

The background of the cover is a solid red color. Overlaid on this background is a faint, white line-art illustration of a fire sprinkler system. The illustration shows a large, complex sprinkler head on the right side, with various pipes, valves, and fittings extending from it. The NFPA logo is visible in the top left corner, and the NFPA logo is also present in the bottom left corner.

NFPA®

13

Standard for the Installation of Sprinkler Systems

2019



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NFPA® 13

Standard for the

Installation of Sprinkler Systems

2019 Edition

This edition of NFPA 13, *Standard for the Installation of Sprinkler Systems*, was prepared by the Technical Committees on Hanging and Bracing of Water-Based Fire Protection Systems, Private Water Supply Piping Systems, Sprinkler System Discharge Criteria, and Sprinkler System Installation Criteria, released by the Correlating Committee on Automatic Sprinkler Systems, and acted on by NFPA at its June Association Technical Meeting held June 11–14, 2018, in Las Vegas, NV. It was issued by the Standards Council on August 14, 2018, with an effective date of September 3, 2018, and supersedes all previous editions.

This document has been amended by one or more Tentative Interim Amendments (TIAs) and/or Errata. See “Codes & Standards” at www.nfpa.org for more information.

This edition of NFPA 13 was approved as an American National Standard on September 3, 2018.

Origin and Development of NFPA 13

NFPA 13 represents the first standard published under the auspices of the NFPA Committee on Automatic Sprinklers. Originally titled *Rules and Regulations of the National Board of Fire Underwriters for Sprinkler Equipments, Automatic and Open Systems*, the standard has been continuously updated to keep in step with change.

Full information about the NFPA actions on various changes will be found in the NFPA Proceedings. The dates of successive editions are as follows: 1896, 1899, 1902, 1905, 1907, 1908, 1912, 1913, 1915, 1916, 1917, 1919, 1920, 1921, 1922, 1923, 1924, 1925, 1926, 1927, 1928, 1929. In 1930, a separate standard was published on Class B systems. This was integrated into the 1931 edition. Further revisions were adopted in 1934, 1935, and 1936. A two-step revision was presented in the form of a progress report in 1939 and finally adopted in 1940. Further amendments were made in 1947, 1950, 1953, 1956, 1958, 1960, 1961, 1963, 1964, 1965, 1966, 1968, 1969, 1971, 1972, 1973, 1974, 1975, 1976, 1978, 1980, 1982, 1984, 1986, and 1989.

The 1991 edition incorporated an entire rewrite of the standard to make the overall format user friendly. Substantive changes were made to numerous terms, definitions, and descriptions, with additional refinements made in 1994.

The centennial (1996) edition included a significant rework of the requirements pertaining to the application, placement, location, spacing, and use of various types of sprinklers. Other changes provided information on extended coverage sprinklers and recognized the benefits of fast-response sprinkler technology.

The 1999 edition encompassed a major reorganization of NFPA's Sprinkler Project that included the establishment of a Technical Correlating Committee on Automatic Sprinkler Systems and four new sprinkler systems technical committees, the consolidation of NFPA's sprinkler system design and installation requirements, and the implementation of numerous technical changes.

The scope of NFPA 13 was expanded to address all sprinkler system applications. The 1999 edition contained information on the installation of underground pipe from NFPA 24 and sprinkler system discharge criteria for on-floor and rack storage of Class I, II, III, IV, and plastic commodities, rubber tires, baled cotton, and roll paper that were previously located in NFPA 231, 231C, 231D, 231E, and 231F. Additionally, sprinkler system information for specialized hazards from over 40 NFPA documents was either brought into NFPA 13 using NFPA's extract policy or specifically referenced. A new chapter was also added to address the structural aspects of exposed and buried system piping. A table of cross-references to previous editions and material that was located in other NFPA documents was included at the end of the 1999 edition.

More specific changes included a new sprinkler identification marking system and the designation of sprinkler sizes by nominal K-factors. New criteria for the use of steel pipe in underground applications was added, as well as a new provision to guard against microbiologically influenced corrosion. Obstruction rules for specific sprinkler types and rules for locating sprinklers in concealed spaces were revised. New limitations were placed on the sprinkler sizes in storage applications, and criteria for the K-25 sprinkler was added. Additionally, the requirements for protecting sprinklers against seismic events also underwent significant revision.

