

NFPA 214

Standard on Water-Cooling Towers

2005 Edition



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

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This edition of NFPA 214, *Standard on Water-Cooling Towers*, was prepared by the Technical Committee on Water-Cooling Towers, and acted on by NFPA at its November Association Technical Meeting held November 13–17, 2004, in Miami Beach, FL. It was issued by the Standards Council on January 14, 2005, with an effective date of February 7, 2005, and supersedes all previous editions.

This edition of NFPA 214 was approved as an American National Standard on February 7, 2005.

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 that 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 in that year. Final adoption 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 has added requirements for pilot line detectors.

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

A reference in brackets [] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, the complete title and edition of the source documents for mandatory extracts are given in Chapter 2 and those for nonmandatory extracts are given in Annex C. Editorial changes to extracted material consist of revising references to an appropriate division in this document or the inclusion of the document number with the division number when the reference is to the original document. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced 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*, 2002 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*, 2003 edition.

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

NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines*, 2002 edition.

NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*, 2003 edition.

NFPA 70, *National Electrical Code*®, 2002 edition.

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

NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials*, 1999 edition.

NFPA 780, *Standard for the Installation of Lightning Protection Systems*, 2004 edition.

2.3 Other Publications.

2.3.1 ASTM Publication. American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM A 153A/153M, *Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware*, 2004.

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 horizontal distance through the fill measured just below the distribution basin.

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. Capable of undergoing combustion.

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

3.3.4.4* 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.

3.3.6* Fire-Resistant Partition. A tight, continuous partition suitable for use in a cooling tower environment that has a fire resistance rating of 20 minutes or more.

3.3.7 Noncombustible. Not capable of supporting combustion. [80, 1999]

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

Chapter 4 Location of Water-Cooling Towers

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.

4.2* Fire Risk Analysis. A fire risk analysis shall be conducted. The following are some of the factors that shall be considered in determining the extent and method of fire protection required for induced-draft and natural-draft water-cooling towers:

- (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) Construction of materials (*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 30.5 m (100 ft) 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 30.5 m (100 ft) from the hazards listed in Section 4.3.

4.5 Noncombustible Exterior Surfaces. Towers with noncombustible exterior surfaces shall be located 12 m (40 ft) 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 12 m (40 ft) 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 fire fighting 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 for water-cooling towers shall be tested in accordance with NFPA 251.

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

Chapter 5 Fire Protection

5.1 General.

5.1.1* Types of Suppression Systems. If the fire risk analysis results in Section 4.2, or the conditions of Section 4.7 exist, requiring a fire protection system, one of the following general types of systems shall be used:

- (1) Open-head deluge system
- (2) Closed-head dry-pipe system
- (3) Wet-pipe automatic sprinkler system
- (4) Closed-head preaction system

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* Because the counterflow tower design lends itself to either closed- or open-head systems, the following systems shall be permitted to be used:

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

5.2.2.2* The open-head deluge system shall be used in cross-flow towers to maximize the water distribution and heat detection activation.

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 20.4 mm/min (0.5 gpm/ft²), including fan opening.

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

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

5.2.4 Types and Locations of Discharge Outlets.

5.2.4.1* Counterflow Towers.

5.2.4.1.1 The discharge outlets shall be located under the fan deck and fan opening.

5.2.4.1.2 Except under the fan opening, all discharge outlets shall have deflector distances installed in accordance with NFPA 13.

5.2.4.1.3 Closed-head discharge outlets for dry-pipe and preaction systems shall be installed in the upright position only.

5.2.4.2* Crossflow Towers.

5.2.4.2.1 The discharge outlets protecting the plenum area shall be located under the fan deck and in the fan opening.

5.2.4.2.2 Discharge outlets protecting the fill shall be located under the distribution basin on either the louver or drift eliminator side, discharging horizontally through the joist channels.

5.2.4.2.3 Placement and Pressure of Discharge Devices.

5.2.4.2.3.1 Towers with an air travel dimension longer than the maximum allowable for the discharge device being used shall have discharge devices placed on both sides of the fill area in each joist channel.

5.2.4.2.3.2 The pressure at each discharge device shall be adequate to provide protection for half of the length of the fill measured along the air travel.

5.2.4.2.4 Number of Discharge Devices.

5.2.4.2.4.1 Where joist channels are wider than 0.6 m (2 ft), more than one discharge device shall be required per joist channel.

5.2.4.2.4.2 If the discharge device being used is listed for the width of the joist channel being protected, one discharge device per joist channel shall be permitted to be used.

5.2.4.3* Extended Fan Decks. On towers having extended fan decks that completely enclose the distribution basin, the discharge outlets protecting the fill area shall be located over the basin, under the extension of the fan deck.

5.2.4.3.1 These discharge outlets shall be open directional spray nozzles or other approved spray devices arranged to discharge 14.26 mm/min (0.35 gpm/ft²) directly on the distribution basin and 6.11 mm/min (0.15 gpm/ft²) on the underside of the fan deck extension.

5.2.4.3.2 On towers having extended fan decks that do not completely enclose the hot-water basin, outlets protecting the fill shall be located under the distribution basin in accordance with 5.2.4.2.2.

5.2.4.4 Combustible Fan Decks. For deluge systems using directional spray nozzles in the pendant position, provisions shall be made to protect the underside of a combustible fan deck at a minimum rate of 6.11 mm/min (0.15 gpm/ft²), which shall be included as part of the application rate specified in 5.2.3.

5.2.4.5* Water Basin Covers. On film-filled towers that have solid, hot-water basin covers over the complete basin, the discharge outlets protecting the fill area shall be permitted to be located under the basin covers.

5.2.4.5.1 These discharge outlets shall be open directional spray nozzles or other approved devices arranged to discharge 20.4 mm/min (0.50 gpm/ft²) into the distribution basin horizontally, with some of the spray splashing up and on the underside of the water basin covers.

5.2.4.5.2 On towers having basin covers that do not completely enclose the hot-water basin, outlets protecting the fill shall be located under the distribution basin in accordance with 5.2.4.2.2.

5.2.5 Pipe, Fittings, and Hangers.

5.2.5.1* Piping shall be installed in accordance with the requirements of NFPA 13.

5.2.5.2* Piping or tubing used within the cooling tower shall be metallic and approved for fire protection use, except as outlined in 5.2.5.2.1.

5.2.5.2.1 Piping or tubing used for pneumatic detection systems shall be permitted to be of other materials suitable for use in a cooling tower environment.

5.2.5.3 Hydraulic calculations shall be made in accordance with NFPA 13.

5.2.5.4 All fittings shall be of a type specifically approved for fire protection use.

5.2.5.4.1 In dry sections of the system piping, which can be exposed to possible fire conditions, ferrous fittings shall be of steel, malleable iron, or ductile iron, except as outlined in 5.2.5.4.2.