

# NFPA 14

## Standard for the Installation of Standpipe and Hose Systems

### 2003 Edition



NFPA, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101  
An International Codes and Standards Organization

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**NFPA 14**  
**Standard for the**  
**Installation of Standpipe and Hose Systems**  
**2003 Edition**

This edition of NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*, was prepared by the Technical Committee on Standpipes and acted on by NFPA at its November Association Technical Meeting held November 16–20, 2002, in Atlanta, GA. It was issued by the Standards Council on January 17, 2003, with an effective date of February 6, 2003, and supersedes all previous editions.

This edition of NFPA 14 was approved as an American National Standard on January 17, 2003.

**Origin and Development of NFPA 14**

This standard dates from 1912, when an initial report was made by the Committee on Standpipe and Hose Systems. The report was amended in 1914 and adopted by the Association in 1915. Revisions were adopted in 1917. Additional revisions were submitted by the Committee on Field Practice and adopted in 1926, 1927, 1931, 1938 (included action by the NFPA Board of Directors), 1941, and 1945. The Committee on Standpipes recommended revisions adopted in 1949, 1952, 1963, 1968, 1969, 1970, 1971, 1973, 1974, 1976, 1978, 1980, 1982, 1985, and 1990.

The 1993 edition of NFPA 14 was a complete reorganization of the document. The “user friendliness” of NFPA 14 was evaluated, and numerous changes followed. The standard was arranged to provide for a logical system design approach where designing and installing a standpipe system.

Substantive changes to the 1993 edition were the result of recent experience with standpipe systems under fire conditions. Flow rates, pressures, and the specific location of the hose connections were studied to determine optimum combinations for each factor.

The 1996 edition of NFPA 14 was a continuation of the changes that were initiated for the 1993 edition. Some definitions were expanded, and certain requirements for piping materials, pipe support, waterflow alarms, valves, fire department connections, system testing, and water supplies were revised. In addition, a number of editorial changes were made to improve the user friendliness of the document.

The 2000 edition of NFPA 14 incorporated requirements for hydrants, hose houses, and master streams previously contained in NFPA 24. Also included in this revision were test procedures for fire flow testing and marking of hydrants previously contained in NFPA 291.

The 2003 edition has been reformatted to conform to the NFPA *Manual of Style*, 2000 edition. Hydraulic calculation requirements have been rewritten for clarification, and requirements for horizontal standpipes have been added. Guidance for hydrants, hose houses, and master streams have been deleted as this information is retained by NFPA 13, *Standard for the Installation of Sprinkler Systems*, and NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*. Similarly, test procedures for fire flow testing and marking of hydrants were returned to NFPA 291, *Recommended Practice for Fire Flow Testing and Marking of Hydrants*, thus “private hydrant” was removed from the title of NFPA 14.

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**Committee Scope:** This Committee shall have primary responsibility for documents on the installation of standpipes, private hydrants, monitor nozzles, hose systems and hose houses including methods and procedures of water flow testing for the evaluation of water supplies in buildings and structures.

*This list represents the membership at the time the Committee was balloted on the final text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the back of the document.*

NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

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## NFPA 14

### Standard for the

## Installation of Standpipe and Hose Systems

### 2003 Edition

NOTICE: An asterisk (\*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

Changes other than editorial are indicated by a vertical rule beside the paragraph, table, or figure in which the change occurred. These rules are included as an aid to the user in identifying changes from the previous edition. Where one or more complete paragraphs have been deleted, the deletion is indicated by a bullet (•) between the paragraphs that remain.

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

### Chapter 1 General Information

**1.1\* Scope.** This standard covers the minimum requirements for the installation of standpipes, private hydrants, monitor nozzles, hose systems, and hose houses including methods and procedures of waterflow testing for the evaluation of water supplies. This standard does not cover requirements for periodic inspection, testing, and maintenance of these systems.

**1.2 Purpose.** The purpose of this standard is to provide a reasonable degree of protection for life and property from fire through installation requirements for standpipes, hydrants, and hose systems based on sound engineering principles, test data, and field experience. Nothing in this standard is intended to restrict new technologies or alternate arrangements, provided that the level of safety prescribed by the standard is not lowered.

**1.3 Retroactivity.** The provisions of this standard reflect a consensus of 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 determines that the existing situation presents an unacceptable degree of risk, the authority having jurisdiction 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 authority having jurisdiction, 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.

**1.4.1** Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

**1.4.2** The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

### 1.5 Units.

**1.5.1** Metric units of measurement in this standard are in accordance with the modernized metric system known as the International System of Units (SI). Liter and bar units, which are outside of but recognized by SI, are commonly used in international fire protection. These units and their conversion factors are provided in Table 1.5.1.

**Table 1.5.1 Metric Units of Measure**

Name of Unit	Unit Symbol	Conversion Factor
meter	m	1 ft = 0.3048 m
millimeter	mm	1 in. = 25.4 mm
liter	L	1 gal = 3.785 L
cubic decimeter	dm <sup>3</sup>	1 gal = 3.785 dm <sup>3</sup>
Pascal	Pa	1 psi = 6894.757 Pa
bar	bar	1 psi = 0.0689 bar
bar	bar	1 bar = 105 Pa

Note: For additional conversion and information, see ASTM E 380, *Standard Practice for Use of the International System of Units (SI)*.

**1.5.2** If a value for measurement provided in this standard is followed by an equivalent value in other units, the first value stated shall be regarded as the requirement. An equivalent value could be approximate.

**1.5.3** Where sizes for pipe, sheet and plate steel, and wire gauges are indicated, they are noted in trade sizes and not by hard conversions.

### 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, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2002 edition.

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*, 1999 edition.

NFPA 22, *Standard for Water Tanks for Private Fire Protection*, 2003 edition.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, 2002 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, 2002 edition.

NFPA 72®, *National Fire Alarm Code*®, 2002 edition.

NFPA 101®, *Life Safety Code*®, 2003 edition.

NFPA 1963, *Standard for Fire Hose Connections*, 1998 edition.

### 2.3 Other Publications.

**2.3.1 ANSI Publications.** American National Standards Institute, Inc., 11 West 42nd Street, 13th Floor, New York, NY 10036.



ANSI B16.1, *Cast Iron Pipe Flanges and Flanged Fittings*, 1998.

ANSI B16.3, *Malleable Iron Threaded Fittings*, 1998.

ANSI B16.4, *Gray Iron Threaded Fittings*, 1998.

ANSI B16.5, *Pipe Flanges and Flanged Fittings*, 1996.

ANSI B16.9, *Factory-Made Wrought Steel Butt welding Fittings*, 2001.

ANSI B16.11, *Forged Fittings, Socket-Welding and Threaded*, 2001.

ANSI B16.18, *Cast Copper Alloy Solder Joint Pressure Fittings*, 1984.

ANSI B16.22, *Wrought Copper and Copper Alloy Solder Joint Pressure Fittings*, 1995.

ANSI B16.25, *Butt welding Ends*, 1992.

ANSI B36.10M, *Welded and Seamless Wrought Steel Pipe*, 1996.

**2.3.2 ASTM Publications.** American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM A 53, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless*, 2001.

ASTM A 135, *Standard Specification for Electric-Resistance-Welded Steel Pipe*, 2001.

ASTM A 234, *Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service*, 2001.

ASTM A 795, *Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use*, 2000.

ASTM B 75, *Standard Specification for Seamless Copper Tube*, 1999.

ASTM B 88, *Standard Specification for Seamless Copper Water Tube*, 1999.

ASTM B 251, *Standard Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube*, 1997.

ASTM E 380, *Standard Practice for Use of the International System of Units (SI)*, 1993.

**2.3.3 AWS Publication.** American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

AWS A5.8, *Specification for Filler Metals for Brazing and Braze Welding*, 1992.

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

AWWA C104, *Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water*, 1995.

AWWA C110, *Ductile-Iron and Gray-Iron Fittings, 3 in. Through 48 in. (75 mm Through 1200 mm) for Water and Other Liquids*, 1998.

AWWA C151, *Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids*, 1996.

## 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 included, common usage of the terms shall apply.

### 3.2 NFPA Official Definitions.

**3.2.1\* Approved.** Acceptable to the authority having jurisdiction.

**3.2.2\* Authority Having Jurisdiction (AHJ).** The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure.

**3.2.3\* 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.

**3.2.4 Shall.** Indicates a mandatory requirement.

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

### 3.3 General Definitions.

**3.3.1 Automatic Standpipe System.** A standpipe system that is attached to a water supply capable of supplying the system demand at all times and that requires no action other than opening a hose valve to provide water at hose connections.

**3.3.2 Branch Line.** A piping system, generally in a horizontal plane, connecting not more than one hose connection with a standpipe.

**3.3.3 Combined System.** A standpipe system having piping that supplies both hose connections and automatic sprinklers.

**3.3.4 Control Valve.** A valve used to control the water supply system of a standpipe system.

**3.3.5 Dry Standpipe.** A standpipe system designed to have piping contain water only when the system is being utilized.

### 3.3.6 Exit.

**3.3.6.1 Exit Passageway.** Hallways, corridors, passages, or tunnels used as exit components and separated from other parts of the building in accordance with NFPA 101®, *Life Safety Code*®.

**3.3.6.2 Horizontal Exit.** A way of passage from an area in one building to an area in another building on approximately the same level, or a way of passage through or around a fire barrier from one area to another on approximately the same level in the same building that affords safety from fire and smoke originating from the area of incidence and areas communicating therewith.

**3.3.7 Feed Main.** That portion of a standpipe system that supplies water to one or more standpipes.

**3.3.8 Fire Department Connection.** A connection through which the fire department can pump supplemental water into the sprinkler system, standpipe, or other system furnishing water for fire extinguishment to supplemental existing water supplies.

**3.3.9 High-Rise Building.** A building greater than 23 m (75 ft) in height. Where the building height is measured from the lowest level of fire department vehicle access to the floor of the highest occupiable story.

**3.3.10 Hose Connection.** A combination of equipment provided for connection of a hose to the standpipe system that includes a hose valve with a threaded outlet.



**3.3.11 Hose Station.** A combination of a hose rack, hose nozzle, hose, and hose connection.

**3.3.12 Hose Valve.** The valve to an individual hose connection.

**3.3.13 Manual Standpipe System.** A standpipe system that relies exclusively on the fire department connection to supply the system demand.

**3.3.14 Nozzle Pressure.** Pressure required at the inlet of a nozzle to produce the desired water discharge characteristics.

**3.3.15 Pressure Control Valve.** A pilot-operated pressure-reducing valve designed for the purpose of reducing the downstream water pressure to a specific value under both flowing (residual) and nonflowing (static) conditions.

**3.3.16\* Pressure-Reducing Valve.** A valve designed for the purpose of reducing the downstream water pressure under both flowing (residual) and nonflowing (static) conditions.

**3.3.17 Pressure-Regulating Device.** A device designed for the purpose of reducing, regulating, controlling, or restricting water pressure. Examples include pressure-reducing valves, pressure control valves, and pressure-restricting devices.

**3.3.18 Pressure-Restricting Device.** A valve or device designed for the purpose of reducing the downstream water pressure under flowing (residual) conditions only.

**3.3.19 Rated Capacity.** The flow available from a device, at the designated residual pressure either measured or calculated.

**3.3.20 Residual Pressure.** Pressure acting on a point in the system with a flow being delivered.

**3.3.21 Semiautomatic Standpipe System.** A standpipe system that is attached to a water supply capable of supplying the system demand at all times and that requires activation of a control device to provide water at hose connections.

**3.3.22 Standpipe.** The vertical portion of the system piping that delivers the water supply for hose connections, and sprinklers on combined systems, vertically from floor to floor. The term *standpipe* can also refer to the horizontal portion of the system piping that delivers the water supply for two or more hose connections, and sprinklers on combined systems, on a single level.

**3.3.23 Standpipe System.** An arrangement of piping, valves, hose connections, and allied equipment installed in a building or structure, with the hose connections located in such a manner that water can be discharged in streams or spray patterns through attached hose and nozzles, for the purpose of extinguishing a fire, thereby protecting a building or structure and its contents in addition to protecting the occupants. This is accomplished by means of connections to water supply systems or by means of pumps, tanks, and other equipment necessary to provide an adequate supply of water to the hose connections.

**3.3.24 Standpipe System Zone.** A vertical subdivision of a standpipe system by height.

**3.3.25 Static Pressure.** Pressure acting on a point in the system with no flow from the system.

**3.3.26 System Demand.** The flow rate and residual pressure required from a water supply, measured at the point of connection of a water supply to a standpipe system, to deliver the total waterflow rate and the minimum residual pressures required for a standpipe system at the hydraulically most remote

hose, and the minimum waterflow rate for sprinkler connections, on combined systems.

### 3.3.27 System Type.

**3.3.27.1 Class I System.** A Class I standpipe system provides 65-mm (2½-in.) hose connections to supply water for use by fire departments and those trained in handling heavy fire streams.

**3.3.27.2 Class II System.** A Class II standpipe system provides 38-mm (1½-in.) hose stations to supply water for use primarily by the building occupants or by the fire department during initial response.

**3.3.27.3 Class III System.** A Class III standpipe system provides 38-mm (1½-in.) hose stations to supply water for use by building occupants and 65-mm (2½-in.) hose connections to supply a larger volume of water for use by fire departments and those trained in handling heavy fire streams.

**3.3.28 Wet Standpipe.** A standpipe system having piping containing water at all times.

## Chapter 4 System Components and Hardware

### 4.1\* General.

**4.1.1** Standpipe system components and hardware shall be in accordance with this chapter.

**4.1.2** All devices and materials used in standpipe systems shall be of an approved type.

**4.1.3** System components shall be rated for working pressures not less than the maximum pressure to be developed at their corresponding locations within the system under any condition, including the pressure that occurs when a permanently installed fire pump is operating at shutoff pressure.

### 4.2 Pipe and Tube.

**4.2.1** Pipe or tube used in standpipe systems shall meet or exceed one of the standards in Table 4.2.1 or shall be in accordance with 4.2.2 through 4.2.6.

**4.2.2** Where ductile iron pipe is installed in accordance with Table 4.2.1, it shall be lined in accordance with AWWA C104, *Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water*.

