



**American Water Works  
Association**

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**ANSI/AWWA C503-14**  
(Revision of ANSI/AWWA C503-05)

**AWWA Standard**

# Wet-Barrel Fire Hydrants

Effective date: Aug. 1, 2014.

First edition approved by AWWA Board of Directors July 7, 1959.

This edition approved June 8, 2014.

Approved by American National Standards Institute April 4, 2014.



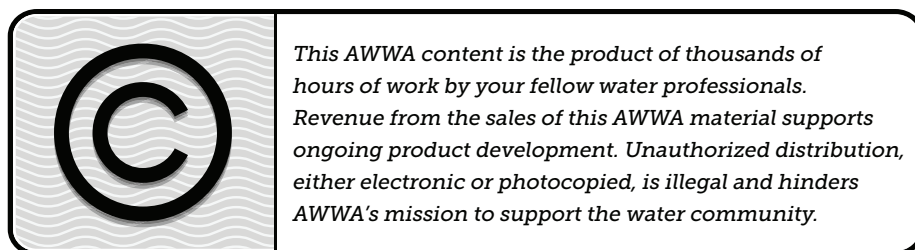
## AWWA Standard

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ISBN-13, print: 978-1-62576-025-8

eISBN-13, electronic: 978-1-61300-284-1

DOI: <http://dx.doi.org/10.12999/AWWA.C503.14>

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# Foreword

*This foreword is for information only and is not a part of ANSI\* /AWWA C503.*

## **I. Introduction.**

I.A. *Background.* 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, a hydrant is operated by members of a fire department rather than by water utility personnel.

The use of a fire hydrant 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.

This standard pertains to wet-barrel fire hydrants that are intended for use in water-supply systems in areas where the climate is mild and freezing temperatures do not occur.

ANSI/AWWA C502, Dry-Barrel Fire Hydrants, pertains to dry-barrel fire hydrants that are intended for use in water-supply systems, including those where freezing temperatures do occur.

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

I.B. *History.* Previous editions of ANSI/AWWA C503 were approved by the AWWA Board of Directors in January 1958 (tentative), July 1959, January 1970, June 1975, February 1982, June 1988, June 1997, and June 2005. This edition of C503 was approved 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)

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\* American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

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 in 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.
3. Two standards developed under the direction of NSF, NSF<sup>†</sup>/ANSI<sup>‡</sup> 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*,<sup>§</sup> 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 C503 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.

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\* Persons outside the United States should contact the appropriate authority having jurisdiction.

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

‡ American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

§ Both publications available from National Academy of Sciences, 500 Fifth Street, N.W., Washington, DC 20001.



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. *Gate Valve.* Installing a gate valve on the branch connection of hydrants is considered good water utility practice. This practice is particularly important for wet-barrel hydrants. Dry-barrel hydrants manufactured according to ANSI/AWWA C502 are designed so that if the hydrant is damaged or broken above or near the grade level, the main valve will remain closed and reasonably tight against leakage. However, in the case of wet-barrel hydrants, a break will discharge water unless used in conjunction with a break-off style check valve. The gate valve on the branch connection enables the water to be shut off in the shortest possible time to prevent or reduce damage.

II.B. *Torque.* Hydrants produced according to this standard shall meet a torque requirement of 200 ft-lb (270 N·m) of torque applied at the operating nut in both opening and closing directions, as required in Sec. 4.6.13. This amount of torque is considered fully adequate to operate a hydrant that is in satisfactory working condition. The use of a wrench longer than 15 in. (380 mm), or an indefinite extender operated by two or more persons, is not considered good practice. If one person using a 15-in. (380-mm) wrench cannot open and close a fire hydrant, the hydrant is not in proper working condition, and it should be repaired promptly.

A fire-hydrant wrench shall be readily reversible.

II.C. *Single-Outlet Nozzle.* Hydrants with a single 2½-in. (65-mm) outlet nozzle are not considered suitable for normal fire-protection service.

II.D. *Head Loss.* Table 3 of ANSI/AWWA C503 does not show permissible loss of head above a flow of 1,500 gpm (5,678 L/min). If hydrants are to be required to deliver more than 1,500 gpm (5,678 L/min), the manufacturer should be consulted regarding head losses at higher flows to determine the suitability of the hydrant for its intended purpose.

II.E. *Physical and chemical properties.* 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 C503, Wet-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. If a complete hydrant (a hydrant top section and bury section bolted together) is not desired, the purchaser should specify the quantity of each section.
4. Threaded boss on top of hydrant top section. The top of a wet-barrel hydrant may have a threaded boss of sufficient thickness to receive a supplementary hose-outlet angle valve. If required, the threaded boss must be specified by the purchaser.
5. Number of outlet nozzles for hose and pumper.
6. Nominal inside diameter of the outlet nozzles, in inches (or millimeters).
7. Type of outlet-nozzle connection. Outlet-nozzle connections should conform to those in service in the system in which the hydrant is to be installed. If the connections are to conform to NFPA\* 1963, Standard for Fire Hose Connections (reproduced in part in appendix A of this standard), this requirement should be specified.