The 2002 edition of NFPA 13 underwent style formatting and technical revisions. The style formatting was completed to comply with the *Manual of Style for NFPA Technical Committee Documents* and to reorganize many of the requirements in NFPA 13 into unique chapters. Editorially, NFPA 13 eliminated all of the exceptions and reworded them as requirements where applicable, moved the mandatory references to Chapter 2, and relocated all of the definitions to Chapter 3. In reorganizing NFPA 13, several new chapters were created to consolidate requirements including the following: Chapter 10 contained all of the applicable requirements for underground piping including materials, installation, and acceptance testing; Chapter 11 contained design approaches including pipe schedule, density/area method, room design method, special design areas, residential sprinklers, exposure protection, and water curtains; Chapter 12 contained the design approaches for the protection of storage, including idle pallets, miscellaneous storage, storage less than 12 ft, palletized, solid pile, bin box, and shelf storage, rack storage less than 25 ft, rack storage greater than 25 ft, rubber tire, baled cotton, rolled paper, and special storage designs; and Chapter 13 contained all of the design and installation requirements from all of the various documents that have been extracted into NFPA 13.

The 2002 edition made specific technical changes to address several key issues. Three major areas of irregular ceiling were addressed, including skylights, stepped ceilings, and ceiling pockets. The design requirements for ESFR sprinklers were expanded to allow the user to choose the storage height and then the building height for any allowable arrangement. Design requirements for the protection of storage on solid shelves were added. Requirements for the installation of residential sprinklers were added that parallel the requirements for other types of sprinklers.

For the 2007 edition, definitions were reorganized to locate all of the storage definitions in one area, and several new definitions addressing private water supply terms were added. The definitions and requirements of Ordinary Hazard Group 1 and 2 Occupancies were clarified where storage is present. The requirements for trapeze hangers were clarified and made consistent for all components, and the seismic bracing criteria were updated to ensure that NFPA 13 contains all of the appropriate requirements for installation and design of seismic bracing of fire sprinkler systems. The requirements for storage were further reorganized and divided into separate chapters addressing general requirements for storage; miscellaneous storage; protection of Class I to Class IV commodities that are stored palletized, solid piled, bin boxes, or shelf storage; protection of plastic and rubber commodities that are stored palletized, solid piled, bin boxes, or shelf storage; protection of Class I through Class IV commodities that are stored on racks; protection of plastic and rubber commodities that are stored on racks; protection of rubber tire storage; protection of roll paper; and special designs of storage protection.

For the 2010 edition, many of the major changes related to the requirements for storage protection. First was the combination of large drop sprinkler and the specific application control mode sprinkler requirements and the revision of the terminology to identify them as Control Mode Specific Application sprinklers (CMSA). Next, new criteria for use of smoke vents were added to Chapter 12. The density/area curves in the storage chapters were reduced to a maximum 3000 ft² (278 m²) operating area; this was a significant reduction of some curves that had extended up to 6000 ft² (557 m²). Changes to rack storage in the 2010 edition included a new method to calculate the rack shelf area. Finally, the provisions for back-to-back shelf storage were added to the storage chapters.

Criteria for the protection of three new special storage arrangements were added to Chapter 20. These included protection of carton records storage with catwalk access; compact shelving of commodities consisting of paper files, magazines, books, and similar documents in folders and miscellaneous supplies with no more than 5 percent plastics up to 8 ft high; and protection of high bay record storage.

In Chapter 9, a number of changes occurred regarding sway bracing of sprinkler systems, including the introduction of new zone of influence tables for Schedule 5 steel pipe, CPVC, and Type M copper tube. Also the means for calculating the loads in the zone of influence were modified to correlate with SEI/ASCE-7, and a new Annex E was added that described this calculation.

Other areas of change included requirements for listed expansion chambers; clarification of ceiling pocket rules; and clarification of the formulas used in calculating large antifreeze systems.

