

NFPA®

24

Standard for the
Installation of
Private Fire Service Mains
and Their Appurtenances

2022



NFPA® 24

Standard for the Installation of Private Fire Service Mains and Their Appurtenances

2022 Edition



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NFPA® 24

Standard for the

Installation of Private Fire Service Mains and Their Appurtenances

2022 Edition

This edition of NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, was prepared by the Technical Committee on Private Water Supply Piping Systems and released by the Correlating Committee on Automatic Sprinkler Systems. It was issued by the Standards Council on March 18, 2021, with an effective date of April 8, 2021, and supersedes all previous editions.

This edition of NFPA 24 was approved as an American National Standard on April 8, 2021.

Origin and Development of NFPA 24

In 1903, the NFPA Committee on Hose and Hydrants first presented *Specifications for Mill Yard Hose Houses*, taken substantially from a standard published by the Eastern Factory Insurance Association. This text was revised and adopted in 1904. The NFPA Committee on Field Practice amended the Specifications in 1926, published as NFPA 25.

In 1925, the Committee on Field Practice prepared a *Standard on Outside Protection, Private Underground Piping Systems Supplying Water for Fire Extinguishment*, which was adopted by NFPA. It was largely taken from the 1920 edition of the NFPA *Automatic Sprinkler Standard*, Section M on Underground Pipes and Fittings. In September 1931, a revision was made, with the resulting standard designated as NFPA 24. In the 1981 edition, the title was changed from *Standard for Outside Protection to Standard for the Installation of Private Fire Service Mains and Their Appurtenances*.

In 1953, on recommendation of the Committee on Standpipes and Outside Protection, the two standards (NFPA 24 and NFPA 25) were completely revised and adopted as NFPA 24. Amendments were made leading to separate editions in 1955, 1959, 1962, 1963, 1965, 1966, 1968, 1969, 1970, 1973, 1977, 1981, 1983, and 1987.

The 1992 edition included amendments to further delineate the point at which the water supply stops and the fixed fire protection system begins. Minor changes were made concerning special topics such as thrust restraint and equipment provisions in valve pits.

The 1995 edition clarified requirements for aboveground and buried piping. Revisions were made to provide additional information regarding listing requirements, signage, valves, valve supervision, hydrant outlets, system attachments, piping materials, and thrust blocks. User friendliness of the document was also addressed.

The 2002 edition represented a complete revision of NFPA 24. Changes included reorganization and editorial modifications to comply with the *Manual of Style for NFPA Technical Committee Documents*. Additionally, all of the underground piping requirements were relocated into a new Chapter 10.

The 2007 edition was revised in five major areas: Chapter 10 was updated editorially, and minor technical changes were made. Newly established leakage test criteria, as well as updated requirements for thrust blocks and restrained joints, were added to Chapter 10. Two annexes were new to this edition: Annex C, *Recommended Practice for Fire Flow Testing*, and Annex D, *Recommended Practice for Marking of Hydrants*. These two annexes were developed based on the 2002 edition of NFPA 291.

The 2010 edition was revised in three major areas: the provisions for location and identification of fire department connections, valves controlling water supply, and protection of fire service mains entering the building.

The 2013 edition of NFPA 24 included clarifications on the requirements for running piping under buildings, including annex figures depicting clearances. The Contractors Material and Test

Certificate for Underground Piping (Figure 10.10.1) was modified to include confirmation that the forward flow test of the backflow preventer had been conducted. A provision was also added that required the automatic drip valve to be in an accessible location that permits inspections in accordance with NFPA 25.

NFPA 24 underwent a structural rewrite for the 2016 edition. The hydrant definitions were clarified to describe the type of hydrant in question, as opposed to describing when and where they would be used. The valve arrangement requirements were rewritten for clarity, and annex figures added to provide figures that are consistent with NFPA 13. The title of Chapter 6 was changed from Valves to Water Supply Connections to better describe the material in the chapter. Revisions to Section 6.1 more clearly call out the permitted exceptions to indicating valves and permit nonlisted tapping sleeve and valve assemblies in connections to municipal water supplies. The center of hose outlet measurements was updated to include clear minimum and maximum values for the location of the outlet, along with the appropriate measurement for a hose house installation. The steel underground piping references have been removed from the table in Chapter 10 because steel pipe is required to be listed other than in the FDC line. A statement also was added to allow underground fittings to be used above the ground to transition to aboveground piping.

The 2019 edition included minor changes related to trenching and backfill. Acceptance testing requirements for aboveground piping were included. The standard was also revised to clarify the unacceptable use of steel piping for underground service.