If the threaded connections do not conform to NFPA 1963, the following thread detail dimensions for both nozzle and cap (coupling) should be specified, including appropriate tolerances:

- a. Major diameter.
- b. Minor diameter.
- c. Pitch diameter.
- d. Thread form.
- e. Number of threads per inch.
8. Special designs or features, if required (Sec. 4.2, 4.5, and 4.6).
9. Catalog and maintenance data, net weight, and drawings, if required. If the manufacturer is required to provide drawings, specify the number of drawings and whether the drawings are to be approved before the hydrants are manufactured (Sec. 4.3).
10. Details of other federal, state or provincial, and local requirements (Sec. 4.4).

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\* National Fire Protection Association, P.O. Box 9101, 1 Batterymarch Park, Quincy, MA 02269.

11. Alternative materials, if the water that will be used in the hydrants promotes corrosion (Sec. 4.4.6.3) or if low-lead (less than 0.25 percent weighted average of the wetted surface area lead content) alloys are required.
12. Corrosion-resistant bolts and nuts, if required (Sec. 4.4.12.2).
13. Bury depth, measured in feet and inches to the nearest 6 inches from the bottom of the connecting pipe to the ground line (trench depth).
14. Size and type of inlet connection and joint accessories, such as gaskets, bolts, or nuts, if any (Sec. 4.6.7). The number of slotted bolt holes, if any, should also be specified (Sec. 4.6.7.3).
15. Harnessing lugs, if required (Sec. 4.6.8).
16. Outlet-nozzle cap chains and cap gasket, if not required (Sec. 4.6.9.3).
17. Whether the outlet-nozzle cap is not to have pressure-relief capability (Sec. 4.6.9.7).
18. Whether the outlet nozzle caps may be made of a suitable type of plastic (Sec. 4.6.9.8).
19. Whether bolting or traffic flange must be provided that is designated to fail at a lower force than is required to break the pressure-containing vessel (Sec. 4.6.10.2).
20. The hydrant top-section and bury-section flange drilling. If the desired flange detail dimensions do not conform to Sec. 4.6.11, the following details should be specified:
  - a. Bolt-circle diameter.
  - b. Number of bolt holes.
  - c. Size of bolt holes.
  - d. Orientation of bolt holes to centerline of a specified outlet nozzle or bury-section inlet.
21. 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. 4.6.12.4).
22. Size, shape, and dimensions of stem-operating nut and outlet-nozzle cap nuts, if different from those in this standard and if an attachable stem-operating nut is required (Sec. 4.6.13).
23. The use of pressure-actuating seals other than O-rings (Sec. 4.6.14.3).
24. Color and type of paint to be applied on the outside of the hydrant top section (Sec. 4.7 and appendix B).
25. Special interior coatings (Sec. 4.4.15).
26. Whether the repair of structural defects is allowed (Sec. 4.8.2).

27. Records of standard tests, if required (Sec. 5.3).
28. Whether special markings are required (Sec. 6.1).
29. Location to which hydrants are to be shipped and any special shipping instructions or requirements (Sec. 6.2).
30. Affidavit of compliance, if required (Sec. 6.3).
31. Manufacturer's Certification of Compliance to NSF/ANSI 61, Drinking Water System Components—Health Effects

III.B. *Modification to Standard.* Any modification to 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. Revised requirements for aluminum bronze alloys (Sec. 4.4.6.3).
2. Added requirements for threaded and nonthreaded outlet nozzle connections (Sec. 4.6.9).
3. Added casting date marking requirements. (Sec. 6.1.1).

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



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**AWWA Standard**

# Wet-Barrel Fire Hydrants

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## SECTION 1: GENERAL

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### **Sec. 1.1 Scope**

This standard pertains to the various types and classes of wet-barrel fire hydrants for use in fire-protection service in areas where the climate is mild and freezing temperatures do not occur. A wet-barrel hydrant has one or more valve openings above the ground line and, under normal operating conditions, the entire interior of the hydrant is subjected to water pressure at all times. Each outlet nozzle has an independent, compression-type valve (i.e., working with or against the pressure) that controls discharge from that particular outlet.

1.1.1 *Exceptions.* This standard does not pertain to dry-barrel fire hydrants. (For such hydrants, see ANSI/AWWA C502.) References to the setting of hydrants are not included in ANSI/AWWA C503. For installation information, see ANSI/AWWA C600 and AWWA Manual M17.

Hydrants of steel-pipe risers and angle-valve construction are not covered in this standard.

### **Sec. 1.2 Purpose**

The purpose of this standard is to provide purchasers, manufacturers, and suppliers with the minimum requirements for wet-barrel fire hydrants for fire-protection service, including materials, design, inspection, testing, marking, and shipping requirements. Fire hydrants designed and constructed to the requirements of

this standard are intended for fire protection service only. They are not designed or intended as a conveyance of potable water.

### Sec. 1.3 Application

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

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## SECTION 2: REFERENCES

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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.

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

ANSI/AWWA C502—Dry-Barrel Fire Hydrants.

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

ASME<sup>†</sup> 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 B18.2.2—Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series).

ASTM<sup>‡</sup> A48/A48M—Standard Specification for Gray Iron Castings.

