

DELETED**Second Revision No. 1195-NFPA 13-2023 [Global Comment]**

Based on the new definition of "blocking," replace "firestopped" or any derivations with the appropriate phrasing of "blocking."

The following sections need to be revised

19.2.3.1.5.2

A.19.2.3.1.5.2(10)

20.10.2

25.5.2.2.1

25.5.2.2.2

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
SR_1195.docx	For prod use	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Sep 07 08:35:52 EDT 2023

Committee Statement

Committee Statement: The term "firestopping" was revised to say "blocking."

Response Message: SR-1195-NFPA 13-2023



Second Revision No. 1169-NFPA 13-2023 [Detail]

[See

"28.3.4.8.1_Hazen-Williams_C_Values" word document for revisions to 28.3.4.8.1 and Table 2

28.3.4.8.1

Pipe friction loss shall be calculated in accordance with the Hazen–Williams formula with *C* values from Table 28.3.4.8.1, as follows:

- (1) Pipe, fittings, and devices such as valves, meters, flow switches in pipes 2 in. (50 mm) or less in size, and shall be included, and elevation changes that affect the sprinkler discharge shall be calculated.
- (2) Tie-in drain piping shall not be included in the hydraulic calculations.
- (3) Losses for a tee or a cross shall be calculated where flow direction change occurs based on the equivalent length of the piping segment in which the fitting is included.
- (4) The tee at the top of a riser nipple shall be included in the branch line, the tee at the base of a riser nipple shall be included in the riser nipple, and the tee or cross at a cross main–feed main junction shall be included in the cross main.
- (5) Losses for straight-through flow in a tee or cross shall not be included.
- (6) The loss of reducing elbows based on the equivalent length value of the smallest outlet shall be calculated.
- (7) The equivalent length value for the standard elbow on any abrupt 90-degree turn, such as the screw-type elbow, shall be used.
- (8) The equivalent length value for a fitting with a bushing shall be the same as for a similarly sized and configuration reducing fitting.
- (9) The equivalent length value for the long-turn elbow on any sweeping 90-degree turn, such as a flanged, or mechanical joint-elbow type, shall be used. *(See Table 28.3.3.1.1.)*
- (10) Losses shall be permitted to be excluded for tapered reducers.
- (11) Losses shall be permitted to be excluded for a fitting with or without a bushing, directly connected to a section of pipe, except as required in 28.3.3.1.2 and 28.3.3.4.
- (12) Losses through a pressure-reducing valve shall be included based on the normal inlet pressure condition. Pressure loss data from the manufacturer's literature shall be used.
- (13) In new systems, an increased *C* value of 120 shall be permitted where nitrogen is provided in accordance with 8.2.10.

[15. In new systems, an increased *C* value of 120 shall be permitted where vacuum pressure is provided in accordance with Section 8.11](#)

Table 28.3.4.8.1 Hazen–Williams *C* Values

Pipe or Tube	<i>C</i> Value
Unlined cast or ductile iron	100

[See
"28.3.4.8.1_Hazen-Williams_C_Values" word document for revisions to 28.3.4.8.1 and Table 2

Pipe or Tube	C Value
Black steel (dry systems including preaction)	100
Black steel (wet systems including deluge)	120
Black steel (dry system including preaction) using nitrogen [†] _{-b}	120
<u>Black steel (dry system including preaction) using vacuum pressure^c</u>	<u>120</u>
Galvanized steel (dry systems including preaction)	100
Galvanized steel (wet systems including deluge)	120
Galvanized steel (dry systems including preaction) using nitrogen [†] _{-b}	120
<u>Galvanized steel (dry systems including preaction) using vacuum pressure^c</u>	<u>120</u>
Plastic all (listed)	150
Cement-lined cast- or ductile iron	140
Copper tube, brass or stainless steel	150
Asbestos cement	140
Concrete	140

a

* The authority having jurisdiction is permitted to allow other C values.

†

~~-b Nitrogen supply shall be installed in accordance with 8.2.10.~~

c

Vacuum pressure shall be installed in accordance with Section 8.11

Supplemental Information

File Name	Description	Approved
28.3.4.8.1_Hazen-Williams_C_Values.docx	For editorial use	

Submitter Information Verification

Committee: AUT-SSD

Submission Date: Tue Aug 29 15:33:27 EDT 2023

Committee Statement

Committee Statement: The vacuum conditions should minimize corrosion. Vacuum systems are listed.

Response Message: SR-1169-NFPA 13-2023

[Public Comment No. 125-NFPA 13-2023 \[Section No. 28.3.4.8.1\]](#)



Second Revision No. 1171-NFPA 13-2023 [Detail]

[See
"28.3.4.8.1 Vapor Phase" word document for revisions to 28.3.4.8.1 and Table 28.3.4.8.1]

28.3.4.8.1

Pipe friction loss shall be calculated in accordance with the Hazen–Williams formula with *C* values from Table 28.3.4.8.1, as follows:

- (1) Pipe, fittings, and devices such as valves, meters, flow switches in pipes 2 in. (50 mm) or less in size, and strainers shall be included, and elevation changes that affect the sprinkler discharge shall be calculated.
- (2) Tie-in drain piping shall not be included in the hydraulic calculations.
- (3) Losses for a tee or a cross shall be calculated where flow direction change occurs based on the equivalent pipe length of the piping segment in which the fitting is included.
- (4) The tee at the top of a riser nipple shall be included in the branch line, the tee at the base of a riser nipple shall be included in the riser nipple, and the tee or cross at a cross main–feed main junction shall be included in the cross main.
- (5) Losses for straight-through flow in a tee or cross shall not be included.
- (6) The loss of reducing elbows based on the equivalent length value of the smallest outlet shall be calculated.
- (7) The equivalent length value for the standard elbow on any abrupt 90-degree turn, such as the screw-type pattern, shall be used.
- (8) The equivalent length value for a fitting with a bushing shall be the same as for a similarly sized and configured reducing fitting.
- (9) The equivalent length value for the long-turn elbow on any sweeping 90-degree turn, such as a flanged, welded, or mechanical joint-elbow type, shall be used. (See Table 28.3.3.1.1.)
- (10) Losses shall be permitted to be excluded for tapered reducers.
- (11) Losses shall be permitted to be excluded for a fitting with or without a bushing, directly connected to a sprinkler, except as required in 28.3.3.1.2 and 28.3.3.4.
- (12) Losses through a pressure-reducing valve shall be included based on the normal inlet pressure condition, and pressure loss data from the manufacturer's literature shall be used.
- (13) In new systems, an increased *C* value of 120 shall be permitted where nitrogen is provided in accordance with 8.2.10.

16. In new systems, an increased *C* value of 120 shall be permitted where vacuum pressure is provided in accordance with Section 8.11

Table 28.3.4.8.1 Hazen–Williams *C* Values

Pipe or Tube	C Value ^a
Unlined cast or ductile iron	100
Black steel (dry systems including preaction)	100
Black steel (wet systems including deluge)	120
Black steel (dry system including preaction) using nitrogen [†]	120
Black steel (dry system including preaction) using vacuum pressure^c	<u>120</u>
Galvanized steel (dry systems including preaction)	100
Galvanized steel (wet systems including deluge)	120
Galvanized steel (dry systems including preaction) using nitrogen [†]	120
Galvanized steel (dry systems including preaction) using vacuum pressure^d	<u>120</u>
Plastic all (listed)	150
Cement-lined cast- or ductile iron	140
Copper tube, brass or stainless steel	150
Asbestos cement	140
Concrete	140

^a

The authority having jurisdiction is permitted to allow other C values.

^{*}

[†]

^b Nitrogen supply shall be installed in accordance with 8.2.10.

