Ductile Iron and Gray-Iron Fittings.

ANSI/AWWA C111/A21.11—Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

ANSI/AWWA C115/A21.15—Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges.

ANSI/AWWA C151/A21.51—Ductile-Iron Pipe, Centrifugally Cast.

ANSI/AWWA C503—Wet-Barrel Fire Hydrants.

ANSI/AWWA C550—Protective Interior Coatings for Valves and Hydrants.

ANSI/AWWA C600—Installation of Ductile-Iron Mains and Their Appurtenances.

ASME† B18.2.1—Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series).

ASME B18.2.3.5M—Metric Hex Bolts.

ASME B18.2.4.2M—Metric Hex Nuts Style 2.

ASTM‡ A47—Standard Specification for Ferritic Malleable Iron Castings.

ASTM A48—Standard Specification for Gray Iron Castings.

ASTM A108—Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.

ASTM A126—Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

ASTM A153—Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

ASTM A197—Standard Specification for Cupola Malleable Iron.

ASTM A220—Standard Specification for Pearlitic Malleable Iron.

ASTM A242—Standard Specification for High-Strength Low-Alloy Structural Steel.

* Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.
† ASME International, Three Park Avenue, New York, NY 10016.
‡ ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

ASTM A307—Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.

ASTM A395—Standard Specification for Ferritic Ductile Iron Pressure Retaining Castings for Use at Elevated Temperatures.

ASTM A536—Standard Specification for Ductile Iron Castings.

ASTM A575—Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.

ASTM A576—Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.

ASTM B16—Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines.

ASTM B21/B21M—Standard Specification for Naval Brass Rod, Bar, and Shapes.

ASTM B36—Standard Specification for Brass Plate, Sheet, Strip, and Rolled Bar.

ASTM B62—Standard Specification for Composition Bronze or Ounce Metal Castings.

ASTM B75/B75M—Standard Specification for Seamless Copper Tube.

ASTM B88—Standard Specification for Seamless Copper Water Tube.

ASTM B98—Standard Specification for Copper-Silicon Alloy Rod, Bar and Shapes.

ASTM B124—Standard Specification for Copper and Copper Alloy Forging Rod, Bar, and Shapes.

ASTM B135—Standard Specification for Seamless Brass Tube.

ASTM B138—Standard Specification for Manganese Bronze Rod, Bar, and Shapes.

ASTM B148—Standard Specification for Aluminum-Bronze Sand Castings.

ASTM B154—Standard Test Method for Mercurous Nitrate Test for Copper Alloys.

ASTM B283/B283M—Standard Specification for Copper and Copper-Alloy Die Forgings (Hot-Pressed).

ASTM B453—Standard Specification for Copper-Zinc-Lead Alloy (Leaded-Brass) Rod, Bar, and Shapes.

ASTM B505/B505M—Standard Specification for Copper Alloy Continuous Castings.

ASTM B584—Standard Specification for Copper Alloy Sand Castings for General Applications.

ASTM B633—Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

ASTM B763/B763M—Standard Specification for Copper Alloy Sand Castings for Valve Applications.

ASTM D2000—Standard Classification System for Rubber Products in Automotive Applications.

AWWA M17—*Installation, Field Testing, and Maintenance of Fire Hydrants.*

Federal Standard 595C—Colors Used in Government Procurement.

ISO 6509—Corrosion of metals and alloys: Determination of dezincification resistance of brass.

NFPA* 291—Recommended Practices of Fire Flow Testing and Marking of Hydrants.

NFPA 1963—Standard for Fire Hose Connections.

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

SECTION 3: DEFINITIONS

For preferred terminology for hydrant component nomenclature, see AWWA Manual M17. The following definitions shall apply in this standard:

1. *Bury depth:* The distance measured in feet and inches to the nearest 6 in. from the bottom of the connecting pipe to the ground line (trench depth).
2. *Cast iron:* Includes gray iron and ductile iron.
3. *Cosmetic defect:* A blemish that has no effect on the ability of a component to meet the structural design and production test requirements of this standard. Should the blemish or the activity of plugging, welding, grinding, or repairing such blemish cause the component to fail the test requirements, the blemish shall then be considered a structural defect.
4. *Manufacturer:* The party that manufactures, fabricates, or produces materials or products.
5. *Purchaser:* The person, company, or organization that purchases any materials or work to be performed.

* National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269.

6. *Structural defect:* A flaw that causes a component to fail the structural design or test requirements of this standard. This includes but is not limited to imperfections that result in leakage through the walls of a casting, failure to meet minimum wall thickness requirements, or failure to meet production tests.

7. *Supplier:* The party that supplies materials or services. A supplier may or may not be the manufacturer.

SECTION 4: REQUIREMENTS

Sec. 4.1 Permeation

The selection of materials is critical for water service and distribution piping in locations where there is likelihood the pipe will be exposed to significant concentrations of pollutants composed of low-molecular-weight petroleum products or organic solvents or their vapors. Documented research has shown that pipe materials such as polyethylene and polyvinyl chloride, and elastomers, such as those used in jointing gaskets and packing glands, are subject to permeation by low-molecular-weight organic solvents or petroleum products. If a water pipe must pass through a contaminated area or an area subject to contamination, consult with the manufacturer regarding permeation of pipe walls, jointing materials, and so on, *before* selecting materials for use in that area.

Sec. 4.2 Data to Be Provided by the Purchaser

If the purchaser has special requirements, such as nozzle threads, nozzle caps, weather shields, operating nuts, markings, special coatings, or terms of repair, the purchaser shall provide all necessary drawings, samples, and specifications to the manufacturer.

Sec. 4.3 Data to Be Provided by the Manufacturer

4.3.1 *Catalog and maintenance data.* If requested by the purchaser, the manufacturer shall, when required, provide catalog data (including illustrations and a schedule of parts and the materials of which they are made) in sufficient detail to guide in assembling and disassembling of the hydrant (including top and bottom extension pieces), as well as in ordering repair parts, including providing instructions and recommended frequencies for lubrication and maintenance.

4.3.2 *Net weight.* When required, the manufacturer shall provide the net assembled weight of each size of hydrant ordered.