ASTM A53/A53M—Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

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

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

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\* American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

† ASME International, Three Park Avenue, New York, NY 10016.

‡ ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

ASTM A351/351M—Standard Specification for Castings, Austenitic, for Pressure-Containing Parts.

ASTM A395/A395M—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/B16M—Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines.

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

ASTM B98/B98M—Standard Specification for Copper-Silicon Alloy Rod, Bar and Shapes.

ASTM B124/B124M—Standard Specification for Copper and Copper-Alloy Forging Rod, Bar and Shapes.

ASTM B138/B138M—Standard Specification for Manganese Bronze Rod, Bar and Shapes.

ASTM B148—Standard Specifications 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 B584—Standard Specification for Copper-Alloy Sand Castings for General Applications.

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

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

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

Fed. Spec. TT-P-664—Primer Coating, Alkyd, Wood and Ferrous Metal.

Federal Standard 595C—Colors Used in Government Procurement.

MIL-P-5514\*—Hydraulic General Specifications for Packings, Installations and Gland Design.

NFPA† 291 Recommended Practice for Fire Flow Testing and Marking of Hydrants.

NFPA 1963—Standard for Fire Hose Connections.

NSF/ANSI 60—Drinking Water Treatment Chemicals—Health Effects.

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

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## SECTION 3: DEFINITIONS

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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. *Bury section*: The lower portion (belowground section) of a wet-barrel hydrant. This portion usually consists of the midsection (or spool) and the bury elbow. This is one of two major sections that make up wet-barrel hydrants.
3. *Cast iron*: Includes gray iron and ductile iron.
4. *Cosmetic defect*: A blemish that has no effect on the ability of the 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 of such blemish cause the component to fail these requirements, the blemish shall be considered a structural defect.
5. *Flange connection*: The bolted connection used to fasten the hydrant top section (whether a single-piece or two-piece unit) to the bury section.
6. *Hydrant assembly*: The hydrant top section and bury section assembled at the bolted flange connection.
7. *Hydrant barrel*: The portion of a two-piece hydrant top section (above-ground) that connects the hydrant head and the bury section.
8. *Hydrant head*: When the hydrant top section is constructed as a two-piece unit, the hydrant head is the portion containing the valve mechanism and outlet nozzles.

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\* Military Specifications and Standards available from Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

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



9. *Hydrant top section:* The upper portion (aboveground section) of a wet-barrel hydrant. This is one of two major sections that make up wet-barrel hydrants.

10. *Manufacturer:* The party that manufactures, fabricates, or produces materials or products.

11. *Purchaser:* The person, company, or organization that purchases any materials or work to be performed.

12. *Structural defect:* A flaw that causes the 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 the minimum wall thickness requirement, or failure to meet production tests.

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

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## SECTION 4: REQUIREMENTS

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### Sec. 4.1 Permeation

The selection of materials is critical for water service and distribution piping in locations where there is likelihood the hydrant 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 and hydrant must pass through a contaminated area or an area subject to contamination, consult with the manufacturer regarding permeation of pipe walls, jointing materials, etc., *before* selecting for use in that area.

### Sec. 4.2 Data to Be Provided by the Purchaser

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

### Sec. 4.3 Drawings or Data to Be Provided by the Manufacturer

4.3.1 *Catalog and maintenance data.* After purchase, the manufacturer shall, when required, provide catalog data (including illustrations and a schedule of parts and the materials from which they are made) in sufficient detail to serve as a

guide for the assembly and disassembly of the hydrant, as well as for ordering repair parts. The manufacturer, when required, shall also provide maintenance information necessary for keeping the hydrant in proper working condition.

4.3.2 *Net weight.* When required, the manufacturer shall provide a statement that lists the total net assembled weight of the hydrant top section and complete hydrant assembly for each size of hydrant ordered.

4.3.3 *Drawings.* When required, the manufacturer shall submit two sets of drawings showing principal dimensions, construction details, and materials for consideration by the purchaser. The purchaser shall return one set of drawings indicating acceptance to the manufacturer. No work shall be done or hydrants supplied that do not conform with these drawings. If required by the purchaser, the manufacturer shall provide additional copies of the drawings.

## **Sec. 4.4 Materials**

4.4.1 *General.* 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, provincial, and local regulations.

4.4.2 *Physical and chemical properties of components.* The physical and chemical requirements of hydrant components shall be as required by the AWWA, ANSI, ASTM, or other standards to which reference is made.

4.4.3 *Gray iron.* Gray cast iron shall conform to ANSI/AWWA C110/A21.10; ASTM A126, Class B; or ASTM A48, Class 30.

4.4.4 *Ductile iron.* Ductile cast iron shall conform to one of the following standards: ANSI/AWWA C110/A21.10, ASTM A395, or ASTM A536. Centrifugally cast ductile-iron pipe shall conform to the applicable portions of ANSI/AWWA C151/A21.51.

4.4.5 *Steel.* Hydrant components, other than bolting, that are made from steel and subject to mechanical requirements shall conform to ASTM A575 or ASTM A576. Other steel components shall conform to ASTM A53.