**4.2.3** Where steel pipe specified in Table 4.2.1 is used and joined by welding as specified in Section 4.4 or by roll-grooved pipe and fittings as specified in Section 4.4, the minimum nominal wall thickness for pressures up to 20.7 bar (300 psi) shall be in accordance with Schedule 10 for pipe sizes up to 127 mm (5 in.), 3.40 mm (0.134 in.) for 150-mm (6-in.) pipe, and 4.78 mm (0.188 in.) for 203-mm and 254-mm (8-in. and 10-in.) pipe.

**4.2.3.1** Pressure limitations and wall thickness for steel pipe listed in accordance with 4.2.6 shall be in accordance with the listing requirements.

**4.2.4** Where steel pipe specified in Table 4.2.1 is joined by threaded fittings as specified in Section 4.4 or by fittings used with pipe having cut grooves, the minimum wall thickness shall be in accordance with Schedule 30 [sizes 203 mm (8 in.) and larger] or Schedule 40 [sizes less than 203 mm (8 in.)] pipe for pressures up to 20.7 bar (300 psi).

**4.2.4.1** Pressure limitations and wall thicknesses for steel pipe specially listed in accordance with 4.2.6 shall be in accordance with the listing requirements.

Table 4.2.1 Pipe or Tube Materials and Dimensions

Material and Dimensions (Specifications)	Standard
<b>Ferrous Piping</b>	
<i>Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids</i>	AWWA C151
<b>Electric-Resistance Welded Steel Pipe</b>	
<i>Standard Specification for Electric-Resistance-Welded Steel Pipe</i>	ASTM A 135
<b>Welded and Seamless Steel</b>	
<i>Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use</i>	ASTM A 795
<b>Welded and Seamless Steel Pipe</b>	
<i>Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless</i>	ASTM A 53
<i>Welded and Seamless Wrought Steel Pipe</i>	ANSI B36.10M
<b>Copper Tube (Drawn, Seamless)</b>	
<i>Standard Specification for Seamless Copper Tube</i>	ASTM B 75
<i>Standard Specification for Seamless Copper Water Tube</i>	ASTM B 88
<i>Standard Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube</i>	ASTM B 251
<b>Brazing Filler Metal (Classifications BCuP-3 or BCuP-4)</b>	
<i>Specification for Filler Metals for Brazing and Braze Welding</i>	AWS A5.8

**4.2.5** Copper tube as specified in the standards referenced in Table 4.2.1 shall have a wall thickness of Type K, L, or M where used in standpipe systems.

**4.2.6** Other types of pipe or tube investigated for use in standpipe installations and listed for this service, including, but not limited to, steel differing from that provided in Table 4.2.1, shall be permitted where installed in accordance with their listing limitations, including installation instructions.

**4.2.6.1** Pipe or tube shall not be listed for portions of an occupancy classification.

#### **4.2.7 Bending of Pipe and Tube.**

**4.2.7.1** Bending of Schedule 40 steel pipe and Types K and L copper tube shall be permitted where bends are made with no kinks, ripples, distortions, reductions in diameter, or any noticeable deviations from a round shape.

**4.2.7.2** The minimum radius of a bend shall be six pipe diameters for pipe sizes 50 mm (2 in.) and smaller, and five pipe diameters for pipe sizes 65 mm (2½ in.) and larger.

#### **4.3 Fittings.**

**4.3.1** Fittings used in standpipe systems shall meet or exceed the standards in Table 4.3.1 or shall be in accordance with 4.3.2.

Table 4.3.1 Fittings Materials and Dimensions

Materials and Dimensions	Standard
<b>Cast Iron</b>	
<i>Gray Iron Threaded Fittings</i>	ANSI B16.4
<i>Cast Iron Pipe Flanges and Flanged Fittings</i>	ANSI B16.1
<b>Malleable Iron</b>	
<i>Malleable Iron Threaded Fittings</i>	ANSI B16.3
<b>Ductile Iron</b>	
<i>Ductile-Iron Fittings and Gray-Iron Fittings, 3 in. Through 48 in. (75 mm Through 1200 mm) for Water and Other Liquids</i>	AWWA C110
<b>Steel</b>	
<i>Factory-Made Wrought Steel Buttwelding Fittings</i>	ANSI B16.9
<i>Buttwelding End</i>	ANSI B16.25
<i>Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures</i>	ASTM A 234
<i>Pipe Flanges and Flanged Fittings</i>	ANSI B16.5
<i>Forged Fittings, Socket-Welding and Threaded</i>	ANSI B16.11
<b>Copper</b>	
<i>Wrought Copper and Copper Alloy Solder Joint Pressure Fittings</i>	ANSI B16.22
<i>Cast Copper Alloy Solder Joint Pressure Fittings</i>	ANSI B16.18

**4.3.2** Other types of fittings investigated for suitability in standpipe installations and listed for this service, including, but not limited to, steel differing from that provided in Table 4.3.1, shall be permitted where installed in accordance with their listing limitations, including installation instructions.

**4.3.3** Fittings shall be extra-heavy pattern where pressures exceed 12.1 bar (175 psi).

**4.3.3.1** Standard weight pattern cast-iron fittings 50 mm (2 in.) in size and smaller shall be permitted where pressures do not exceed 20.7 bar (300 psi).

**4.3.3.2** Standard weight pattern malleable-iron fittings 150 mm (6 in.) in size and smaller shall be permitted where pressures do not exceed 20.7 bar (300 psi).

**4.3.3.3** Fittings shall be permitted for system pressures up to the limits specified in their listings.

**4.3.4** Screwed unions shall not be used on pipe larger than 50 mm (2 in.).

**4.3.4.1** Couplings and unions of other than the screwed type shall be of the types listed specifically for use in standpipe systems.

**4.3.5** A one-piece reducing fitting shall be used wherever a change is made in the size of the pipe.

**4.3.5.1** Hexagonal or face bushings shall be permitted for reducing the size of openings of fittings where standard fittings of the required size are not available.

**4.4 Joining of Pipe and Fittings.** Joining, hanging, and bracing of pipe and fittings shall be in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

#### **4.5 Valves.**

**4.5.1** All valves controlling connections to water supplies and standpipes shall be listed indicating valves.

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

**4.5.1.2** A listed water control valve assembly with a position indicator connected to a remote supervisory station shall be permitted.

**4.5.1.3** A nonindicating valve, such as an underground gate valve with approved roadway box complete with T-wrench, acceptable to the authority having jurisdiction, shall be permitted.

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

#### **4.6 Hose Stations.**

##### **4.6.1 Closets and Cabinets.**

**4.6.1.1** Closets and cabinets used to contain fire hose shall be of a size to allow the installation of the necessary equipment at hose stations and designed so they do not interfere with the prompt use of the hose connection, the hose, and other equipment at the time of fire.

**4.6.1.1.1** Within the cabinet, the hose connections shall be located so that there is at least 25.4 mm (1 in.) between any part of the cabinet and the handle of the valve when the valve is in any position ranging from fully open to fully closed.

**4.6.1.1.2** The cabinet shall be used for fire equipment only, and each cabinet shall be conspicuously identified.

**4.6.1.2** Where a “break glass”-type protective cover for a latching device is provided, the device provided to break the glass panel shall be attached securely in the immediate area of the break glass panel and shall be arranged so that the device cannot be used to break other glass panels in the cabinet door.

**4.6.1.3** Where a fire-resistive assembly is penetrated by a cabinet, the fire resistance of the assembly shall be maintained as required by the local building code.

##### **4.6.2 Hose.**

**4.6.2.1\*** Each hose connection provided for use by trained personnel (Class II and Class III systems) shall be equipped with not more than 30.5 m (100 ft) of listed, 40-mm (1½-in.), lined, collapsible or noncollapsible fire hose attached and ready for use.

**4.6.2.2** Where hose less than 40 mm (1½ in.) is used for 38-mm (1½-in.) hose stations in accordance with 5.3.2 and 5.3.3, listed noncollapsible hose shall be used.

##### **4.6.3 Hose Racks.**

**4.6.3.1** Each 40-mm (1½-in.) hose station provided with 40-mm (1½-in.) hose shall be equipped with a listed rack or other approved storage facility.

**4.6.3.2** Each 40-mm (1½-in.) hose station provided with hose less than 40 mm (1½ in.) in accordance with 5.3.2 and 5.3.3 shall be equipped with a listed continuous flow reel.

**4.6.4 Nozzles.** Nozzles provided for Class II service shall be listed.

**4.6.5\* Label.** Each rack or storage facility for 40-mm (1½-in.) or smaller hose shall be provided with a label that includes the wording “fire hose for use by trained personnel” and operating instructions.

#### **4.7 Hose Connections.**

**4.7.1** Hose valves shall be listed.

**4.7.2** Hose connections shall have external National Hose Standard (NHS) threads, for the valve size specified, in accordance with NFPA 1963, *Standard for Fire Hose Connections*.

**4.7.3** Hose connections shall be equipped with caps to protect the hose threads.

**4.7.4** Where local fire department hose threads do not conform to NFPA 1963, the authority having jurisdiction shall designate the hose threads that shall be used.

#### **4.8 Fire Department Connections.** (See Figure A.6.3.)

**4.8.1** Fire department connections shall be listed for a working pressure equal to or greater than the pressure requirement of the system demand.

**4.8.2** Each fire department connection shall have at least two 65-mm (2½-in.) internal threaded swivel fittings having NHS threads, as specified in NFPA 1963, *Standard for Fire Hose Connections*. (See Section 7.7 and 7.12 for design requirements.)

**4.8.2.1** Fire department connections shall be equipped with caps to protect the system from the entry of debris.

**4.8.2.2** Where the local fire department uses fittings that differ from those specified, fittings compatible with local fire department equipment shall be used and their minimum size shall be 65 mm (2½ in.).

**4.9 Pressure Regulating Devices.** Pressure regulating devices shall be listed.

**4.10 Signs.** Signs shall be permanently marked and shall be constructed of weather-resistant metal or rigid plastic materials.

## **Chapter 5 System Requirements**

### **5.1 General.**

**5.1.1** The number and arrangement of standpipe equipment necessary for proper protection is governed by local conditions such as the occupancy, character, and construction of the building and its accessibility.

**5.1.2** The authority having jurisdiction shall be consulted regarding the required type of system, class of system, and special requirements.

**5.1.3** The spacing and location of standpipes and hose connections shall be in accordance with Chapter 7.

**5.1.4** Standpipe and hose systems not required by the authority having jurisdiction and not meeting the requirements of this standard shall be marked with a sign that reads “FOR FIRE BRIGADE USE ONLY”.

### **5.2 Types of Standpipe Systems.**

**5.2.1 Automatic-Dry.** An automatic-dry standpipe system shall be a dry standpipe system, normally filled with pressurized air, that is arranged through the use of a device, such as a dry pipe valve, to admit water into the system piping automatically upon the opening of a hose valve.

**5.2.1.1** The water supply for an automatic-dry standpipe system shall be capable of supplying the system demand.

**5.2.2 Automatic-Wet.** An automatic-wet standpipe system shall be a wet standpipe system that has a water supply that is capable of supplying the system demand automatically.

**5.2.3 Semiautomatic-Dry.** A semiautomatic-dry standpipe system shall be a dry standpipe system that is arranged through the use of a device, such as a deluge valve, to admit water into the system piping upon activation of a remote control device located at a hose connection.

**5.2.3.1** A remote control activation device shall be provided at each hose connection.

**5.2.3.2** The water supply for a semiautomatic-dry standpipe system shall be capable of supplying the system demand.

**5.2.4 Manual-Dry.** A manual-dry standpipe system shall be a dry standpipe system that does not have a permanent water supply attached to the system.

**5.2.4.1** Manual-dry standpipe systems need water from a fire department pumper (or the like) to be pumped into the system through the fire department connection in order to supply the system demand.

**5.2.5 Manual-Wet.** A manual-wet standpipe system shall be a wet standpipe system connected to a small water supply for the purpose of maintaining water within the system or sharing a water supply with an automatic sprinkler system but not having a water supply capable of delivering the system demand attached to the system.

**5.2.5.1** Manual-wet standpipe systems need water from a fire department pumper (or the like) to be pumped into the system in order to supply the system demand.

### 5.3 Classes of Standpipe Systems.

**5.3.1 Class I Systems.** A Class I standpipe system shall provide 65-mm (2½-in.) hose connections to supply water for use by fire departments and those trained in handling heavy fire streams.

**5.3.2 Class II Systems.** A Class II standpipe system shall provide 40-mm (1½-in.) hose stations to supply water for use primarily by trained personnel or by the fire department during initial response.

**5.3.2.1** A minimum 25-mm (1-in.) hose shall be permitted to be used for hose stations in light hazard occupancies where investigated and listed for this service and where approved by the authority having jurisdiction.

**5.3.3 Class III Systems.** A Class III standpipe system shall provide 40-mm (1½-in.) hose stations to supply water for use by trained personnel and 65-mm (2½-in.) hose connections to supply a larger volume of water for use by fire departments and those trained in handling heavy fire streams.

**5.3.3.1** A minimum 25-mm (1-in.) hose shall be permitted to be used for hose stations in light hazard occupancies where investigated and listed for this service and where approved by the authority having jurisdiction.

**5.3.3.2** Where the building is protected throughout by an approved automatic sprinkler system, Class II hose stations for use by trained personnel shall not be required, subject to the approval of the authority having jurisdiction, provided that each Class I hose connection is 65 mm (2½ in.) and is equipped with a 65-mm × 40-mm (2½-in. × 1½-in.) reducer and a cap attached with a chain, the 39.7-m (130-ft) travel distance limitation shall not apply.

### 5.4\* Required Type of System.

#### 5.4.1 Class I Standpipe Systems.

**5.4.1.1** Class I standpipe systems in buildings not classified as high-rise buildings shall be permitted to be manual, automatic, or semiautomatic.

**5.4.1.2** Class I standpipe systems in buildings classified as high-rise buildings shall be automatic or semiautomatic.