4.3.3 *Drawings.* If requested by the purchaser, the manufacturer shall submit assembly drawings showing the principal dimensions, construction details, and materials for review by the purchaser.

Sec. 4.4 Materials

4.4.1 *General.* Materials designated hereinafter, when used in hydrants produced under the provisions of this standard, shall conform to the referenced standards designated in Sec. 4.4.2 for each material listed.

Materials shall comply with the requirements of the Safe Drinking Water Act and other federal regulations as applicable. Legislation is subject to change. Therefore, it is the manufacturer's and purchaser's responsibility to verify the current requirements of federal, state, and local regulations.

4.4.2 *Physical and chemical properties of components.* Materials shall conform to the physical and chemical requirements of this section.

4.4.2.1 Gray iron. Gray iron shall meet or exceed the requirements of one of the following standards: ANSI/AWWA C110/A21.10; ASTM A126, class B; or ASTM A48, class 30.

4.4.2.2 Ductile iron. Ductile iron shall meet or exceed the requirements of one of the following standards: ANSI/AWWA C110/A21.10, ASTM A395, ASTM A536, or ANSI/AWWA C151/A21.51.

4.4.2.3 Malleable iron. Malleable iron shall meet or exceed the requirements of one of the following standards: ASTM A47, ASTM A220, or ASTM A197.

4.4.2.4 Steel. Steel shall meet or exceed the requirements of one of the following standards: ASTM A575, ASTM A576, or ASTM A108.

4.4.2.5 Copper alloys. Copper alloys used in hydrants shall comply with the following:

4.4.2.5.1 Copper alloy hydrant components shall be made to ASTM recognized alloys with Unified Numbering System for Metals and Alloys (UNS)* designations. Copper alloys are not limited to those specified in this standard. Copper alloys, however, must meet the performance requirements of this standard, including but not limited to, minimum yield strength, chemical requirements, and corrosion resistance. Table 1 is a representative list of ASTM standards for copper alloys most commonly used in hydrant components.

* Joint Publication of ASTM and SAE (ASTM DS56E/SAE HS-1086 February '93).

Table 1 Copper alloy standards

ASTM Specification Number (Designation)*	Standard Specification for
B16/B16M	Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines
B21/B21M	Naval Brass Rod, Bar, and Shapes
B36/B36M	Brass Plate, Sheet, Strip, and Rolled Bar
B62	Composition Bronze or Ounce Metal Castings
B75/B75M	Seamless Copper Tube
B88	Seamless Copper Water Tube
B98/B98M	Copper-Silicon Alloy Rod, Bar, and Shapes
B124/B124M	Copper and Copper Alloy Forging Rod, Bar, and Shapes
B135	Seamless Brass Tube
B138/B138M	Manganese Bronze Rod, Bar, and Shapes
B148	Aluminum-Bronze Sand Castings
B283/B283M	Copper and Copper-Alloy Die Forgings (Hot-Pressed)
B453/B453M	Copper-Zinc-Lead Alloy (Leaded-Brass) Rod, Bar, and Shapes
B505/B505M	Copper Alloy Continuous Castings
B584	Copper Alloy Sand Castings for General Applications
B763/B763M	Copper Alloy Sand Castings for Valve Applications

*Alloys actually used or specified by the manufacturer or purchaser are not limited to those specified in the ASTM standards listed in Table 1; see Sec. 4.4.2.5.1.

NOTE: The ASTM standards for copper alloys may permit minimum chemical or mechanical requirements that do not meet the minimum requirements of ANSI/AWWA C502. To comply with C502 when manufacturing or purchasing components made from these alloys for use in hydrants, the hydrant manufacturer must specify minimum chemical or mechanical requirements for these alloys that exceed the minimums allowed by the ASTM specification.

4.4.2.5.2 Any copper alloy used in the cold-worked condition shall be capable of passing the mercurous nitrate test, in accordance with ASTM B154, to minimize susceptibility to stress corrosion.

4.4.2.5.3 Waters in some areas have been shown to promote corrosion in the form of dezincification or dealuminization of copper alloys. The manufacturer should be notified if the condition exists. Copper alloys that contain more than 16 percent zinc shall not be used in these waters unless specimens of the alloy tested in accordance with ISO 6509 exhibit dezincification depth of less than 25 µm. If aluminum bronze is used, the alloy shall be inhibited against dealuminization.

4.4.2.5.4 Copper alloy that contains more than 16 percent zinc shall not contain less than 57 percent copper.

4.4.2.5.5 Copper alloys that contain 16 percent zinc or less shall not contain less than 79 percent copper.

4.4.2.5.6 Hydrant components manufactured from some grades of manganese bronze or some other materials are subject to stress corrosion. The manufacturer shall design the hydrant and select materials to minimize stress corrosion.

4.4.2.5.7 Copper alloys that contact drinking water shall not contain more than 8 percent lead.

4.4.2.6 Aluminum alloy. Aluminum alloy shall be made to ASTM-recognized alloys with Unified Numbering System for Metals and Alloys (UNS) designations. Aluminum alloys shall meet the performance requirements of this standard, including, but not limited to, minimum yield strength and corrosion resistance.

Sec. 4.5 General Design

4.5.1 *Working pressure.* Hydrants shall be designed for a minimum working pressure of 150 psig (1,034 kPa [gauge]).

4.5.2 *Material stress limits.* Parts of the hydrant shall be designed to withstand, without being functionally impaired nor structurally damaged, a hydrostatic test of not less than 300 psig (2,068 kPa [gauge]) or twice the rated working pressure, whichever is greater, with the hydrant completely assembled and pressurized as follows.

4.5.2.1 Condition A. With the nozzle caps in place, the main valve open, the hydrant inlet capped, and the test pressure applied to the interior of the hydrant.

4.5.2.2 Condition B. With the main valve closed, the hydrant inlet capped, and the test pressure applied at the hydrant inlet.

4.5.3 *Parts made of copper alloy.* (See Table 2 for hydrant component parts.)