^d

[Vacuum pressure shall be installed in accordance with Section 8.11](#)

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
28.3.4.8.1_Vapor_Phase.docx	For editorial use	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Tue Aug 29 16:29:17 EDT 2023

Committee Statement

Committee Statement: Vapor corrosion inhibitor systems are listed and can minimize corrosion.

Response Message: SR-1171-NFPA 13-2023

[Public Comment No. 189-NFPA 13-2023 \[Section No. 28.3.4.8.1\]](#)



Second Revision No. 1172-NFPA 13-2023 [Detail]

28.3.4.8.1

Pipe friction loss shall be calculated in accordance with the Hazen–Williams formula with *C* values from Table 28.3.4.8.1, as follows:

- (1) Pipe, fittings, and devices such as valves, meters, flow switches ~~in pipes 2 in. (50 mm) or less in size,~~ and strainers shall be included, and elevation changes that affect the sprinkler discharge shall be calculated.
- (2) Tie-in drain piping shall not be included in the hydraulic calculations.
- (3) Losses for a tee or a cross shall be calculated where flow direction change occurs based on the equivalent pipe length of the piping segment in which the fitting is included.
- (4) The tee at the top of a riser nipple shall be included in the branch line, the tee at the base of a riser nipple shall be included in the riser nipple, and the tee or cross at a cross main–feed main junction shall be included in the cross main.
- (5) Losses for straight-through flow in a tee or cross shall not be included.
- (6) The loss of reducing elbows based on the equivalent length value of the smallest outlet shall be calculated.
- (7) The equivalent length value for the standard elbow on any abrupt 90-degree turn, such as the screw-type pattern, shall be used.
- (8) The equivalent length value for a fitting with a bushing shall be the same as for a similarly sized and configured reducing fitting.
- (9) The equivalent length value for the long-turn elbow on any sweeping 90-degree turn, such as a flanged, welded, or mechanical joint-elbow type, shall be used. (See Table 28.3.3.1.1.)
- (10) Losses shall be permitted to be excluded for tapered reducers.
- (11) Losses shall be permitted to be excluded for a fitting with or without a bushing, directly connected to a sprinkler, except as required in 28.3.3.1.2 and 28.3.3.4.
- (12) Losses through a pressure-reducing valve shall be included based on the normal inlet pressure condition, and pressure loss data from the manufacturer's literature shall be used.
- (13) In new systems, an increased *C* value of 120 shall be permitted where nitrogen is provided in accordance with 8.2.10.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Tue Aug 29 16:34:25 EDT 2023

Committee Statement

Committee There appears to be a contradiction between this section and the friction loss table

Statement: regarding when to consider the friction loss of flow switches. Since friction loss occurs in flow switches it should be accounted for regardless of pipe sizes.

Response Message: SR-1172-NFPA 13-2023



Second Revision No. 1182-NFPA 13-2023 [Detail]

20.15 Hose Stream Allowance and Water Supply Duration. ([See Section C.8](#))

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Sep 01 12:04:22 EDT 2023

Committee Statement

Committee Statement: The reference to 20.19 in Section C.8 is incorrect. The reference to “20.19” has been corrected to “20.15.”

CC note No. 42-NFPA 13-2023 [Section No. C.8]

Review C.8 and verify the correct cross reference. Should it be 20.19 or 25.3.1?

Response Message: SR-1182-NFPA 13-2023



Second Revision No. 1203-NFPA 13-2023 [Detail]

19.1.4.1

The water demand requirements shall be determined from the following:

- (1) Occupancy hazard fire control approach and special design approaches of Chapter 19
- (2) Storage design approaches of Chapter 20 through Chapter 25
- (3) Special occupancy approaches of Chapter 27

(See A.4.2.)

~~A.19.1.4.1~~

~~See A.4.2.~~

~~25.1.4.3 In-Rack Sprinkler Waterflow Alarm. (Reserved) (See A.16.11.2 and Section C.4.)~~

~~A.25.1.4.3~~

~~See A.16.11.2 and Section C.4.~~

~~A.26.4.1.2~~

~~(See Section C.20.)~~

~~26.6.6 Sprinkler Criteria. (See Section C.25.)~~

~~A.26.6.6~~

~~See Section C.25.~~

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Mon Nov 06 09:35:14 EST 2023

Committee Statement

Committee Statement: Revised to meet the Manual of Style requirements and create consistency within the document.

Response Message: SR-1203-NFPA 13-2023



Second Revision No. 1077-NFPA 13-2023 [Section No. 3.3.22]

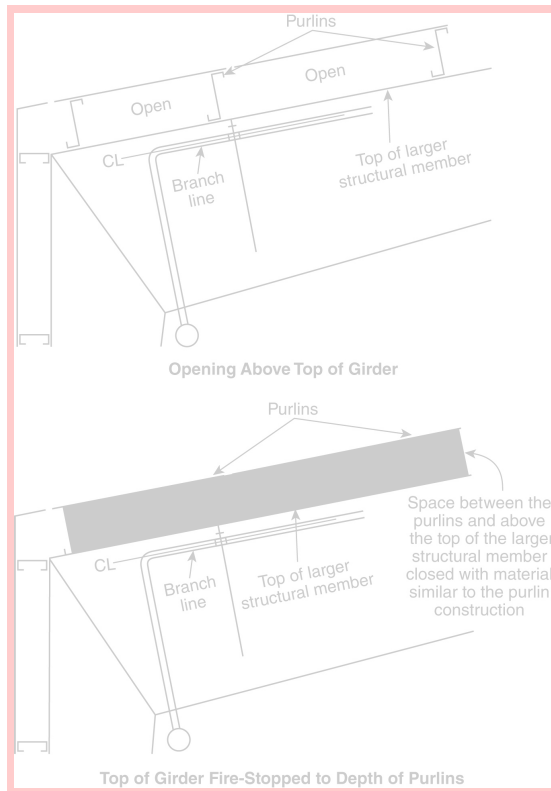
3.3.21* Blocking.

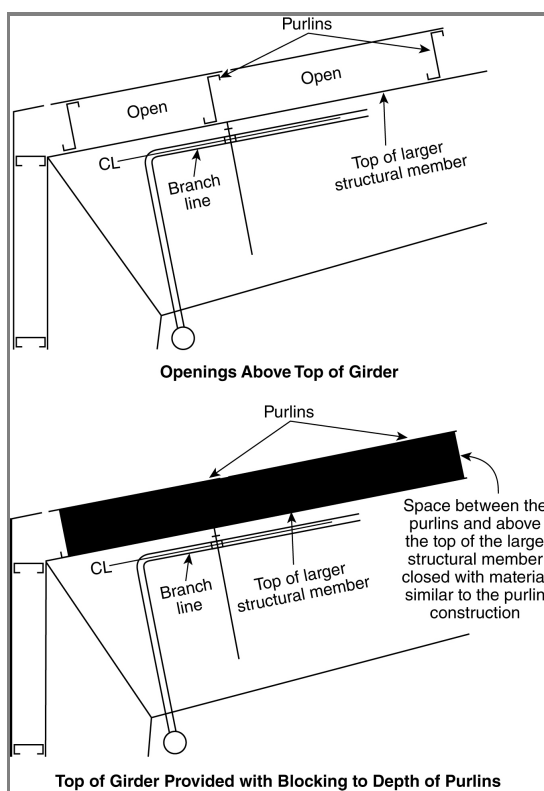
A means by which the horizontal spread of flame or heat during a fire event is stopped by the installation of materials ~~equivalent to or less than the combustibility of the structural member~~ that will stay in place before and during sprinkler operation to limit the channeling of heat ~~within the~~ between structural members. (AUT-SSD)

A.3.3.21 Blocking.

