**Chapter 4 General Requirements**

4.1 Level of Protection

4.1.1

A building, where protected by an automatic sprinkler system installation, shall be provided with sprinklers in all areas except where specific sections of this standard permit the omission of sprinklers.

4.1.2 Limited Area Systems

4.1.2.1

When partial sprinkler systems are installed, the requirements of this standard shall be used insofar as they are applicable.

4.1.2.2

The authority having jurisdiction shall be consulted in each case.

4.2\* Owner's Certificate

The owner(s) of a building or structure where the fire sprinkler system is going to be installed or their authorized agent shall provide the sprinkler system installer with the following information prior to the layout and detailing of the fire sprinkler system [see Figure A.27.1(b)]:

Intended use of the building including the materials within the building and the maximum height of any storage

A preliminary plan of the building or structure along with the design concepts necessary to perform the layout and detail for the fire sprinkler system

Water supply information as identified in 5.2.2

\* Any special knowledge of the water supply, including known environmental conditions that might be responsible for corrosion, including microbiologically influenced corrosion (MIC)

4.3\* Classification of Hazard

4.3.1 General

4.3.1.1

Occupancy classifications for this standard shall relate to sprinkler design, installation, and water supply requirements only.

4.3.1.2

Occupancy classifications shall not be intended to be a general classification of occupancy hazards.

4.3.1.3

Commodity classification and storage arrangements for miscellaneous and low-piled storage specified in 4.3.1.5 through 4.3.1.8 shall be determined in accordance with Sections 20.3 through 20.5.

4.3.1.4\* Miscellaneous Storage

4.3.1.4.1

Miscellaneous storage shall not constitute more than 10 percent of the building area or 4000 ft2 (370 m2) of the sprinklered area, whichever is greater.

4.3.1.4.2

Miscellaneous storage shall not exceed 1000 ft2 (93 m2) in one pile or area.

4.3.1.4.3

Miscellaneous storage shall be separated from other storage piles or areas by at least 25 ft (7.6 m).

4.3.1.5 Low-Piled Storage

4.3.1.5.1

For storage of Class I through Class IV commodities 12 ft (3.7 m) or less in height that do not meet the definition of Miscellaneous Storage that is on solid shelf racks, in-rack sprinklers shall be provided in accordance with 25.6.1, and ceiling sprinkler protection shall be provided in accordance with this chapter for the applicable occupancy hazard criteria.

4.3.1.5.2

For storage of Group A plastic commodities 5 ft (1.5 m) or less in height that do not meet the definition of Miscellaneous Storage that is on solid shelf racks, in-rack sprinklers shall be provided in accordance with 25.6.1, and ceiling sprinkler protection shall be provided in accordance with this chapter for the applicable occupancy hazard criteria.

4.3.1.6 Miscellaneous Tire Storage

4.3.1.6.1

Miscellaneous tire storage shall not exceed 2000 ft2 (185 m2).

4.3.1.6.2

Miscellaneous tire storage piles on-tread, regardless of storage method, shall not exceed 25 ft (7.6 m) in the direction of the wheel holes.

4.3.1.7 Protection Criteria for Miscellaneous and Low-Piled Storage

4.3.1.7.1

The protection criteria for miscellaneous and low-piled storage protected by ceiling sprinklers only shall be selected from Table 4.3.1.7.1 and Figure 19.3.3.1.1 in accordance with the density/area method of 19.3.3.2.

Table 4.3.1.7.1 Discharge Criteria for Miscellaneous Storage Up to 12 ft (3.7 m) in Height

Commodity Type of Storage Storage Height Maximum Ceiling Height Design Curve Figure 19.3.3.1.1 Note Inside Hose Total Combined Inside and Outside Hose Duration (minutes)

ft m ft m gpm L/min gpm L/min

Class I to Class IV

Class I Solid-piled, palletized, bin box, shelf, single-, double-, multiple-row rack, and back-to-back shelf storage ≤12 ≤3.7 — — OH1 0, 50, 100 0, 190, 380 250 950 90

Class II ≤10 ≤3.0 — — OH1 0, 50, 100 0, 190, 380 250 950 90

Class II >10 to ≤12 >3.0 to ≤3.7 — — OH2 0, 50, 100 0, 190, 380 250 950 90

Class III ≤12 ≤3.7 — — OH2 0, 50, 100 0, 190, 380 250 950 90

Class IV ≤10 ≤3.0 — — OH2 0, 50, 100 0, 190, 380 250 950 90

Class IV Palletized, bin box, shelf, and solid-piled >10 to ≤12 >3.0 to ≤3.7 32 10 OH2 0, 50, 100 0,190, 380 250 950 90