4.5.3.1 Copper alloy parts for 14,000 psi. The following parts shall be made from copper alloys specified in ASTM standards such as those listed in Table 1, which have a minimum yield strength of 14,000 psi (96.53 MPa): glands, gland bushings, threaded outlet nozzles, stem nuts, or threaded portions of stems (see Sec. 4.6.4.1); valve seats, valve-seat rings, and valve carriers.

4.5.3.2 Copper alloy parts for 20,000 psi. The following parts shall be made from copper alloys specified in ASTM standards such as those listed in

Table 2 Hydrant component parts

Component	Refer to Section*
Drain-valve parts	4.8.2.1, 4.8.2.3, 4.8.2.4
Packing glands	4.9.1, 4.9.1.1
Packing-gland bushings	4.9.1, 4.9.1.2
Threaded outlet nozzles	4.6.3.1
Stems or threaded portion of stems	4.6.4.1
Stem nuts	4.6.4.1, 4.6.4.4
Stuffing boxes	4.10.3.2
Valve seats or valve-seat rings	4.8.1.3
Nonthreaded connections	4.5.4, 4.6.3.3

*Reference should be made to the designated sections of ANSI/AWWA C502 in which the various components are specified.

Table 1, which have a yield strength of 20,000 psi (137.89 MPa) or greater: gland bolts and nuts, and stuffing-box bolts and nuts.

4.5.3.3 Parts in contact. Parts working in contact with each other shall not both be made of ferrous metal.

4.5.4 *Parts made of gray or ductile iron.* The following parts of the hydrant may be made of either gray or ductile iron: barrel, bonnet, base, packing plate, gates and plates, and outlet-nozzle caps. Miscellaneous structural parts may be made of gray iron, ductile iron, or malleable iron. Outlet caps for nonthreaded connections may be made of other materials provided these parts meet the requirements of Sec. 4.6.3.3. (See Table 2 for hydrant component parts.)

4.5.5 *Operating mechanism torque limits.* The design safety factor of the operating mechanism shall be not less than 5 and shall be based on the torque required for the closing and opening of the hydrant at a working pressure of 150 psig (1,034 kPa [gauge]). Hydrants shall be functional and capable of being opened or closed without difficulty following application of an operating torque of 200 lbf·ft (270 N·m) at the operating nut in the opening direction with the hydrant fully opened and the closing direction with the hydrant fully closed (see Sec. 5.2.2). The torque requirements apply only to hydrants of 5-ft (1.5-m) bury or less.

4.5.6 *Traffic model components.* Hydrants with frangible sections near the ground line designed to break on impact shall, except for the frangible components, conform to structural design requirements of this standard. Frangible components will not be required to meet the structural design safety factor of 5.

Sec. 4.6 Detailed Design

4.6.1 *Bonnet.* The bonnet shall be free-draining and of a type that will maintain the operating mechanism in readiness for use. The bonnet shall be designed to make tampering difficult and shall be provided with convenient means for lubricating to ensure easy operation and prevent wear and corrosion. An arrow and the word "OPEN" shall be cast on or near the top of the hydrant bonnet to indicate the direction of operation and shall be clearly visible when viewed from the top.

4.6.2 *Barrel sections.* If hydrants are made in two or more sections with a flange or other joint near the ground line, the joint shall, unless otherwise provided in the purchaser's specifications, be located at least 2 in. (51 mm) above the ground line.

4.6.2.1 Minimum wall thickness. The minimum wall thickness of the barrel and base at any point shall not be less than shown in Table 3. The wall thickness of barrels of fractional-inch diameters shall be that of the next larger diameter. For statically cast barrels, a minus tolerance of 0.02 in. (0.5 mm) over areas not exceeding 8 in. (203 mm) in length in any direction shall be permissible.

4.6.2.2 Change in shape or size. To meet the requirements of Sec. 5.2.1, changes in the shape or size of the waterways should be accomplished by the use of curves. The junction of hose and pumper outlet nozzles with the barrel should be rounded. Exclusive of the main valve opening, the net area of the waterway of the

Table 3 Minimum wall thicknesses

Barrel ID		Statically Cast Gray Iron		Centrifugally Cast Gray Iron		Ductile Iron	
in.	*(mm)*	*in.*	*(mm)*	*in.*	*(mm)*	*in.*	*(mm)*
5	(125)	0.35	(8.9)	0.32	(8.2)	0.25	(6.4)
6	(150)	0.36	(9.2)	0.33	(8.4)	0.26	(6.6)
7	(175)	0.40	(10.2)	0.35	(8.9)	0.27	(6.9)
8	(200)	0.43	(10.9)	0.36	(9.2)	0.28	(7.2)
9	(225)	0.50	(12.7)	0.37	(9.4)	0.28	(7.2)
10	(250)	0.56	(14.2)	0.38	(9.7)	0.29	(7.4)

barrel and base at the smallest parts shall be not less than 120 percent of that of the net opening of the main valve.

4.6.3 *Outlet connections.*

4.6.3.1 Threaded outlet nozzles. Threaded outlet nozzles shall be made of copper alloy and be fastened to the nozzle section by mechanical means or caulking. If caulking is used, an adequate recess shall be provided for the caulking material. Outlet nozzles shall be safeguarded against blowing out. For outlet nozzles threaded into the body, a pin or equivalent method shall be used to secure the outlet.

4.6.3.2 Caps for threaded outlet nozzles. Outlet-nozzle caps shall be provided for threaded outlet nozzles. The threads shall conform to those of the outlet nozzle except that the Higbee cut may be omitted. A recess shall be provided at the inner end of the thread to retain a gasket unless the purchaser requests the deletion of the gasket. Unless otherwise specified, caps shall be secured to the hydrant barrel with a metal chain having links made from stock not less than ⅛ in. (3 mm) in diameter, or of equivalent cross-sectional area, or with a cable of strength equivalent to the chain. The attachment shall permit free rotation of the cap. For cap nuts, see Sec. 4.6.4.5.

4.6.3.3 Nonthreaded outlet nozzles. Nonthreaded outlet nozzles shall be made of copper alloy or aluminum alloy. If made of aluminum alloy, nozzles shall be capable of being coupled and uncoupled using accepted practices after testing for corrosion resistance in accordance with Sec. 4.12 of NFPA 1963. For this testing, coupling assemblies shall consist of the outlet nozzle and the nozzle cap and gasket.