The 2022 edition explains that NFPA 24 does not apply to dry fire hydrants used for drafting. Chapter 5 clarifies that a single fire department connection can supply multiple buildings where approved by the AHJ. Alternate distance criteria were added to Chapter 6 for post indicator valves and backflow preventors. A new section was added to Chapter 10 to clarify that the flush rates of NFPA 20 need to be used where a fire pump is connected to the water supply. Also, a new section has been added that provides an alternate cleaning procedure in place of traditional flushing. New annex material has been added to help determine ice thickness where taking water from a source exposed to freezing conditions.

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Committee Scope: This Committee shall have overall responsibility for documents that pertain to the criteria for the design and installation of automatic, open and foam-water sprinkler systems including the character and adequacy of water supplies, and the selection of sprinklers, piping, valves, and all materials and accessories. This Committee does not cover the installation of tanks and towers, nor the installation, maintenance, and use of

central station, proprietary, auxiliary, and local signaling systems for watchmen, fire alarm, supervisory service, nor the design of fire department hose connections.

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Committee Scope: This Committee shall have the primary responsibility for documents on private piping systems supplying water for fire protection and for hydrants, hose houses, and valves. The Committee is also responsible for documents on fire flow testing and marking of hydrants.

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Standard for the

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2022 Edition

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Information on referenced and extracted publications can be found in Chapter 2 and Annex E.

Chapter 1 Administration

1.1 Scope.

1.1.1 This standard shall provide the minimum requirements for the installation of private fire service mains and their appurtenances, which include supplying the following:

- (1) Automatic sprinkler systems
- (2) Open sprinkler systems
- (3) Water spray fixed systems
- (4) Foam systems
- (5) Private hydrants
- (6) Monitor nozzles or standpipe systems with reference to water supplies
- (7) Hose houses

1.1.2 This standard shall apply to combined service mains intended to carry water for fire service and other uses.

1.1.3 This standard shall not apply to the following situations:

- (1) Mains under the control of a water utility

- (2) Mains providing fire protection and/or domestic water that are privately owned but are operated as a water utility
- (3)* Dry fire hydrants utilized for drafting or mains connected to dry fire hydrants utilized for drafting

1.1.4 This standard shall not apply to underground mains serving sprinkler systems designed and installed in accordance with NFPA 13R that are less than 4 in. (100 mm) in nominal diameter.

1.1.5 This standard shall not apply to underground mains serving sprinkler systems designed and installed in accordance with NFPA 13D.

1.2 Purpose. The purpose of this standard shall be to provide a reasonable degree of protection for life and property from fire through installation requirements for private fire service main systems based on sound engineering principles, test data, and field experience.

1.3 Retroactivity. The provisions of this standard reflect a consensus for what is necessary to provide an acceptable degree of protection from the hazards addressed in this standard at the time the standard was issued.

1.3.1 Unless otherwise specified, the provisions of this standard shall not apply to facilities, equipment, structures, or installations that existed or were approved for construction or installation prior to the effective date of the standard. Where specified, the provisions of this standard shall be retroactive.

1.3.2 In those cases where the authority having jurisdiction (AHJ) determines that the existing situation presents an unacceptable degree of risk, the AHJ shall be permitted to apply retroactively any portions of this standard deemed appropriate.

1.3.3 The retroactive requirements of this standard shall be permitted to be modified if their application clearly would be impractical in the judgment of the AHJ and only where it is clearly evident that a reasonable degree of safety is provided.

1.4 Equivalency. Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard. Technical documentation shall be submitted to the AHJ to demonstrate equivalency. The system, method, or device shall be approved for the intended purpose by the AHJ.

1.5 Units.

1.5.1 Metric units of measurement in this standard shall be in accordance with the modernized metric system known as the International System of Units (SI).

1.5.1.1 Two units (liter and bar) are outside of but recognized by SI, and are commonly used in international fire protection.

1.5.1.2 These units with conversion factors shall be used as listed in Table 1.5.1.2.

1.5.2 If a value for a measurement given in this standard is followed by an equivalent value in other units, the first stated is to be regarded as the requirement.

1.5.3* It shall be acceptable to use the exact conversion or the conversions stated in the standard, even though they might not be exact.

N Table 1.5.1.2 Conversion Table for SI Units

Quantity	Name of Unit	Unit Symbol	Conversion Factor
Length	Meter	m	1 ft = 0.3048 m
Area	Square meter	m ²	1 ft ² = 0.092903 m ²
Volume	Cubic meter	m ³	1 ft ³ = 0.028317 m ³
Fluid capacity	Liter	L	1 gal = 3.785 L
Flow	Liter per minute	L/min	1 gpm = 3.785 L/min
Pressure	Bar Kilopascal Newton per square meter	bar kPa N/m ²	1 psi = 0.0689 bar 1 psi = 6.894757 kPa 1 lbf/ft ² = 47.8800 N/m ²
Temperature	Degrees Celsius	°C	1°F = $\frac{9}{5} \times ^\circ\text{C} + 32$
Velocity	Meter per second	m/s	1 fps = 0.3048 m/s
Force	Newton	N	1 lbf = 4.448822 N
Stress	Kilonewton per square meter Megapascal	kN/m ² MPa	1 lbf/ft ² = 0.047880 kN/m ² 1 lbf/in. ² = 0.006895 MPa

Note: For additional conversions and information, see ASTM SI10, *IEEE/ASTM SI 10 American National Standard for Metric Practice*.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2022 edition.

NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, 2022 edition.

NFPA 13R, *Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies*, 2022 edition.

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*, 2022 edition.

NFPA 22, *Standard for Water Tanks for Private Fire Protection*, 2018 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, 2020 edition.

NFPA 780, *Standard for the Installation of Lightning Protection Systems*, 2020 edition.

NFPA 1961, *Standard on Fire Hose*, 2020 edition.

NFPA 1963, *Standard for Fire Hose Connections*, 2019 edition.

2.3 Other Publications.

2.3.1 ASME Publications. American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016-5990.

ASME B1.20.1, *Pipe Threads, General Purpose (Inch)*, 2013.

ASME B16.1, *Gray Iron Pipe Flanges and Flanged Fittings, Classes 25, 125, and 250*, 2015.

ASME B16.3, *Malleable Iron Threaded Fittings, Classes 150 and 300*, 2016.

ASME B16.4, *Gray Iron Threaded Fittings, Classes 125 and 250*, 2016.

ASME B16.15, *Cast Copper Alloy Threaded Fittings, Classes 125 and 250*, 2018.

ASME B16.18, *Cast Copper Alloy Solder Joint Pressure Fittings*, 2018.

ASME B16.22, *Wrought Copper and Copper Alloy Solder Joint Pressure Fittings*, 2018.

2.3.2 ASTM Publications. ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM A53/A53M, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless*, 2018.

ASTM A135/A135M, *Standard Specification for Electric-Resistance-Welded Steel Pipe*, 2009, reapproved 2019.

ASTM A312/312M, *Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes*, 2019.

ASTM A403/A403M, *Specification for Wrought Austenitic Stainless Steel Pipe Fittings*, 2019a.

ASTM A795/A795M, *Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use*, 2013.

ASTM B43, *Specification for Seamless Red Brass Pipe, Standard Sizes*, 2015.

ASTM B75/B75M, *Specification for Seamless Copper Tube*, 2019.

ASTM B88, *Specification for Seamless Copper Water Tube*, 2020.

ASTM B251/B251M, *Standard Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube*, 2017.

ASTM SI10, *IEEE/ASTM SI 10 American National Standard for Metric Practice*, 2016.

2.3.3 AWWA Publications. American Water Works Association, 6666 West Quincy Avenue, Denver, CO 80235.

AWWA C104/A21.4, *Cement-Mortar Lining for Ductile-Iron Pipe and Fittings*, 2016.

AWWA C105/A21.5, *Polyethylene Encasement for Ductile-Iron Pipe Systems*, 2018.

AWWA C110/A21.10, *Ductile-Iron and Gray-Iron Fittings*, 2012.

AWWA C111/A21.11, *Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings*, 2017.

AWWA C115/A21.15, *Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges*, 2011.

AWWA C150/A21.50, *Thickness Design of Ductile-Iron Pipe*, 2014.

AWWA C151/A21.51, *Ductile-Iron Pipe, Centrifugally Cast*, 2017, errata 2018.

AWWA C153/A21.53, *Ductile-Iron Compact Fittings*, 2019.

AWWA C300, *Reinforced Concrete Pressure Pipe, Steel-Cylinder Type*, 2016.

AWWA C301, *Prestressed Concrete Pressure Pipe, Steel-Cylinder Type*, 2014 reaffirmed without revision 2019.

AWWA C302, *Reinforced Concrete Pressure Pipe, Noncylinder Type*, 2016.

AWWA C303, *Concrete Pressure Pipe, Bar-Wrapped, Steel-Cylinder Type*, 2017.

AWWA C600, *Installation of Ductile Iron Water Mains and Their Appurtenances*, 2017.

AWWA C602, *Cement-Mortar Lining of Water Pipe Lines in Place, 4 in. (100 mm) and Larger*, 2017.

AWWA C900, *Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. Through 60 in. (100 mm Through 1,500 mm)*, 2016.

AWWA C906, *Polyethylene (PE) Pressure Pipe and Fittings, 4 in. (100 mm) Through 63 in. (1650 mm) for Waterworks*, 2015.

AWWA C909, *Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 in. – 24 in. (100 mm – 600 mm) for Water, Wastewater, and Reclaimed Water Service*, 2016.

