

NFPA 13R

Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height

2007 Edition



NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471
An International Codes and Standards Organization

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NFPA 13R

Standard for the

Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height

2007 Edition

This edition of NFPA 13R, *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height*, was prepared by the Technical Committee on Residential Sprinkler Systems, released by the Technical Correlating Committee on Automatic Sprinkler Systems, and acted on by NFPA at its June Association Technical Meeting held June 4–8, 2006, in Orlando, FL. It was issued by the Standards Council on July 28, 2006, with an effective date of August 17, 2006, and supersedes all previous editions.

This edition of NFPA 13R was approved as an American National Standard on August 17, 2006.

Origin and Development of NFPA 13R

The first edition of NFPA 13R, which was published in 1989, represented a milestone in the development of sprinkler installation design standards. The first edition resulted in a standard for the protection of low-rise, residential facilities.

This standard is intended to provide a higher degree of life safety and property protection to the inhabitants of low-rise, multifamily dwellings. Promulgated as a document that provides for increased levels of protection to building occupants, the document also considers the economic aspects of a sprinklered facility as compared to an unsprinklered facility.

As the number of states and cities that implement sprinkler ordinances continues to grow, and as the threshold levels for sprinkler requirements in residential occupancies in the building codes extend to certain low-rise structures, it is believed that systems for certain residential occupancies can be efficiently and effectively installed in accordance with this standard.

The 1994 edition provided expanded information on nonmetallic pipe materials, minor changes to clarify the established design criteria, and a new recommendation on underground pipe materials.

The 1996 edition included several changes that paralleled amendments in the 1996 edition of NFPA 13, *Standard for the Installation of Sprinkler Systems*. Other changes included a number of clarifications concerning the selection of sprinklers as well as the proper use of sprinklers.

The 1999 edition clarified criteria for nonmetallic pipe and fittings and established a minimum operating pressure for sprinklers. Guidance on providing freeze protection using insulation in attics and antifreeze systems was provided, as was information on the application of solvent cement for nonmetallic piping. Exceptions for omitting sprinkler coverage in closets on balconies and underneath garage doors were added.

The 2002 edition incorporated revisions to update the standard to comply with the 2000 edition of the *Manual of Style for NFPA Technical Committee Documents*. These revisions included editorially rewording any exceptions as requirements. The 2002 edition also included changes that further clarified the scope of the standard, established a minimum design discharge density, and added protection requirements specifically for garages. The section addressing spaces where sprinklers are permitted to be omitted was changed so that the area of full-height tub/shower enclosures would be included in the area determination for bathrooms, sprinklers would be provided in concealed spaces with fuel-fired equipment, and the omission of sprinklers in elevator machine rooms would not be dependent on the room's location.

This 2007 edition now includes spacing and obstruction rules addressing sloped ceilings, ceiling pockets, ceiling fans, and kitchen cabinets. For this edition, the requirements for utilizing quick-response sprinklers within NFPA 13R regulations were clarified, and new requirements addressing architectural features within dwelling units were added. Additionally, the requirements covering closets, including obstructions within closets and protection of mechanical closets, were clarified. Finally, new requirements were added that are applicable from NFPA 13 to NFPA 13R, to ensure proper administration of those requirements where relevant.

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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.

Committee Scope: This Committee shall have overall responsibility for documents that pertain to the criteria for the design and installation of automatic, open and foam-water sprinkler systems including the character and adequacy of water supplies, and the selection of sprinklers, piping, valves, and all materials and accessories. This Committee does not cover the installation of tanks and towers, nor the installation, maintenance, and use of central station, proprietary, auxiliary, and local signaling systems for watchmen, fire alarm, supervisory service, nor the design of fire department hose connections.



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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.

Committee Scope: This Committee shall have primary responsibility for documents on the design and installation of automatic sprinkler systems in dwellings and residential occupancies up to and including four stories in height, including the character and adequacy of water supplies, and the selection of sprinklers, piping, valves, and all materials and accessories.