Nonthreaded outlet nozzles shall be fastened to the nozzle section by mechanical means. For outlets threaded into the body, a pin or equivalent method shall be used to secure the outlet.

4.6.3.4 Caps for nonthreaded outlet nozzles. Outlet-nozzle caps shall be provided for nonthreaded outlet nozzles. Unless otherwise specified, caps shall be secured to the hydrant barrel with a metal chain having links not less than ⅛ in. (3 mm) in diameter, or a cable having strength equivalent to the chain. The attachment shall permit free rotation of the cap. Caps for nonthreaded outlet nozzles may connect to the outlet with threads, or by other means, provided the test requirements of Sec. 4.5.2 and 5.1.3 are met.

4.6.3.5 Nonthreaded outlet nozzles and the caps for those nozzles shall meet the requirements of NFPA 1963 Sec. 6.8, Hydrant and Fire Department Connections, with the following additional provisions.

1. Dimension *L* shall be permitted to be modified for the cap as necessary to increase friction between the cap and the outlet nozzle to provide protection from tampering. To avoid interference with coupling lugs, diameter *K* shall not be increased but permitted to be reduced, provided the nozzle still meets requirements of Sec. 4.5.2 and 5.1.3.

2. Wrenching lugs, when provided, shall be compatible with test wrenches that are in accordance with Figures 6.5.3.2(a) or 6.5.3.2(b) in NFPA 1963.

4.6.4 *Operating mechanism.*

4.6.4.1 Threads. The operating threads of the hydrant shall be designed to avoid the working of any iron or steel parts against either iron or steel. The threaded portion of the stem or its threaded stem nut (or sleeve) shall be made of copper alloy.

4.6.4.2 Turns. The lead of the threads shall be such that no fewer than 8 complete turns will be required to close a 4-in. (100-mm) hydrant; 10 complete turns to close a 5-in. (125-mm) hydrant; and 12 complete turns to close a 6-in. (150-mm) hydrant. The minimum number of turns for intermediate sizes shall be that designated for the next larger size.

4.6.4.3 Direction. Unless otherwise specified, the hydrant shall be opened by turning the operating nut counterclockwise.

4.6.4.4 Stem nut. Stem nuts shall be made of copper alloy if the threaded portion of the stem is made of steel. If the threaded portion of the stem is made of copper alloy, stem nuts may be made of copper alloy or steel.

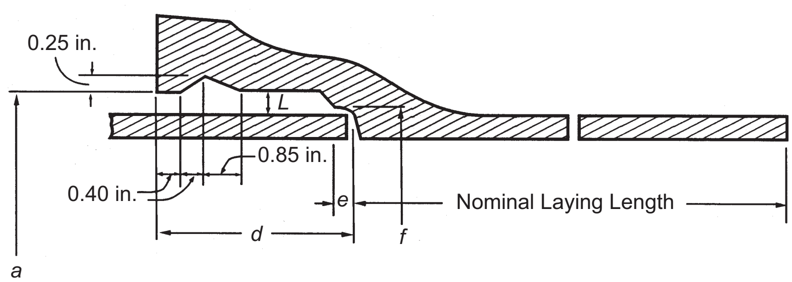
4.6.4.5 Operating nut shape. Unless otherwise specified, the operating nuts shall be pentagonal in shape. The pentagon shall measure 1½ in. (38.1 mm) from point to flat at the base of the operating nut and 1⁷⁄₁₆ in. (36.5 mm) at the top; faces shall be tapered uniformly, and the height of the operating nut shall not be less than 1 in. (25.4 mm). The point-to-flat dimension shall be measured to the theoretical point where the faces would intersect if the corners were not rounded off. The opening between the operating nut and the top of the bonnet shall be protected from rain or dirt by skirting the operating nut, installing a seal ring, or using other means acceptable to the manufacturer and the purchaser.

4.6.5 *Damage to barrel and operating mechanism.* The barrel and operating mechanism shall be designed so that in the event of accident, damage, or breaking of the hydrant above or near the ground line, the main valve will remain closed and reasonably tight against leakage.

Sec. 4.7 Hydrant Inlet

4.7.1 *Connections.* The base of the hydrant shall have a side or bottom inlet provided with a hub end for a poured joint (for repairs only), flange, mechanical joint, push-on joint, or other type of connection for connecting the hydrant to the hydrant lead from the main. The inlet shall be suitable for connection to pipe of not less than 6 in. (150 mm) in nominal diameter, unless otherwise specified by the purchaser. When the hydrant is provided with a hub end for a poured joint (for repairs only), it shall conform to the dimensions shown in Table 4. When the hydrant is provided with a flange end, the flange shall conform to the dimensions called for in ANSI/AWWA C115/A21.15. When the hydrant is provided with a mechanical joint or a push-on joint, the joint shall conform to the dimensions shown in ANSI/AWWA C111/A21.11. If the hydrant is provided with a mechanical joint or flanged connections, the top one or two bolt holes in which the body interferes with the insertion of the bolts may be slotted to the outer face of the flange.

Table 4 Dimensions of poured joints (for repairs only)*



Bell-and-spigot pipe, 4–8 in. (102–203 mm), with plain ends

Size	Pipe OD†	Socket Diam. *a*†	Thickness of Joint *L*	Socket Depth *d*	Centering Shoulder Depth *e*	Centering Shoulder ID *f*†
4	4.80	5.60	0.40	3.30	0.30	4.94
6	6.90	7.70	0.40	3.88	0.38	7.06
8	9.05	9.85	0.40	4.38	0.38	9.21

*To convert inches to millimeters, multiply by 25.4.
†Tolerances for outside diameter (OD) of spigot ends, socket diameter *a*, and centering shoulder inside diameter (ID) *f* shall be ± 0.06 in. (1.52 mm) for sizes 4–8 in. (102–203 mm).

4.7.2 *Harnessing lugs.* If required by the purchaser, lugs for harnessing the hydrant to the hydrant lead shall be provided.