Single-, double-, multiple-row rack and back-to-back shelf storage >10 to ≤12 >3.0 to ≤3.7 32 10 EH1 0, 50, 100 0, 190, 380 500 1900 120

Single-, double-, multiple-row rack >10 to ≤12 >3.0 to ≤3.7 32 10 See Chapter 25. +1 level of in-rack 0, 50, 100 0, 190, 380 250 950 90

Group A Plastic Storage

Cartoned Nonexpanded and expanded Solid-piled, palletized, bin box, shelf, single-, double-, multiple-row rack, and back-to-back shelf storage ≤5 ≤1.5 — — OH2 0, 50, 100 0, 190, 380 250 950 90

>5 to ≤10 >1.5 to ≤3.0 15 4.6 EH1 0, 50, 100 0, 190, 380 500 1900 120

>5 to ≤10 >1.5 to ≤3.0 20 6.1 EH2 0, 50, 100 0, 190, 380 500 1900 120

>10 to ≤12 >3.0 to ≤3.7 17 5.2 EH2 0, 50, 100 0, 190, 380 500 1900 120

Solid-piled, palletized, bin box, shelf, and back-to-back shelf storage >10 to ≤12 >3.0 to ≤3.7 32 10 EH2 0, 50, 100 0, 190, 380 500 1900 120

Single-, double-, multiple-row rack >10 to ≤12 >3.0 to ≤3.7 32 10 See Chapter 25. + 1 level of in-rack 0, 50, 100 0, 190, 380 250 950 90

Exposed Nonexpanded and expanded Solid-piled, palletized, bin box, shelf, single-, double-, multiple-row rack, and back-to-back shelf storage ≤5 ≤1.5 — — OH2 0, 50, 100 0, 190, 380 250 950 90

Solid-piled, palletized, bin box, shelf, and back-to-back shelf storage >5 to ≤8 >1.5 to ≤2.4 28 8.5 EH2 0, 50, 100 0, 190, 380 500 1900 120

Solid-piled, palletized, bin box, shelf, single-, double-, multiple-row rack, and back-to-back shelf storage >5 to ≤10 >1.5 to ≤3.0 15 4.6 EH2 0, 50, 100 0, 190, 380 500 1900 120

Nonexpanded Solid-piled, palletized, bin box, shelf, single-, double-, multiple-row rack, and back-to-back shelf storage >5 to ≤10 >1.5 to ≤3.0 20 6.1 EH2 0, 50, 100 0, 190, 380 500 1900 120

Expanded Single-, double-, multiple-row rack >5 to ≤10 >1.5 to ≤3.0 20 6.1 See Chapter 25. +1 level of in-rack 0, 50, 100 0, 190, 380 250 950 90

Nonexpanded and expanded Solid-piled, palletized, bin box, shelf, and back-to-back shelf storage >10 to ≤12 >3.0 to ≤3.7 17 5.2 EH2 0, 50, 100 0, 190, 380 500 1900 120

Single-, double-, multiple-row rack >10 to ≤12 >3.0 to ≤3.7 17 5.2 EH2 0, 50, 100 0, 190, 380 500 1900 120

>10 to ≤12 >3.0 to ≤3.7 32 10 See Chapter 25. +1 level of in-rack 0, 50, 100 0, 190, 380 250 950 90

Tire Storage

Tires On floor, on side >5 to ≤12 >1.5 to ≤3.7 32 10 EH1 0, 50, 100 0, 190, 380 500 1900 120

On floor, on tread, or on side ≤5 ≤1.5 — — OH2 0, 50, 100 0, 190, 380 250 950 90

Single-, double-, or multiple-row racks on tread or on side ≤5 ≤1.5 — — OH2 0, 50, 100 0, 190, 380 250 950 90

Single-row rack, portable, on tread or on side >5 to ≤12 >1.5 to ≤3.7 32 10 EH1 0, 50, 100 0, 190, 380 500 1900 120

Single-row rack, fixed, on tread or on side >5 to ≤12 >1.5 to ≤3.7 32 10 EH1 0, 50, 100 0, 190, 380 500 950 120

>5 to ≤12 >1.5 to ≤3.7 32 10 See Chapter 25. +1 level of in-rack 0, 50, 100 0, 190, 380 250 950 90

Rolled Paper Storage

Heavyweight and mediumweight On end ≤10 ≤3.0 30 9.1 OH2 0, 50, 100 0, 190, 380 250 950 90

Tissue and lightweight On end ≤10 ≤3.0 30 9.1 EH1 0, 50, 100 0, 190, 380 250 950 120

4.3.1.7.1.1

The protection criteria for rack storage of miscellaneous and low-piled storage with in-rack sprinklers shall be in accordance with 25.2.2.