Contents

Chapter 1 Administration	13R- 5	Chapter 5 System Components	13R- 8
1.1 Scope	13R- 5	5.1 General	13R- 8
1.2 Purpose	13R- 5	5.2 Piping	13R- 9
1.3 Retroactivity	13R- 5	5.3 System Types	13R-11
1.4 Equivalency	13R- 5		
1.5 Units	13R- 5	Chapter 6 Working Plans, Design, Installation,	
Chapter 2 Referenced Publications	13R- 5	Acceptance Tests, and	
2.1 General	13R- 5	Maintenance	13R-11
2.2 NFPA Publications	13R- 5	6.1 General System Requirements	13R-11
2.3 Other Publications	13R- 5	6.2 Working Plans	13R-12
2.4 References for Extracts in Mandatory		6.3 Approval of Sprinkler Systems	13R-12
Sections. (Reserved)	13R- 6	6.4 Acceptance Tests	13R-12
Chapter 3 Definitions	13R- 6	6.5 Design and Installation	13R-12
3.1 General	13R- 6	6.6 Water Supply	13R-15
3.2 NFPA Official Definitions	13R- 6	6.7 Installation of System Components	13R-15
3.3 General Definitions	13R- 6	6.8 System Design	13R-17
Chapter 4 General Requirements	13R- 7	6.9 Location of Sprinklers	13R-20
4.1 Sprinklered Throughout	13R- 7	6.10 Maintenance	13R-21
4.2 Compartments	13R- 7	Annex A Explanatory Material	13R-21
4.3 Basic Requirements	13R- 7	Annex B Informational References	13R-30
4.4 Tube	13R- 7	Index	13R-31
4.5 Listed or Labeled	13R- 7		



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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 Administration

1.1* Scope. This standard shall cover the design and installation of automatic sprinkler systems for protection against fire hazards in residential occupancies up to and including four stories in height.

1.2* Purpose. The purpose of this standard shall be to provide design and installation requirements for a sprinkler system to aid in the detection and control of fires in residential occupancies and thus provide improved protection against injury, life loss, and property damage. A sprinkler system designed and installed in accordance with this standard shall be expected to prevent flashover (total involvement) in the room of fire origin, where sprinklered, and to improve the chance for occupants to escape or be evacuated.

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. 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. 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. 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 restrict new technologies or alternative arrangements, provided that the level of safety prescribed by the standard is not reduced.

1.5 Units.

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

1.5.2 The liter and bar units shall be permitted to be used in this standard.

1.5.3 The conversion factors for liter, pascal, and bar shall be in accordance with Table 1.5.3.

Table 1.5.3 Metric Conversions

Name of Unit	Unit Symbol	Conversion Factor
liter	L	1 gal = 3.785 L
pascal	Pa	1 psi = 6894.757 Pa
bar	bar	1 psi = 0.0689 bar
bar	bar	1 bar = 10 ⁵ Pa

1.5.4* Where a value for measurement as specified in this standard is followed by an equivalent value in other units, the first stated value shall be regarded as the requirement.

1.5.5 The equivalent value for a measurement in SI shall be converted by multiplying the value by the conversion factor and then rounding the result to the appropriate number of significant digits.

Chapter 2 Referenced Publications

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

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

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2007 edition.

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*, 2007 edition.

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

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

NFPA 101®, *Life Safety Code*®, 2006 edition.

NFPA 220, *Standard on Types of Building Construction*, 2006 edition.

NFPA 251, *Standard Methods of Tests of Fire Resistance of Building Construction and Materials*, 2006 edition.

2.3 Other Publications.

2.3.1 ANSI Publications. American National Standards Institute, Inc., 25 West 43rd Street, 4th Floor, New York, NY 10036.

ANSI A17.1, *Safety Code for Elevators and Escalators*, 2004.

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

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

ASME B16.1, *Cast Iron Pipe Flanges and Flanged Fittings*, 1989.

ASME B16.3, *Malleable Iron Threaded Fittings*, 1992.

ASME B16.4, *Gray Iron Threaded Fittings*, 1992.

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

ASME B16.9, *Factory-Made Wrought Steel Butt welding Fittings*, 1993.