Sec. 4.8 Valves

4.8.1 *Main valves.* The hydrant shall be designed so that, when it is in place, no excavation is required to remove the main valve, the operating mechanism of the hydrant, or the movable parts of the drain valve.

4.8.1.1 Interface. Where removal of the main valve, the main valve seat assembly, or both requires an interface connection with gray cast or ductile iron, the nonferrous thread or connections shall be designed so that the products of corrosion will not prevent disassembly. The interface between the ferrous and nonferrous surfaces shall be coated with antiseize material.

4.8.1.2 Facing material. The main valve shall be faced with a suitable yielding material, such as rubber, elastomer, polymer, leather, balata, or other composition, where the valve face bears on the seat ring.

4.8.1.3 Valve-seat ring. The valve-seat ring for the main valve shall be made of copper alloy.

4.8.1.4 Valve opening. The size of the hydrant is designated by the nominal diameter of the main valve opening. The diameter of the main valve opening shall not be less than 4 in. (100 mm).

4.8.2 *Barrel drain outlet.*

4.8.2.1 Drain. Unless otherwise specified by the purchaser, a positive-operating drain valve or valves shall be provided to drain the hydrant properly by opening as soon as the main valve is closed. The drain valve shall close when the main valve is opened. The seat of the drain valve shall be copper alloy or other corrosion-resistant material, fastened securely in the hydrant. The drain valve may be faced with a suitable yielding material, such as rubber, elastomer, polymer, leather, balata, or other composition, where the drain valve face bears on the seat.

4.8.2.2 Location. The drain outlet shall be provided in the base or barrel or between the base and barrel of the hydrant unless otherwise specified by the purchaser. The drain outlet shall be tapped to receive a drain pipe, if specified by the purchaser.

4.8.2.3 Integral part material. The drain outlet shall be an integral part of the drain valve or shall be bushed with copper alloy or other corrosion-resistant material.

4.8.2.4 Nonintegral part material. If the drain outlet is not an integral part of the drain valve, it shall be bushed with copper alloy or other corrosion-resistant material to the outside of the hydrant.

Sec. 4.9 Packing Glands and Packing-Gland Bolts

4.9.1 *Packing glands.* Packing glands shall be made of solid copper alloy or copper alloy-bushed cast iron.

4.9.1.1 Secured. Glands shall be secured to prevent rotation when the operating nut is turned.

4.9.1.2 Material. The copper alloy shall be made from copper alloys specified in ASTM standards such as those listed in Table 1, which have a minimum yield strength of 14,000 psi (96.3 MPa).

4.9.2 *Packing-gland bolts.* Packing-gland bolts or studs shall not be less than ⅝ in. (16 mm) in diameter if made of copper alloy, or not less than ½ in. (13 mm) in diameter if made of steel. Packing-gland bolt nuts shall be made of copper alloys specified in ASTM standards such as those listed in Table 1 that have a minimum yield strength of 20,000 psi (137.89 MPa).

Sec. 4.10 Seals

4.10.1 *O-ring seals.* O-rings shall be compounded to meet ASTM D2000 and have physical properties suitable for the application.

4.10.1.1 Dimensions. When an O-ring or other pressure-actuated stem seal is used, the dimensions of such seals are to be in accordance with SAE AS568. Tolerances may be altered for economical manufacturing purposes provided that the seal remains watertight at pressures required by this standard.

4.10.2 *Other pressure-actuated seals.* Other types of pressure-actuated seals may be used, if accepted by the purchaser.

4.10.3 *Stuffing-box seals.* If accepted by the purchaser, stuffing-box seals may be used in place of O-ring seals.

4.10.3.1 Width. When stuffing boxes are used, the width of the packing shall be at least ¼ in. (6.4 mm), and the depth of packing space shall be at least four times its width.

4.10.3.2 Material. Stuffing boxes shall be made of either copper alloy or cast iron.

4.10.3.3 Hemp or asbestos. Hemp and asbestos packing shall not be used for stuffing-box packing.

4.10.4 *Gaskets.* Gasket material shall be of rubber composition or paper free from corrosive ingredients, either alkaline or acid. O-rings or other suitable elastomeric seals may be used in place of gaskets.

Sec. 4.11 Bolts and Nuts

Bolting materials shall develop the physical strength requirements of ASTM A307 and may have either regular, square, or hexagonal heads with dimensions conforming to ASME B18.2.1. Bolts, studs, and nuts shall be zinc-coated (ASTM A153 or ASTM B633) or rust-proofed by some other process disclosed to and accepted by the purchaser. The purchaser may require that bolts, studs, and nuts shall be made from a corrosion-resistant material, such as low-zinc copper alloy, Monel, stainless steel, or low-alloy steel (ASTM A242).

If specified by the purchaser, metric bolting shall be per ASME B18.2.3.5M and B18.2.4.2M.

Sec. 4.12 Workmanship

Foundry and machine work shall be performed in accordance with good standard practice for the class of work involved and in conformance with accepted drawings, if required. When assembled, hydrants manufactured in accordance with this standard shall be well fitted and shall operate smoothly. The body and shaft seal shall be watertight.

4.12.1 *Proper functioning.* Parts shall conform to the required dimensions and shall be free from defects that could prevent proper functioning of the hydrant.

4.12.2 *Castings.* Castings shall be clean and sound without defects that will weaken their structure or impair their service. Plugging, welding, or repairing of cosmetic defects is allowed. Repairing of structural defects is not allowed unless accepted by the purchaser. Repaired hydrants shall comply with the testing requirements of this standard after repairs have been made. Repairs within the bolt circle of any flange face are not allowed.

4.12.3 *Interchangeable parts.* Like parts of hydrants of the same model, bury, and size, produced by the same manufacturer, shall be interchangeable.

Sec. 4.13 Painting

4.13.1 *General.* Unless otherwise specified by the purchaser, ferrous metal parts of the hydrant, inside and outside, shall be thoroughly cleaned before coating. Coatings used on interior surfaces of the hydrant that are in contact with water in or flowing through the hydrant shall be suitable for contact with drinking water.