AWWA M9, *Concrete Pressure Pipe*, 2008, errata 2014.

AWWA M23, *PVC Pipe — Design and Installation*, 2019.

AWWA M55, *PE Pipe — Design and Installation*, 2006.

2.3.4 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*, 2022 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.3 Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

3.2.4* Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.5 Shall. Indicates a mandatory requirement.

3.2.6 Should. Indicates a recommendation or that which is advised but not required.

3.2.7 Standard. An NFPA Standard, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase “standards development process” or “standards development activities,” the term “standards” includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides.

3.3 General Definitions.

3.3.1 Appurtenance. An accessory or attachment that enables the private fire service main to perform its intended function.

3.3.2 Automatic Drain Valve (Automatic Drip or Ball Drip). A device intended to remove water using gravity from piping or valve cavities, which is required to be empty when the system is not discharging water.

3.3.3* Control Valve (Shutoff Valve). A valve controlling flow to water-based fire protection systems and devices.

3.3.4 Corrosion-Resistant Piping. Piping that has the property of being able to withstand deterioration of its surface or its properties when exposed to its environment.

3.3.5 Corrosion-Retarding Material. A lining or coating material that when applied to piping or appurtenances has the property of reducing or slowing the deterioration of the object's surface or properties when exposed to its environment.

3.3.6 Fire Department Connection. A connection through which the fire department can pump supplemental water into the sprinkler system, standpipe, or other water-based fire protection systems, thereby supplementing existing water supplies.

3.3.7 Fire Pump. A pump that is a provider of liquid flow and pressure dedicated to fire protection. [20, 2022]

3.3.8 Hose House. An enclosure located over or adjacent to a hydrant or other water supply designed to contain the necessary hose nozzles, hose wrenches, gaskets, and spanners to be used in fire fighting in conjunction with and to provide aid to the local fire department.

3.3.9 Hydrant Butt. The hose connection outlet of a hydrant.

3.3.10 Hydraulically Calculated Water Demand Flow Rate. The waterflow rate for a system or hose stream that has been calculated using accepted engineering practices.

3.3.11 Pressure.

3.3.11.1 Residual Pressure. The pressure that exists in the distribution system, measured at the residual hydrant at the time the flow readings are taken at the flow hydrants.

3.3.11.2 Static Pressure. The pressure that exists at a given point under normal distribution system conditions measured at the residual hydrant with no hydrants flowing.

3.3.12* Pressure-Regulating Device. A device designed for the purpose of reducing, regulating, controlling, or restricting water pressure.

3.3.13* Private Fire Service Main. A private fire service main, as used in this standard, is that pipe and its appurtenances on private property that is between a source of water and the base of the system riser for water-based fire protection systems; between a source of water and inlets to foam-making systems; between a source of water and the base elbow of private hydrants or monitor nozzles; and used as fire pump suction and discharge piping, beginning at the inlet side of the check valve on a gravity or pressure tank.

3.3.14 Pumper Outlet. The hydrant outlet intended to be connected to a fire department pumper for use in taking supply from the hydrant.

3.3.15 Rated Capacity. The flow, either measured or calculated, that is available from a hydrant at the designated residual pressure (rated pressure).

N 3.3.16 System Working Pressure. The maximum anticipated static (nonflowing) or flowing pressure applied to fire protection system components exclusive of surge pressures and exclusive of pressure from the fire department connection.

3.3.17 Test.

3.3.17.1 Flow Test. A test performed by the flow and measurement of water from one hydrant and the static and residual pressures from an adjacent hydrant for the purpose of determining the available water supply at that location.

3.3.17.2 Flushing Test. A test of a piping system using flow-rates intended to remove debris from the piping system prior to it being placed in service.

3.3.17.3 Hydrostatic Test. A test of a closed piping system and its attached appurtenances consisting of subjecting the piping to an increased internal pressure for a specified duration to verify system integrity and system leakage rates.

3.3.18 Valve.

3.3.18.1 Check Valve. A valve that allows flow in one direction only.

3.3.18.2* Indicating Valve. A valve that has components that provide the valve operating condition, open or closed.

3.4 Hydrant Definitions.

3.4.1 Hydrant. An exterior valved connection to a water supply system that provides hose connections.

3.4.1.1* Dry Barrel Hydrant (Frostproof Hydrant). A type of hydrant with the main control valve below the frost line between the footpiece and the barrel.

3.4.1.2 Flow Hydrant. The hydrant that is used for the flow and flow measurement of water during a flow test.

3.4.1.3* Private Fire Hydrant. A valved connection on a water supply system having one or more outlets that is used to supply hose and fire department pumpers with water on private property.

3.4.1.4 Public Hydrant. A valved connection on a water supply system having one or more outlets that is used to supply hose and fire department pumpers with water.