ASME B16.11, *Forged Fittings, Socket-Welding and Threaded*, 1996.

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

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

ASME B16.25, *Butt welding Ends*, 1997.

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

ASTM A 53, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless*, 1998.

ASTM A 135, *Standard Specification for Electric-Resistance-Welded Steel Pipe*, 1997.

ASTM A 234, *Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures*, 1997.

ASTM A 795, *Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use*, 1997.

ASTM B 32, *Standard Specification for Solder Metal*, 1996.

ASTM B 88, *Standard Specification for Seamless Copper Water Tube*, 1996.

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

ASTM B 813, *Standard Specification for Liquid and Paste Fluxes for Soldering Applications of Copper and Copper-Alloy Tube*, 1993.

ASTM F 437, *Standard Specification for Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80*, 1996.

ASTM F 438, *Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40*, 1997.

ASTM F 439, *Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80*, 1997.

ASTM F 442, *Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR)*, 1997.

2.3.4 AWS Publications. American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

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

2.3.5 Other Publications.

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

2.4 References for Extracts in Mandatory Sections. (Reserved)

Chapter 3 Definitions

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

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

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

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

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

3.2.5 Shall. Indicates a mandatory requirement.

3.2.6 Standard. A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix or annex, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

3.3 General Definitions.

3.3.1* Bathroom. Within a dwelling unit, any room or compartment containing a lavatory dedicated to personal hygiene, or a water closet, or bathing capability such as a shower or tub, or any combination of facilities thereof.

3.3.2 Compartment. See Section 4.2.

3.3.3 Design Discharge. The rate of water discharged by an automatic sprinkler, expressed in gpm (mm/min).

3.3.4 Dwelling Unit. One or more rooms, arranged for the use of one or more individuals living together, as in a single housekeeping unit, that normally have cooking, living, sanitary, and sleeping facilities.

3.3.5 Hazard Classifications.

3.3.5.1* Light Hazard Occupancy. Occupancies or portions of other occupancies where the quantity and/or combustibility of contents is low and fires with relatively low rates of heat release are expected.



3.3.5.2* Ordinary Hazard (Group 1). Occupancies or portions of other occupancies where combustibility is low, quantity of combustibles is moderate, stockpiles of combustibles do not exceed 8 ft (2.4 m), and fires with moderate rates of heat release are expected.

3.3.5.3* Ordinary Hazard (Group 2). Occupancies or portions of other occupancies where the quantity and combustibility of contents are moderate to high, where stockpiles of contents with moderate rates of heat release do not exceed 12 ft (3.7 m) and stockpile of contents with high rates of heat release do not exceed 8 ft (2.4 m).

3.3.6 Residential Occupancies. Occupancies, as specified in the scope of this standard, that include the following, as defined in NFPA 101, *Life Safety Code*: (1) apartment buildings, (2) lodging and rooming houses, (3) board and care facilities, and (4) hotels, motels, and dormitories.

3.3.7 Sprinkler.

3.3.7.1 Automatic Sprinkler. A fire suppression or control device that operates automatically when its heat-actuated element is heated to its thermal rating or above, allowing water to discharge over a specific area.

3.3.7.2 Residential Sprinkler. A type of fast-response sprinkler having a thermal element with an RTI of 50 (meters-seconds)^{1/2} or less, that has been specifically investigated for its ability to enhance survivability in the room of fire origin, and is listed for use in the protection of dwelling units.

3.3.8 Sprinkler System. For fire protection purposes, an integrated system of underground and overhead piping designed in accordance with fire protection engineering standards. The installation includes one or more automatic water supplies. The portion of the sprinkler system aboveground is a network of specially sized or hydraulically designed piping installed in a building, structure, or area, generally overhead, and to which sprinklers are attached in a systematic pattern. The valve controlling each system riser is located in the system riser or its supply piping. Each sprinkler system riser includes a device for actuating an alarm when the system is in operation. The system is usually activated by heat from a fire and discharges water over the fire area.