**5.4.1.3** Where an existing standpipe system having standpipes with a minimum diameter of 100 mm (4 in.) is to be utilized to supply a new retrofit sprinkler system, the water supply required by Section 7.10 shall not be required to be provided by automatic or semiautomatic means, provided that the water supply is adequate to supply the hydraulic demand of the sprinkler system in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

**5.4.1.4** Class I standpipe systems shall be wet systems except where piping is subject to freezing.

**5.4.2** Where a manual standpipe system is provided, each hose connection shall be provided with a conspicuous sign that reads "MANUAL STANDPIPE FOR FIRE DEPARTMENT USE ONLY".

**5.4.3 Class II and Class III Standpipe System.** Class II and Class III standpipe systems shall be automatic-wet or semiautomatic-wet systems unless located in a facility where piping is subject to freezing and where a fire brigade is trained to operate the system without fire department intervention, in which case an automatic-dry or semiautomatic-dry system shall be permitted.

**5.5 Requirements for Semiautomatic Systems.** Circuits for remote control devices on semiautomatic standpipe systems shall be supervised in accordance with NFPA 72®, *National Fire Alarm Code*®.

### 5.6\* Gauges.

**5.6.1** A listed 90-mm (3½-in.) dial spring pressure gauge shall be connected to each discharge pipe from the fire pump and the public waterworks at the pressure tank, at each main drain connection at the air pump supplying the pressure tank, and at the top of each standpipe.

**5.6.1.1** Gauges shall be located in a place so that water cannot freeze.

**5.6.1.2** Each gauge shall be controlled by a valve having an arrangement for draining.

**5.6.1.3** Where several standpipes are interconnected at the top, a single gauge shall be permitted to be substituted for a gauge at the top of each standpipe.

**5.6.2** A valved outlet for a pressure gauge shall be installed on the upstream side of every pressure-regulating device.

### 5.7\* Waterflow and Supervisory Alarms.

**5.7.1** Where required by the authority having jurisdiction for automatic or semiautomatic systems, listed waterflow and supervisory alarms shall be provided.

**5.7.2** Waterflow alarms shall utilize a sensing mechanism appropriate to the type of standpipe.

**5.7.3** Paddle-type waterflow alarms shall be used on wet standpipe systems only.



**5.7.4** A test connection for testing the water flow device shall be provided.

**5.7.5** Alarm and supervisory devices shall be installed in accordance with *NFPA 72<sup>®</sup>, National Fire Alarm Code<sup>®</sup>*.

## Chapter 6 Installation Requirements

### 6.1\* Location and Protection of Piping.

**6.1.1 Location of Dry Standpipes.** Dry standpipes shall not be concealed unless the piping integrity is monitored with supervisory air pressure.

#### 6.1.2 Protection of Piping.

**6.1.2.1\*** Standpipe system piping shall be protected from mechanical damage.

**6.1.2.2** Standpipes and lateral piping supplied by standpipes shall be located in enclosed exit stairways or shall be protected by a degree of fire resistance equal to that required for enclosed exit stairways in the building in which they are located.

**6.1.2.2.1** In buildings equipped with an approved automatic sprinkler system, lateral piping to 65-mm (2½-in.) hose connections shall not be required to be protected.

**6.1.2.2.2** Piping connecting standpipes to 40-mm (1½-in.) hose connections shall not be required to be protected.

**6.1.2.3** Where a standpipe or lateral pipe that is normally filled with water passes through an area subject to freezing temperatures, it shall be protected to maintain the temperature of the water in the piping between 4.4°C and 48.9°C (40°F and 120°F).

**6.1.2.3.1** Antifreeze solutions shall not be used to protect standpipe system piping from freezing.

**6.1.2.4** Where corrosive conditions exist or piping is exposed to the weather, corrosion-resistant types of pipe, tube, fittings, and hangers or protective corrosion-resistive coatings shall be used.

**6.1.2.4.1** If steel pipe is to be buried underground, it shall be protected against corrosion before being buried.

**6.1.2.5** To minimize or prevent pipe breakage where subject to earthquakes, standpipe systems shall be protected in accordance with *NFPA 13, Standard for the Installation of Sprinkler Systems*.

**6.1.2.6** Piping for any standpipe system shall be permitted to be installed underground. Pipe shall not be run under buildings.

**6.1.2.6.1** When absolutely necessary to run pipe under buildings, special precautions shall be taken that include arching the foundation walls over the pipe, running pipe in covered trenches, and providing valves to isolate sections of pipe under buildings.

### 6.2 Gate Valves and Check Valves.

**6.2.1** Connections to each water supply shall be provided with an approved indicating-type valve and check valve located close to the supply, such as at tanks, pumps, and connections from waterworks systems. Fire department connections shall not be provided with isolation valves.

**6.2.2** Valves shall be provided to allow isolation of a standpipe without interrupting the supply to other standpipes from the same source of supply.

**6.2.3** Listed indicating-type valves shall be provided at the standpipe for controlling branch lines for remote hose stations.

**6.2.4** Where wafer-type valve discs are used, they shall be installed so that they do not interfere with the operation of other system components.

### 6.2.5 Valves on Combined Systems.

**6.2.5.1** Each connection from a standpipe that is part of a combined system to a sprinkler system shall have an individual control valve and check valve of the same size as the connection.

### 6.2.6 Valves on Connections to Water Supplies.

**6.2.6.1** Connections to public water systems shall be controlled by post-indicator valves of an approved type located at least 12.2 m (40 ft) from the building protected.

**6.2.6.1.1** All valves shall be plainly marked to indicate the service that they control.

**6.2.6.1.2** Where the valve cannot be located at least 12.2 m (40 ft) from the building, it shall be installed in an approved location and where it is readily accessible in case of fire and not subject to damage.

**6.2.6.1.3** Where post-indicator valves cannot be used, underground valves shall be permitted.

**6.2.6.1.3.1** The valve locations, directions for their opening, and services that they control shall be plainly marked on the buildings served.

**6.2.6.2\*** Where the standpipes are supplied from a yard main or header in another building, the connection shall be provided with a listed indicating-type valve located outside at a safe distance from the building or at the header.

**6.2.7 Valve Supervision.** System water supply valves, isolation control valves, and other valves in feed mains shall be supervised in an approved manner in the open position by one of the following methods:

- (1) A central station, proprietary, or remote station signaling service
- (2) A local signaling service that initiates an audible signal at a constantly attended location
- (3) Locking of valves in the open position
- (4) Sealing of valves and an approved weekly recorded inspection where valves are located within fenced enclosures under the control of the owner

**6.2.7.1** Underground gate valves with roadway boxes shall not be required to be supervised.

### 6.2.8 Signs and Room Identification for Valves.

**6.2.8.1** All main and sectional system control valves, including water supply control valves, shall have a sign indicating the portion of the system that is controlled by the valve.

**6.2.8.2** All control, drain, and test connection valves shall be provided with signs indicating their purpose.

**6.2.8.3** Where sprinkler system piping supplied by a combined system is supplied by more than one standpipe ("loop" or "dual feed" design), a sign shall be located at each dual or multiple feed connection to the combination system standpipe to indicate that in order to isolate the sprinkler system served by the control valve, an additional control valve or valves at other standpipes shall be shut off.

**6.2.8.3.1** The sign also shall identify the location of the additional control valves.

**6.2.8.4** Where a main or sectional system control valve is located in a closed room or concealed space, the location of the valve shall be indicated by a sign in an approved location on the outside of the door or near the opening to the concealed space.

### **6.3\* Fire Department Connections.**

**6.3.1** There shall be no shutoff valve between the fire department connection and the system.

**6.3.2** A listed check valve shall be installed in each fire department connection and located as near as practicable to the point where it joins the system.

**6.3.3** The fire department connection shall be installed as follows:

- (1) *Automatic-Wet and Manual-Wet Standpipe Systems.* On the system side of the system control valve, check valve, or any pump, but on the supply side of any isolating valves required in 6.2.2
- (2) *Automatic-Dry Standpipe Systems.* On the system side of the control valve and check valve and the supply side of the dry pipe valve
- (3) *Semiautomatic-Dry Standpipe Systems.* On the system side of the deluge valve
- (4) *Manual-Dry Standpipe Systems.* Directly connected to system piping

**6.3.4** In areas subject to freezing, a listed automatic drip valve that is arranged to allow drainage without causing water damage shall be installed in the piping between the check valve and the fire department connection.

### **6.3.5 Location and Identification.**

**6.3.5.1** Fire department connections shall be on the street side of buildings, fully visible and recognizable from the street or nearest point of fire department apparatus accessibility, and shall be located and arranged so that hose lines can be attached to the inlets without interference from nearby objects, including buildings, fences, posts, or other fire department connections.

**6.3.5.2** Each fire department connection shall be designated by a sign having raised letters, at least 25.4 mm (1 in.) in height, cast on a plate or fitting that reads "STANDPIPE".

**6.3.5.2.1** If automatic sprinklers are also supplied by the fire department connection, the sign or combination of signs shall indicate both designated services (e.g., "STANDPIPE AND AUTOSPKR," or "AUTOSPKR AND STANDPIPE").

**6.3.5.2.2** A sign also shall indicate the pressure required at the inlets to deliver the system demand.

**6.3.5.3** Where a fire department connection services only a portion of a building, a sign shall be attached indicating the portions of the building served.

**6.3.5.4\*** A fire department connection for each standpipe system shall be located not more than 30.5 m (100 ft) from the nearest fire hydrant connected to an approved water supply.

**6.3.5.4.1** The location of the fire department connection shall be permitted to exceed 30.5 m (100 ft) subject to the approval of the authority having jurisdiction.

**6.3.6** Fire department connections shall be located not less than 457 mm (18 in.) nor more than 1219 mm (48 in.) above the level of the adjoining ground, sidewalk, or grade surface.

**6.3.7** Fire department connection piping shall be supported in accordance with Section 6.4.

## **6.4 Support of Piping.**

### **6.4.1 Support of Standpipes.**

**6.4.1.1** Standpipes shall be supported by attachments connected directly to the standpipe.

**6.4.1.2** Standpipe supports shall be provided at the lowest level, at each alternate level above the lowest level, and at the top of the standpipe.

**6.4.1.2.1** Supports above the lowest level shall restrain the pipe to prevent movement by an upward thrust where flexible fittings are used.

**6.4.1.3** Clamps supporting pipe by means of set screws shall not be used.

### **6.4.2 Support of Horizontal Piping.**

**6.4.2.1** Horizontal piping from the standpipe to hose connections that are more than 457 mm (18 in.) in length shall be provided with hangers.

**6.4.2.2** Horizontal piping hangers shall be spaced at a maximum separation distance of 4.6 m (15 ft).

**6.4.2.2.1** The piping shall be restrained to prevent movement by horizontal thrust where flexible fittings are used.

**6.5 Installation of Signs.** Signs shall be secured to a device or the building wall with corrosion-resistant chains or fasteners.

**6.6 Signs for Water Supply Pumps.** Where a fire pump is provided, a sign shall be located in the vicinity of the pump indicating the minimum pressure and flow required at the pump discharge flange to meet the system demand.

### **6.7\* Hydraulic Design Information Sign.**

**6.7.1** The installing contractor shall provide a sign identifying the basis of the system design as either hydraulic calculations or pipe schedule.

**6.7.2** The sign shall be located at the water supply control valve for automatic or semiautomatic standpipe systems and at an approved location for manual systems.

**6.7.3** The sign shall indicate the following:

- (1) The location of the two hydraulically most remote hose connections
- (2) The design flow rate for the connections identified in 6.7.3(1)
- (3) The design residual inlet and outlet pressures for the connections identified in 6.7.3(1)
- (4) The design static pressure and the design system demand (i.e., flow and residual pressure) at the system control valve, or at the pump discharge flange where a pump is installed, and at each fire department connection

## **Chapter 7 Design**

**7.1\* General.** The design of the standpipe system is governed by building height, area per floor occupancy classification, egress system design, required flow rate and residual pressure, and the distance of the hose connection from the source(s) of the water supply.

**7.1.1\*** When pressure regulating devices are used, they shall be approved for installation within the maximum and minimum anticipated flow conditions.

**7.2\* Pressure Limitation.** The maximum pressure at any point in the system at any time shall not exceed 24.1 bar (350 psi).

### 7.2.1 Maximum Pressure for Hose Connections.

**7.2.1.1** Where the residual pressure at a 40-mm (1½-in.) outlet on a hose connection exceeds 6.9 bar (100 psi), an approved pressure-regulating device shall be provided to limit the residual pressure at the flow required by Section 7.10 to 6.9 bar (100 psi).

**7.2.1.2** Where the static pressure at a hose connection exceeds 12.1 bar (175 psi), an approved pressure-regulating device shall be provided to limit static and residual pressures at the outlet of the hose connection to 6.9 bar (100 psi) for 40-mm (1½-in.) hose connections and 12.1 bar (175 psi) for other hose connections. The pressure on the inlet side of the pressure-regulating device shall not exceed the device's rated working pressure.

### 7.3 Locations of Hose Connections.

**7.3.1\* General.** Hose connections and hose stations shall be unobstructed and shall be located not less than 0.9 m (3 ft) or more than 1.5 m (5 ft) above the floor.

**7.3.2\* Class I Systems.** Class I systems shall be provided with 65-mm (2½-in.) hose connections in the following locations:

- (1) At each intermediate landing between floor levels in every required exit stairway
- (2) On each side of the wall adjacent to the exit openings of horizontal exits
- (3) In other than covered mall buildings, in each exit passageway at the entrance from the building areas into the passageway
- (4) In covered mall buildings, at the entrance to each exit passageway or exit corridor, and at the interior side of public entrances from the exterior to the mall
- (5) At the highest landing of stairways with stairway access to a roof, and on the roof where stairways do not access the roof.

**7.3.2.1** Hose connections shall be permitted to be located at the main floor landings in exit stairways where approved by the authority having jurisdiction.

**7.3.2.2** An additional 65-mm (2½-in.) hose connection shall be provided at the hydraulically most remote portion of the system to facilitate testing.

**7.3.2.3\*** Where the most remote portion of a nonsprinklered floor or story is located in excess of 45.7 m (150 ft) of travel distance from a required exit containing or adjacent to a hose connection, or the most remote portion of a sprinklered floor or story is located in excess of 61 m (200 ft) of travel distance from a required exit containing or adjacent to a hose connection, additional hose connections shall be provided, in approved locations, where required by the local fire department or the authority having jurisdiction.

