

NFPA®

214

Standard on
Water-Cooling Towers

2021



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NFPA® 214

Standard on

Water-Cooling Towers

2021 Edition

This edition of NFPA 214, *Standard on Water-Cooling Towers*, was prepared by the Technical Committee on Water-Cooling Towers. It was issued by the Standards Council on October 5, 2020, with an effective date of October 25, 2020, and supersedes all previous editions.

This edition of NFPA 214 was approved as an American National Standard on October 25, 2020.

Origin and Development of NFPA 214

The subject of the protection of water-cooling towers was first considered by the NFPA Committee on Building Construction in 1957, and a progress report on the subject was published in the Advance Reports of that year. In 1958, a new Committee on Water-Cooling Towers was appointed, and a Tentative Standard on Fire Protection of Water-Cooling Towers proposed by the Committee was adopted by the Association. Final adoption of NFPA 214, *Standard on Water-Cooling Towers*, was secured in 1959. Revised editions were published in 1961, 1966, 1968, 1971, 1976, 1977, 1983, 1988, and 1992.

The 1996 edition of the standard reinforced a performance-based approach to fire protection for water-cooling towers. The scope was also changed to include protection of field-erected water-cooling towers.

The changes in the 2000 edition reflected the new *Manual of Style for NFPA Technical Committee Documents*. The 2005 edition added requirements for pilot line detectors.

The 2011 edition made several clarifications to improve NFPA 214's functionality for the user and to coordinate with other documents.

The 2016 edition better aligned the sprinkler requirements within the standard with the types of systems defined in NFPA 13, *Standard for the Installation of Sprinkler Systems*.

The majority of the changes made for the 2021 edition of the standard are limited to updating the references in the document. Two notable exceptions are the updated definition for *fire-resistant partition* and the requirement to evaluate certain factors when determining proper fire protections in Chapter 4. Previously, the definition of *fire-resistant partition* directed the user to a mandatory requirement, which is not allowed by the *Manual of Style for NFPA Technical Committee Documents*, while the update to Chapter 4 provides clearer requirements for the AHJ.

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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, construction, protection, and maintenance of water-cooling towers.

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NFPA 214

Standard on

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2021 Edition

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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.

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

Chapter 1 Administration

1.1* Scope. This standard applies to fire protection for field-erected and factory-assembled water-cooling towers of combustible construction or those in which the fill is of combustible material.

1.2 Purpose. The purpose of this standard is to provide a reasonable degree of protection for life and property from fire where water-cooling towers are located.

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*, 2019 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*, 2019 edition.

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

NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines*, 2021 edition.

NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*, 2019 edition.

NFPA 70®, *National Electrical Code*®, 2020 edition.

NFPA 72®, *National Fire Alarm and Signaling Code*®, 2019 edition.

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

2.3 Other Publications.

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

ASTM A153/A153M, *Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*, 2016a.

ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, 2019.

ASTM E136, *Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C*, 2019.

ASTM E2652, *Standard Test Method for Assessing Combustibility of Materials Using a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C*, 2018.

2.3.2 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 263, *Fire Tests of Building Construction and Materials*, 2018.

2.3.3 Other Publications.

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

2.4 References for Extracts in Mandatory Sections.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2019 edition.

NFPA 5000®, *Building Construction and Safety Code*®, 2021 edition.

Chapter 3 Definitions

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

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

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

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

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

3.2.5 Shall. Indicates a mandatory requirement.

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

3.3 General Definitions.

3.3.1 Air Travel. The distance that air travels through the cooling tower fill by tower type, measured horizontally in cross-flow towers (as the fill packing width), or vertically in counter-flow towers (as the fill packing depth).

3.3.2* Cell. The smallest tower subdivision that can function as an independent unit with regard to air and water flow.

3.3.3 Combustible Material. A material that, in the form in which it is used and under the conditions anticipated, will ignite and burn; a material that does not meet the definition of noncombustible.