3.3.8.1 Dry Pipe Sprinkler System. A sprinkler system employing automatic sprinklers that are attached to a piping system that contains air or nitrogen under pressure, the release of which (as from the opening of a sprinkler) permits the water pressure to open a valve known as a dry pipe valve, and the water then flows into the piping system and out the opened sprinkler.

3.3.8.2 Preaction Sprinkler System. A sprinkler system employing automatic sprinklers that are attached to a piping system containing air that might or might not be under pressure, with a supplemental detection system installed in the same areas as the sprinklers.

3.3.8.3 Wet Pipe Sprinkler System. A sprinkler system employing automatic sprinklers attached to a piping system containing water and connected to a water supply so that water discharges immediately from sprinklers opened by heat from a fire.

3.3.9 System Working Pressure. The maximum anticipated static (nonflowing) or flowing pressure applied to sprinkler system components exclusive of surge pressures.

3.3.10 Thermal Barrier. A material that limits the average temperature rise of an unexposed surface to not more than 250°F (121°C) for a specified fire exposure complying with the standard time-temperature curve of NFPA 251, *Standard Methods of Tests of Fire Resistance of Building Construction and Materials*.

3.3.11 Valve.

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

3.3.11.2 Control Valve. An indicating valve employed to control (shut) a supply of water to a sprinkler system.

3.3.12 Waterflow Alarm. A sounding device activated by a waterflow detector or alarm check valve.

3.3.13 Waterflow Detector. An electric signaling indicator or alarm check valve actuated by waterflow in one direction only.

Chapter 4 General Requirements

4.1 Sprinklered Throughout. A building provided with a fire sprinkler system designed and installed in accordance with the requirements of this standard, including its allowable omissions, shall be considered fully sprinklered throughout.

4.2 Compartments.

4.2.1 A compartment, for the purposes of this standard, shall be a space that is completely enclosed by walls and a ceiling.

4.2.2 Compartment. A space completely enclosed by walls and a ceiling. The compartment enclosure is permitted to have openings in walls to an adjoining space if the openings have a minimum lintel depth of 8 in. (203 mm) from the ceiling and the openings do not exceed 8 ft (2.4 m) in width. A single opening of 36 in. (914 mm) or less in width without a lintel is permitted when there are no other openings to adjoining spaces.

4.3 Basic Requirements.

4.3.1 The requirements for spacing, location, and position of sprinklers shall be based on the following principles:

- (1) Sprinklers shall be installed throughout the premises.
- (2) Sprinklers shall be located so as not to exceed maximum protection area per sprinkler.
- (3) Sprinklers shall be positioned and located so as to provide satisfactory performance with respect to activation time and distribution.
- (4) Sprinklers shall be permitted to be omitted from areas specifically allowed by this standard (*see Section 6.9*).
- (5) When sprinklers are specifically tested and test results demonstrate that deviations from clearance requirements to structural members do not impair the ability of the sprinkler to control or suppress a fire, their positioning and locating in accordance with the test results shall be permitted.
- (6) Clearance between sprinklers and ceilings exceeding the maximums specified in this standard shall be permitted, provided that tests or calculations demonstrate comparable sensitivity and performance of the sprinklers to those installed in conformance with these sections.

4.4 Tube. Wherever the word *pipe* is used in this standard, it shall also mean *tube*.

4.5 Listed or Labeled. Listed or labeled devices and materials shall be installed and used in accordance with the listing limitations and the manufacturers' instructions unless permitted by other sections of this document.

Chapter 5 System Components

5.1 General.

5.1.1 Sprinklers.

5.1.1.1* Only new listed sprinklers shall be installed in sprinkler systems.

5.1.1.2* Sprinkler Identification.

5.1.1.2.1 All sprinklers shall be permanently marked with a one- or two-character manufacturer symbol, followed by three or four numbers, so as to identify a unique sprinkler identification for every change in orifice size or shape, deflector characteristic, pressure rating, and thermal sensitivity.