**7.3.3\* Class II Systems.** Class II systems shall be provided with 40-mm (1½-in.) hose stations so that all portions of each floor level of the building are within 39.7 m (130 ft) of a hose connection provided with 40-mm (1½-in.) hose or within 36.6 m (120 ft) of a hose connection provided with less than 40-mm (1½-in.) hose. Distances shall be measured along a path of travel originating at the hose connection.

**7.3.4 Class III Systems.** Class III systems shall be provided with hose connections as required for both Class I and Class II systems.

**7.3.4.1** Where the building is protected throughout by an approved automatic sprinkler system, Class II hose stations for use by trained personnel shall not be required, subject to the approval of the authority having jurisdiction, provided that each Class I hose connection is 65 mm (2½ in.) and is equipped with a 65-mm × 40-mm (2½-in. × 1½-in.) reducer and a cap attached with a chain.

**7.3.4.1.1** The 39.7-m (130-ft) travel distance limitation shall not apply.

**7.4 Number of Standpipes.** Separate standpipes shall be provided in each required exit stairway.

### 7.5\* Interconnection of Standpipes.

**7.5.1** Where two or more standpipes are installed in the same building or section of building, they shall be interconnected.

**7.5.2** Where standpipes are supplied by tanks located at the top of the building or zone, the standpipes also shall be interconnected at the top.

**7.5.2.1** In such cases, check valves shall be installed at the base of each standpipe to prevent circulation.

### 7.6 Minimum Sizes for Standpipes and Branchlines.

**7.6.1** Class I and Class III standpipes shall be at least 100 mm (4 in.) in size.

**7.6.2** Standpipes that are part of a combined system shall be at least 150 mm (6 in.) in size.

**7.6.3** In fully sprinklered buildings having a combined standpipe system that is hydraulically calculated, the minimum standpipe size shall be 100 mm (4 in.).

**7.6.4** Branch lines shall be sized based on the hydraulic criteria established in Section 7.8 and Section 7.10 but not less than 65 mm (2½ in.).

### 7.7\* System Design and Sizing of Pipe for Delivery of System Demand.

**7.7.1** Class I and Class III standpipe systems shall be designed so that the system demand can be supplied by each fire department connection.

**7.7.1.1** Fire department connections shall be provided in accordance with Section 7.13.

**7.7.2** Where an automatic or semiautomatic water supply is required for a Class I, II, or III standpipe system by Section 5.4, the standpipe system shall be designed so that the system demand can be independently supplied by the attached water supply, and each fire department connection provided on the system.

**7.7.3** Where a manual system is permitted by Section 5.4 and an attached water supply is provided to supply an automatic sprinkler system or to maintain water in a wet system, the attached water supply shall not be required to satisfy the standpipe system demand.

**7.7.4** Where a standpipe system is provided with a fire department connection, the authority having jurisdiction shall be consulted regarding the water supply available from a fire department pumper.



## 7.8\* Minimum and Maximum Pressure Limits.

### 7.8.1 Minimum Design Pressure for Hydraulically Designed Systems.

**7.8.1.1** Hydraulically designed standpipe systems shall be designed to provide the waterflow rate required by Section 7.10 at a minimum residual pressure of 100 psi (6.9 bar) at the outlet of the hydraulically most remote 65-mm (2½-in.) hose connection and 4.5 bar (65 psi) at the outlet of the hydraulically most remote 38-mm (1½-in.) hose station.

### 7.8.2 Minimum Design Pressure for Pipe Schedule Designed Systems.

**7.8.2.1** Pipe schedule designed standpipe systems shall have piping sized in accordance with the pipe schedule in Table 7.8.2.1 to provide the required waterflow rate at a minimum residual pressure of 6.9 bar (100 psi) at the topmost 65-mm (2½-in.) hose connection and 4.5 bar (65 psi) at the topmost 40-mm (1½-in.) hose station.

**Table 7.8.2.1 Pipe Schedule — Standpipes and Supply Piping Minimum Nominal Pipe Sizes in Inches**

Total Accumulated Flow		Total Distance of Piping from Farthest Outlet		
L/min	gpm	<15.2 m (<50 ft)	15.2–30.5 m (50–100 ft)	>30.5 m (>100 ft)
379	100	2	2½	3
382–1893	101–500	4	4	6
1896–2839	501–750	5	5	6
2843–4731	751–1250	6	6	6
4735	1251 and over	8	8	8

Note: For SI units, 3.785 L/min = 1 gpm; 0.3048 m = 1 ft.

**7.8.2.2** Pipe schedule designs shall be limited to wet standpipes for buildings that are not high-rise buildings.

### 7.8.3\* Maximum Pressure at Hose Connections.

**7.8.3.1** Where the residual pressure at a 40-mm (1½-in.) outlet on a hose connection available for trained personnel use exceeds 6.9 bar (100 psi), an approved pressure-regulating device shall be provided to limit the residual pressure at the flow required by Section 7.10 to 6.9 bar (100 psi).

**7.8.3.2\*** Where the static pressure at a hose connection exceeds 12.1 bar (175 psi), an approved pressure-regulating device shall be provided to limit static and residual pressures at the outlet of the hose connection to 6.9 bar (100 psi) for 40-mm (1½-in.) hose connections available for trained personnel use and 12.1 bar (175 psi) for other hose connections.

**7.8.3.3** The pressure on the inlet side of the pressure-regulating device shall not exceed the device's rated working pressure.

## 7.9 Standpipe System Zones.

**7.9.1** Each zone requiring pumps shall be provided with a separate pump.

**7.9.1.1** This shall not preclude the use of pumps arranged in series.

**7.9.2** Where pumps supplying two or more zones are located at the same level, each zone shall have separate and direct supply piping of a size not smaller than the standpipe that it serves.

**7.9.2.1** Zones with two or more standpipes shall have at least two direct supply pipes of a size not smaller than the largest standpipe that they serve.

**7.9.3** Where the supply for each zone is pumped from the next lower zone, and the standpipe or standpipes in the lower zone are used to supply the higher zone, such standpipes shall comply with the provisions for supply lines in 7.9.2.

**7.9.3.1** At least two lines shall be provided between zones.

**7.9.3.1.1** One of these lines shall be arranged so that the supply can be automatically delivered from the lower to the higher zone.

**7.9.4** For systems with two or more zones in which portions of the second and higher zones cannot be supplied using the residual pressure required by Section 7.8 by means of fire department pumpers through a fire department connection, an auxiliary means of supply shall be provided.

**7.9.4.1** This means shall be in the form of high-level water storage with additional pumping equipment or other means acceptable to the authority having jurisdiction.

## 7.10 Flow Rates.

### 7.10.1 Class I and Class III Systems.

#### 7.10.1.1\* Minimum Flow Rate.

**7.10.1.1.1** For Class I and Class III systems, the minimum flow rate for the hydraulically most remote standpipe shall be 1893 L/min (500 gpm), and the calculation procedure shall be in accordance with 7.10.1.2.

**7.10.1.1.2\*** Where a horizontal standpipe on a Class I and Class III system supplies three or more hose connections on any floor, the minimum flow rate for the hydraulically most demanding horizontal standpipe shall be 2840 L/min (750 gpm), and the calculation procedure shall be in accordance with 7.10.1.2.

**7.10.1.1.3** The minimum flow rate for additional standpipes shall be 946 L/min (250 gpm) per standpipe, with the total not to exceed 4731 L/min (1250 gpm) or 3785 L/min (1000 gpm) for buildings sprinklered throughout.

**7.10.1.1.4** Flow rates for combined systems shall be in accordance with 7.10.1.3.

**7.10.1.1.4.1** When the floor area exceeds 7432 m<sup>2</sup> (80,000 ft<sup>2</sup>), the second most remote standpipe shall be designed to accommodate 1893 L/min (500 gpm).

#### 7.10.1.2\* Hydraulic Calculation Procedure.

**7.10.1.2.1** Hydraulic calculations and pipe sizes for each standpipe shall be based on providing 946 L/min (250 gpm) at the two hydraulically most remote hose connections on the standpipe and at the topmost outlet of each of the other standpipes at the minimum residual pressure required by Section 7.8.

**7.10.1.2.2** Where a horizontal standpipe on a Class I and Class III system supplies three or more hose connections on any floor, hydraulic calculations and pipe sizes for each standpipe shall be based on providing 946 L/min (250 gpm) at the three hydraulically most remote hose connections on the standpipe and at the topmost outlet of each of the other standpipes at the minimum residual pressure required by Section 7.8.

**7.10.1.2.3** Common supply piping shall be calculated and sized to provide the required flow rate for all standpipes connected to such supply piping, with the total not to exceed 4731 L/min (1250 gpm).

#### **7.10.1.3 Combined Systems.**

**7.10.1.3.1\*** For a building protected throughout by an approved automatic sprinkler system, the system demand established by Section 7.7 and 7.10.1 also shall be permitted to serve the sprinkler system.

**7.10.1.3.1.1** Where the sprinkler system water supply requirement, including the hose stream allowance as determined in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, exceeds the system demand established by Section 7.7 and 7.10.1, the larger of the two values shall be provided.

**7.10.1.3.1.2** A separate sprinkler demand shall not be required.

**7.10.1.3.2** For a combined system in a building equipped with partial automatic sprinkler protection, the flow rate required by 7.10.1 shall be increased by an amount equal to the hydraulically calculated sprinkler demand or 568 L/min (150 gpm) for light hazard occupancies, or by 1893 L/min (500 gpm) for ordinary hazard occupancies, whichever is less.

#### **7.10.2 Class II Systems.**

##### **7.10.2.1 Minimum Flow Rate.**

**7.10.2.1.1** For Class II systems, the minimum flow rate for the hydraulically most remote hose connection shall be 379 L/min (100 gpm).

**7.10.2.1.2** Additional flow shall not be required where more than one hose connection is provided.

##### **7.10.2.2 Hydraulic Calculation Procedure.**

**7.10.2.2.1** Hydraulic calculations and pipe sizes for each standpipe shall be based on providing 379 L/min (100 gpm) at the hydraulically most remote hose connection on the standpipe at the minimum residual pressure required by Section 7.8.

**7.10.2.2.2** Common supply piping serving multiple standpipes shall be calculated and sized to provide 379 L/min (100 gpm).

#### **7.10.3 Maximum Flow Rates for Individual Connections.**

**7.10.3.1** The maximum flow required from a 65-mm (2½-in.) hose connection shall be 946 L/min (250 gpm).

**7.10.3.2** The maximum flow required from a 40-mm (1½-in.) hose connection shall be 379 L/min (100 gpm).

#### **7.11 Equivalent Pipe Lengths of Valves and Fittings for Hydraulically Designed Systems.**

##### **7.11.1 General.**

**7.11.1.1** Table 7.11.1.1 shall be used to determine the equivalent length of pipe for fittings and devices unless the

manufacturer's test data indicate that other factors are more accurate.

**7.11.1.2** For saddle-type fittings having friction loss greater than that shown in Table 7.11.1.1, the increased friction loss shall be included in the hydraulic calculations.

##### **7.11.2 Adjustments.**

**7.11.2.1** Table 7.11.1.1 shall be used only where the Hazen-Williams *C* factor is 120.

**7.11.2.2** For other values of *C*, the values in Table 7.11.1.1 shall be multiplied by the factors indicated in Table 7.11.2.2.

**7.11.2.3** Table 7.11.2.3 indicates typical *C* factors that shall be used for commonly used piping materials.

**7.11.2.4** The authority having jurisdiction shall be permitted to require other *C* values.

#### **7.12\* Drains and Test Riser.**

**7.12.1** A permanently installed 76-mm (3-in.) drain riser shall be provided adjacent to each standpipe equipped with pressure-regulating devices to facilitate tests of each device.

**7.12.1.1** The riser shall be equipped with a 76-mm × 65-mm (3-in. × 2½-in.) tee with an internal threaded swivel fitting having NHS threads, as specified in NFPA 1963, *Standard for Fire Hose Connections*, with a plug, and shall be located on at least every other floor.

**7.12.1.2** Where local fire department hose threads do not conform to NFPA 1963, the authority having jurisdiction shall designate the hose threads to be used.

**7.12.2** Each standpipe shall be provided with a means of draining.

**7.12.2.1** A drain valve and piping, located at the lowest point of the standpipe piping downstream of the isolation valve, shall be arranged to discharge water at an approved location.

**7.12.2.2** Sizing shall be as specified in Table 7.12.2.2.

**7.12.3 Main Drain Test Connections.** See Figure 7.12.3.

**7.12.3.1** Main drain test connections shall be provided at locations that will permit flow tests of water supply connections.

**7.12.3.2** Main drain test connections shall be so installed that the valve can be opened wide without causing water damage.

**7.12.3.3** Main drain connections shall be sized in accordance with 7.12.2.

#### **7.13\* Fire Department Connections.**

**7.13.1** One or more fire department connections shall be provided for each zone of each Class I or Class III standpipe system.

**7.13.1.1** The high zone fire department connection(s) shall not be required to be provided where 7.9.4 applies.

**7.13.2** High-rise buildings shall have at least two remotely located fire department connections for each zone.

**7.13.2.1** A single connection for each zone shall be permitted where acceptable to the fire department.

**Table 7.11.1.1 Equivalent Pipe Length Chart**

Fittings and Valves	Fittings and Valves Expressed in Equivalent Feet of Pipe													
	¾ in.	1 in.	1¼ in.	1½ in.	2 in.	2½ in.	3 in.	3½ in.	4 in.	5 in.	6 in.	8 in.	10 in.	12 in.
45-degree elbow	1	1	1	2	2	3	3	3	4	5	7	9	11	13
90-degree standard elbow	2	2	3	4	5	6	7	8	10	12	14	18	22	27
90-degree long-turn elbow	1	2	2	2	3	4	5	5	6	8	9	13	16	18
Tee or cross (flow turned 90 degrees)	3	5	6	8	10	12	15	17	20	25	30	35	50	60
Butterfly valve	—	—	—	—	6	7	10	—	12	9	10	12	19	21
Gate valve	—	—	—	—	1	1	1	1	2	2	3	4	5	6
Swing check*	—	5	7	9	11	14	16	19	22	27	32	45	55	65
Globe valve	—	—	—	46	—	70	—	—	—	—	—	—	—	—
Angle valve	—	—	—	20	—	31	—	—	—	—	—	—	—	—

Note: For SI units, 1 in. = 25.4 mm.