3.3.4* Cooling Tower.

3.3.4.1* Counterflow. A cooling tower classification in which the water flows countercurrent to the airflow.

3.3.4.2* Crossflow. A cooling tower classification in which the airflow is essentially perpendicular to the flow of water.

3.3.4.3 Deluge Sprinkler System. A sprinkler system employing open sprinklers or nozzles that are attached to a piping system that is connected to a water supply through a valve that is opened by the operation of a detection system installed in the same areas as the sprinklers or the nozzles. When this valve opens, water flows into the piping system and discharges from all sprinklers or nozzles attached thereto. [13, 2019]

3.3.4.4 Dry Pipe Sprinkler System. A sprinkler system employing automatic sprinklers that are attached to a piping system containing 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 sprinklers. [13, 2019]

3.3.4.5* Mechanical-Draft. A cooling tower classification in which air movement depends on fans or blowers.

3.3.4.6* Natural-Draft. A cooling tower containing no fans or blowers, in which air movement depends on the difference in densities of the heated air inside the tower and the cooler air outside.

3.3.5 Film Fill. Water-cooling media made of formed plastic sheets and placed parallel to tower air travel at evenly spaced intervals.

Δ 3.3.6* Fire-Resistant Partition. A partition suitable for use in a cooling tower environment that has a fire resistance rating of 20 minutes or more when tested in accordance with ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or UL 263, *Fire Tests of Building Construction and Materials*.

Δ 3.3.7 Noncombustible Material. See Section 4.10.

3.3.8 Pilot Line Detector. An automatic sprinkler or thermostatic fixed temperature release device used as a detector to pneumatically or hydraulically release the system actuation valve.

3.3.9 Preaction Sprinkler System. A sprinkler system employing automatic sprinklers that are attached to a piping system that contains air that might or might not be under pressure, with a supplemental detection system installed in the same areas as the sprinklers. [13, 2019]

3.3.10 System Actuation Valve. The main valve that controls the flow of water into the fire protection system.

3.3.11 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. [13, 2019]

Chapter 4 General Requirements

4.1 Construction Materials of Water-Cooling Towers.

4.1.1 Where the cooling tower's structure, fan, distribution system, louvers, and fill and drift eliminator materials are all of noncombustible materials, a fire protection system shall not be required.

4.1.2 If any of the construction materials are combustible and the factors in Section 4.2 necessitate it, fire protection shall be provided in accordance with Chapter 5, and towers shall be located in accordance with Chapter 4.

Δ 4.2* Fire Hazard or Fire Risk Analysis.

N 4.2.1 A fire hazard or fire risk analysis shall be conducted.

N 4.2.2 Factors that shall be evaluated in determining the extent and method of fire protection required for induced-draft and natural-draft water-cooling towers include but are not limited to the following:

- (1) Importance to continuity of operation
- (2) Size and construction of tower
- (3) Type of tower
- (4) Location of tower
- (5) Water supply
- (6) Value of tower
- (7) Climate
- (8)* Water delivery time

- (9) Environment
- (10) Rooftop towers
- (11) Limited access
- (12)* Materials of construction (see Section 4.1)

4.3 Combustible Exterior Surfaces. Water-cooling towers with combustible exterior surfaces, including the deck, distribution basins, and so forth, shall be located at least 100 ft (30.5 m) from the following hazards:

- (1) Structures or processes that emit sparks or flying brands under ordinary circumstances, such as chimneys, incinerators, flare stacks, or cob burners
- (2) Materials or processes of severe fire hazard, such as petroleum processing and storage tanks, explosives manufacturing or storage, and petroleum product pipelines and pumping stations

4.4 Combustible Surfaces with Fixed Protection. Towers with combustible exterior surfaces that are provided with fixed exposure protection in accordance with 5.2.10 shall be permitted to be located closer than 100 ft (30.5 m) from the hazards listed in Section 4.3.