4.13.2 *Shop coating of hydrant top section.* The exterior ferrous surfaces of the hydrant top section shall be painted with a coat of primer or an inert, corrosion-resistant coating. If a primer coat is applied, a second coat of primer or paint of a color required by the purchaser shall be applied. If an inert, corrosion-resistant coating is applied, it shall be of a color specified by the purchaser. Colors should be selected from Federal Standard 595C.

4.13.3 *Exterior coating of parts below ground line.* Exterior ferrous surfaces below the ground line shall be covered with either two coats of asphaltic coating or an equivalent coating. The first asphaltic coating shall dry thoroughly before the second is applied. The hydrant inlet shoe shall be permitted to be coated with an inert, corrosion-resistant coating.

4.13.4 *Interior coating of surfaces.* Interior ferrous surfaces, except machined surfaces, such as the threaded portion of the stem or stem nut that must fit closely with the adjacent parts shall be coated with asphaltic coating, primer, or an inert, corrosion-resistant coating.

SECTION 5: VERIFICATION

Sec. 5.1 Production Testing

5.1.1 *General.* Specified tests and inspections shall be conducted at the place of manufacture or place of assembly, or both. Once a hydrant is delivered, the purchaser shall inspect it; any hydrant not meeting the requirements of this standard will be rejected. Whenever hydrant components are to be made in conformance with AWWA, ANSI, ASTM, or other standards that include test requirements or testing procedures, the hydrant manufacturer shall conform with such requirements or procedures. Test results shall be made available to the purchaser in accordance with the provisions of Sec 5.3.1.

5.1.2 *Mechanical test.* Each assembled hydrant shall be operated through a full open-close cycle when not under pressure. The torque required for performing this operation shall not exceed 20 lbf·ft (27 N·m).

5.1.3 *Hydrostatic test.* Each assembled hydrant shall be subjected to two shop tests under a hydrostatic pressure of 300 psig (2,068 kPa [gauge]) or twice the rated working pressure, whichever is greater. One test shall be made with the entire interior of the hydrant under pressure and another test made with the main valve closed and the base under pressure from the inlet side. Under the test procedure, there shall be no leakage through the main valve or seals or through the castings or the joints of the assembled hydrant. Under the test conditions, the leakage through the drain valve shall not exceed 5 fl oz/min (148 mL/min). Other leakage or other imperfections found in either test shall be corrected and the hydrant retested. The tests shall be conducted for a sufficient time to allow a check of points of possible leakage and for a minimum of 30 sec after air has been exhausted.

Sec. 5.2 Prototype Testing

5.2.1 *Hydraulic test.* Hydrants used in loss-of-head tests shall not be less than 5-ft (1.5-m) bury and the inlet size shall be 6 in. (150 mm). Loss of head caused by friction, in pounds per square inch (kilopascals), corrected for inlet and outlet velocity head, shall not exceed the permissible loss of head shown in Table 5.

5.2.1.1 Friction loss. Tests shall be made to determine that the friction losses given in Table 5 are not exceeded for the flow conditions indicated. For tests involving simultaneous discharge from two or more outlet nozzles, the discharge from each nozzle shall be approximately equal.

5.2.1.2 Test gauge. Tests shall be made by means of a differential gauge connected to a piezometer on the hydrant inlet and one or more piezometers on the outlet nozzle or nozzles, or by other methods of equal accuracy.

5.2.2 *Torque test.* Hydrants used in prototype torque tests shall be functional and capable of being opened or closed without difficulty following application of an operating torque of 200 lbf·ft (270 N·m) at the operating nut as follows:

Table 5 Maximum permissible loss of head for hydrants

No. of Outlet Nozzles	Nominal Diam. of Outlet Nozzles		Total Flow From Outlet Nozzles		Max. Permissible Head Loss	
	in.	*(mm)*	*gpm*	*(m³/hr)*	*psi*	*(kPa)*
1	2½	(64)	250	(57)	1.0	(6.9)
2	2½	(64)	500*	(114)	2.0	(13.8)
3	2½	(64)	750*	(170)	3.0	(20.7)
4	2½	(64)	1,000*	(227)	4.0	(27.6)
1	4	(100 or larger)	1,500	(341)	13.0	(89.7)
2	4	(100 or larger)	2,000†	(454)	18.0	(124.1)

*Approximately 250 gpm (57 m^3/hr) from each outlet nozzle.
†Approximately 1,000 gpm (227 m^3/hr) from each outlet nozzle.

1. In the opening direction with the hydrant fully opened.
2. In the closing direction with the hydrant fully closed.
3. The hydrant bury is 5 ft (1.5 m) or less.

Sec. 5.3 Inspection and Nonconformance

5.3.1 *Inspection.* Work performed in accordance with this standard, except prototype testing, shall be subject to inspection and acceptance by the purchaser. Certified results of prototype and/or production tests shall be requested in writing at the time of purchase, if required. The purchaser shall have access to places where materials are being produced or fabricated, or where tests are being conducted, and shall be accorded full facilities to inspect and observe tests.

5.3.2 *Basis for nonconformance.* Any hydrant or part that does not conform to the requirements of this standard shall be made satisfactory or shall be replaced.

SECTION 6: DELIVERY

Sec. 6.1 Marking

Hydrants shall have permanent markings identifying the manufacturer by name, initials, insignia, or abbreviations in common usage, and designating the size of the main valve opening and the year of manufacture. Markings shall be placed to be readily discernible and legible after hydrants have been installed.

6.1.1 *Year of manufacture.*

6.1.1.1 A means to identify the manufacture year of the hydrant body or bonnet shall be permanently affixed to the respective casting.

6.1.1.2 Hydrant bodies cast in the last three months of a calendar year may be marked with the following year as the date of casting. Hydrants produced in the first six months of a calendar year may be marked with the previous year as the date of casting. For example, a casting marked with the date of "2009" shall not be used before October 1, 2008, and shall be used no later than June 30, 2010.

Sec. 6.2 Shipment

Hydrants shall be complete when shipped. The manufacturer shall use due and customary care in preparing them for shipment. Hydrants must be drained and completely closed before shipment.