Blocking is required in several instances within this standard to restrict the horizontal flow of heat within channels created by obstructed construction, which is referred to as *channeling*. The blocking helps reduce the channeling effect created by obstructed construction so that the heat from a fire can fill a specified channel volume before eventually flowing horizontally under the structural members and activating ceiling sprinklers in a timely fashion. See Figure A.3.3.21 for an example of blocking a purlin at the intersection of a girder. The material utilized for blocking does not have to have a fire resistive rating, rather it only requires noncombustible materials for the blocking when the structural elements are noncombustible. While it is ideal to have blocking that is tight to the ceiling, the intent of this section is to not require the small gaps created by a corrugated roof decking to be filled. (AUT-SSD)

Figure A.3.3.21 Example of Blocking at Intersection of Purlins and Girders.





Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
Figure_A.3.3.22.docx	Updated Figure A.3.3.22	
13_SSD_SR-1077_3.3.22_Blocking.docx	For prod use	

Submitter Information Verification

Committee: AUT-SSD
Submittal Date: Thu Aug 03 10:57:35 EDT 2023

Committee Statement

Committee Statement: It was established during the first draft that the preferred term “blocking” be used instead of “fire-stopping.” As such, the terminology needs to be consistent. This proposed text also clarifies what is intended with the use of the term “blocking.”

Response Message: SR-1077-NFPA 13-2023

[Public Comment No. 135-NFPA 13-2023 \[Section No. 3.3.22\]](#)

[Public Comment No. 136-NFPA 13-2023 \[Section No. A.3.3.22\]](#)



Second Revision No. 1174-NFPA 13-2023 [Section No. 4.2]

4.2* Basis of Design for the 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.28.1(b)*]:

- (1) Intended use of the building, including the materials within the building and the maximum height and arrangement of any storage configuration
- (2) Storage layout, including the maximum height, storage commodity, and arrangement of any storage configuration, where applicable
- (3) 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
- (4)* Determination and confirmation of the water supply including any necessary adjustments
- (5)* Any special knowledge of the water supply, including known environmental conditions that might be responsible for corrosion, including microbiologically influenced corrosion (MIC)
- (6) Whether seismic protection is required and the ~~applicable short period response parameter~~ design spectral response acceleration at short periods, S_{DS}
- (7) Any special knowledge of the general environment in which the system will be installed that might be responsible for corrosion, including airborne chemicals that could contact system components or chemical solutions that might be exposed to the sprinkler system components

A.4.2

A building constructed where the expected occupancy hazard and commodity classification of tenant uses are unknown at the time of the sprinkler system's design and installation presents special problems due to unknown factors. The design of sprinkler systems for such buildings should be carefully reviewed with the owners, builders, leasing agents, and local authorities having jurisdiction prior to the selection of design criteria and installation of the system. Consideration should be given to the available height for storage, as well as the occupancy hazards of potential tenants and their likely storage needs.

The ~~short period response parameter, S_S~~ , design spectral response acceleration at short periods, S_{DS} , is defined in 3.3.58. Additional information about S_S is provided in 4.5.9 Chapter 18 .

The intent of Section 4.2 is to provide the owner's certificate for all new systems and where there is a change of occupancy and/or building use. [See *Figure A.28.1(b)*.]

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
4.2_edits.docx	For editorial use	

Submitter Information Verification

Committee: AUT-SSD

Submission Date: Wed Aug 30 08:08:57 EDT 2023

Committee Statement

Committee Statement: The title was revised to make it clear that this information is needed for designing the sprinkler system. (2) was added because storage layout plans are often required by the fire code when a building is going to be used for storage purposes and this plan is needed for the sprinkler design, when applicable. (6) was updated to align with ASCE/SEI 7-22. "A.4.2 (3) was revised to read "A.4.2(4)" and "A.4.2(4)" was revised to read "A.4.2(5)." A.4.2 was updated to align with ASCE/SEI 7.

CC note No. 14-NFPA 13-2023 [Section No. 4.2]

Review section 4.2(5) and Figure A.28.1(b) to make sure it aligns with any changes to the seismic revisions of Chapter 18 during the A2024 revision cycle (currently requires Ss while the A2024 revision will require Sds). Update owners certificate. Coordinate with AUT-HBS committee.

Response SR-1174-NFPA 13-2023

Message:

[Public Comment No. 19-NFPA 13-2023 \[Section No. 4.2\]](#)

[Public Comment No. 49-NFPA 13-2023 \[Section No. 4.2\]](#)

[Public Comment No. 18-NFPA 13-2023 \[Section No. 4.2\]](#)



Second Revision No. 1080-NFPA 13-2023 [Section No. 4.3]

4.3 Qualified Personnel-

Qualified personnel shall meet at least one of the following qualifications:

~~Meets the requirements and training for a given field acceptable to the AHJ~~

~~Is certified by an approved fire protection certification organization~~

~~Is registered, licensed, or certified by a state or local authority to perform design or installation of sprinkler systems~~

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 03 14:37:12 EDT 2023

Committee Statement

Committee Statement: The standard requires knowledgeable and experienced personnel to perform the work found in the standard. It is up to the jurisdiction enforcing codes and standards to determine what constitutes "qualified personnel." It is the responsibility of the contractor to train their personnel for the jobs they will be performing in conformance with the jurisdiction's requirements.

Response Message: SR-1080-NFPA 13-2023

[Public Comment No. 97-NFPA 13-2023 \[Section No. 4.3\]](#)

[Public Comment No. 131-NFPA 13-2023 \[Section No. 4.3\]](#)

[Public Comment No. 156-NFPA 13-2023 \[Section No. 4.3\]](#)



Second Revision No. 1095-NFPA 13-2023 [Section No. 4.4.1.4.5]

4.3.1.4.5

Solid shelf racks in accordance with the requirements of Section ~~25.4~~ 25.3 shall not apply to miscellaneous storage of Class I through Class IV commodities up to 12 ft (3.7 m) and Group A plastics up to 5 ft (1.5 m).

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Aug 04 10:03:26 EDT 2023

Committee Statement

Committee Statement: Corrected reference.

Response Message: SR-1095-NFPA 13-2023



Second Revision No. 1175-NFPA 13-2023 [Section No. 4.4.1.7.1]



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.

Table 4.3.1.7.1 Discharge Criteria for Miscellaneous and Low-Piled Storage

<u>Commodity</u>	<u>Type of Storage</u>	<u>Storage Height</u>		<u>Maximum Ceiling Height</u>		<u>Design from 19.2.3.1.1</u>	<u>In-Rack Sprinklers Required</u>	<u>Inside Hose</u>		
		<u>ft</u>	<u>m</u>	<u>ft</u>	<u>m</u>			<u>gpm</u>	<u>L/m</u>	
Class I to Class IV										
Class I	Solid-piled, palletized,	≤12	≤3.7	—	—	OH1	No	0, 50, 100	0, 138	
Class II	bin box, shelf,	≤10	≤3.0	—	—	OH1	No	0, 50, 100	0, 138	
Class II	single-, double-, or multiple-row rack,	>10 to ≤12	>3.0 to ≤3.7	—	—	OH2	No	0, 50, 100	0, 138	
Class III	and back-to-back shelf storage	≤12	≤3.7	—	—	OH2	No	0, 50, 100	0, 138	
Class IV	shelf storage	≤10	≤3.0	—	—	OH2	No	0, 50, 100	0, 138	
Class IV	Palletized, bin box, shelf, and solid-piled	>10 to ≤12	>3.0 to ≤3.7	32	9.8	OH2	No	0, 50, 100	0, 138	
	Single-, double-, or multiple-row rack, and back-to-back shelf storage	>10 to ≤12	>3.0 to ≤3.7	32	9.8	EH1	No	0, 50, 100	0, 138	
	Single-, double-, or multiple-row rack	>10 to ≤12	>3.0 to ≤3.7	32	9.8	See Chapter 25 25.2.1.	+1 level of in-rack Yes	0, 50, 100	0, 138	
Group A Plastic Storage										
Cartoned	Nonexpanded and expanded	Solid-piled, palletized,	≤5	≤1.5	—	—	OH2	No	0, 50, 100	0, 138
		bin box, shelf,	>5 to ≤10	>1.5 to ≤3.0	15	4.6	EH1	No, unless solid shelf	0, 50, 100	0, 138
		single-, double-, or multiple-row rack,	>5 to ≤10	>1.5 to ≤3.0	20	6.1	EH2	No, unless solid shelf	0, 50, 100	0, 138