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

4.4.6.1 *Components.* Copper alloy hydrant components shall be made to ASTM-recognized alloy specifications with Unified Numbering System for

Metals and Alloys (UNS)\* designations. Copper alloys are not limited to those 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.

4.4.6.2 Mercurous nitrate test. 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.

4.4.6.3 Zinc and aluminum content. 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  $\mu\text{m}$ . If aluminum bronze is used, the alloy shall be inhibited against dealuminization.

4.4.6.4 Zinc and copper. Copper alloys that contain more than 16 percent zinc shall not contain less than 57 percent copper.

4.4.6.5 Zinc and copper. Copper alloys that contain 16 percent zinc or less shall not contain less than 79 percent copper.

4.4.6.6 Stress corrosion. 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.

4.4.6.7 Lead. Copper alloys that contact drinking water shall not contain more than 8 percent lead (US Safe Drinking Water Act Amendments of 1986).

4.4.6.8 Stainless steel. Hydrant components made from cast stainless steel shall conform to the requirements of ASTM A351/A351M.

4.4.7 *Parts made from gray or ductile cast iron.* The following parts of the hydrant may be made from either gray or ductile cast iron: hydrant top section (head and barrel), bury section (including hydrant extensions or risers), foot piece or bury elbow, bonnet, packing plate, outlet-nozzle caps, and small miscellaneous parts where the use of cast iron conforms to a standard of good practice. Outlet caps for nonthreaded connections may be made of other materials provided these parts meet the requirements of Sec. 4.6.9.

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\* Joint publication of ASTM and the Society of Automotive Engineers International (ASTM D5-56E/ SAE HS-1086, Feb. 93).

4.4.8 *Parts made of stainless steel.* The following parts may be made from cast stainless steel; hydrant top section (head and barrel).

4.4.9 *Parts made from steel.* The following parts of the hydrant may be made from steel: bury section (hydrant extensions or risers), foot piece or bury elbow, and small miscellaneous parts where the use of steel conforms to a standard of good practice.

4.4.10 *Parts made from copper alloy.*

4.4.10.1 Glands and gland bushings. The following parts shall be made from copper alloys, such as those listed in Table 1, which have a minimum yield strength of 14,000 psi (96.53 MPa): glands, gland bushings, nozzles, stem nuts, stems or threaded portions of stems (see Sec. 4.6.13.2), valve seats, valve-seat rings, and valve carriers.

4.4.10.2 Gland bolts and nuts and stuffing-box bolts and nuts. The following parts shall be made from copper alloys, such as those listed in 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.

4.4.10.3 Hydrant head, barrel, stuffing box. The following parts, if made from copper alloy, shall be made from copper alloys, such as those listed in Table 1, which have a maximum zinc content of 16 percent, and a minimum yield strength of 14,000 psi (96.53 MPa): hydrant heads, barrels, and stuffing boxes.

4.4.10.4 Parts in contact. Parts working in contact with each other shall not both be made from ferrous metal.

4.4.11 *Aluminum alloys.* Aluminum alloys shall be made to ASTM-recognized alloys with Unified Numbering System for Metal 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.

4.4.12 *Top-section bolts and nuts.* Top-section bolts and nuts shall conform to ASTM A307 (Grade B) and may have either regular, square, or hexagonal heads with dimensions conforming to ASME B18.2.1.

4.4.12.1 Nuts. Nuts shall be either the regular square series or hexagonal nuts with dimensions conforming to ASME B18.2.2.

4.4.12.2 Corrosion protection. Corrosion protection of top-section studs and bolts is not required on wet-barrel hydrants, unless specified by the purchaser.

4.4.13 *Stuffing boxes.* When stuffing boxes are used, they shall be made from copper alloy or cast iron.

**Table 1 Copper alloys**

Copper Alloy*		Minimum Tensile Strength		Minimum Yield Strength		Minimum Copper Percentage
ASTM Standard Number	Alloy Designation	<i>psi</i>	<i>(MPa)</i>	<i>psi</i>	<i>(MPa)</i>	
B16	UNS C36000	40,000	275	15,000	105	60.0
B62	UNS C83600	30,000	207	14,000	97	84.0
B98	UNS C65500	52,000	358	15,000	105	94.8
B124	UNS C37700	†	†	†	†	58.0
B138	UNS C67500	55,000	380	22,000	150	57.0
B148	UNS C95200	65,000	448	25,000	172	86.0
	UNS C95300	65,000	448	25,000	172	86.0
	UNS C95500	90,000	621	60,000	414	78.0
	UNS C67500	†	†	†	†	57.0
B283	UNS C67600	†	†	†	†	57.0
	UNS C83450	30,000	207	14,000	97	87.0
	UNS C84400‡	29,000	200	14,000	90	78.0
	UNS C86200	90,000	621	45,000	310	60.0
B584 or B763	UNS C86500‡	65,000	448	25,000	172	57.0
	UNS C86700‡	80,000	552	32,000	221	57.0
	UNS C87500	60,000	414	24,000	165	79.0
	UNS C87600	60,000	414	30,000	207	88.0
	UNS C87610	45,000	331	18,000	124	90.0
	UNS C92200	34,000	234	16,000	110	86.0
	UNS C99400	60,000	414	30,000	207	83.75
B763	UNS C99500	70,000	483	40,000	276	82.75

\*Alloys actually used or specified not limited to those listed in Table 1; see Sec. 4.4.6.1.