3.4.1.5 Residual Hydrant. The hydrant that is used for measuring static and residual pressures during a flow test.

3.4.1.6 Wet Barrel Hydrant. A type of hydrant that is intended for use where there is no danger of freezing weather and where each outlet is provided with a valve and an outlet.

Chapter 4 General Requirements

4.1* Plans.

4.1.1 Working plans shall be submitted for approval to the authority having jurisdiction before any equipment is installed or remodeled.

4.1.2 Deviation from approved plans shall require permission of the authority having jurisdiction.

4.1.3 Working plans shall be drawn to an indicated scale on sheets of uniform size, with a plan of each floor as applicable, and shall include the following items that pertain to the design of the system:

- (1) Name of owner
- (2) Location, including street address
- (3) Point of compass

- (4) A graphic representation of the scale used on all plans
- (5) Name and address of contractor
- (6) Size and location of all water supplies
- (7) Size and location of standpipe risers, hose outlets, hand hose, monitor nozzles, and related equipment
- (8) The following items that pertain to private fire service mains:
 - (a) Size
 - (b) Length
 - (c) Location
 - (d) Weight
 - (e) Material
 - (f) Point of connection to city main
 - (g) Sizes, types, and locations of valves, valve indicators, regulators, meters, and valve pits
 - (h) Depth at which the top of the pipe is laid below grade
 - (i) Method of restraint
- (9) The following items that pertain to hydrants:
 - (a) Size and location, including size and number of outlets and whether outlets are to be equipped with independent gate valves
 - (b) Thread size and coupling adapter specifications if different from NFPA 1963
 - (c) Whether hose houses and equipment are to be provided, and by whom
 - (d) Static and residual hydrants used in flow
 - (e) Method of restraint
- (10) Size, location, and piping arrangement of fire department connections

4.1.4 The working plan submittal shall include the manufacturer's installation instructions for any specially listed equipment, including descriptions, applications, and limitations for any devices, piping, or fittings.

4.2 Installation Work.

4.2.1 Installation work shall be performed by fully experienced and responsible persons.

4.2.2 The authority having jurisdiction shall always be consulted before the installation or remodeling of private fire service mains.

Chapter 5 Water Supplies

5.1* Connection to Waterworks Systems.

5.1.1 A connection to a reliable waterworks system shall be an acceptable water supply source.

5.1.2* The flow rate and pressure of a public water supply shall be determined from waterflow test data or other approved method.

5.2 Size of Fire Mains.

Δ 5.2.1 Private Fire Service Mains.

N 5.2.1.1 Hydraulic calculations shall show that the main is able to supply the total flow rate at the required design pressure.

N 5.2.1.2 For mains that supply fire hydrants, pipe size shall not be less than 6 in. (150 mm) nominal size.

5.2.2 Mains Not Supplying Hydrants. For mains that do not supply hydrants, pipe sizes less than 6 in. (150 mm) nominal

size shall be permitted to be used subject to the following restrictions:

- (1) The main shall supply only the following types of systems:
 - (a) Automatic sprinkler systems
 - (b) Open sprinkler systems
 - (c) Water spray fixed systems
 - (d) Foam systems
 - (e) Standpipe systems
- (2) Hydraulic calculations shall show that the main is able to supply the total flow rate at the required design pressure.
- (3) Systems that are not hydraulically calculated shall have a main at least as large as the riser.

5.3 Pressure-Regulating Devices and Meters.

5.3.1 Pressure-regulating valves shall not be used.

5.3.1.1 Pressure-regulating valves shall be permitted to be used when acceptable to the AHJ.

5.3.2 Where meters are required, they shall be listed for fire protection service.

5.4* Connection from Waterworks Systems.

5.4.1 The requirements of the public health AHJ shall be determined and followed.

5.4.2 Where a backflow prevention device is installed to guard against possible cross-contamination of the public water system, it shall be listed for fire protection service.

5.4.2.1* Where a check valve or alarm check valve is permitted by the AHJ in lieu of a backflow preventer, it shall be listed for fire protection service.

5.5 Connections to Public Water Systems. Connections to public water systems shall be arranged to be isolated by one of the methods permitted in 6.2.9.

5.6* Pumps. Fire pump units installed in accordance with NFPA 20 and connected to a water supply source complying with Sections 5.5, 5.7, or 5.8 shall use an acceptable water supply source.

5.7 Tanks. Tanks shall be installed in accordance with NFPA 22.

5.8 Penstocks, Rivers, Lakes, or Reservoirs. Water supply connections from penstocks, rivers, lakes, or reservoirs shall be designed to prevent the introduction of mud and sediment and shall be provided with approved, double, removable screens or approved strainers installed in an approved manner.