4.3.1.7.2

Except as provided in 4.3.1.6.1, the maximum design area for miscellaneous and low-piled storage shall not exceed 3000 ft2 (279 m2).

4.3.1.8 In-Rack Sprinklers

Miscellaneous and low-piled storage per 4.3.1.5 through 4.3.1.7 that require in-rack sprinklers shall follow Chapter 25 for their installation and design requirements.

4.3.2\* Light Hazard

The following shall be protected with light hazard occupancy criteria in this standard:

Spaces with low quantity and combustibility of contents

4.3.3\* Ordinary Hazard (Group 1)

The following shall be protected with OH1 occupancy criteria in this standard:

Spaces with moderate quantity and low combustibility of contents

Stockpiles of contents with low combustibility that do not exceed 8 ft (2.4 m)

4.3.4\* Ordinary Hazard (Group 2)

The following shall be protected with OH2 occupancy criteria in this standard:

Spaces with moderate to high quantity and combustibility of contents

Stockpiles of contents with moderate to high combustibility that do not exceed 12 ft (3.7 m)

4.3.5\* Extra Hazard (Group 1) (EH1)

The following shall be protected with EH1 occupancy criteria in this standard:

Spaces with very high quantity and combustibility of contents

Spaces where dust, lint, or other materials are present, introducing the probability of rapidly developing fires

4.3.6\* Extra Hazard (Group 2) (EH2)

The following shall be protected with EH2 occupancy criteria in this standard:

Spaces with very high quantity and combustibility of contents

Spaces with substantial amounts of combustible or flammable liquids

Spaces where shielding of combustibles is extensive

4.3.7 High-Piled Storage

Storage arrangements that do not meet the requirements of 4.3.1.5 through 4.3.1.8 shall be protected in accordance with Chapters 20 through 25.

4.3.8\* Special Occupancy Hazards. (Reserved)

4.3.9

Where K-11.2 (160) or larger sprinklers are used with EH1 or EH2 design curves, the design area shall be permitted to be reduced by 25 percent but not below 2000 ft2 (185 m2), regardless of temperature rating.

4.4 Hose Connections

Hose connections shall not be required for the protection of miscellaneous storage.

4.5 System Protection Area Limitations

4.5.1

The maximum floor area on any one floor to be protected by sprinklers supplied by any one sprinkler system riser or combined system riser shall be as follows:

Light hazard — 52,000 ft2 (4830 m2)

Ordinary hazard — 52,000 ft2 (4830 m2)

\* Extra hazard — Hydraulically calculated — 40,000 ft2 (3720 m2)

High-piled Storage — High-piled storage (as defined in 3.3.95) and storage covered by other NFPA standards — 40,000 ft2 (3720 m2)

In-rack Storage — 40,000 ft2 (3720 m2)

4.5.2

The floor area occupied by mezzanines shall comply with 4.5.2.1, 4.5.2.2, or 4.5.2.3.

4.5.2.1

In a building with only one sprinkler system, the floor area occupied by mezzanines shall not be included in the area limits of 4.5.1.

4.5.2.2

In a building with more than one sprinkler system, if a mezzanine is located entirely within the same sprinkler system boundary as the sprinklers protecting the ceiling above, the floor area occupied by mezzanine(s) shall not be included in the area limits of 4.5.1.

4.5.2.3

In a building with more than one sprinkler system, if any portion of the mezzanine floor area that is located outside the system boundary of the riser supplying the sprinklers under the mezzanine, the area of the mezzanine of the system boundary shall be added to the system area from which it is supplied, and the total system area shall meet the limits of 4.5.1.

4.5.3

Where single systems protect extra hazard, high-piled storage, or storage covered by other NFPA standards, and ordinary or light hazard areas, the extra hazard or storage area coverage shall not exceed the floor area specified for that hazard and the total area coverage shall not exceed 52,000 ft2 (4830 m2).