<u>Commodity</u>	<u>Type of Storage</u>	<u>Storage Height</u>		<u>Maximum Ceiling Height</u>		<u>Design from 19.2.3.1.1</u>	<u>In-Rack Sprinklers Required</u>	<u>Inside Hose</u>	
		<u>ft</u>	<u>m</u>	<u>ft</u>	<u>m</u>			<u>gpm</u>	<u>L/r</u>
	and back-to-back shelf storage	>10 to ≤12	>3.0 to ≤3.7	17	5.2	EH2	No, unless solid shelf	0, 50, 100	0, 1, 38
	Solid-piled, palletized, bin box, shelf, and back-to-back shelf storage	>10 to ≤12	>3.0 to ≤3.7	32	9.8	EH2	No, unless solid shelf	0, 50, 100	0, 1, 38
	Single-, double-, or multiple-row rack	>10 to ≤12	>3.0 to ≤3.7	32	9.8	See Chapter 25 25.2.1	+ 1 level of in-rack Yes	0, 50, 100	0, 1, 38
Exposed and expanded	Solid-piled, palletized, bin box, shelf, single-, double-, or multiple-row rack, and back-to-back shelf storage	≤5	≤1.5	—	—	OH2	No	0, 50, 100	0, 1, 38
	Solid-piled, palletized, bin box, shelf, and back-to-back shelf storage	>5 to ≤8	>1.5 to ≤2.4	28	8.5	EH2	No, unless solid shelf	0, 50, 100	0, 1, 38
	Solid-piled, palletized, bin box, shelf, single-, double-, or multiple-row rack, and back-to-back	>5 to ≤10	>1.5 to ≤3.0	15	4.6	EH2	No, unless solid shelf	0, 50, 100	0, 1, 38

Commodity	Type of Storage	Storage Height		Maximum Ceiling Height		Design from 19.2.3.1.1	In-Rack Sprinklers Required	Inside Hose	
		ft	m	ft	m			gpm	L/m
		shelf storage							
Nonexpanded	Solid-piled, palletized, bin box, shelf, single-, double-, or multiple-row rack, and back-to-back shelf storage	>5 to ≤10	>1.5 to ≤3.0	20	6.1	EH2	No, unless solid shelf	0, 50, 100	0, 138
Expanded	Single-, double-, or multiple-row rack	>5 to ≤10	>1.5 to ≤3.0	20	6.1	See Chapter 25 25.2.1	+1 level of in-rack Yes	0, 50, 100	0, 138
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	No, unless solid shelf	0, 50, 100	0, 138
	Single-, double-, or multiple-row rack	>10 to ≤12	>3.0 to ≤3.7	17	5.2	EH2	No, unless solid shelf	0, 50, 100	0, 138
	Single-, double-, or multiple-row rack	>10 to ≤12	>3.0 to ≤3.7	32	9.8	See Chapter 25 25.2.1	+1 level of in-rack Yes	0, 50, 100	0, 138
Tire Storage									
Tires	On floor or on side	>5 to ≤12	>1.5 to ≤3.7	32	9.8	EH1	No N/A	0, 50, 100	0, 138
	On floor, on tread, or on side	≤5	≤1.5	—	—	OH2	No N/A	0, 50, 100	0, 138
	Single-, double-, or multiple-row racks, on tread or on side	≤5	≤1.5	—	—	OH2	No	0, 50, 100	0, 138

<u>Commodity</u>	<u>Type of Storage</u>	<u>Storage Height</u>		<u>Maximum Ceiling Height</u>		<u>Design from 19.2.3.1.1</u>	<u>In-Rack Sprinklers Required</u>	<u>Inside Hose</u>	
		<u>ft</u>	<u>m</u>	<u>ft</u>	<u>m</u>			<u>gpm</u>	<u>L/m</u>
		Single-row rack, portable, on tread or on side	>5 to ≤12	>1.5 to ≤3.7	32			9.8	EH1
Single-row rack, fixed, on tread or on side	>5 to ≤12	>1.5 to ≤3.7	32	9.8	EH1	No	0, 50, 100	0, 138	
	>5 to ≤12	>1.5 to ≤3.7	32	9.8	See Chapter 25 25.2.1	+1 level of in-rack Yes	0, 50, 100	0, 138	
Rolled Paper Storage									
Heavyweight and mediumweight	On end	≤10	≤3.0	30	9.1	OH2	No N/A	0, 50, 100	0, 138
Tissue and lightweight	On end	≤10	≤3.0	30	9.1	EH1	No N/A	0, 50, 100	0, 138

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
Table_4_4_1_7_1_Miscellaneous_PC_207.docx	Revisions to Table 4.4.1.7.1	
Table_4_4_1_7_1_Miscellaneous_SR-1175.docx	For prod use	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 31 07:15:49 EDT 2023

Committee Statement

Committee Statement: Reorganizing and separating out miscellaneous and low-piled storage to make it easier for the end user to follow.

Response Message: SR-1175-NFPA 13-2023

Public Comment No. 207-NFPA 13-2023 [Section No. 4.4.1.7.1]



Second Revision No. 1168-NFPA 13-2023 [Section No. 4.4.1.7.2]

4.3.1.7.2

For miscellaneous storage with open frame racks where in-rack sprinklers are required by Table 4.3.1.7.1, one level of in-rack sprinkler protection and ceiling ~~sprinkler~~ design shall be in accordance with 25.2.1.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Tue Aug 29 12:01:18 EDT 2023

Committee Statement

Committee Statement: Reorganizing and separating out miscellaneous and low-piled storage to make it easier for the end user to follow.

Response Message: SR-1168-NFPA 13-2023



Second Revision No. 1167-NFPA 13-2023 [New Section after 4.4.1.7.3]



4.3.1.7.4

The protection criteria for low-piled storage protected by ceiling sprinklers only shall be selected from Table 4.3.1.7.4.

Table 4.3.1.7.4 Discharge Criteria for Low-Piled Storage

Commodity	Type of Storage	Storage Height		Maximum Ceiling Height		Design from 19.2.3.1.1	In-Rack Sprinklers Required	Inside Hose		Total Combined Inside and Outside Hose	
		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-, or multiple-row rack, and back-to-back shelf storage	≤12	≤3.7	—	—	OH1	No, unless solid shelf	0, 50, 100	0, 190, 380	250	950
Class II	bin box, shelf, single-, double-, or multiple-row rack, and back-to-back shelf storage	≤10	≤3.0	—	—	OH1	No, unless solid shelf	0, 50, 100	0, 190, 380	250	950
Class II	or multiple-row rack, and back-to-back shelf storage	>10 to ≤12	>3.0 to ≤3.7	—	—	OH2	No, unless solid shelf	0, 50, 100	0, 190, 380	250	950
Class III	and back-to-back shelf storage	≤12	≤3.7	—	—	OH2	No, unless solid shelf	0, 50, 100	0, 190, 380	250	950
Class IV	shelf storage	≤10	≤3.0	—	—	OH2	No, unless solid shelf	0, 50, 100	0, 190, 380	250	950
Class IV	Palletized, bin box, shelf, and solid-piled	>10 to ≤12	>3.0 to ≤3.7	32	9.8	OH2	No, unless solid shelf	0, 50, 100	0, 190, 380	250	950
-	Single-, double-, or multiple-row rack, and back-to-back shelf storage	>10 to ≤12	>3.0 to ≤3.7	32	9.8	EH1	No, unless solid shelf	0, 50, 100	0, 190, 380	500	1900
-	Single-, double-, or multiple-row rack	>10 to ≤12	>3.0 to ≤3.7	32	9.8	See 25.2.2	Yes	0, 50, 100	0, 190, 380	250	950
Group A Plastic Storage											
Group A Plastic (All)	Solid-piled, palletized, bin box, shelf, single-, double-, or	≤5	≤1.5	—	—	OH2	No, unless solid shelf	0, 50, 100	0, 190, 380	250	950