N 5.8.1* When water supply connections are from penstocks, rivers, lakes, or reservoirs, measures shall be taken to prevent freezing at the water supply inlet.

5.9* Remote Fire Department Connections.

5.9.1 General. Where the AHJ requires a remote fire department connection for systems requiring one by another standard, a fire department connection shall be provided as described in Section 5.9.

5.9.1.1 Fire department connections shall be permitted to be omitted where approved by the AHJ.

N 5.9.1.2 A single fire department connection shall be permitted to supply multiple buildings where acceptable to the AHJ.

5.9.1.3 Fire department connections shall be of an approved type.

Δ 5.9.1.4 Fire department connections shall be equipped with approved plugs or caps that are secured and arranged for removal by fire departments.

5.9.1.5 Fire department connections shall be protected where subject to mechanical damage.

5.9.2 Couplings.

5.9.2.1 The fire department connection(s) shall use an NH internal threaded swivel fitting(s) with an NH standard thread(s), except as permitted by 5.9.2.3 and 5.9.2.4.

5.9.2.2 At least one of the connections shall be the 2.5 to 7.5 NH standard thread specified in NFPA 1963.

5.9.2.3 Where local fire department connections use threads that do not conform to NFPA 1963, the AHJ shall designate the thread to be used.

5.9.2.4 Nonthreaded couplings shall be permitted where required by the AHJ.

5.9.2.4.1 Nonthreaded couplings shall be listed.

5.9.3 Valves.

5.9.3.1 A listed check valve shall be installed in the piping from each fire department connection.

5.9.3.2 Control valves shall not be installed in the piping from the fire department connection to the fire service main.

5.9.3.2.1* Control valves shall be permitted in the system piping downstream of the fire department connection piping.

5.9.4 Drainage.

5.9.4.1 The pipe between the check valve and the outside hose coupling shall be equipped with an approved automatic drain valve.

5.9.4.2 The automatic drain valve shall be installed in a location that permits inspection and testing as required by NFPA 25 and reduces the likelihood of freezing.

5.9.4.2.1 The automatic drip shall be permitted to be buried where permitted by the AHJ.

5.9.4.2.2 Where the automatic drip is buried as allowed by 5.9.4.2.1, the outlet shall discharge into a bed of crushed stone or pea gravel.

5.9.4.3 An automatic drain valve is permitted to be omitted from areas where the piping is not subject to freezing.

5.9.5 Location and Signage.

5.9.5.1* Remote fire department connections shall be located adjacent to a street or an access route to permit fire department apparatus accessibility, or at a location approved by the AHJ.

5.9.5.2* Remote fire department connections shall be located and arranged so that hose lines can be attached to the inlets without interference.

5.9.5.3 Each remote fire department connection shall be designated by a sign as follows:

- (1) The sign shall have raised or engraved letters at least 1 in. (25 mm) in height on a plate or fitting.
- (2)* The sign shall indicate the type of system for which the connection is intended.

5.9.5.4 Where the system demand pressure exceeds 150 psi (10.3 bar), a sign located at the fire department connection shall indicate the required inlet pressure.

5.9.5.5 Where a remote fire department connection only supplies a portion(s) of the building, a sign shall be attached to indicate the portion(s) of the building supplied.

5.9.5.6 Remote fire department connections shall not be connected on the suction side of fire pumps.

5.9.5.7 Where a remote fire department connection services multiple buildings, structures, or locations, a sign shall be provided indicating the buildings, structures, or locations served.

Chapter 6 Water Supply Connections

6.1 Valves.

6.1.1 All valves controlling connections to water supplies and to supply pipes to water-based fire protection systems shall be listed indicating valves, except as permitted by 6.1.1.3 and 6.1.1.4.

6.1.1.1 A listed underground gate valve equipped with a listed indicator post shall be permitted.

6.1.1.2 A listed water control valve assembly with a position indication connected to a remote supervisory station shall be permitted.

6.1.1.3* A listed, nonindicating valve, such as an underground gate valve, including a T-wrench, shall be permitted to be installed in a roadway box when acceptable to the AHJ.

6.1.1.3.1 For new installations, where more than one nonindicating underground gate valve is installed in a water system, all underground gate valves shall be of the same opening direction.

6.1.1.4* A new connection to a municipal water supply shall be permitted to utilize a nonlisted, nonindicating valve, including a T-wrench as part of a tapping assembly.

6.1.1.4.1 For new installations, where more than one nonindicating underground gate valve is installed in a water system, all underground gate valves shall be of the same opening direction.

6.1.2 Indicating valves shall not close in less than 5 seconds when operated at maximum possible speed from the fully open position.

6.2 Connections to Water Supplies.

6.2.1 A valve in accordance with Section 6.1 shall be installed in each pipeline from each water supply.

6.2.1.1 Control valves shall not be installed in the piping from the fire department connection to the point it connects to the fire service main.