The 2013 edition of NFPA 13 included changes to many technical requirements as well as the reorganization of multiple chapters. One significant change that was made to the administrative chapter of NFPA 13 was to clarify that watermist systems were not covered within NFPA 13 and that NFPA 750 should be used when looking for guidance on the design and installation of those systems. A series of new requirements addressed the need for a compatibility review where nonmetallic piping and fittings are installed in systems also using petroleum-based products such as cutting oils and corrosion inhibitors. Several modifications were made to the standard pertaining to freeze protection. The use of antifreeze in new NFPA 13 sprinkler systems was prohibited unless the solution use was listed and the listing indicated illustrated the inability for the solution to ignite. Other freeze protection modifications to the standard included clarification on the use of heat tracing, required barrel

length for dry sprinklers, and the allowance for engineering analyses to be submitted to support an alternate freeze protection scheme. New sprinkler omission requirements were added for elevator machine rooms and other elevator associated spaces where certain criteria were met. Chapter 9 included updated information on shared support structures as well as a revised seismic bracing calculation form. Chapters 16 and 17 were reorganized to make the chapters easier to follow, to create more consistency between the various storage chapters. A new chapter on alternative approaches for storage applications was added to provide guidance on performance-based approaches dealing with storage arrangements.

One of the largest changes to the 2016 edition of NFPA 13 was the review of all metric conversions. Historically the document had used an “exact” conversion process, but in the 2016 edition an approximate conversion process was used. The intent of this change was to make the document more usable outside the United States. Another major change was the inclusion of a pipe venting requirement to eliminate as much air as possible from wet pipe systems. This requirement contemplates only a single vent in each wet system.

There were a significant number of changes to the storage chapters of NFPA 13. New design criteria were included for the protection of exposed, expanded Group A plastics stored in racks. Also, a ceiling and in-rack design approach, called an “alternative protection scheme,” was added to Chapters 16 and 17. A similar concept had existed for sprinkler protection in NFPA 30 for several revision cycles.

A new section on sprinkler design where cloud ceilings are installed was added. This design scheme allows sprinklers to be omitted above cloud ceilings when the gap between clouds (or clouds and walls) meets a maximum allowable dimension based on the floor-to-cloud ceiling height. This new language was created based on a project conducted by the Fire Protection Research Foundation. Chapter 10, which is extracted from NFPA 24, was significantly revised based on the rewrite of NFPA 24. Most of the technical content remained the same, although the organization and structure were modified.

The 2019 edition of NFPA 13 has undergone a complete reorganization and is now fashioned in order of how one would approach the design of a sprinkler system. Users will now find hazard classifications, water supplies, and underground piping at the beginning of the standard. Chapter 8 has been divided into several new chapters, breaking out general rules for sprinkler locations into one chapter and several other chapters specific to sprinkler technology. The storage chapters have also been reorganized by sprinkler technology and address ceiling-only design. Chapter 25 has been revised and now contains all the requirements for in-rack sprinklers.

Requirements for vertical pipe chases have been clarified as have requirements for electrical equipment rooms where sprinklers can be omitted. Additionally, new beam rules for residential sprinklers have been added and details provided.

Due to the extensive reorganization of the 2019 edition, new features have been added to help users locate requirements and identify sections with technical changes. The 2016–2019 Roadmap comparing the section numbers of the 2016 edition to the 2019 edition has been compiled and is located after the index. It is provided for information only and should be used as a quick-reference locator. Technical changes from the last edition are also indicated and should be used as a guide. Shaded text identifies requirements that have been modified as a result of additions and deletions with the exception of tables and figures. New requirements are marked with the N symbol. Users can view complete revision details in the First and Second Draft Reports located in the NFPA 13 archived revision section at www.nfpa.org/docinfo.

Previous editions of this document have been translated into languages other than English, including French and Spanish.

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

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Committee Scope: This Committee shall have the primary responsibility for those portions of NFPA 13 that pertain to the criteria for the use and installation of components and devices used for the support of water-based fire protection system piping including protection against seismic events.