\* Due to the variations in design of swing check valves, the pipe equivalents indicated in this table are considered to be average.

**Table 7.11.2.2 Adjustment Factors for C Values**

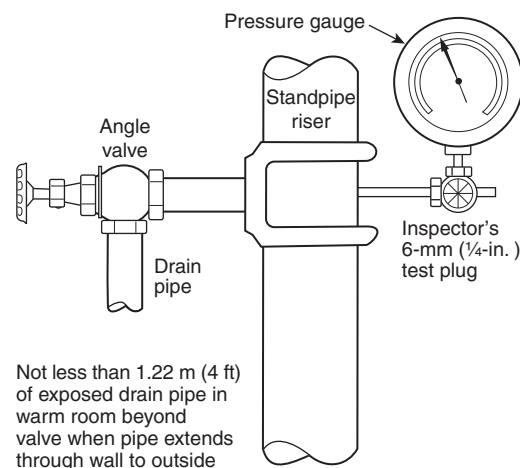
Value of C	100	130	140	150
Multiplying factor	0.713	1.16	1.33	1.51

**Table 7.11.2.3 Hazen-Williams C Values**

Pipe or Tube	C Value
Unlined cast or ductile iron	100
Black steel (dry systems, including preaction)	100
Black steel (wet systems, including deluge)	120
Galvanized (all)	120
Plastic (listed — all)	150
Cement-lined cast or ductile iron	140
Copper tube or stainless steel	150

**Table 7.12.2.2 Sizing for Standpipe Drains**

Standpipe Size	Size of Drain Connection
Up to 2 in.	¾ in. or larger
2½ in., 3 in., or 3½ in.	1¼ in. or larger
4 in. or larger	2 in. only

**FIGURE 7.12.3 Drain Connection for System Riser.**

## Chapter 8 Plans and Calculations

### 8.1\* Plans and Specifications.

**8.1.1** Plans accurately showing the details and arrangement of the standpipe system shall be furnished to the authority having jurisdiction prior to the installation of the system.

**8.1.2** Such plans shall be clear, legible, and drawn to scale.

**8.1.3** The drawings shall show the location, arrangement, water supply, equipment, and all other details necessary to establish compliance with this standard.

**8.1.4** The plans shall include specifications covering the character of materials used and shall describe all system components.

**8.1.5** The plans shall include an elevation diagram.

**8.2 Hydraulic Calculations.** Where standpipe system piping is sized by hydraulic calculations, a complete set of calculations shall be submitted with the plans.

## Chapter 9 Water Supplies

### 9.1\* Required Water Supply.

**9.1.1** Automatic and semiautomatic standpipe systems shall be attached to an approved water supply capable of supplying the system demand.

**9.1.2** Manual standpipe systems shall have an approved water supply accessible to a fire department pumper.

**9.1.3** A single automatic or semiautomatic water supply shall be permitted where it is capable of supplying the system demand for the required duration. Where a secondary water supply is required by 7.9.4, a single water supply shall not be permitted.

**9.1.4** Water supplies from the following sources shall be permitted:

- (1) A public waterworks system where pressure and flow rate are adequate
- (2) Automatic fire pumps connected to an approved water source in accordance with NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*
- (3) Manually controlled fire pumps in combination with pressure tanks
- (4) Pressure tanks installed in accordance with NFPA 22, *Standard for Water Tanks for Private Fire Protection*
- (5) Manually controlled fire pumps operated by remote control devices at each hose station
- (6) Gravity tanks installed in accordance with NFPA 22, *Standard for Water Tanks for Private Fire Protection*

**9.2 Minimum Supply for Class I and Class III Systems.** The water supply shall be capable of providing the system demand established by Section 7.8 and Section 7.10 for at least 30 minutes.

**9.3 Minimum Supply for Class II Systems.** The minimum supply for Class II systems shall be capable of providing the system demand established by Section 7.8 and Section 7.10 for at least 30 minutes.

## Chapter 10 Water Supply Testing

**10.1\* Introduction.** A waterflow test shall be conducted on the water distribution system to determine the rate of flow and pressures available for system design and for fire-fighting purposes.

### 10.2 Procedure.

**10.2.1** Tests shall be conducted during a period of expected normal demand.

**10.2.2** The procedure shall consist of discharging water at a measured rate of flow from the system at a given location and observing the corresponding pressure drop in the mains.

**10.2.3** Tests for the purpose of system design shall not be conducted more than 9 months prior to the commencement of the system installation.

## Chapter 11 System Acceptance

### 11.1\* General.

**11.1.1** All new systems shall be tested prior to the occupancy of the building.

**11.1.2** Existing standpipe systems that are to be utilized as standpipes for a combination system in the retrofit of a new sprinkler system shall be tested in accordance with Section 11.4.

**11.1.3** The installing contractor shall complete and sign the appropriate contractor's material and test certificate(s). [See Figure 11.1.3(a) and Figure 11.1.3(b).]

### 11.2 Flushing of Piping.

**11.2.1** Underground piping supplying the system shall be flushed in accordance with NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*.

**11.2.2** Piping between the fire department connection and the check valve in the inlet pipe shall be flushed with a sufficient volume of water in order to remove any construction debris and trash accumulated in the piping prior to the completion of the system and prior to the installation of the fire department connection.

### 11.3 Hose Threads.

**11.3.1** All hose connection and fire department connection threads shall be tested to verify their compatibility with threads used by the local fire department.

**11.3.2** The test shall consist of threading coupling samples, caps, or plugs onto the installed devices.

### 11.4 Hydrostatic Tests.

**11.4.1\* General.** All new systems, including yard piping and fire department connections, shall be tested hydrostatically at not less than 13.8 bar (200 psi) of pressure for 2 hours, or at 3.5 bar (50 psi) in excess of the maximum pressure where the maximum pressure is in excess of 10.3 bar (150 psi).

**11.4.2** The hydrostatic test pressure shall be measured at the low elevation point of the individual system or zone being tested.

**11.4.3** The inside standpipe system piping shall show no leakage.

**11.4.4** Underground pipe shall be tested in accordance with NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*.

**11.4.5** Where cold weather prevents testing with water, an interim air test shall be permitted to be conducted prior to the standard hydrostatic test.

**11.4.5.1** An air pressure leakage test at 2.8 bar (40 psi) shall be conducted for 24 hours.

**11.4.5.2** Any leakage that results in a loss of pressure in excess of 0.1 bar (1½ psi) during a continuous 24-hour period shall be corrected.

**11.4.6 Fire Department Connection.** Piping between the fire department connection and the check valve in the inlet pipe shall be tested hydrostatically in the same manner as the balance of the system.

**11.4.7 Existing Systems.** Where an existing standpipe system, including yard piping and fire department connection, is modified, the new piping shall be tested in accordance with 11.4.1.

**11.4.8 Protection from Freezing.** During testing, care shall be taken to ensure that no portion of the piping is subject to freezing during cold weather.

<b>Contractor's Material and Test Certificate for Aboveground Piping</b> <b>Standpipe System NFPA 14</b>	
<b>PROCEDURE</b> Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.  A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.	
PROPERTY NAME	DATE
PROPERTY ADDRESS	
PLANS	ACCEPTED BY APPROVING AUTHORITIES (NAMES)
	ADDRESS
	INSTALLATION CONFORMS TO ACCEPTED PLANS <input type="checkbox"/> YES <input type="checkbox"/> NO EQUIPMENT USED IS APPROVED OR LISTED <input type="checkbox"/> YES <input type="checkbox"/> NO IF NO, EXPLAIN DEVIATIONS
TYPE OF SYSTEM	AUTOMATIC-DRY <input type="checkbox"/> YES AUTOMATIC-WET <input type="checkbox"/> YES SEMIAUTOMATIC-DRY <input type="checkbox"/> YES MANUAL-DRY <input type="checkbox"/> YES MANUAL-WET <input type="checkbox"/> YES COMBINATION STANDPIPE/SPRINKLER <input type="checkbox"/> YES OTHER, IF YES EXPLAIN <input type="checkbox"/> YES
WATER SUPPLY DATA USED FOR DESIGN AND AS SHOWN ON PLANS	FIRE PUMP DATA MANUFACTURER _____ MODEL _____ TYPE: <input type="checkbox"/> ELECTRIC <input type="checkbox"/> DIESEL <input type="checkbox"/> OTHER, EXPLAIN _____ RATED GPM _____ RATED PSI _____ SHUT-OFF PSI _____
WATER SUPPLY SOURCE CAPACITY, GALLONS	PUBLIC WATERWORKS SYSTEM <input type="checkbox"/> STORAGE TANK <input type="checkbox"/> GRAVITY TANK <input type="checkbox"/> OPEN RESERVOIR <input type="checkbox"/> OTHER <input type="checkbox"/> EXPLAIN
IF PUBLIC WATERWORKS SYSTEM:	STATIC PSI _____ RESIDUAL PSI _____ GPM _____ FLOW IN _____
HAVE COPIES OF THE FOLLOWING BEEN LEFT ON THE PREMISES?	<input type="checkbox"/> SYSTEM COMPONENTS INSTRUCTIONS <input type="checkbox"/> CARE AND MAINTENANCE OF SYSTEM <input type="checkbox"/> NFPA 25 <input type="checkbox"/> COPY OF ACCEPTED PLANS <input type="checkbox"/> HYDRAULIC DATA/CALCULATIONS
SUPPLIES BUILDING(S)	MAIN WATERFLOW SHUT-OFF LOCATION _____ NUMBER OF STANDPIPE RISERS _____ DO ALL STANDPIPE RISERS HAVE BASE OF RISER SHUT-OFF VALVES? <input type="checkbox"/> YES <input type="checkbox"/> NO
VALVE SUPERVISION	LOCKED OPEN <input type="checkbox"/> SEALED AND TAGGED <input type="checkbox"/> TAMPERPROOF SWITCH <input type="checkbox"/> OTHER <input type="checkbox"/> IF OTHER, EXPLAIN _____
PIPE AND FITTINGS	TYPE OF PIPE _____ TYPE OF FITTINGS _____
BACKFLOW PREVENTOR	A) DOUBLE CHECK ASSEMBLY <input type="checkbox"/> SIZE _____ MAKE AND MODEL _____ B) REDUCED-PRESSURE DEVICE <input type="checkbox"/>

(NFPA 14, 1 of 3)

FIGURE 11.1.3(a) Sample Contractor's Material and Test Certificate for Aboveground Piping.

<b>CONTROL VALVE DEVICE</b>						
TYPE	SIZE	MAKE	MODEL			
TIME TO TRIP THROUGH REMOTE HOSE VALVE _____ MIN _____ SEC    WATER PRESSURE _____ AIR PRESSURE _____ TIME WATER REACHED REMOTE HOSE VALVE OUTLET _____ MIN _____ SEC    TRIP POINT AIR PRESSURE _____ PSI ALARM OPERATED PROPERLY <input type="checkbox"/> YES <input type="checkbox"/> NO    IF NO, EXPLAIN _____						
TIME WATER REACHED REMOTE HOSE VALVE OUTLET _____ MIN _____ SEC HYDRAULIC ACTIVATION <input type="checkbox"/> YES ELECTRIC ACTIVATION <input type="checkbox"/> YES PNEUMATIC ACTIVATION <input type="checkbox"/> YES MAKE AND MODEL OF ACTIVATION DEVICE _____ EACH ACTIVATION DEVICE TESTED <input type="checkbox"/> YES <input type="checkbox"/> NO    IF NO, EXPLAIN _____						
EACH ACTIVATION DEVICE OPERATED PROPERLY <input type="checkbox"/> YES <input type="checkbox"/> NO    IF NO, EXPLAIN _____						
<b>PRESSURE-REGULATING DEVICE</b>						
LOCATION & FLOOR	MODEL	NONFLOWING (PSI)		FLOWING (PSI)		GPM
		INLET	OUTLET	INLET	OUTLET	
ALL HOSE VALVES ON SYSTEM OPERATED PROPERLY <input type="checkbox"/> YES <input type="checkbox"/> NO    IF NO, EXPLAIN _____						

(NFPA 14, 2 of 3)