<u>Commodity</u>	<u>Type of Storage</u>	<u>Storage Height</u>		<u>Maximum Ceiling Height</u>		<u>Design from 19.2.3.1.1</u>	<u>In-Rack Sprinklers Required</u>	<u>Inside Hose</u>		<u>Total Combined Inside and Outside Hose</u>	
		<u>ft</u>	<u>m</u>	<u>ft</u>	<u>m</u>			<u>gpm</u>	<u>L/min</u>	<u>gpm</u>	<u>L/min</u>
	multiple-row rack, and back-to-back shelf storage										

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
Table_4.4.1.7.4.docx	Table 4.4.1.7.4	
Table_4.4.1.7.4_SR-1167.docx	For prod use	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Tue Aug 29 11:45:05 EDT 2023

Committee Statement

Committee Statement: Reorganizing and separating out miscellaneous and low-piled storage to make it easier for the end user to follow.

Response Message: SR-1167-NFPA 13-2023

[Public Comment No. 208-NFPA 13-2023 \[New Section after 4.4.1.7.1\]](#)



Second Revision No. 1098-NFPA 13-2023 [Section No. 4.4.1.7.3]

4.3.1.7.3

For miscellaneous storage having solid shelf racks, ~~protection of racks in accordance with Section 25.4 shall only be required~~ where in-rack sprinklers are required by Table 4.3.1.7.1, in-rack sprinklers shall be in accordance with Section 25.3 and the ceiling design shall be in accordance with 25.2.1.4 .

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Aug 04 10:24:00 EDT 2023

Committee Statement

Committee Statement: Reorganizing and separating out miscellaneous and low-piled storage to make it easier for the end user to follow.

Public Comment No. 175-NFPA 13-2023 [Section No. 4.4.1.7.3]



Second Revision No. 1099-NFPA 13-2023 [Section No. 4.4.1.7.4]

4.3.1.7.5

For low-piled storage with open frame racks where in-rack sprinklers are required by Table 4.3.1.7.4, one level of in-rack sprinkler protection and ceiling sprinkler design shall be in accordance with 25.2.2.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Aug 04 10:26:02 EDT 2023

Committee Statement

Committee Statement: Reorganizing and separating out miscellaneous and low-piled storage to make it easier for the end user to follow.

Response Message: SR-1099-NFPA 13-2023



Second Revision No. 1081-NFPA 13-2023 [Section No. 4.4.1.7.5]

4.3.1.7.6

For low-piled storage having solid ~~shelves~~ shelf racks where in-rack sprinklers are required by Table 4.3.1.7.4 , in-rack ~~sprinkler protection~~ sprinklers shall be in accordance with Section 25.3 and the ceiling design shall be required, with corresponding ceiling protection in accordance with 25.2.2.4.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 03 15:03:26 EDT 2023

Committee Statement

Committee Statement: Reorganizing and separating out miscellaneous and low-piled storage to make it easier for the end user to follow.

Response Message: SR-1081-NFPA 13-2023

[Public Comment No. 177-NFPA 13-2023 \[Section No. 4.4.1.7.5\]](#)



Second Revision No. 1082-NFPA 13-2023 [Section No. 4.5.1]

4.4.1

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:

- (1) Light hazard — 52,000 ft² (4830 m²)
- (2)* Light hazard protected with a wet pipe system and the system water flow and supervisory alarms are transmitted to a supervising station in accordance with NFPA 72 — 78,000 ft² (7250 m²)

A.4.4.1(2)

Should the system be impaired, it should be noted that the increased area will result in impairment procedures in accordance with NFPA 25 being applied to the larger area which could have operational and economic impacts on the building.

- (3) Ordinary hazard — 52,000 ft² (4830 m²)
- (4) Extra hazard, ~~Hydraulically~~ hydraulically calculated — 40,000 ft² (3720 m²)

A.4.5.1(3)

Pipe schedule — 25,000 ft² (2320 m²).

- (5) ~~High-piled Storage~~ — ~~High-piled~~ storage (as defined in 3.3.103) and storage covered by other NFPA standards — 40,000 ft² (3720 m²)
- (6) ~~In-rack Storage~~ storage — 40,000 ft² (3720 m²)

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_SSD_SR-1082_4.5.1.docx		

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 03 15:27:58 EDT 2023

Committee Statement

Committee Statement: This revision to wet systems allows for flexibility in light hazard occupancies where the building area is slightly over a system size limitation. The proposed language uses the concept of rounding off for an increase in system size but it still contains a maximum system protection area. The 78,000 square feet represents a 50% increase that can be applied to all the systems in the building. However, to utilize the increase the system

waterflow alarm and supervisory alarms must be transmitted to an alarm supervising station. The transmission of the alarm and supervisory signals to a supervising station is required for most sprinkler systems by US building and life safety codes, NFPA 1, NFPA 101, and NFPA 5000.

Response SR-1082-NFPA 13-2023

Message:

[Public Comment No. 101-NFPA 13-2023 \[Section No. 4.5.1\]](#)

[Public Comment No. 91-NFPA 13-2023 \[Section No. 4.5.1\]](#)



Second Revision No. 1197-NFPA 13-2023 [Section No. 4.10]

4.9 Noncombustible Materials and Limited-Combustible Materials.

4.9.1* Noncombustible Material.

4.9.1.1

A material that complies with any 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]

4.9.1.2

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

4.9.2* Limited-Combustible Material.

A material shall be considered a limited-combustible material where ~~both one~~ of the following conditions of 4.9.2 (1) and 4.9.2 (2), and the conditions of either 4.9.2.1 or 4.9.2.2, are is met:

- (1) ~~The material does not comply with the requirements for a noncombustible material in accordance with 4.9.1~~ The conditions of 7.1.4.2.1 and 7.1.4.2.2 of *NFPA 5000*, and the conditions of either 4.9.2.1 or 4.9.2.2, shall be met.
- (2) ~~The material, in the form in which it is used, exhibits a potential heat value not exceeding 3500 Btu/lb (8150 kJ/kg), when tested in accordance with NFPA 259~~ The conditions of 4.9.2.3 shall be met.

[5000:7.1.4.2]

4.9.2.1

The material shall have a structural base of noncombustible material with a surfacing not exceeding a thickness of $\frac{1}{8}$ 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, *Test for Surface Burning Characteristics of Building Materials*. [5000:7.1.4.2.1 7.1.4.2.3]

4.9.2.2

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 7.1.4.2.4]

4.9.2.3

Materials shall be considered limited-combustible 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:

- (1) The peak heat release rate shall not exceed 150 kW/m² for longer than 10 seconds.
- (2) The total heat released shall not exceed 8 MJ/m².

[5000:7.1.4.2.3 7.1.4.2.5]

4.9.2.4

Where the term *limited-combustible* is used in this standard, it shall also include the term *noncombustible*. [5000:7.1.4.2.4 7.1.4.2.6]

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13-2022_Chapter_4.10.docx	For editorial use	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Sep 08 10:22:20 EDT 2023

Committee Statement

Committee Statement: Extracts updated.