5.1.1.3 Sprinkler Discharge Characteristics.

5.1.1.3.1 General. Unless the requirements of 5.1.1.3.2 or 5.1.1.3.3 are met, the K-factor, relative discharge, and marking identification for sprinklers having different orifice sizes shall be in accordance with Table 5.1.1.3.1.

5.1.1.3.2 Pipe Threads. Listed sprinklers having pipe threads different from those shown in Table 5.1.1.3.1 shall be permitted.

5.1.1.3.3 Residential Sprinklers. Residential sprinklers shall be permitted with K-factors other than those specified in Table 5.1.1.3.1.

5.1.1.4 Occupancy Limitations. Unless the requirements of 5.1.1.4.1 or 5.1.1.4.2 are met, sprinklers shall not be listed for protection of a portion of an occupancy classification.

5.1.1.4.1 Residential Sprinklers. Residential sprinklers shall be permitted to be listed for portions of residential occupancies.

5.1.1.4.2 Special Sprinklers. Special sprinklers shall be permitted to be listed for protection of a specific construction feature in a portion of an occupancy classification where such sprinklers meet 5.1.1.4.3 and have been evaluated and listed for performance under the following conditions:

- (1) Fire tests related to the intended hazard

- (2) Distribution of the spray pattern with respect to wetting of floors and walls
- (3) Distribution of the spray pattern with respect to obstructions
- (4) Evaluation of the thermal sensitivity of the sprinkler
- (5) Performance under horizontal or sloped ceilings
- (6) Area of design

5.1.1.4.3 Special sprinklers shall maintain the following characteristics:

- (1) Orifice size shall be in accordance with 5.1.1.3.
- (2) Temperature ratings shall be in accordance with Table 5.1.1.5.1.
- (3) The protection area of coverage shall not exceed 400 ft² (37 m²) for light hazard and ordinary hazard occupancies.

5.1.1.5* Temperature Characteristics.

5.1.1.5.1 Automatic sprinklers shall have their frame arms, deflector, coating material, or liquid bulb colored in accordance with the requirements of Table 5.1.1.5.1 or the requirements of 5.1.1.5.2, 5.1.1.5.3, 5.1.1.5.4, or 5.1.1.5.5.

5.1.1.5.2 A dot on the top of the deflector, the color of the coating material, or colored frame arms shall be permitted for color identification of corrosion-resistant sprinklers.

5.1.1.5.3 Color identification shall not be required for ornamental sprinklers such as factory-plated or factory-painted sprinklers or for recessed, flush, or concealed sprinklers.

5.1.1.5.4 The frame arms of bulb-type sprinklers shall not be required to be color coded.

5.1.1.5.5 The liquid in bulb-type sprinklers shall be color coded in accordance with Table 5.1.1.5.1.

5.1.1.6 Escutcheons and Cover Plates.

5.1.1.6.1 Nonmetallic escutcheons shall be listed.

5.1.1.6.2* Escutcheons used with recessed, flush-type, or concealed sprinklers shall be part of a listed sprinkler assembly.

Table 5.1.1.3.1 Sprinkler Discharge Characteristics Identification

Nominal K-factor [gpm/(psi) ^{1/2}]	K-factor Range [gpm/(psi) ^{1/2}]	K-factor Range [dm ³ /min/(kPa) ^{1/2}]	Percent of Nominal K-5.6 Discharge	Thread Type (in. NPT)
1.4	1.3–1.5	1.9–2.2	25	1/2
1.9	1.8–2.0	2.6–2.9	33.3	1/2
2.8	2.6–2.9	3.8–4.2	50	1/2
4.2	4.0–4.4	5.9–6.4	75	1/2
5.6	5.3–5.8	7.6–8.4	100	1/2
8.0	7.4–8.2	10.7–11.8	140	3/4
				or
				1/2
11.2	11.0–11.5	15.9–16.6	200	1/2
				or
				3/4
14.0	13.5–14.5	19.5–20.9	250	3/4
16.8	16.0–17.6	23.1–25.4	300	3/4
19.6	18.6–20.6	27.2–30.1	350	1
22.4	21.3–23.5	31.1–34.3	400	1
25.2	23.9–26.5	34.9–38.7	450	1
28.0	26.6–29.4	38.9–43.0	500	1