6.2.1.2 Control valves shall be permitted in the system piping downstream of the fire department connection.

6.2.2 Where more than one water supply exists, a check valve shall be installed in each connection.

6.2.2.1 Except for the check valve installed in the fire department connection piping, all check valves shall have a control valve installed upstream and downstream of the check valve.

6.2.2.2* When water supply connections serve as one source of supply, valves shall be installed in accordance with 6.1.1 on both sides of all check valves required in 6.2.2.

6.2.3 Check valves shall not be required in a break tank where break tanks are used with automatic fire pumps.

6.2.4 In the discharge pipe from a pressure tank or a gravity tank of less than 15,000 gal (57 m³) capacity, a control valve shall not be required to be installed on the tank side of the check valve.

6.2.5* The following requirements shall apply where a gravity tank is located on a tower in the yard:

- (1) The control valve on the tank side of the check valve shall be an outside screw and yoke or a listed indicating valve.
- (2) The other control valve shall be an outside screw and yoke, a listed indicating valve, or a listed valve having a post-type indicator.

6.2.6* The following requirements shall apply where a gravity tank is located on a building:

- (1) Both control valves shall be outside screw and yoke or listed indicating valves.
- (2) All fittings inside the building, except the drain tee and heater connections, shall be under the control of a listed valve.

6.2.7 Where a pump is located in a combustible pump house or exposed to danger from fire or falling walls, or where a tank discharges into a private fire service main fed by another supply, one of the following requirements shall be met:

- (1)* The check valve in the connection shall be located in a pit.
- (2) The control valve shall be of the post indicator type and located not less than 40 ft (12 m) from outside buildings.
- (3) For buildings less than 40 ft (12 m) in height, a post indicator valve shall be permitted to be installed closer than 40 ft (12 m) but at least as far from the building as the height of the wall facing the post indicator valve.

6.2.8* All control valves shall be located where accessible and free of obstructions.

6.2.9 All connections to private fire service mains for fire protection systems shall be arranged in accordance with one of the following so that they can be isolated:

- (1)* A post indicator valve installed not less than 40 ft (12 m) from the building
 - (a) For buildings less than 40 ft (12 m) in height, a post indicator valve shall be permitted to be installed closer than 40 ft (12 m) but at least as far from the building as the height of the wall facing the post indicator valve.
 - (b) Post indicating valves shall be allowed to be closer than 40 ft (12 m) to the building when a property line or other physical barriers make it impossible to have a post indicating valve 40 ft (12 m) away.

(c) Post indicating valves shall be allowed to be closer than 40 ft (12 m) to the building when building driveway or fire access roadways or other building traffic make it impractical to be 40 ft (12 m).

- (2) A wall post indicator valve on risers located within the building, either a nonrising stem gate valve with a wall post indicator or a listed butterfly valve with an indicating handle extending out through the building wall.
- (3) An indicating valve in a pit, installed in accordance with Section 6.4
- (4)* A backflow preventer with at least one indicating valve not less than 40 ft (12 m) from the building
 - (a) For buildings less than 40 ft (12 m) in height, a backflow preventer with at least one indicating valve shall be permitted to be installed closer than 40 ft (12 m) but at least as far from the building as the height of the wall facing the backflow preventer.
 - (b) Backflow preventer valves shall be allowed to be closer than 40 ft (12 m) to the building when a property line or other physical barriers make it impossible to have a backflow preventer valve 40 ft (12 m) away.
 - (c) Backflow preventer valves shall be allowed to be closer than 40 ft (12 m) to the building when building driveway or fire access roadways or other building traffic make it impractical to be 40 ft (12 m).
- (5)* A nonindicating valve, such as an underground nonrising stem gate valve with an approved roadway box, complete with T-wrench, located not less than 40 ft (12 m) from the building
 - (a) For buildings less than 40 ft (12 m) in height, a nonindicating valve, such as an underground nonrising stem gate valve with an approved roadway box, complete with T-wrench, shall be permitted to be installed closer than 40 ft (12 m) but at least as far from the building as the height of the wall facing the nonindicating valve.
 - (b) A nonindicating valve, such as an underground nonrising stem gate valve with an approved roadway box complete with T-wrench shall be allowed to be closer than 40 ft (12 m) to the building when a property line or other physical barriers make it impossible to have the valve 40 ft (12 m) away.
- (6) Indicating control valves installed in a fire-rated room accessible from the exterior
- (7) Indicating control valves in a fire-rated stair enclosure accessible from the exterior as permitted by the AHJ
- (8) Any other valve type or location as permitted by the AHJ.

6.3 Post Indicator Valves.

6.3.1 Where post indicator valves are used, they shall be set so that the top of each post is 32 in. to 40 in. (800 mm to 1000 mm) above the final grade.