†Values not specified in the ASTM standard.

‡The ASTM standard for these alloys permits minimum chemical or mechanical requirements that do not meet the minimum requirements of ANSI/AWWA C503. To comply with C503 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 standard.

4.4.13.1 *Stuffing-box glands.* Stuffing-box glands shall be made from solid copper alloy, copper alloy-bushed cast iron, or a suitable plastic.

4.4.13.2 *Stuffing box packing.* Hemp and asbestos packing shall not be used for stuffing-box packing.

4.4.13.3 *Stuffing-box O-rings.* Stuffing-box O-rings shall be compounded to conform to ASTM D2000 and have physical properties suitable for the application.

4.4.14 *Gaskets.* Gasket materials shall be made of rubber composition or paper that is free from corrosive ingredients, either alkaline or acid. O-rings or other suitable elastomeric seals may be used for gaskets.

4.4.15 *Coating.* Paint used for coating interior and exterior ferrous surfaces of the hydrant, except as noted in Sec. 4.7, shall conform at a minimum to Fed. Spec. TT-P-664, unless otherwise specified by the purchaser.

## **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 *Hydrants with breakable features.* Hydrants that have replaceable “breakable” sections or components are not explicitly covered by this standard. However, such hydrants shall conform to this standard except the special bolts or sections that intentionally have a lower breaking point than the rest of the unit.

## **Sec. 4.6 Detailed Design**

4.6.1 *Valve openings.* Outlet valve openings shall have waterways equal to or larger than the nominal sizes of the outlet nozzles.

4.6.2 *Valve facing.* The individual valves of the hydrant shall be faced with a suitable yielding material, such as rubber, where the contact surface would otherwise bear on metal seats. The material shall be attached so that a valve will not leak at the stem.

4.6.3 *Hydrant top-section wall thickness.*

4.6.3.1 *Wall thickness.* The wall thickness of gray or ductile cast-iron top sections shall not be less than indicated in Table 2. For a top-section internal diameter (ID) that measures a fraction of an inch larger or smaller than the diameter measurements given in Table 2, the wall thickness shall be that of the next larger diameter.

4.6.3.2 *Hydrostatic pressure.* The hydrant head and hydrant barrel, when made of brass or bronze, shall be capable of withstanding a hydrostatic test pressure

**Table 2 Minimum wall thickness for sections of wet-barrel hydrants**

Minimum Wall Thickness							
Top Section and Bury Section ID		Statically Cast Gray Iron		Centrifugally Cast Gray Iron		Ductile Iron	
<i>in.</i>	<i>(mm)</i>	<i>in.</i>	<i>(mm)</i>	<i>in.</i>	<i>(mm)</i>	<i>in.</i>	<i>(mm)</i>
5	(127)	0.35	(8.89)	0.32	(8.13)	0.25	(6.35)
6	(152)	0.36	(9.14)	0.33	(8.38)	0.26	(6.60)
7	(178)	0.40	(10.16)	0.35	(8.89)	0.27	(6.36)
8	(203)	0.43	(10.92)	0.36	(9.14)	0.28	(7.11)

of four times the hydrant working pressure (Sec. 4.5) without stressing the material beyond its yield point. However, their minimum wall thicknesses shall not be less than 0.20 in. (5.08 mm). The test pressure shall be applied as specified in Sec. 5.2.2.

**4.6.4 Hydrant bury section.** The wall thickness of the bury section shall comply with top-section wall thicknesses in Sec. 4.6.3.1 and 4.6.3.2.

**4.6.4.1 Buried materials.** If the bury section is made of steel, the wall thickness shall be the same as indicated for ductile iron in Table 2, and corrosion protection shall be provided.

**4.6.4.2 Flange connection.** The bury section shall be connected to the top-section barrel with a flange joint (Sec. 4.6.10).

**4.6.4.3 Flange location.** The flange joint shall, unless otherwise required by the purchaser, be located at least 2 in. (50 mm) above the ground line or finished grade line.

**4.6.5 Waterway.** To meet the requirements of Sec. 4.6.6, changes in the shape or size of the waterway should be accomplished by using smooth curves where practical. The junction of outlet nozzles with the top section shall be rounded to ample radii. The net area of the waterway of the top section and that of the bury section at their smallest parts shall be not less than 120 percent of the sum of the net areas of valve openings.

**4.6.6 Friction losses.** Test samples of hydrants used in loss-of-head tests shall have bury sections with nominal ID of 6 in. (150 mm), not less than 5-ft (1.5-m) long, measured from the center of the connecting pipe to the flange connection with the hydrant top section.

**4.6.6.1 Head loss.** Loss of head caused by friction, corrected for inlet and outlet velocity, shall not exceed the permissible head loss given in Table 3.