4.5.4

The area protected by a single in-rack system includes all of the floor area occupied by the racks, including aisles, regardless of the number of levels of in-rack sprinklers.

4.5.4.1

Multiple buildings attached by canopies, covered breezeways, common roofs, or a common wall(s) shall be permitted to be supplied by a single fire sprinkler riser.

4.5.5

The maximum system size shall comply with 4.5.1.

4.5.6\* Detached Buildings

4.5.6.1

Unless the requirements of 4.5.6.2 apply, detached buildings, regardless of separation distance, that do not meet the criteria of 4.5.4 shall be provided with separate fire sprinkler systems.

4.5.6.2

When acceptable to the authority having jurisdiction, detached structures shall be permitted to be supplied by the fire sprinkler system of an adjacent building.

4.6 Water Supply Information

4.6.1 Water Supply Capacity Information

The following information shall be included:

Location and elevation of static and residual test gauge with relation to the riser reference point

Flow location

Static pressure, psi (bar)

Residual pressure, psi (bar)

Flow, gpm (L/min)

Date

Time

Name of person who conducted the test or supplied the information

Other sources of water supply, with pressure or elevation

4.6.1.1\*

Where a waterflow test is used for the purposes of system design, the test shall be conducted no more than 12 months prior to working plan submittal unless otherwise approved by the authority having jurisdiction.

4.6.2 Water Supply Treatment Information

The following information shall be included when water supply treatment is provided in accordance with 5.1.5:

Type of condition that requires treatment

Type of treatment needed to address the problem

Details of treatment plan

4.7\* Additives

Additives or chemicals intended to stop leaks, such as sodium silicate or derivatives of sodium silicate, brine, or similar acting chemicals, shall not be used in sprinkler systems.

4.8 Air, Nitrogen, or Other Approved Gas

Where air is used to charge, maintain, or supervise sprinkler systems, nitrogen or other approved gas shall also be permitted to be used.

4.9\* Support of Nonsprinkler System Components

Sprinkler system components shall not be used to support nonsprinkler system components unless expressly permitted by this standard.

4.10 Noncombustible Materials and Limited-Combustible Materials

4.10.1\* Noncombustible Material

4.10.1.1

A material that complies with any of the following shall be considered a noncombustible material:

\* 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.

The material is reported as passing ASTM E136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.

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 Behavior of Materials in a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C.

[5000:7.1.4.1.1]

4.10.1.2

Where the term limited-combustible is used in this standard, it shall also include the term noncombustible. [5000:7.1.4.1.2]

4.10.2\* Limited-Combustible Material

A material shall be considered a limited-combustible material where both of the following conditions of 4.10.2(1) and 4.10.2(2), and the conditions of either 4.10.2.1 or 4.10.2.2, are met:

The material does not comply with the requirements for a noncombustible material in accordance with 4.10.1.

The material, in the form in which it is used, exhibits a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg), when tested in accordance with NFPA 259.

[5000:7.1.4.2]

4.10.2.1

The material shall have a structural base of noncombustible material with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm) where the surfacing exhibits a flame spread index not greater than 50 when tested in accordance with ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials, or UL 723, Standard for Test for Surface Burning Characteristics of Building Materials. [5000:7.1.4.2.1]

4.10.2.2

The material shall be composed of materials that in the form and thickness used, neither exhibit a flame spread index greater than 25 nor evidence of continued progressive combustion when tested in accordance with ASTM E84 or UL 723 and are of such composition that all surfaces that would be exposed by cutting through the material on any plane would neither exhibit a flame spread index greater than 25 nor exhibit evidence of continued progressive combustion when tested in accordance with ASTM E84 or UL 723. [5000:7.1.4.2.2]

4.10.2.3

Materials shall be considered materials where tested in accordance with ASTM E2965, Standard Test Method for Determination of Low Levels of Heat Release Rate for Materials and Products Using an Oxygen Consumption Calorimeter, at an incident flux of 75 kW/m2 for a 20-minute exposure, and both the following conditions are met:

The peak heat release rate shall not exceed 150 kW/m2 for longer than 10 seconds.

The total heat released shall not exceed 8 MJ/m2.

[5000:7.1.4.2.3]

4.10.2.4

Where the term limited-combustible is used in this standard, it shall also include the term noncombustible. [5000:7.1.4.2.4]