6.3.2 Where post indicator valves are used, they shall be protected against mechanical damage where needed.

6.4 Valves in Pits.

6.4.1 Valve pits located on the discharge pipe of an elevated tank shall be designed in accordance with NFPA 22.

6.4.2 Where used, valve pits shall be of a size to permit access for inspection, operation, testing, maintenance, and removal of equipment contained therein.

Δ 6.4.3 Valve pits shall be constructed and arranged to protect the installed equipment from movement of earth, freezing, and accumulation of water.

6.4.3.1 Depending on soil conditions and the size of the pit, valve pits shall be permitted to be constructed of any of the following materials:

- (1) Poured-in-place or precast concrete, with or without reinforcement
- (2) Brick
- (3) Other approved materials

6.4.3.2 Where the water table is low and the soil is porous, crushed stone or gravel shall be permitted to be used for the floor of the pit.

6.4.4 The location of the valve shall be marked, and the cover of the pit shall be kept free of obstructions.

6.5 Backflow Prevention Assemblies.

6.5.1 Where used in accordance with 6.2.9(4), backflow prevention assemblies shall be installed in accordance with their installation instructions.

6.5.2 Backflow prevention assemblies shall be protected against mechanical damage and freezing where the potential exists.

6.6 Sectional Valves.

6.6.1* Sectional valves shall be provided on looped systems at locations within piping sections such that the number of fire protection connections between sectional valves does not exceed six.

6.6.2 A sectional valve shall be provided at the following locations:

- (1) On each bank of a river, pond, or lake where a main crosses water
- (2) Outside the building foundation(s) where a main or a section of a main is installed under a building

6.7 Identifying and Securing Valves.

6.7.1 Identification signs shall be provided at each valve to indicate the valve's function and the part of the system the valve controls.

6.7.1.1 Identification signs in 6.7.1 shall not be required for underground gate valves with roadway boxes.

6.7.2* Control valves shall be supervised by one of the following methods:

- (1) Central station, proprietary, or remote station signaling service
- (2) Local signaling service that causes the sounding of an audible signal at a constantly attended location
- (3) An approved procedure to ensure that valves are locked in the correct position
- (4) An approved procedure to verify that valves are located within fenced enclosures under the control of the owner, sealed in the open position, and inspected weekly

6.7.3 Supervision of underground gate valves with roadway boxes shall not be required.

6.8 Check Valves. Check valves shall be permitted to be installed in a vertical or horizontal position in accordance with their listing.

Chapter 7 Hydrants

7.1* General.

7.1.1 Hydrants shall be listed and approved.

Δ 7.1.1.1 The connection from the hydrant to the main shall not be less than 6 in. (150) (nominal).

7.1.1.2 A listed control valve shall be installed in each hydrant connection.

Δ 7.1.1.2.1 A valve required by 7.1.1.2 shall be permitted to be a listed, nonindicating valve, such as an underground gate valve in a roadway box.

7.1.1.2.2 Valves required by 7.1.1.2 shall be installed within 20 ft (6.1 m) of the hydrant.

7.1.1.2.2.1 Valves shall be clearly identified and kept free of obstructions.

7.1.1.2.3 Where valves cannot be located in accordance with 7.1.1.2.2, valve locations shall be permitted where approved by the AHJ.

Δ 7.1.1.3* The number, size, and arrangement of outlets; the size of the main valve opening; the size of the barrel; and the color of the hydrant shall be determined by the required flow and pressure for the protection to be provided and shall be approved by the AHJ.

7.1.1.4 Independent gate valves on 2½ in. (65 mm) outlets shall be permitted.

7.1.2 Hydrant outlet threads shall have NHS external threads for the size outlet(s) supplied as specified in NFPA 1963.

7.1.3 Where local fire department connections do not conform to NFPA 1963, the AHJ shall designate the connection to be used.

7.2 Number and Location.

7.2.1* Hydrants shall be provided and spaced in accordance with the requirements of the AHJ.

7.2.2 Public hydrants shall be permitted to be recognized as meeting all or part of the requirements of Section 7.2.

7.2.3* Hydrants shall be located not less than 40 ft (12 m) from the buildings or structures to be protected.

7.2.4 Where hydrants cannot be located in accordance with 7.2.3, hydrants located closer than 40 ft (12 m) from the building or wall hydrants shall be permitted to be used where approved by the AHJ.

7.3 Installation.

7.3.1* Hydrants shall be installed on flat stones, concrete slabs, or other approved materials.

7.3.2 Small stones or an approved equivalent shall be provided below and around the drain in an adequate amount to prevent the weep hole from being clogged with native soil, mud, or debris that would prevent adequate drainage for dry barrel hydrants.