**Table 3 Maximum permissible loss of head for hydrants**

Number of Nominal Outlet Nozzles	Nominal Diameter of Outlet Nozzles (ID)		Total Flow From Outlet Nozzles		Maximum Permissible Head Loss for Hydrant Top Section	
	<i>in.</i>	<i>(mm)</i>	<i>gpm</i>	<i>(L/min)</i>	<i>psi</i>	<i>(kPa)</i>
1	2½	(63.5)	250	(946)	1.0	(6.9)
2	2½	(63.5)	500*	(1,893)*	2.0	(13.8)
1	4½	(114.3)	1,000	(3,785)	5.0†	(34.5)†
1	4	(101.6)	1,500	(5,678)	14.0	(96.6)
1	4½	(114.3)	1,500	(5,678)	12.0	(82.7)

\*Approximately 250 gpm (946 L/min) from each outlet nozzle.

†Also to apply to pumper outlet nozzles of other sizes.

4.6.6.2 Multiple outlets. For tests involving simultaneous discharge from two or more outlet nozzles, the discharge from each shall be approximately equal.

4.6.6.3 Testing. Tests shall be made with a differential pressure gauge connected to a piezometer opening on the hydrant inlet and one or more piezometer openings on the hydrant outlet nozzle or nozzles. Other methods of equal accuracy may be used.

4.6.7 *Hydrant inlet.* The base of the hydrant shall have a side or bottom inlet that is provided with a bell end for a poured or push-on joint, a flange, a mechanical joint, or other type of connection between the hydrant and the branch from the main, as required by the purchaser.

4.6.7.1 Inlet size. The inlet shall be suitable for connection to pipe with not less than a 6-in. (150-mm) nominal diameter unless otherwise required by the purchaser.

4.6.7.2 Buried connection. When a hydrant is provided with a flange end, the flange shall conform to the dimensions called for in ANSI/AWWA C111/ A21.15. When a 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.

4.6.7.3 Slotted bolt holes. In mechanical joint or flanged connections, the top one or two bolt holes may be slotted to the outer face of the flange, if deemed necessary by the manufacturer and the purchaser.

4.6.8 *Lugs.* If required by the purchaser, lugs for harnessing the hydrant to the connecting pipe from the street main shall be provided.

4.6.9 *Outlet connections.*



4.6.9.1 Joining outlet nozzles to hydrant head or barrel. Outlet nozzles shall be securely fastened to the hydrant top section by suitable means so as to withstand a torque of 300 ft-lb (407 N-m) applied to the nozzle in either direction. Outlet nozzles may be cast as an integral part of the head or barrel, provided the head or barrel is of a suitable bronze.

4.6.9.2 Threaded outlet nozzles. Threaded outlet nozzles shall be made of a 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.

4.6.9.3 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 requires 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  $\frac{1}{8}$  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. 4.6.13.2.

4.6.9.4 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.

4.6.9.5 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  $\frac{1}{8}$  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 4.6.3.2 and 5.2.2 are met.

4.6.9.6 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 4.6.3.2 and 5.2.2.

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.

4.6.9.7 Pressure buildup. Unless otherwise required by the purchaser, some means of preventing a pressure buildup between the valve and the outlet nozzle cap when it is fully tightened on the outlet nozzle shall be provided in the outlet nozzle cap.

4.6.9.8 Plastic caps. Outlet nozzle caps may be made of a suitable type of plastic, if so required by the purchaser.

4.6.10 *Removal of hydrant top section.* The hydrant top section, complete with operating valves, shall be so designed that it may be removed by unbolting it from the bury section above the ground level.

4.6.10.1 Flanges. The bury section and the top-section barrel shall be cast with facing flanges. The flange drilling for the bury section shall match the drilling in the hydrant flange.

4.6.10.2 Failing force. If required by the purchaser, the bolting provided shall be designed to fail at a lower force than is required to break the hydrant top section.

4.6.11 *Hydrant flange drilling.* The hydrant flanges shall, unless otherwise required by the purchaser, contain no fewer than six equally spaced bolt holes of  $\frac{3}{4}$ -in. (19-mm) diameter drilled on a bolt circle of  $9\frac{3}{8}$ -in. (238-mm) diameter. The purchaser may indicate the desired orientation of the bolt holes in the hydrant top-section and bury-section flange drilling to obtain the desired field direction of the hydrant outlets regarding the curb line or centerline of the bury elbow or connecting pipeline.

4.6.12 *Valves.*

4.6.12.1 Safety factor. The design factor of safety of the operating mechanism shall not be less than 5; and it shall be based on the foot-pounds of torque required for the closing and opening of individual hydrant valves at 150-psig (1,034-kPa [gauge]) or the rated working water pressure, whichever is

greater. Hydrants shall show no signs of damage. They shall be capable of being opened or closed without difficulty following application of an operating torque of 200 ft-lb (270 N-m) in the direction of opening to fully open valve and in the direction of closing to fully close valve. The valve shall show no sign of damage and shall be capable of being opened or closed without difficulty thereafter.

4.6.12.2 Threads. Operating stems and stem nuts shall have square, V, or Acme threads.

4.6.12.3 Assembly. Operating stems shall be assembled with other valve parts so that they cannot become disassembled during hydrant use.