4.5 Noncombustible Exterior Surfaces. Towers with noncombustible exterior surfaces shall be located 40 ft (12 m) or more from the hazards listed in Section 4.3.

4.6 Noncombustible Surfaces with Fixed Protection. Towers with noncombustible exterior surfaces that are provided with fixed interior fire protection installed in accordance with Chapter 5 shall be permitted to be located closer than 40 ft (12 m) from the hazards listed in Section 4.3.

4.7 Combustible Towers on Building Roofs. Combustible water-cooling towers located on building roofs or other locations to which access for manual firefighting is restricted or difficult shall be provided with a protection system in accordance with Chapter 5.

4.8 Screening.

4.8.1 Open areas or space between a combustible cold-water basin and the ground or roof of a building upon which it is located shall be effectively screened to prevent the accumulation of waste combustible material under the tower and to prevent the use of such areas or space under the tower for the storage of combustible material.

4.8.2 Fire protection shall be permitted to be installed in lieu of screening.

4.9 Fire-Resistant Partition.

4.9.1* A fire-resistant partition shall be a tight, continuous partition suitable for use in a water-cooling tower environment that has a fire resistance rating of 20 minutes or more when tested in accordance with ASTM E119 or UL 263.

4.9.2 The partition shall extend from 1 ft (0.3 m) below the operating water level of the cold-water basin to the underside of the fan deck (counterflow towers) or distribution basin (crossflow towers).

N 4.10* Noncombustible Material. A material that complies with any one of the following shall be considered a noncombustible material:

- (1)* The material, in the form in which it is used, and under the conditions anticipated, will not ignite, burn, support

combustion, or release flammable vapors when subjected to fire or heat.

- (2) The material is reported as passing ASTM E136, *Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C*.
- (3) The material is reported as complying with the pass/fail criteria of ASTM E136 when tested in accordance with the test method and procedure in ASTM E2652, *Standard Test Method for Assessing Combustibility of Materials Using a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C*. [5000:7.1.4.1.1]

Chapter 5 Fire Protection

5.1 General.

Δ 5.1.1* Types of Fire Protection Systems. If the results of the fire hazard analysis or the fire risk analysis in Section 4.2 indicate a need for a fire protection system or if the conditions in Section 4.7 exist, the fire protection system shall be in accordance with 5.2.2.

5.1.2 Complete Plans and Data Required. A complete plan showing piping arrangement, location of sprinklers, fixed detectors, and operating equipment such as valves and deluge valves, together with hydraulic calculations, water requirements, and water supply information, shall be submitted to the authority having jurisdiction for approval before installation.

5.1.2.1 Plans shall be drawn to scale and shall include the details necessary to indicate clearly all of the equipment and its arrangement.

5.1.2.2 Plans shall show location of new work with relation to existing structures, water-cooling towers, and water supplies.

5.1.2.3 Plans shall include a note listing the types of materials used in the system.

5.2 Fire Protection System Design.

5.2.1 General. Fire protection systems shall be designed, installed, and tested in accordance with NFPA 13.

5.2.2 Types of Systems.

5.2.2.1* The following fire protection systems shall be permitted to be used in counterflow cooling towers:

- (1) Wet pipe sprinkler system
- (2) Dry pipe sprinkler system
- (3) Preaction sprinkler system
- (4) Deluge sprinkler system

5.2.2.2* A deluge sprinkler system shall be used in crossflow towers.

5.2.3 Minimum Rate of Application.

5.2.3.1 Under the fan decks of counterflow towers, the rate of application of water shall be 0.5 gpm/ft² (20.4 mm/min), including fan opening.

5.2.3.2 Under the fan decks of crossflow towers, the rate of application of water shall be 0.33 gpm/ft² (13.45 mm/min), including fan opening.

5.2.3.3 Over the fill areas of crossflow towers, the rate of application of water shall be 0.5 gpm/ft² (20.4 mm/min).