CC note 4-NFPA 13-2023 [Section No. 4.10]

Review extracts from NFPA 5000 as they currently do not align. Revise extracted text and extract tags as appropriate.

Response Message: SR-1197-NFPA 13-2023



Second Revision No. 1101-NFPA 13-2023 [Section No. 5.1.4.3]

5.1.4.3* Inhibitors.

A.5.1.4.3

Vapor corrosion inhibitors entering a sprinkler system as vapor in the air supply are not part of the water supply. Requirements for air supply are applicable to vapor corrosion inhibitors.

5.1.4.3.1

Where used, listed bacterial inhibitors and/or corrosion inhibitors shall be compatible with system components.

5.1.4.3.2

Where used together, listed bacterial inhibitors and corrosion inhibitors shall be compatible with each other.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Aug 04 10:41:00 EDT 2023

Committee Statement

Committee Statement: Vapor corrosion inhibitors are applied through equipment attached to the air supply for dry-pipe or preaction systems.

Response Message: SR-1101-NFPA 13-2023

Public Comment No. 183-NFPA 13-2023 [New Section after 5.1.4.3]



Second Revision No. 1138-NFPA 13-2023 [Section No. 19.1.6.4]

19.1.6.4*

When hose valves for fire department use are attached to wet pipe sprinkler system risers in accordance with 16.15.2, the following shall apply:

- (1) The sprinkler system demand shall not be required to be added to standpipe demand as determined from NFPA 14.
- (2) Where the combined sprinkler system demand and hose stream allowance of Table 19.2.3.1.2 exceeds the requirements of NFPA 14, this higher demand shall be used.
- (3) For partially sprinklered buildings, the sprinkler demand, not including hose stream allowance, as indicated in ~~Figure 19.2.3.1.1~~ Chapters 19 through 28 shall be added to the requirements given in NFPA 14.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Tue Aug 22 06:39:25 EDT 2023

Committee Statement

Committee Statement: Figure 19.2.3.1.1 has been removed from NFPA 13. The reference has been corrected from "Figure 19.2.3.1.1" to "chapters 19 through 28". The flow resulting from a complete hydraulic calculation needs to be added to the standpipe demand not just the density from a single table.

CC note No. 5-NFPA 13-2023 [Section No. 19.1.6.4]

Review section 19.1.6.4(3) as Figure 19.2.3.1.1 has been deleted as part of an FR. References to this figure will need to be cleaned up. Suggest changing "or Figure 19.2.3.1.1" to "Table 19.2.3.1.1."

Response Message: SR-1138-NFPA 13-2023



Second Revision No. 1156-NFPA 13-2023 [Section No. 19.2.3.2.2.1]

19.2.3.2.2.1

The densities and areas provided in Table 19.2.3.1.1 ~~or Figure 19.2.3.1.1 shall~~ be for use only with spray sprinklers.

Submitter Information Verification

Committee: AUT-SSD

Submission Date: Tue Aug 22 10:35:19 EDT 2023

Committee Statement

Committee Statement: Figure 19.2.3.1.1 was removed as part of a first revision. The term "or Figure 19.2.3.1.1" has been removed from the section.

CC note No. 6-NFPA 13-2023 [Section No. 19.2.3.2.2.1]

Review section 19.2.3.2.2.1 as Figure 19.2.3.1.1 has been deleted as part of an FR. References to this figure will need to be cleaned up. Suggest removing "or Figure 19.2.3.1.1."

Response Message: SR-1156-NFPA 13-2023



Second Revision No. 1140-NFPA 13-2023 [Section No. 19.2.3.2.2.3]

19.2.3.2.2.3

For extended coverage sprinklers, the minimum design area shall be that corresponding to the hazard in Table 19.2.3.1.1 or ~~Figure 19.2.3.1.1~~ or the area protected by five sprinklers, whichever is greater.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Tue Aug 22 06:56:16 EDT 2023

Committee Statement

Committee Statement: Figure 19.2.3.1.1 was removed from NFPA 13 During First Revision. The reference to Figure 19.2.3.1.1 has been deleted.

CC note No. 35-NFPA 13-2023 [Section No. 19.2.3.2.2.3]

Review section 19.2.3.2.2.3 as Figure 19.2.3.1.1 has been deleted as part of an FR. References to this figure will need to be cleaned up. Suggest removing "or Figure 19.2.3.1.1."

Response Message: SR-1140-NFPA 13-2023



Second Revision No. 1184-NFPA 13-2023 [New Section after 19.2.3.2.4]

19.2.3.2.5* Sprinklers for Ceiling Heights Over 30 ft (9.1 m).

A.19.2.3.2.5

Historically, prior to 2025, NFPA 13 has not limited ceiling heights for nonstorage occupancies, and for any ceiling height providing sprinklers has always been considered appropriate. Large-scale fire testing has demonstrated that the protection needed for Ordinary Hazard Group 1 and Group 2 occupancies is greater than the protection indicated in Table 19.2.3.1.1. See Table C.27 for fire test data specific to Ordinary Hazard Group 1 and Group 2 type occupancies where the ceiling heights exceed 30 ft (9.1 m).

19.2.3.2.5.1*

Sidewall sprinklers shall not be permitted for use in Ordinary Hazard Group 1 and higher occupancy hazards where the ceiling height is greater than 30 ft (9.1 m).

A.19.2.3.2.5.1

The large-scale fire testing applicable to the requirements of this section did not include the use of sidewall sprinklers. As a result, sidewall sprinklers are not currently allowed for the protection of Ordinary Hazard Group 1 or greater occupancy hazards where the ceiling height exceeds 30 ft (9.1 m).

(A)*

Sprinklers having a nominal K-factor less than K-11.2 (K-160) shall not be permitted for use in Ordinary Hazard Group 2 and higher occupancy hazards where the ceiling height is greater than 30 ft (9.1 m).

A.19.2.3.2.5.1(A)

The large-scale fire testing applicable to the requirements of this section demonstrated that sprinklers with a K-factor of K-8.0 (K-115) were not effective in providing fire control for a simulated Ordinary Hazard Group 2 occupancy with the ceiling height greater than 30 ft (9.1 m), whereas sprinklers with a minimum K-factor of K-11.2 (K-160) were effective at providing fire control. As a result, sprinklers with a K-factor less than K-11.2 (K-160) are not currently allowed for the protection of Ordinary Hazard Group 2 or greater occupancy hazards where the ceiling height exceeds 30 ft (9.1 m).

(B)*

Extended-coverage pendent sprinklers having a nominal K-factor of K-22.4 (K-320) or less shall not be permitted for use in Ordinary Hazard Group 2 and higher occupancy hazards where the ceiling height is greater than 30 ft (9.1 m).

A.19.2.3.2.5.1(B)

The large-scale fire testing applicable to the requirements of this section did not include the use of extended-coverage sprinklers with a K-factor of less than K-25.2 (K-360). Testing at FM Global, however, has demonstrated that upright extended-coverage sprinklers with a K-factor of K-11.2 (K-160) and K-14.0 (K-200) can be effective for Ordinary Hazard Group 1 and 2 occupancies where the ceiling height is greater than 30 ft (9.1 m), whereas the testing at FM Global did not demonstrate this for the pendent version of these extended-coverage sprinklers. As a result, pendent extended-coverage sprinklers with K-factors of K-22.4 or less are not currently allowed for the protection of Ordinary Hazard Group 2 or greater occupancy hazards where the ceiling height exceeds 30 ft (9.1 m).

(C)*

Standard-response standard-coverage sprinklers shall not be permitted for use in Ordinary Hazard Group 2 occupancies where the ceiling height is greater than 40 ft (12.2 m).