4.6.12.4 Operating direction. Unless otherwise required by the purchaser, the hydrant valves shall be opened by turning the operating nut to the left (that is, counterclockwise).

4.6.13 *Valve-operating and outlet-nozzle-cap nuts.* The valve-operating nuts and the outlet-nozzle-cap nuts shall conform to those in service in the system in which the hydrant is to be installed.

4.6.13.1 Nut. Attachable operating nuts shall be pentagonal unless otherwise required by the purchaser.

4.6.13.2 Nut dimensions. Unless otherwise required by the purchaser, the pentagon shall measure 1½ in. (38 mm) from the point to flat at the base of the nut, and 1⅞ in. (36 mm) at the top.

4.6.13.3 Nut faces. Faces shall be tapered uniformly, and the height of the nut shall be not less than 1 in. (25 mm).

4.6.13.4 Point-to-flat dimension. The point-to-flat dimension of the nut shall be measured to the theoretical point where the faces would intersect if the corner were not rounded.

4.6.13.5 Stem with no nut. When an attachable operating cap nut is not used, the operating end of the stem shall be pentagonal, with 1⅛ in. (29 mm) from point to flat, and the length of the pentagon shall be not less than 1 in. (25 mm).

4.6.14 *Stem seals.*

4.6.14.1 Packing space. When stuffing boxes are used, the depth of packing space shall be at least four times the width of the packing space.

4.6.14.2 Glands. Glands shall be properly secured to prevent rotation with the operating nut.

4.6.14.3 Seal materials. A seal using O-rings that conform to Sec. 4.4.13.3 may be used in place of conventional stuffing-box construction. Other types of pressure-actuated seals may be used, if acceptable to the purchaser. The dimensions of the O-ring grooves shall be according to Table 1 of MIL-P-5514. Tolerances

may be altered for economical manufacturing purposes on the condition that the seal remains watertight at pressures required by this standard. The seals shall be designed for dynamic applications.

## **Sec. 4.7 Coating**

Metal parts of the hydrant shall be cleaned (see Sec. 4.4.15).

4.7.1 *General.* Unless otherwise specified by the purchaser, ferrous metal parts of a hydrant, except those made of stainless steel and machined surfaces such as the threaded portion of components that must fit closely with adjacent parts, shall be thoroughly cleaned before coating.

4.7.1.1 Exterior of hydrant top section. The exterior ferrous surfaces of the hydrant top section, except fasteners and those surfaces made of corrosion-resistant materials, shall be coated with an asphaltic coating, primer paint, or an inert, corrosion-resistant coating. If required, a second coat of primer or paint shall be applied. Colors shall be selected from Federal Standard 595C.

4.7.1.2 Interior of hydrant top section. Interior ferrous surfaces, except those made of stainless steel and machined surfaces such as the threaded portion of components that must fit closely with adjacent parts, shall be coated with primer or an inert corrosion-resistant 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.

## **Sec. 4.8 Workmanship**

Foundry and machine work shall be done according to standards of good practice for the class of work involved and conforming to approved drawings, if required. When assembled, hydrants that are manufactured according to this standard shall be well-fitted, shall operate smoothly, and shall be watertight.

4.8.1 *Proper functioning.* Hydrant parts shall conform to the required dimensions of this standard and shall be free from defects that could prevent proper functioning of the hydrant.

4.8.2 *Castings.* Castings shall be clean and sound without defects that will weaken their structure or impair their service. Weld repair of stainless-steel castings shall require a post-weld heat treatment per ASTM A351/351M. Plugging, welding, or repairing cosmetic defects is allowed. Repairing structural defects is not allowed unless agreed to 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.

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

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## SECTION 5: VERIFICATION

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### Sec. 5.1 Fire-Hydrant Component Tests

Tests and inspections shall be conducted at the place of manufacture or place of assembly or both.

5.1.1 *Component test requirements.* Whenever hydrant components are required to conform with AWWA, ANSI, ASTM, or other standards that include test requirements or testing procedures, the manufacturer shall comply with such requirements or procedures.

### Sec. 5.2 Production Tests

5.2.1 *Mechanical test.* While the assembled hydrant is not under pressure, it shall be operated through a full open-and-closed cycle of outlet valves. The torque required for performing this operation shall not exceed 20 ft-lb (27 N·m) at any time for any valve.

5.2.2 *Hydrostatic test.* Assembled hydrants shall be subjected to a shop test under a hydraulic pressure of 300 psig (2,068 kPa [gauge]) or twice the rated working pressure, whichever is greater. The hydrostatic test shall be made with the complete interior of the hydrant under pressure and outlet valves closed.

5.2.2.1 *Leakage.* The castings, joints, or valves of the assembled hydrant shall not leak during the hydrostatic test. Leakage or other imperfections found in the test shall be corrected before the hydrant is delivered to the purchaser.

5.2.2.2 *Duration of test.* The test shall be conducted for a sufficient time to allow a check of points of possible leakage and a minimum of 30 sec after all air has been exhausted.