**FIGURE 11.1.3(a)** *Continued*



TEST DESCRIPTION	<p>HYDROSTATIC: HYDROSTATIC TESTS SHALL BE MADE AT NOT LESS THAN 200 PSI (13.6 BAR) FOR 2 HOURS OR 50 PSI (3.4 BAR) ABOVE STATIC PRESSURE IN EXCESS OF 150 PSI (10.2 BAR) FOR 2 HOURS. DIFFERENTIAL DRY PIPE VALVE CLAPPERS SHALL BE LEFT OPEN DURING TEST TO PREVENT DAMAGE. ALL ABOVEGROUND PIPING LEAKAGE SHALL BE STOPPED.</p> <p>PNEUMATIC: ESTABLISH 40 PSI (2.7 BAR) AIR PRESSURE AND MEASURE DROP, WHICH SHALL NOT EXCEED 1½ PSI (0.1 BAR) IN 24 HOURS. TEST PRESSURE TANKS AT NORMAL WATER LEVEL AND AIR PRESSURE AND MEASURE AIR PRESSURE DROP, WHICH SHALL NOT EXCEED 1½ PSI (0.1 BAR) IN 24 HOURS.</p>		
TESTS	ALL PIPING HYDROSTATICALLY TESTED AT _____ PSI FOR _____ HRS DRY PIPING PNEUMATICALLY TESTED <input type="checkbox"/> YES <input type="checkbox"/> NO EQUIPMENT OPERATES PROPERLY <input type="checkbox"/> YES <input type="checkbox"/> NO		IF NO, STATE REASON
	DO YOU CERTIFY AS THE STANDPIPE CONTRACTOR THAT ADDITIVES AND CORROSIVE CHEMICALS, SODIUM SILICATE, OR DERIVATIVES OF SODIUM SILICATE, BRINE, OR OTHER CORROSIVE CHEMICALS WERE NOT USED FOR TESTING SYSTEMS OR STOPPING LEAKS? <input type="checkbox"/> YES <input type="checkbox"/> NO		
	DRAIN TEST	READING OF GAUGE LOCATED NEAR WATER SUPPLY TEST CONNECTION _____ PSI	RESIDUAL PRESSURE WITH VALVE IN TEST CONNECTION OPEN WIDE _____ PSI
	UNDERGROUND MAINS AND LEAD-IN CONNECTIONS TO SYSTEM RISERS FLUSHED BEFORE CONNECTION MADE TO STANDPIPE PIPING. VERIFIED BY COPY OF THE U FORM NO. 85B <input type="checkbox"/> YES <input type="checkbox"/> NO OTHER EXPLAIN FLUSHED BY INSTALLER OF UNDERGROUND STANDPIPE PIPING <input type="checkbox"/> YES <input type="checkbox"/> NO		
BLANK TESTING	NUMBER USED	LOCATIONS	NUMBER REMOVED
WELDING	WELDED PIPING <input type="checkbox"/> YES <input type="checkbox"/> NO		
	IF YES ...		
	DO YOU CERTIFY AS THE STANDPIPE CONTRACTOR THAT WELDING PROCEDURES COMPLY WITH THE REQUIREMENTS OF AT LEAST AWS D10.9, LEVEL AR-3? <input type="checkbox"/> YES <input type="checkbox"/> NO DO YOU CERTIFY THAT THE WELDING WAS PERFORMED BY WELDERS QUALIFIED IN COMPLIANCE WITH THE REQUIREMENTS OF AT LEAST AWS D10.9, LEVEL AR-3? <input type="checkbox"/> YES <input type="checkbox"/> NO DO YOU CERTIFY THAT WELDING WAS CARRIED OUT IN COMPLIANCE WITH A DOCUMENTED QUALITY CONTROL PROCEDURE TO ENSURE THAT ALL DISCS ARE RETRIEVED, THAT OPENINGS IN PIPING ARE SMOOTH, THAT SLAG AND OTHER WELDING RESIDUE ARE REMOVED, AND THAT THE INTERNAL DIAMETERS OF PIPING ARE NOT PENETRATED? <input type="checkbox"/> YES <input type="checkbox"/> NO		
CUTOUTS (DISCS)	DO YOU CERTIFY THAT YOU HAVE A CONTROL FEATURE TO ENSURE THAT ALL CUTOUTS (DISCS) ARE RETRIEVED? <input type="checkbox"/> YES <input type="checkbox"/> NO		
HYDRAULIC DATA NAMEPLATE	NAMEPLATE PROVIDED <input type="checkbox"/> YES <input type="checkbox"/> NO IF NO, EXPLAIN		
REMARKS	DATE LEFT IN SERVICE WITH ALL CONTROL VALVES OPEN:		
NAME OF SPRINKLER/STANDPIPE CONTRACTOR	NAME OF CONTRACTOR _____ ADDRESS _____ STATE LICENSE NUMBER (IF APPLICABLE) _____		
SYSTEM OPERATING TEST WITNESSED BY	PROPERTY OWNER _____ TITLE _____ DATE _____ SPRINKLER/STANDPIPE CONTRACTOR _____ TITLE _____ DATE _____ APPROVING AUTHORITIES _____ TITLE _____ DATE _____		
ADDITIONAL EXPLANATION AND NOTES			

(NFPA 14, 3 of 3)

FIGURE 11.1.3(a) Continued



Contractor's Material and Test Certificate for <b>U</b> nderground Piping			
<b>PROCEDURE</b> Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job. A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.			
PROPERTY NAME			DATE
PROPERTY ADDRESS			
PLANS	ACCEPTED BY APPROVING AUTHORITIES (NAMES)		
	ADDRESS		
	INSTALLATION CONFORMS TO ACCEPTED PLANS		<input type="checkbox"/> YES <input type="checkbox"/> NO
	EQUIPMENT USED IS APPROVED IF NO, STATE DEVIATIONS		<input type="checkbox"/> YES <input type="checkbox"/> NO
INSTRUCTIONS	HAS PERSON IN CHARGE OF FIRE EQUIPMENT BEEN INSTRUCTED AS TO LOCATION OF CONTROL VALVES AND CARE AND MAINTENANCE OF THIS NEW EQUIPMENT? IF NO, EXPLAIN		<input type="checkbox"/> YES <input type="checkbox"/> NO
	HAVE COPIES OF APPROPRIATE INSTRUCTIONS AND CARE AND MAINTENANCE CHARTS BEEN LEFT ON PREMISES? IF NO, EXPLAIN		<input type="checkbox"/> YES <input type="checkbox"/> NO
LOCATION	SUPPLIES BUILDINGS		
UNDERGROUND PIPES AND JOINTS	PIPE TYPES AND CLASS		TYPE JOINT
	PIPE CONFORMS TO _____ STANDARD		<input type="checkbox"/> YES <input type="checkbox"/> NO
	FITTINGS CONFORM TO _____ STANDARD IF NO, EXPLAIN		<input type="checkbox"/> YES <input type="checkbox"/> NO
	JOINTS NEEDING ANCHORAGE CLAMPED, STRAPPED, OR BLOCKED IN ACCORDANCE WITH _____ STANDARD IF NO, EXPLAIN		<input type="checkbox"/> YES <input type="checkbox"/> NO
TEST DESCRIPTION	<p><b>FLUSHING:</b> Flow the required rate until water is clear as indicated by no collection of foreign material in burlap bags at outlets such as hydrants and blow-offs. Flush at flows not less than 390 gpm (1476 L/min) for 4-in. pipe, 880 gpm (3331 L/min) for 6-in. pipe, 1560 gpm (5905 L/min) for 8-in. pipe, 2440 gpm (9235 L/min) for 10-in. pipe, and 3520 gpm (13,323 L/min) for 12-in. pipe. When supply cannot produce stipulated flow rates, obtain maximum available.</p> <p><b>HYDROSTATIC:</b> Hydrostatic tests shall be made at not less than 200 psi (13.8 bar) for 2 hours or 50 psi (3.4 bar) above static pressure in excess of 150 psi (10.3 bar) for 2 hours.</p> <p><b>LEAKAGE:</b> New pipe laid with rubber gasketed joints shall, if the workmanship is satisfactory, have little or no leakage at the joints. The amount of leakage at the joints shall not exceed 2 qt/hr (1.89 L/hr) per 100 joints irrespective of pipe diameter. The leakage shall be distributed over all joints. If such leakage occurs at a few joints the installation shall be considered unsatisfactory and necessary repairs made. The amount of allowable leakage specified above can be increased by 1 fl oz per in. valve diameter per hr (30 mL/25 mm/hr) for each metal seated valve isolating the test section. If dry barrel hydrants are tested with the main valve open, so the hydrants are under pressure, an additional 5 oz/min (150 mL/min) leakage is permitted for each hydrant.</p>		
FLUSHING TESTS	NEW UNDERGROUND PIPING FLUSHED ACCORDING TO _____ STANDARD BY (COMPANY) IF NO, EXPLAIN		<input type="checkbox"/> YES <input type="checkbox"/> NO
	HOW FLUSHING FLOW WAS OBTAINED <input type="checkbox"/> PUBLIC WATER <input type="checkbox"/> TANK OR RESERVOIR <input type="checkbox"/> FIRE PUMP		THROUGH WHAT TYPE OPENING <input type="checkbox"/> HYDRANT BUTT <input type="checkbox"/> OPEN PIPE
	LEAD-INS FLUSHED ACCORDING TO _____ STANDARD BY (COMPANY) IF NO, EXPLAIN		<input type="checkbox"/> YES <input type="checkbox"/> NO
	HOW FLUSHING FLOW WAS OBTAINED <input type="checkbox"/> PUBLIC WATER <input type="checkbox"/> TANK OR RESERVOIR <input type="checkbox"/> FIRE PUMP		THROUGH WHAT TYPE OPENING <input type="checkbox"/> Y CONN. TO FLANGE <input type="checkbox"/> OPEN PIPE & SPIGOT

(NFPA 14, 1 of 2)

**FIGURE 11.1.3(b) Sample Contractor's Material and Test Certificate for Underground Piping.**

HYDROSTATIC TEST	ALL NEW UNDERGROUND PIPING HYDROSTATICALLY TESTED AT _____ PSI FOR _____ HOURS		JOINTS COVERED <input type="checkbox"/> YES <input type="checkbox"/> NO
LEAKAGE TEST	TOTAL AMOUNT OF LEAKAGE MEASURED _____ GAL _____ HOURS		
	ALLOWABLE LEAKAGE _____ GAL _____ HOURS		
HYDRANTS	NUMBER INSTALLED	TYPE AND MAKE	ALL OPERATE SATISFACTORILY <input type="checkbox"/> YES <input type="checkbox"/> NO
CONTROL VALVES	WATER CONTROL VALVES LEFT WIDE OPEN IF NO, STATE REASON		<input type="checkbox"/> YES <input type="checkbox"/> NO
	HOSE THREADS OF FIRE DEPARTMENT CONNECTIONS AND HYDRANTS INTERCHANGEABLE WITH THOSE OF FIRE DEPARTMENT ANSWERING ALARM		<input type="checkbox"/> YES <input type="checkbox"/> NO
REMARKS	DATE LEFT IN SERVICE		
SIGNATURES	NAME OF INSTALLING CONTRACTOR		
	TESTS WITNESSED BY		
	FOR PROPERTY OWNER (SIGNED)	TITLE	DATE
	FOR INSTALLING CONTRACTOR (SIGNED)	TITLE	DATE
ADDITIONAL EXPLANATION AND NOTES			

(NFPA 14, 2 of 2)

FIGURE 11.1.3(b) *Continued*

**11.4.9 Gauges.** During the hydrostatic test, the pressure gauge at the top of each standpipe shall be observed and the pressure recorded.

**11.4.10 Water Additives.** Additives, corrosive chemicals such as sodium silicate or derivatives of sodium silicate, brine, or other chemicals shall not be used while hydrostatically testing systems or for stopping leaks.

#### 11.5 Flow Tests.

**11.5.1\*** The water supply shall be tested to verify compliance with the design.

**11.5.1.1** This test shall be conducted by flowing water from the hydraulically most remote hose connections.

**11.5.2** For a manual standpipe, a fire department pumper or portable pump of a capacity to provide required flow and pressure shall be used to verify the system design by pumping into the fire department connection.

**11.5.3** A flow test shall be conducted at each roof outlet to verify that the required pressure is available at the required flow.

**11.5.4** The maximum flow to be demonstrated from a single hose connection shall be 946 L/min (250 gpm) for a 65-mm

(2½-in.) connection and (379 L/min) 100 gpm for a 40-mm (1½-in.) connection.

**11.5.5** The filling arrangement for suction tanks shall be verified by shutting down all supplies to the tank, draining the tank to below the designated low water level, and then opening the supply valve to ensure operation of its automatic features.

#### 11.5.6 Pressure-Regulating Devices.

**11.5.6.1\*** Each pressure-regulating device shall be tested to verify that the installation is correct, that the device is operating properly, and that the inlet and outlet pressures at the device are in accordance with the design.

**11.5.6.2** Static and residual inlet pressure and static and residual outlet pressure and flow shall be recorded on the contractor's test certificate.

#### 11.5.7 Main Drain Flow Test.

**11.5.7.1** The main drain valve shall be opened and shall remain open until the system pressure stabilizes.

**11.5.7.2** The static and residual pressure shall be recorded on the contractor's test certificate.

**11.5.8 Testing of Automatic- and Semiautomatic-Dry Systems.**

**11.5.8.1** Automatic- and semiautomatic-dry systems shall be tested by initiating a flow of water from the hydraulically most remote hose connection.

**11.5.8.2** The system shall deliver a minimum of 946 L/min (250 gpm) at the hose connection within 3 minutes of opening the hose valve.

**11.5.8.3** Each remote control device for operating a semiautomatic system shall be tested in accordance with the manufacturer's instructions.

**11.5.9 Systems Having Pumps.** Where pumps are part of the water supply for a standpipe system, testing shall be conducted while the pumps are operating.

**11.6 Manual Valve Test.**

**11.6.1** Each valve intended to be manually opened or closed shall be operated by turning the handwheel crank or wrench for its full range and returning it to its normal position.

**11.6.2** Hose valve caps shall be tightened sufficiently to avoid leaking during the test and removed after the test to drain water and relieve pressure.

**11.7 Alarm and Supervision Tests.** Each alarm and supervisory device provided shall be tested in accordance with NFPA 72®, *National Fire Alarm Code*®.

**11.8 Instructions.** The installing contractor shall provide the owner with the following:

- (1) All literature and instructions provided by the manufacturer describing the proper operation and maintenance of equipment and devices installed
- (2) A copy of NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*

**11.9 Signs.** The installation of signs required by this standard shall be verified.

**Chapter 12 Buildings under Construction**

**12.1 General.** Where required by the authority having jurisdiction, a standpipe system, either temporary or permanent, shall be provided in accordance with this chapter in buildings under construction.

**12.2 Fire Department Connections.** The standpipes shall be provided with conspicuously marked and readily accessible fire department connections on the outside of the building at the street level.

**12.3 Other System Features.** Pipe sizes, hose connections, hose, water supply, and other details for new construction shall be in accordance with this standard.

**12.4 Support of Piping.** Standpipes shall be supported and restrained securely at each alternate floor.

**12.5\* Hose Connections.**

**12.5.1** At least one hose connection shall be provided at each floor level.

**12.5.2** Hose valves shall be kept closed at all times and guarded against mechanical injury.

**12.6\* Extension of System Piping.** Standpipes shall be extended upward for each story and securely capped at the top.

**12.7 Temporary Installations.**

**12.7.1** Temporary standpipes shall remain in service until the permanent standpipe is complete.

**12.7.2** Where temporary standpipes normally contain water, the piping shall be protected against freezing.

**12.8 Timing of Water Supply Installation.**

**12.8.1** Where construction reaches a height at which public waterworks system pressure can no longer provide the required flow and pressure, temporary or permanent fire pumps shall be installed to provide protection to the uppermost level or to the height required by the authority having jurisdiction.