Sec. 6.3 Affidavit of Compliance

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When required by the purchaser, the manufacturer shall provide the purchaser with an affidavit stating that the hydrant and material used in its construction conform to the applicable requirements of this standard. The affidavit shall also state that specified tests have been performed and that test requirements have been met.

APPENDIX A

Characteristics of National Standard Fire-Hose Coupling Screw Thread

This appendix is for information only and is not part of ANSI/AWWA C502.

Nominal and basic dimensions of National (American) Standard fire-hose coupling screw threads are shown in Tables A.1 and A.2. For tolerances and other data not shown, see NFPA 1963, Standard for Fire Hose Connections.*

* Available from National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

Table A.1 Nominal dimensions of NH (fire-hose) threads

Nominal Size of Connection Waterway, *C*	Threads per Inch, *(tpi)*	Thread Designation (NH = Fire Hose)*	Approximate Outside Diameter of External Thread,† *D*	Length of External Thread (Min.), *L*	Length of Pilot to Start of Second Thread (External), *I*	Depth of Internal Connector, *H*	Diameter of Gasket Seat in Coupling, *K*	Length of Internal Thread, *T*	Length of Pilot to Start of Second Thread (Internal), *J*
1	2	3	4	5	6	7	8	9	10
2½	7½	2.5–7.5 NH	3 1/16	1	¼	1 5/16	3 3/16	1 1/16	3/16
3	6	3–6 NH	3⅝	1⅛	5/16	1 1/16	3¾	3¾	¼
3½	6	3.5–6 NH	4¼	1 ⅛	5/16	1 1/16	4⅜	¾	¼
4	4	4–4 NH	5	1¼	7/16	1 3/16	5⅛	⅞	⅜
4½	4	4.5–4 NH	5¾	1¼	7/16	1 3/16	5⅞	⅞	⅜
5‡	4	5–4 NH	6¼	1⅜	7/16	1 5/16	6⅜	1	⅜
6‡	4	6–4 NH	7 1/32	1⅜	7/16	1 5/16	7⅛	1	⅜

NOTE: All values are in inches except for columns 2 and 3.

*NH (fire-hose) threads are defined as "American National Fire Hose Connection Screw Threads" by NFPA Standard 1963.

†Approximate dimensions are for field identification purposes only. Exact basic manufacturing dimensions and tolerances are given in NFPA 1963.

‡Suction hose couplings; these sizes are not recommended for fire-hydrant openings.

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Table A.2 Basic dimensions of NH (fire-hose) threads

					External Thread Dimensions (Nipple)				Minimum Internal Thread Dimensions		
Nominal Size of Hose Connection	Threads per Inch *(tpi)*	Thread Designation (NH = Fire Hose)*	Pitch *(p)*	Basic Thread Height *(h)*	Allowance	Max. Major Diam. D – Col. 6	Max. Pitch Diam. Col. 7 – h	Max. Minor Diam. Col. 7 – $2h$	Min. Minor Diam. $D - 2h$	Basic Pitch Diam. $D - h$	Basic Major Diam. D
1	2	3	4	5	6	7	8	9	10	11	12
2½	7½	2.5–7.5 NH	0.13333	0.08660	0.0150	3.0686	2.9820	2.8954	2.9104	2.9970	3.0836
3	6	3–6 NH	0.16667	0.10825	0.0150	3.6239	3.5156	3.4073	3.4223	3.5306	3.6389
3½	6	3.5–6 NH	0.16667	0.10825	0.0200	4.2439	4.1356	4.0273	4.0473	4.1556	4.2639
4	4	4–4 NH	0.25000	0.16238	0.0250	5.0109	4.8485	4.6861	4.7111	4.8735	5.0359
4½	4	4.5–4 NH	0.25000	0.16238	0.0250	5.7609	5.5985	5.4361	5.4611	5.6235	5.7859
5	4	5–4 NH	0.25000	0.16238	0.0250	6.2600	6.0976	5.9352	5.9602	6.1226	6.2850
6	4	6–4 NH	0.25000	0.16238	0.0250	7.0250	6.8626	6.7002	6.7252	6.8876	7.0500

NOTE: All values are in inches except for columns 2 and 3.

*NH (fire-hose) threads are defined as "American National Fire Hose Connection Screw Threads" by NFPA Standard 1963.