A.19.2.3.2.5.1(C)

The large-scale fire testing applicable to the requirements of this section demonstrated that for standard-coverage sprinklers, the use of quick-response sprinklers provided an acceptable level of fire control for simulated Ordinary Hazard Group 2 occupancy hazards. As a result, quick-response standard-coverage sprinklers with K-factors of K-11.2 (K-160) or greater are required for the protection of Ordinary Hazard Group 2 occupancy hazards where the ceiling height exceeds 30 ft (9.1 m).

19.2.3.2.5.2 Sprinkler Density/Areas for Ceiling Heights Over 30 ft (9.1 m).**(A)***

For Ordinary Hazard Group 1 occupancies where the ceiling height is greater than 30 ft (9.1 m), the design areas obtained from Table 19.2.3.1.1 shall be increased by 30 percent.

A.19.2.3.2.5.2(A)

The results of Test Nos. 1 and 2 listed in Table C.27 demonstrate that standard-response K-5.6 (K-80) and K-8.0 (K-115) sprinklers can provide fire control for a simulated Ordinary Hazard Group 1 storage array under a 58 ft (17.7 m) high ceiling using a 0.15 gpm/ft² (6.1 mm/min) density. However, the number of sprinklers that operated resulted in a design area larger than that specified in Table 19.2.3.1.1 coupled with significant sprinkler skipping for both tests. As a result, the design areas in Table 19.2.3.1.1 are being increased, while maintaining the same design density, to account for the test results.

(B)*

For Ordinary Hazard Group 2 occupancies where the ceiling height is greater than 30 ft (9.1 m) but does not exceed 40 ft (12.2 m), the ceiling sprinkler system shall use a minimum density of 0.37 gpm/ft² (15.1 mm/min) in combination with the design area obtained from Table 19.2.3.1.1.

A.19.2.3.2.5.2(B)

The results of a test reported in the 2014 Suppression Detection conference proceedings (available from the NFPA Library) demonstrated that standard-response K-8.0 (K-115) sprinklers can provide fire control for a simulated Ordinary Hazard Group 2 storage array under a 40 ft (12.2 m) high ceiling using a 0.37 gpm/ft² (15 mm/min) density. However, with 12 sprinklers operating during this test, it demonstrated that a density of 0.37 gpm/ft² (15 mm/min) is more applicable than the density of 0.20 gpm/ft² (8.1 mm/min) that is provided in Table 19.2.3.1.1 and therefore has been given as the design density for this ceiling height. In addition, the results from Test Nos. 6 and 7 in Table C.27 along with a test reported in the 2014 Suppression Detection conference proceedings (available from the NFPA Library) suggest that the use of a K-11.2 (K-160) sprinkler will provide better fire control, as suggested by the requirements given in 21.1.4, even though this is not a storage occupancy.

(C)*

For Ordinary Hazard Group 2 occupancies where the ceiling height is greater than 40 ft (12.2 m), the ceiling sprinkler system shall comply with the following:

- (1) Use a minimum density of 0.45 gpm/ft² (18.3 mm/min)
- (2) Increase the design areas obtained from Table 19.2.3.1.1 by 30 percent
- (3) Use the design areas from Table 19.2.3.1.1, without a 30 percent increase, where an extended-coverage sprinkler having a minimum nominal K-factor of K-25.2 (K-360) is used

A.19.2.3.2.5.2(C)

The results of Test Nos. 6 and 7 listed in Table C.27 demonstrated that quick-response K-11.2 (K-160) sprinklers can provide fire control for a simulated Ordinary Hazard Group 2 storage array under a 60 ft (18.3 m) high ceiling using a 0.45 gpm/ft² (18.3 mm/min) density. However, with 13 and 16 sprinklers operating during these two tests, it demonstrated that a density of 0.45 gpm/ft² (18.3 mm/min) is more applicable than the density of 0.20 gpm/ft² (8.1 mm/min) that is provided in Table 19.2.3.1.1 coupled with a design area greater than the 1,500 ft² (140 m²) given in Table 19.2.3.1.1. As a result, the original design density of 0.20 gpm/ft² (8.1 mm/min) has been increased to 0.45 gpm/ft² (18.3 mm/min), and the design area of 1,500 ft² (140 m²) has been increased by 30 percent. The 30 percent increase to the design area, however, was not applied to the K-25.2 (K-360) extended-coverage sprinkler due to the very positive results (only one sprinkler operated) obtained with it during Test 8 listed in Table C.27.

(D)*

For Extra Hazard Groups 1 and 2 occupancies where the ceiling height is greater than 30 ft (9.1 m), the ceiling sprinkler system shall use a minimum density of 0.45 gpm/ft² (18.3 mm/min) in combination with the design areas obtained from Table 19.2.3.1.1.

A.19.2.3.2.5.2(D)

The test data listed in [Table C.27](#) does not include any tests representing simulated occupancy hazards for either Extra Hazard Group 1 or Extra Hazard Group 2. However, based on the results from the test data listed in [Table C.27](#), the minimum design density requirements of 0.30 gpm/ft² (12.2 mm/min) for Extra Hazard Group 1 and 0.40 gpm/ft² (16.3 mm/min) for Extra Hazard Group 2 are both now less than the 0.45 gpm/ft² (18.3 mm/min) design density required for Ordinary Hazard Group 2. Therefore, the minimum design density for both Extra Hazard Group 1 and Extra Hazard Group 2 has been increased to 0.45 gpm/ft² (18.3 mm/min) while maintaining the same required design area.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
SR_1184.docx	For editorial use	

Submitter Information Verification

Committee: AUT-SSD
Submittal Date: Tue Sep 05 07:50:21 EDT 2023

Committee Statement

Committee Statement: The revisions for protecting non-storage occupancies under ceilings more than 30 ft. (9.1 m) high are based on large-scale fire tests primarily conducted by FM Global. These annex paragraphs have been prepared to explain the reasons for these changes. These fire test results can be seen in [Table C.27](#).

Response Message: SR-1184-NFPA 13-2023



Second Revision No. 1173-NFPA 13-2023 [Section No. 19.2.3.2.4]

19.2.3.2.4 Sloped Ceilings.

Where spray sprinklers, including extended-coverage and quick-response sprinklers, are installed under a ceiling/roof deck with a slope that exceeds 2 in 12, one of the following requirements shall be implemented:

- (1) A horizontal false ceiling capable of withstanding an uplift force of 3 lb/ft² (14.6 kg/m²) is installed below the sloped ceiling and supplemented with ceiling sprinklers.
- (2) The design area for the ceiling sprinkler system is increased by 30 percent for unobstructed construction.
- (3) ~~The design area for the ceiling sprinkler system is increased by 30 percent for obstructed construction where the slope exceeds 4 in 12. Where the ceiling slope does not exceed 4 in 12, apply the sprinkler system criteria specified in Chapter 19 when all of the following conditions are met:~~
 - (a) Purlins or beams supporting the roof deck run across the roof slope.
 - (b) Purlins or beams do not exceed 18 in. (450 mm) deep.
 - (c) Purlins or beams do not exceed 5 ft (1.5 m) on center.
 - (d) Bays created by the solid structural members are not more than 40 ft (12 m) on center.
 - (e) Purlin or beam channels are provided with blocking above each solid structural member.
- (4) For obstructed construction where the ceiling slope does not exceed 4 in 12, install sprinklers in every channel.
- (5) For obstructed construction that does not meet (3) or (4), the design area for the ceiling sprinkler system is increased by 30 percent.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
19.2.3.2.4_SR_1173.docx	Revisions to 19.2.3.2.4	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Tue Aug 29 16:59:28 EDT 2023

Committee Statement

Committee Statement: Based on the discussion at the First Draft Meeting and a re-evaluation of the information from the FPRF testing program, the following changes are recommended:

1. Return the positioning of standard spray and extended coverage sprinklers with respect to obstructed construction to the 2022 edition rules
2. Allow the user to protect a storage occupancy with a sloped ceiling with the sprinkler

location information in Chapter 20 rather than Chapter 10.