### 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 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.

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## SECTION 6: DELIVERY\*

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### Sec. 6.1 Marking

Hydrant top sections and bury sections shall have permanent markings that identify the manufacturer by name, initials, insignia, or abbreviations of common usage. Markings on hydrant top sections shall be placed so as to be readily discernible and legible after hydrants have been installed. Markings on hydrant top sections shall show the year in which the hydrant was manufactured. Special markings in addition to these can be supplied when required by the purchaser, on agreement between the purchaser and the manufacturer.

#### 6.1.1 *Year of manufacture.*

6.1.1.1 A means to identify the manufacture year of the hydrant body shall be permanently affixed to the 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

The complete hydrant assembly, hydrant top sections, or hydrant head when so purchased, shall be complete when shipped. The manufacturer shall prepare the hydrants for shipment to protect them from damage that may occur in handling or in transit. Hydrants must be drained and completely closed before shipment.

### Sec. 6.3 Affidavit of Compliance

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

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\* Governmental packaging and marking references reflect US requirements. Users of ANSI/AWWA C503 outside the United States should verify applicable local and national regulatory requirements.

# APPENDIX A

## Characteristics of National Standard Fire-Hose Coupling Screw Threads

*This appendix is for information only and is not a part of ANSI/AWWA C503.*

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 (2009 edition).\*

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\* 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, <i>C</i>	Threads per Inch ( <i>tpi</i> )	Thread Designation (NH = Fire Hose)*	Approximate Outside Diameter of External Thread, <sup>†</sup> <i>D</i>	Length of External Thread (Min.), <i>L</i>	Length of Pilot to Start Thread (External), <i>I</i>	Depth of Internal Connector, <i>H</i>	Diameter of Gasket Seat in Coupling <i>K</i>	Length of Internal Thread, <i>T</i>	Length of Pilot to Start Thread (Internal), <i>J</i>
1	2	3	4	5	6	7	8	9	10
2½	7½	2.5–7.5 NH	3⅛		¼	15/16	3⅜	¾	
3	6	3–6 NH	3⅝	1⅛	5/16	1⅛	3¾	¾	¼
3½	6	3.5–6 NH	4¼	1⅛	5/16	1⅛	4⅜	¾	¼
4	4	4–4 NH	5	1¼	7/16	1⅜	5⅛	7/8	¾
4½	4	4.5–4 NH	5¾	1¼	7/16	1⅜	5⅞	7/8	¾
5‡	4	5–4 NH	6¼	1⅜	7/16	1⅝	6⅜	1	¾
6‡	4	6–4 NH	7⅓	1⅜	7/16	1⅝	7⅛	1	¾

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**

Nominal Size of Hose Connection	Threads per Inch ( <i>tpi</i> )	Thread Designation (NH = Fire Hose)*	External Thread Dimensions (Nipple)						Minimum Internal Thread Dimensions		
			Basic Thread Height ( <i>h</i> )	Allowance	6	7	8	9	10	11	12
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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## APPENDIX B

### Uniform Color Scheme for Fire Hydrants

*This appendix is for information only and is not a part of ANSI/AWWA C503.*

This appendix includes a revised color scheme based on the National Fire Protection Association (NFPA) NFPA\* 291, Recommended Practice for Fire Flow Testing and Marking of Hydrants, 2010 edition. The original color scheme was based on a proposal adopted by the American Water Works Association at its 1937 conference in Buffalo, N.Y., and was originally published in *Journal AWWA*, 29(4):449 (Apr. 1937). The original color scheme duplicated, in essentials, similar plans adopted by the Maine Water Utilities Association in 1929, the New England Water Association on Mar. 21, 1934, and the NFPA\* on May 14, 1936.

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

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### SECTION B.1: CLASSIFICATION

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1. Hydrants are classified as follows:

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

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

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

*Class C:* Hydrants that on an individual test 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 more than 40 psig (275 kPa [gauge]) at the hydrant under test, the rating is to be based on 20 psig (138 kPa

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\* National Fire Protection Association, 2 Batterymarch Park, Quincy, MA 02169-7471.

[gauge]) residual pressure in the main. When initial pressures are less than 40 psig (275 kPa [gauge]), residual pressures in the main shall be at least half of the initial. The following is the capacity-indicating color scheme.

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## SECTION B.2: COLOR SCHEME

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### Sec. B.2.1 Public Hydrants

Barrels are to be painted chrome yellow, except in cases where another color is desired. The tops and outlet-nozzle caps of hydrants are to be painted as follows: light blue for class AA hydrants, green for class A hydrants, orange for class B hydrants, and red for class C hydrants.

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

### Sec. B.2.2 Private Hydrants

Within private enclosures, the hydrant color is to be at the discretion of the owners. When private hydrants are located in public streets they should be painted red or another color to distinguish them from public hydrants.

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## SECTION B.3: LOCATION MARKERS

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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.

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## SECTION B.4: CAPACITY

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The colors should 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 in any way a guarantee of the capacity indicated by the color.

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*Dedicated to the world's most important resource, AWWA sets the standard for water knowledge, management, and informed public policy. AWWA members provide solutions to improve public health, protect the environment, strengthen the economy, and enhance our quality of life.*



1P-2M 43503-2014 (08/14)

Printed on Recycled Paper

ISBN 978-1-62576-025-8



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