Table 5.1.1.5.1 Temperature Ratings, Classifications, and Color Codings

Maximum Ceiling Temperature		Temperature Rating		Temperature Classification	Color Code	Glass Bulb Colors
°F	°C	°F	°C			
100	38	135–170	57–77	Ordinary	Uncolored or black	Orange or red
150	66	175–225	79–107	Intermediate	White	Yellow or green
225	107	250–300	121–149	High	Blue	Blue
300	149	325–375	163–191	Extra high	Red	Purple
375	191	400–475	204–246	Very extra high	Green	Black
475	246	500–575	260–302	Ultra high	Orange	Black
625	329	650	343	Ultra high	Orange	Black

5.1.1.6.3 Cover plates used with concealed sprinklers shall be part of the listed sprinkler assembly.

5.1.1.7 Painting and Finish. Sprinkler painting and finish material shall only be permitted in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

5.1.1.8 Protective Caps and Straps.

5.1.1.8.1* Protective caps and straps shall be removed using means that are in accordance with the manufacturer's instructions.

5.1.1.8.2* Protective caps and straps shall be removed from all sprinklers prior to the time when the sprinkler system is placed in service.

5.1.1.8.3 Protective caps and straps on all upright sprinklers or on any sprinklers installed more than 10 ft (3 m) above the floor shall be permitted to be removed from sprinklers immediately following their installation.

5.1.2 Listing. Only listed or approved devices and materials as specified in this standard shall be used in sprinkler systems.

5.1.3 Rated Pressure. System components shall be rated for the maximum system working pressure to which they are exposed but shall not be rated at less than 175 psi (12.1 bar) for components installed aboveground and 150 psi (10.4 bar) for components installed underground between the water supply and the system riser.

5.1.4 Reconditioned Equipment.

5.1.4.1 The use of reconditioned valves and devices as replacement equipment in existing systems shall be permitted.

5.1.4.2 Reconditioned sprinklers shall not be permitted to be utilized on any new or existing system.

5.2 Piping.

5.2.1* Pipe or tube used in sprinkler systems shall be of the materials specified in Table 5.2.1 or in accordance with 5.2.2.

5.2.1.1 The chemical properties, physical properties, and dimensions of pipe materials shall be at least equivalent to the standards cited in Table 5.2.1.

5.2.1.2 Pipe shall be designed to withstand a working pressure of not less than 175 psi (12.1 bar).

Table 5.2.1 Pipe or Tube Materials and Dimensions

Materials and Dimensions	Standard
Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use	ASTM A 795
Specification for Welded and Seamless Pipe	ASTM A 53
Wrought Steel Pipe	ANSI B36.10M
Specification for Electric-Resistance-Welded Steel Pipe	ASTM A 135
Specification for Seamless Copper Water Tube [Copper Tube (Drawn, Seamless)]	ASTM B 88
Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube	ASTM B 251
Fluxes for Soldering Applications of Copper and Copper-Alloy Tube	ASTM B 813
Specification for Filler Metals for Brazing and Braze Welding (Classification BCuP-3 or BCuP-4)	AWS A5.8
Specification for Solder Metal Section 1: Solder Alloys Containing Less than 0.2 percent lead (Pb) as identified in ASTM B 32, Table 5, Section 1, and having a solidus temperature that exceeds 400°F (204°C)	ASTM B 32

5.2.1.3 When nonmetallic pipe is used, the pipe shall be designed to withstand a working pressure of not less than 175 psi (12.1 bar) at 120°F (49°C).

5.2.2 Types of pipe other than those specified in Table 5.2.1 shall be permitted to be used where listed for sprinkler system use.

5.2.2.1 Pipe differing from those specified in Table 5.2.1 shall be installed in accordance with their listings and the manufacturers' installation instructions.

5.2.2.2* Chlorinated polyvinyl chloride (CPVC) pipe shall comply with the portions of the American Society for Testing and Materials (ASTM) standards specified in Table 5.2.2.2 that apply to fire protection service.