**12.8.2** Where local fire department pumping apparatus is permitted by the authority having jurisdiction for the standpipe pressure required, temporary or permanent fire pumps shall not be required.

**12.9 Protection of Hose Connections and Fire Department Connections.**

**12.9.1** Threaded caps and plugs shall be installed on fire department connections and hose connections.

**12.9.2** Fire department connections and hose connections shall be protected against physical damage.

**Annex A Explanatory Material**

*Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.*

**A.1.1** See NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*.

**A.3.2.1 Approved.** The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

**A.3.2.2 Authority Having Jurisdiction (AHJ).** The phrase "authority having jurisdiction," or its acronym AHJ, is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated

agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

**A.3.2.3 Listed.** The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

**A.3.3.16 Pressure-Reducing Valve.** A pressure relief valve is not a pressure-reducing valve and should not be used as such.

**A.4.1** The use of standard-weight valves and fittings ordinarily should be confined to the upper stories of very high buildings and to equipment in which the highest available pressures are less than 12.1 bar (175 psi).

**A.4.6.2.1** One method of determining adequately trained personnel is described in NFPA 600, *Standard on Industrial Fire Brigades*.

**A.4.6.5** One method of determining adequately trained personnel is described in NFPA 600, *Standard on Industrial Fire Brigades*.

**A.5.4** The committee's intent is to permit the omission of a fire pump as part of the standpipe system in non high-rise buildings when the automatic sprinkler system can be designed and installed with the available water supply and the flow and pressure demands of the standpipe system can be provided by the fire department apparatus through the fire department connection.

**A.5.6** Additional pressure gauges located at the base of the standpipes could be desirable in some equipment, particularly in large plants and high-rise buildings.

**A.5.7** Audible alarms are normally located on the outside of the building. Approved electric gong bells, horns, or sirens located inside the building, or both inside and outside, are sometimes advisable.

**A.6.1** Connections from fire pumps and sources outside the building should be made at the base of the standpipes.

**A.6.1.2.1** Standpipes should not be placed in unsprinklered areas of combustible construction.

**A.6.2.6.2** See NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*.

**A.6.3** See Figure A.6.3 for general arrangement.

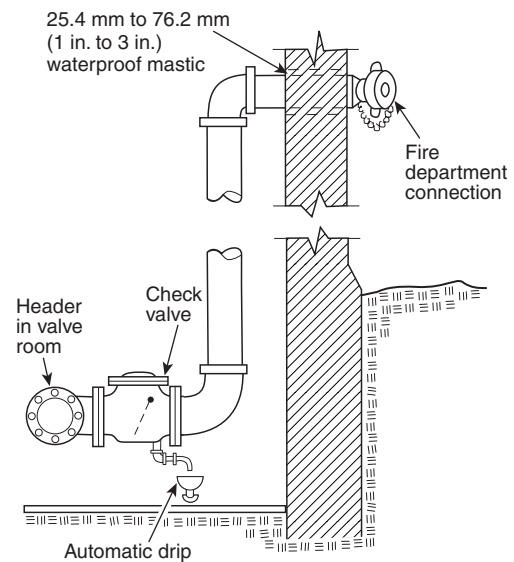
**A.6.3.5.4** The system designer should contact the authority having jurisdiction prior to establishing the location of the fire department connection. The location should be based on the requirements of the fire department.

**A.6.7** See Figure A.6.7 for sample hydraulic information sign.

**A.7.1** The building height determines the number of vertical zones. The area of a floor or fire area and exit locations, as well as the occupancy classification, determines the number and locations of hose connections. Local building codes influence types of systems, classes of systems, and locations of hose connections. Pipe sizing is dependent on the number of hose connections flowing, the quantity of water flowed, the required residual pressure, and the vertical and horizontal distance of those hose connections from the water supplies.

For typical elevation drawings, see Figure A.7.1(a), Figure A.7.1(b), and Figure A.7.1(c).

See Chapter 7 for general system requirements.



**FIGURE A.6.3** Typical Fire Department Connection for Wet Standpipes.

Location of the two hydraulically most remote hose connections: \_\_\_\_\_

Design flow rate for the connections identified above: \_\_\_\_\_

Design residual inlet and outlet pressures for the connections identified above: \_\_\_\_\_

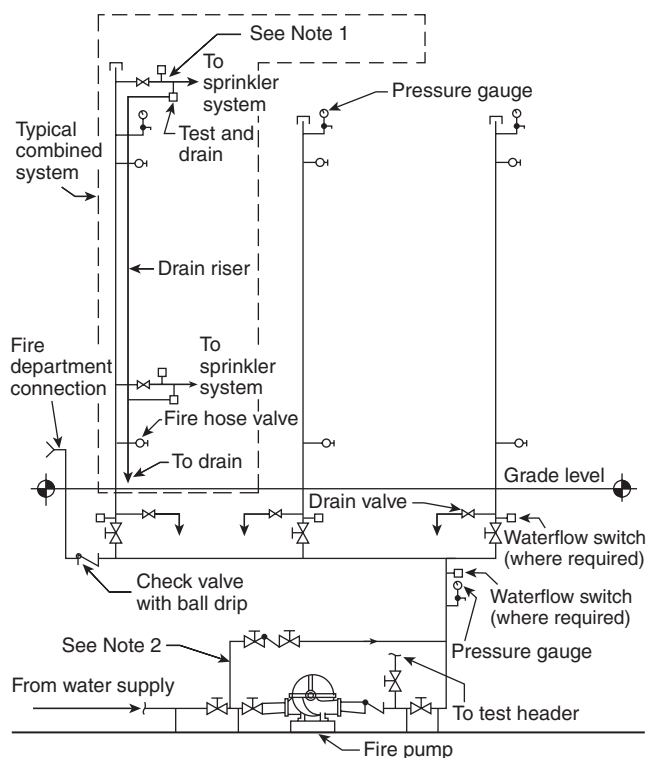
Design static pressure and design system demand (i.e., flow and residual pressure) at the system control valve, or at the pump discharge flange where a pump is installed, and at each fire department connection: \_\_\_\_\_

**FIGURE A.6.7** System Hydraulic Information Sign.

**A.7.1.1** It is important to determine the exact operating range to ensure that pressure regulating devices function in accordance with the manufacturer's instructions for both maximum and minimum anticipated flow rates. Minimum flow can be from a single sprinkler for combined systems or flow from a 40-mm (1.5-in.) hose connection on standpipe systems that do not supply sprinklers. This could require the use of two devices installed in parallel.

**A.7.2** The system pressure limits have been implemented to replace the former height units. Because the issue addressed by the height limits has always been maximum pressure, pressure limitations are a more direct method of regulation and allow flexibility in height units where pumps are used, because a pump curve with less excess pressure at churn yields lower maximum system pressures while achieving the required system demand.

The maximum system pressure normally is at pump churn. The measurement should include both the pump boost and city static pressures. The 24-bar (350-psi) limit was selected because it is the maximum pressure at which most system components are available, and it recognizes the need for a reasonable pressure unit.



## Notes:

1. Sprinkler floor assembly in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.
2. Bypass in accordance with NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*.

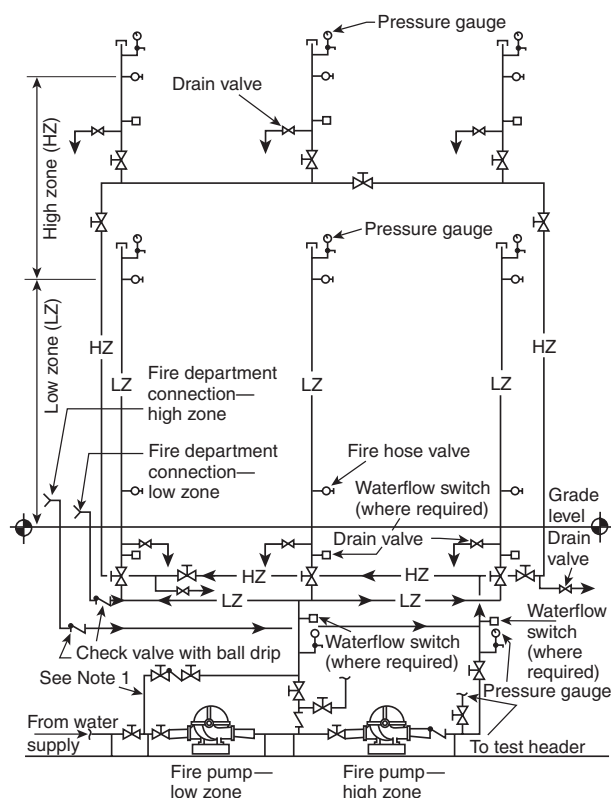
FIGURE A.7.1(a) Typical Single-Zone System.

**A.7.3.1** Hose can be permitted to be located at one side of the standpipe and supplied by short lateral connections to the standpipe where necessary to avoid obstructions.

Hose connections for Class I systems should be located in a stairway enclosure, and connections for Class II systems should be located in the corridor or space adjacent to the stairway enclosure and connected through the wall to the standpipe. For Class III systems, the connections for 65-mm (2½-in.) hose should be located in a stairway enclosure, and Class II connections should be located in the corridor or space adjacent to the stairway enclosure. These arrangements make it possible to use Class II system hose streams promptly in case the stairway is filled with people who are escaping at the time of fire. In buildings having large areas, connections for Class I and Class III systems can be located at interior columns.

**A.7.3.2** Hose connections are now specified to be located at intermediate landings between floors to prevent congestion at doorways. Where there are multiple intermediate floor landings between floors, hose connections should be located at the landing approximately midway between floors. It is recognized that fire departments often use the hose connection on the floor below the fire floor, and the location of hose connections at intermediate landings also reduces the hose lay distance in such cases.

The approach to locating hose connections with respect to exits is shown in Figure A.7.3.2(a), Figure A.7.3.2(b), and Figure A.7.3.2(c).



## Notes:

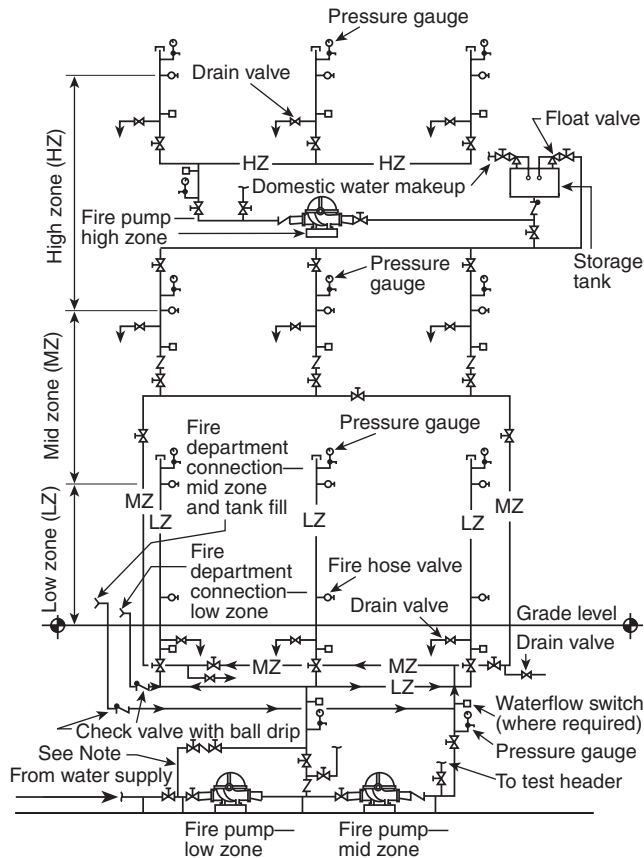
1. Bypass in accordance with NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*.
2. High zone pump can be arranged to take suction directly from source of supply.

FIGURE A.7.1(b) Typical Two-Zone System.

**A.7.3.2.3** Paragraph 7.3.2.3 is intended to provide local fire departments with the authority to require additional hose connections outside of or away from a 2-hour fire-resistive separation. These additional hose connections could be needed to allow fire fighters to attach a fire hose in a reasonable time frame, based on the lengths of hose available on fire department standpipe packs or in carry bags. While it is recognized that outlet spacing limitations provide controls to limit the maximum hose length needed to fight a fire, thereby minimizing the physical demands on fire fighters, it is also recognized that, in some cases, based on architectural layout, additional outlets could be needed in open floor areas in order to meet spacing requirements. In such cases, it is unlikely that such outlets could be utilized, since there would not be a staging area for fire fighters to use when accessing the hose connection. Therefore, additional hose connections, where provided to meet distance requirements, would be located in 1-hour fire-resistive exit corridors wherever possible to provide a degree of protection for fire fighters accessing the connection. Such connections also should be located as uniformly as possible from floor to floor so that fire fighters can find them easily during a fire.

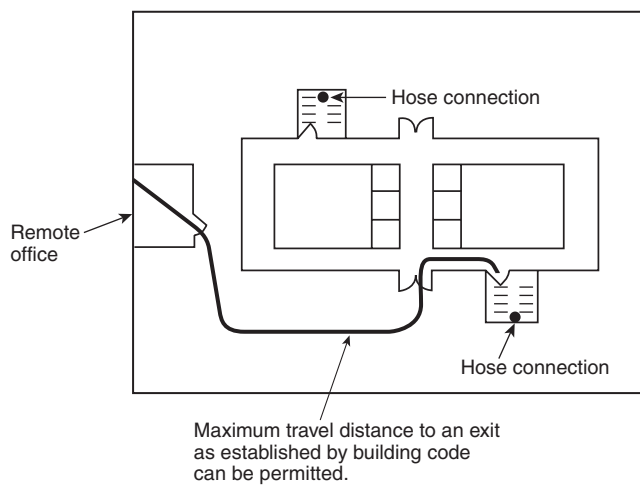
It is recognized that the 61-m (200-ft) distance allowed for sprinklered buildings could necessitate additional hose lengths in order to reach the most remote portion of a floor; however, automatic sprinklers should provide adequate control to allow time for fire fighters to extend hoses in those cases where a fire is located in the most remote area.