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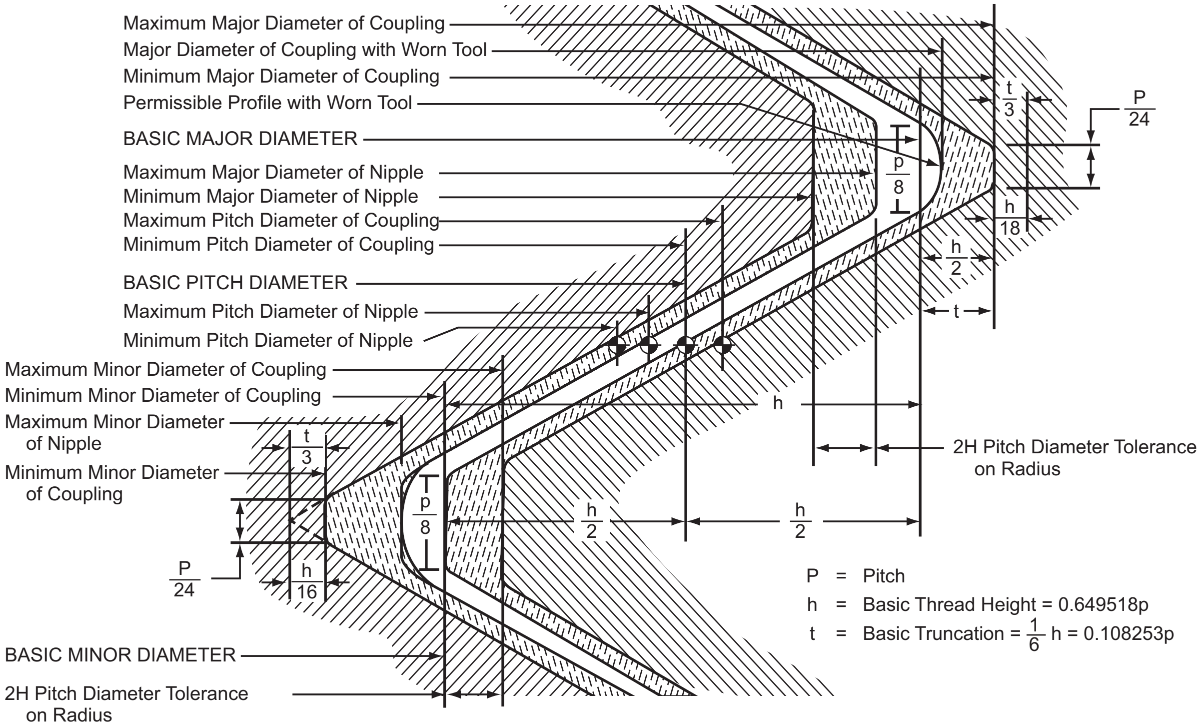
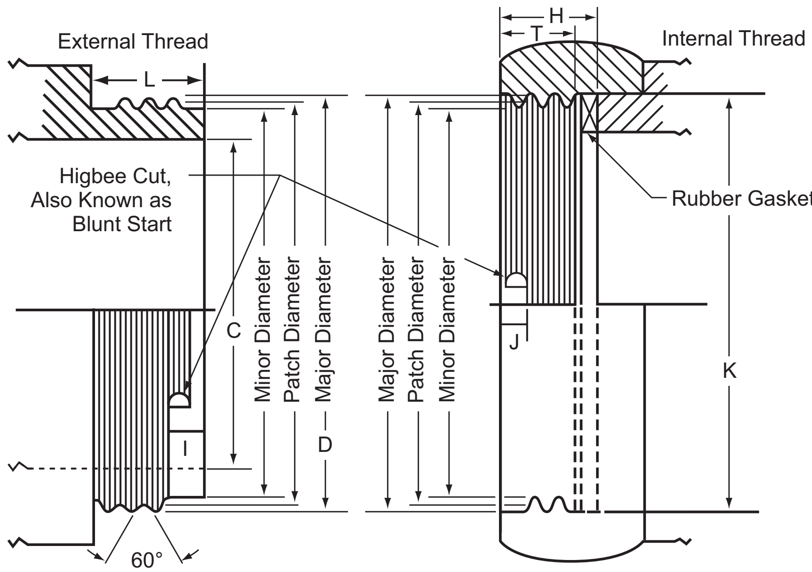


Figure A.1 Form of thread of American National Fire Hose Connection Screw Thread NH.

NOTE: The left-hand portion shows the external thread (nipple) and the right-hand portion the internal thread (coupling) (See Table A.2 for dimensions)



C = Inside diameter of connection waterway.
D = Approximate outside diameter of external thread (ODM).
H = Depth of internal connection.
I = Length of the pilot from the face of the external connection to the start of the second thread (Higbee cut).
J = Distance from the face of the internal connection to the start of the second thread (Higbee cut).
K = Diameter of the gasket seat.
L = Length of external thread.
T = Length of internal thread.

Figure A.2 Nominal Dimensions of Connections (See Table A.2 for dimensions)

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APPENDIX B

Uniform Color Scheme for Fire Hydrants*

This appendix is for information only and is not part of ANSI/AWWA C502.

The American Water Works Association, recognizing that the adoption of a capacity marking scheme by any water utility is optional, herewith provides the following uniform color scheme for painting hydrants rated in terms of their relative capacity.

SECTION B.1: CLASSIFICATION

Hydrants are classified as follows:

Class AA: Hydrants that on individual tests usually have a flow capacity of 1,500 gpm (5,680 L/min) or greater.

Class A: Hydrants that on individual tests usually have a flow capacity of 1,000 to 1,499 gpm (3,785 to 5,675 L/min).

Class B: Hydrants that on individual tests usually have a flow capacity of 500 to 999 gpm (1,900 to 3,780 L/min).

Class C: Hydrants that on individual tests usually have a flow capacity of less than 500 gpm (1,900 L/min).

Sec. B.1.1 Capacity Rating

Capacities are to be rated by flow measurements of individual hydrants at a period of ordinary demand. When initial pressures are over 40 psig (275 kPa [gauge]) at the hydrant under test, the rating is to be based on 20-psig (138-kPa [gauge]) residual pressure, observed at the nearest hydrant connected to the same main and when no water is being drawn. When initial pressures are less than 40 psig (275 kPa [gauge]), residual pressure shall be at least half of the initial pressure.

* This appendix includes a revised color scheme based on NFPA 291, Recommended Practice for Fire Flow Testing and Marking of Hydrants, 2013 edition. The original color scheme was based on a proposal adopted by the American Water Works Association at its 1937 annual conference held in Buffalo, N.Y., and was originally published in *Journal AWWA*, 29:4:449 (April 1937). The original color scheme duplicated, in essentials, similar plans adopted by the Maine Water Utilities Association in 1929; the New England Water Works Association on Mar. 21, 1934; and NFPA on May 14, 1936.

SECTION B.2: COLOR SCHEME

Sec. B.2.1 Public Hydrants

Barrels are to be painted chrome yellow, except in cases where another color is desired. The tops and nozzle caps of hydrants are to be painted as follows:

Class AA—light blue

Class A—green

Class B—orange

Class C—red

These colors shall be as designated in Federal Standard 595C.*

Sec. B.2.2 Private Hydrants

Within private enclosures, hydrant marking is to be at the discretion of the owners. Private hydrants in public streets should be painted to distinguish them from public hydrants.

SECTION B.3: LOCATION MARKERS

Location markers for flush hydrants should carry the same color background as stated for class indication, with such data stenciled or painted thereon as may be deemed necessary.

SECTION B.4: CAPACITY

Hydrant colors shall signify only the approximate capacity of the individual hydrant as tested alone, and not its capacity when more than one hydrant in the vicinity is in use. The marking of the hydrant is not to be considered as in any way guaranteeing the capacity indicated by the color.

* Available from General Services Administration, Specification Section Room 6039, 7th and D Streets, NW, Washington, DC 20407.

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