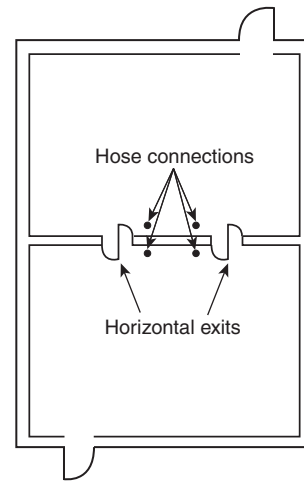
Note: Bypass in accordance with NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*.

**FIGURE A.7.1(c) Typical Multizone System.**

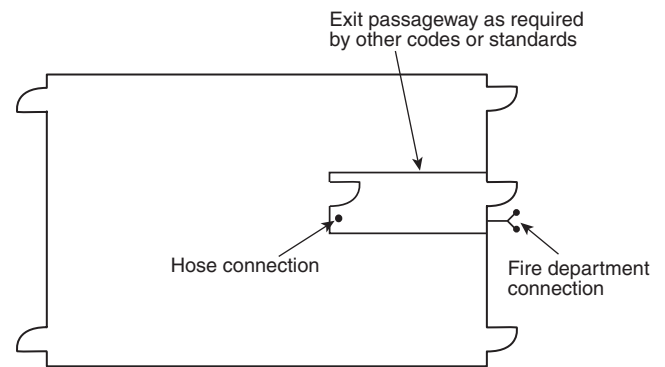


**FIGURE A.7.3.2(a) Location of Hose Connections in Stairwells.**

**A.7.3.3** Hose stations should be so arranged as to allow discharge to be directed from the nozzle into all portions of important enclosures such as closets and similar enclosures.



**FIGURE A.7.3.2(b) Location of Hose Connections at Horizontal Exits.**



**FIGURE A.7.3.2(c) Location of Hose Connections in Exit Passageways.**

**A.7.5** Fire department connections feeding interconnected standpipes, including combined systems, should be arranged to supply all interconnected standpipes in a building or section of a building. See Figure A.7.1(a), Figure A.7.1(b), and Figure A.7.1(c). Interconnection should occur as close to the source of supply(ies) as possible.

**A.7.7** Previous editions of this standard permitted the pipe schedule approach to pipe sizing for standpipe systems. Table A.7.7 has been included here as a reference for the repair of existing standpipe systems.

**A.7.8** Where determining the pressure at the outlet of the remote hose connection, the pressure loss in the hose valve should be considered.

It is very important that fire departments choose an appropriate nozzle type for their standpipe fire-fighting operations. Constant pressure- (automatic-) type spray nozzles [see NFPA 1964, *Standard for Spray Nozzles (Shutoff and Tip)*] should not be used for standpipe operations because many of this type require a minimum of 6.9 bar (100 psi) of pressure at the nozzle inlet to produce a reasonably effective fire stream. In standpipe operations, hose friction loss could prevent the delivery of 6.9 bar (100 psi) to the nozzle.

**Table A.7.7 Hose Stream Friction Losses Summary**

Calc. No.	Nozzle/Hose	Flow		Valve Outlet	
		L/min	gpm	bar	psi
1	63.5-mm (2½-in.) combination nozzle, with 45.7 m (150 ft) of 63.5-mm (2½-in.) hose	946	250	8.5	123
2	63.5-mm (2½-in.) smoothbore nozzle with 28.6-mm (1⅛-in.) tip and 45.7 m (150 ft) of 63.5-mm (2½-in.) hose	946	250	5	73
3	Two 38.1-mm (1½-in.) combination nozzles with 30.5 m (100 ft) of 38.1-mm (1½-in.) hose per nozzle, 63.5-mm (2½-in.) gated wye, and 15.2 m (50 ft) of 63.5-mm (2½-in.) hose	946	250	10.3	149
4	Same as calculation no. 3 with two 30.5-m (100-ft) lengths of 44.5-mm (1¾-in.) hose	946	250	9.6	139
5	Same as calculation no. 3 with two 30.5-m (100-ft) lengths of 51-mm (2-in.) hose	946	250	8.3	120
6	38.1-mm (1½-in.) combination nozzle with 45.7 m (150 ft) of 51-mm (2-in.) hose	757	200	9.4	136
7	Same as calculation no. 6 with 44.5-mm (1¾-in.) hose	757	200	11.6	168

Note: For a discussion of use by the fire department of fire department connections, see NFPA 13E, *Recommended Practice for Fire Department Operations in Properties Protected by Sprinkler and Standpipe Systems*.

In high-rise standpipe systems with pressure-reducing hose valves, the fire department has little or no control over hose valve outlet pressure.

Many fire departments use combination (fog and straight stream) nozzles requiring 6.9-bar (100-psi) residual pressure at the nozzle inlet with 38-mm, 44-mm, or 50-mm (1½-in., 1¾-in., or 2-in.) hose in lengths of up to 45.7 m (150 ft). Some use 65-mm (2½-in.) hose with a smoothbore nozzle or a combination nozzle.

The 65-mm (2½-in.) smoothbore nozzle with a 28.6-mm (1⅛-in.) tip produces a usable stream [946 L/min (250 gpm)] at 3.5-bar (50-psi) inlet pressure requiring 4.5 bar (65 psi) at the valve outlet with 30.5 m (100 ft) of 65-mm (2½-in.) hose or 5 bar (73 psi) at the outlet with 45.7 m (150 ft) of hose.

Some departments use 15.2 m (50 ft) of 65-mm (2½-in.) hose to a gated wye, supplying two 30.5-m (100-ft) lengths of 38-mm to 51-mm (1½-in. to 2-in.) hose with combination nozzles, requiring 8.3 bar to 10.3 bar (120 psi to 149 psi) at the valve outlet. (See Table A.7.7.)

Also see NFPA 1901, *Standard for Automotive Fire Apparatus*.

**A.7.8.3** Due to the different pressure limitations established in Section 7.8, it could be necessary to arrange piping so that separate pressure-regulating devices can be provided on the Class I and Class II hose connections.

**A.7.8.3.2** Many fire departments lay a hoseline from the pumper into the building and connect to an accessible valve outlet using a double female swivel where the building fire department connections are inaccessible or inoperable. To pressurize the standpipe, the hose valve is opened and the engine pumps into the system.

If the standpipe is equipped with pressure-reducing hose valves, the valve acts as a check valve, prohibiting pumping into the system when the valve is open.

A supplementary single-inlet fire department connection or hose valve with female threads at an accessible location on the standpipe allows pumping into that system.

**A.7.10.1.1** If a water supply system supplies more than one building or more than one fire area, the total supply can be

calculated based on the single building or fire area requiring the greatest number of standpipes.

For a discussion of use by the fire department of fire department connections, see NFPA 13E, *Recommended Practice for Fire Department Operations in Properties Protected by Sprinkler and Standpipe Systems*.

For the purpose of this standard buildings sprinklered in accordance with NFPA 13 or NFPA 13 R shall be considered to be sprinklered throughout.

**A.7.10.1.1.2** The intent of this section is to provide a different flow requirement for large area low-rise buildings and other structures protected by horizontal standpipes.

**A.7.10.1.2** See Section 14.4 of NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2002 edition.

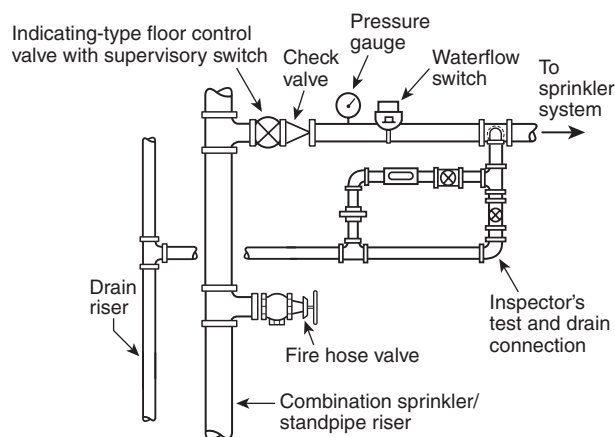
When performing an hydraulic design, the hydraulic characteristics of each water supply must be known. The procedure for determining the hydraulic characteristics of permanent water supplies, such as pumps, is fairly straightforward and is described in NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*. The procedure for determining the hydraulic characteristics of fire apparatus supplying a standpipe system are similar. Lacking better information about local fire apparatus, a conservative design would accommodate a 3785-L/min (1000-gpm) fire department pumper performing at the level of design specifications set forth in NFPA 1901, *Standard for Automotive Fire Apparatus* (hereinafter referred to as NFPA 1901). NFPA 1901 specifies that fire department pumpers must be able to achieve three pressure/flow combinations. These are 100 percent of rated capacity at 1034-kPa (150-psi) net pump pressure, 70 percent of rated capacity at 1379-kPa (200-psi) net pump pressure, and 50 percent of rated capacity at 1724-kPa (250-psi) net pump pressure. Therefore, a 3785-L/min (1000-gpm) pumper can be expected to deliver no less than 3785 L/min (1000 gpm) at 1034 kPa (150 psi), 2650 L/min (700 gpm) at 1379 kPa (200 psi), and 1893 L/min (500 gpm) at 1724 kPa (250 psi). Residual supply pressure on the suction side of a pump from a municipal or other pressurized water supply can also be added.



To perform an hydraulic design, one should determine the minimum required pressure and flow at the hydraulically most remote hose connection and calculate this demand back through system piping to each water supply, accumulating losses for friction and elevation changes and adding flows for additional standpipes and sprinklers at each point where such standpipes or sprinklers connect to the hydraulic design path. When considering fire apparatus as a water supply, flows must be calculated from system piping through the fire department connection and back through connecting hoses to the pump. If the pressure available at each supply source exceeds a standpipe system's pressure demand at the designated flow, the design is acceptable. Otherwise, the piping design or the water supply must be adjusted.

It is the intent of the standard to require that each vertical standpipe serving two or more hose connections be capable of individually flowing 1893 L/min (500 gpm) [946 L/min (250 gpm) at each of the two hydraulically most demanding connections] at the required residual pressure. Given the requirement in 7.10.1.1.4.1 for the hydraulically most remote standpipe to supply this pressure and flow rate and given the minimum standpipe sizes in Section 7.6, the ability of standpipes that are not hydraulically most remote to satisfy this requirement is implicit and should not require additional hydraulic calculations.

**A.7.10.1.3.1** See Figure A.7.10.1.3.1(a) and Figure A.7.10.1.3.1(b).

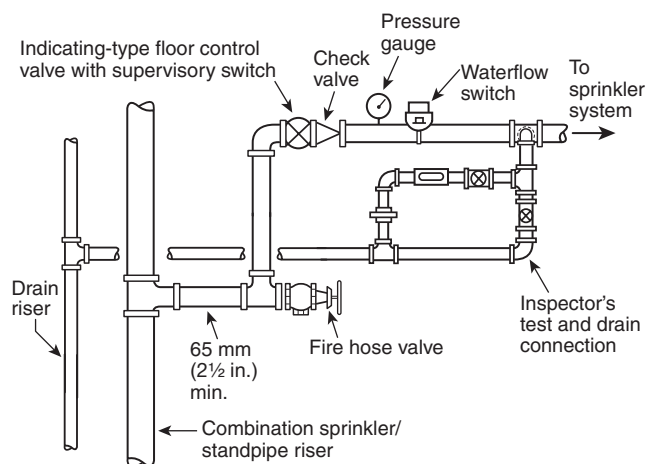


**FIGURE A.7.10.1.3.1(a) Acceptable Piping Arrangement for Combined Sprinkler/Standpipe System.**

**A.7.12** During flow testing of pressure-reducing valves, care should be taken in making connections to drain risers. An air gap should be maintained in order to prevent cross connection to nonpotable water sources.

**A.7.13** See NFPA 13E, *Recommended Practice for Fire Department Operations in Properties Protected by Sprinkler and Standpipe Systems*.

The number of 65-mm (2½-in.) inlets to supply the required water volume and pressure at the fire department connection is dependent on several variables such as the performance of the water supply at the source, the distance from the source to the location of the inlets, the diameter of the hose used, the size of the fire department pumper, and the required water volume and pressure at the base of the standpipe riser(s).



**FIGURE A.7.10.1.3.1(b) Acceptable Piping Arrangement for Combined Sprinkler/Standpipe System.**

**A.8.1** Plans should indicate the type of fire department equipment that the system is designed to serve, including the hose size, hose length, and hose nozzle. Such equipment is the basis for the pressure selected in accordance with Section 7.8.

**A.9.1** The selection of water supplies for each installation should be determined in cooperation with the authority having jurisdiction.

**A.10.1** Additional benefit is derived from waterflow tests by the indication of possible deficiencies, such as tuberculation of piping, closed valves, or other obstructions, which should be corrected to provide adequate waterflows.

**A.11.1** Where standpipe connections are built into the walls or partitions, the hydrostatic tests should be made before they are covered or permanently sealed.

*Example of Required Hydrostatic Test Pressure.* The water supply for a standpipe system is the connection to a public water service main. A 6.9-bar (100-psi) rated pump is installed in the connection. With a maximum normal public water supply pressure of 4.9 bar (70 psi) at the low elevation point of the system or zone being tested and an 8.3-bar (120-psi) pump (churn) pressure, the hydrostatic test pressure is 4.8 bar + 8.3 bar + 3.4 bar, or 16.5 bar (70 psi + 120 psi + 50 psi, or 240 psi). (See NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, for permitted leakage in underground piping.)

**A.11.4.1** The testing and flushing of the underground pipe should be in accordance with NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*.

**A.11.5.1** The hydraulically most remote hose connections in a building are generally at a roof manifold, if provided, or at the top of a stair leading to the roof. In a multizone system, the testing means is generally at a test header at grade or at a suction tank on higher floors.

Where a flow test at the hydraulically most remote hose connection is not practicable, the authority having jurisdiction should be consulted for the appropriate location of the test.

**A.11.5.6.1** It is important to test pressure regulating devices at the maximum and minimum anticipated flow rates. Minimum flow can be from a single sprinkler for combined systems or flow from a 40-mm (1.5-in.) hose connection on standpipe systems that do not supply sprinklers. This can