This approach has a less dramatic effect on the users of NFPA 13 and is still supported by the data of the test program. Ultimately, this approach is more likely to be more user friendly to the typical design professional and will provide options that were not permitted under the 2022 and previous editions of the standard while retaining the status quo for those familiar with the older rules and still wanting to select sprinkler protection using those parameters.

Response SR-1173-NFPA 13-2023
Message:

[Public Comment No. 147-NFPA 13-2023 \[Section No. 19.2.3.2.4\]](#)



Second Revision No. 1084-NFPA 13-2023 [Sections 19.2.3.2.6, 19.2.3.2.7]

~~19.2.3.2.7 High-Temperature Sprinklers~~ Extra Hazard Occupancies .

~~19.2.3.2.7.1~~

~~Where high-temperature sprinklers are used for~~ For extra hazard occupancies with ceilings not exceeding 30 ft (9.1 m) in height , the system area of sprinkler operation shall be permitted to be reduced by 25 percent without revising the density, but not to less than 2000 ft² (185 m²); where one of the following conditions occurs:

- (1) High-temperature sprinklers are used.
- (2) K-11.2 (160) or larger sprinklers are used.

~~19.2.3.2.7.2~~

The 25 percent reduction permitted by 19.2.3.2.7.1 shall only be permitted to be applied once.

~~19.2.3.2.8~~

~~Where K-11.2 (160) or larger sprinklers are used with Extra Hazard Group 1 or Extra Hazard Group 2 design curves and 19.2.3.1.1 , the design area shall be permitted to be reduced by 25 percent but not below 2000 ft² (185 m²), regardless of temperature rating.~~

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
19.2.3.2.6_SR_1084.docx	Clean version of revisions.	
19.2.3.2.6_SR_1084_for_prod_use.docx	For prod use	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 03 16:08:15 EDT 2023

Committee Statement

Committee Statement: The current structure for the 25% reduction is unclear that the reduction can only be taken once with either high-temperature sprinklers or large orifice sprinklers. This revision makes the intent of the section clearer and will clarify the application of the requirements for multiple adjustments. Based on the fire testing data available at this time, the ceiling heights have been limited to 30 feet in height for taking the reduction.

Response Message: SR-1084-NFPA 13-2023

Public Comment No. 57-NFPA 13-2023 [Sections 19.2.3.2.6, 19.2.3.2.7]



Second Revision No. 1159-NFPA 13-2023 [Section No. 19.2.3.2.8]

19.2.3.2.8* Multiple Adjustments.

A.19.2.3.2.8

Example 1-: A dry pipe sprinkler system (OH2) in a building with a ceiling slope exceeding 2 in 12 (16.7 percent). The initial area must be increased 30 percent for the dry pipe system and the resulting area an additional 30 percent for the roof slope if the ceiling construction does not comply with 19.2.3.2.4(3) or 19.2.3.2.4(4). If the point 0.2 gpm/ft² (8.2 mm/min) over 1500 ft² (140 m²) is chosen from Figure 19.2.3.1.1 Table 19.2.3.1.1, requires a density of 0.2 gpm/ft² (8.2 mm/min) over 1500 ft² (140 m²) for situations where the design area is not required to be 3000 ft² per 19.2.3.1.5, the The 1500 ft² (140 m²) area is increased 450 ft² (42 m²) to 1950 ft² (180 m²), which is then further increased 585 ft² (54 m²) to 2535 ft² (235 m²). The final discharge criterion is then 0.2 gpm/ft² (8.2 mm/min) over 2535 ft² (235 m²).

Example 2-: A wet pipe sprinkler system (light hazard) in a building with a 16 ft 8 in. (5.1 m) ceiling and a slope exceeding 2 in 12 (16.7 percent) employs quick-response sprinklers qualifying for a 30 percent reduction as permitted by 19.2.3.2.3. The initial area must be increased 30 percent for the ceiling slope if the ceiling construction does not comply with 19.2.3.2.4(3) or 19.2.3.2.4(4), and the resulting area must be decreased 30 percent for quick-response sprinklers based on the reduction permitted by Figure 19.2.3.2.3.1. It does not matter whether the reduction or increase is applied first. Table 19.2.3.1.1 requires a density of 0.1 gpm/ft² (8.2 mm/min) over 1500 ft² (140 m²) for situations where the design area is not required to be 3000 ft² per 19.2.3.1.5. If a discharge density of 0.1 gpm/ft² (4.1 mm/min) over 1500 ft² (140 m²) is chosen from Figure 19.2.3.1.1, the The 1500 ft² (140 m²) is increased 450 ft² (42 m²), resulting in 1950 ft² (180 m²), which is then decreased 585 ft² (54 m²), resulting in 1365 ft² (125 m²). The final design is 0.1 gpm/ft² (4.1 mm/min) over 1365 ft² (125 m²).

19.2.3.2.8.1

Where multiple adjustments to the area of operation are required to be made in accordance with 19.2.3.2.3, 19.2.3.2.4, 19.2.3.2.6, or 19.2.3.2.7, these adjustments shall be compounded based on the area of operation originally selected from Table 19.2.3.1.1 or Figure 19.2.3.1.1.

19.2.3.2.8.2

If the building has unsprinklered combustibles concealed spaces, the rules of 19.2.3.1.5 shall be applied after all other modifications have been made.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
19.2.3.2.8_Edits.docx	Revisions for 19.2.3.2.8	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Aug 25 19:34:07 EDT 2023

Committee Statement

Committee Statement: Revisions to the annex note align with the requirements for single point density and sloped ceilings.

CC note No. 36-NFPA 13-2023 [Section No. 19.2.3.2.8]

Review section 19.2.3.2.8 and its annex as Figure 19.2.3.1.1 has been deleted as part of an FR. References to this figure will need to be cleaned up. Suggest removing "or Figure 19.2.3.1.1."

Response Message: SR-1159-NFPA 13-2023



Second Revision No. 1142-NFPA 13-2023 [Section No. 19.2.3.3.4]

19.2.3.3.4

If the room is smaller than the area specified in Table 19.2.3.1.1 or ~~Figure 19.2.3.1.1~~, the provisions of 19.2.3.1.4(1) and 19.2.3.1.4(2) shall apply.

Submitter Information Verification

Committee: AUT-SSD

Submission Date: Tue Aug 22 07:37:07 EDT 2023

Committee Statement

Committee Statement: Figure 19.2.3.1.1 was removed from NFPA 13 During First Revision. The reference to Figure 19.2.3.1.1 has been deleted.

CC note No. 37-NFPA 13-2023 [Section No. 19.2.3.3.4]

Review section 19.2.3.3.4 as Figure 19.2.3.1.1 has been deleted as part of an FR. References to this figure will need to be cleaned up. Suggest removing "or Figure 19.2.3.1.1."

Response Message: SR-1142-NFPA 13-2023



Second Revision No. 1177-NFPA 13-2023 [Section No. 20.2]

20.2* Protection of Storage.

Protection of storage shall follow the following criteria:

- (1) Identify the storage commodity class in accordance with Sections 20.3 and 20.4.
- (2) Identify the method of storage in accordance with Section 20.5.
- (3) Establish storage height, building height, and associated clearances in accordance with Section 20.9.
- (4) Define the general protection criteria that are common to all storage protection options in accordance with Sections 20.10 through 20.18.
- (5) Select the appropriate system/sprinkler technology for protection criteria (Chapters 21 through 25).
- (6) Design and install system in accordance with the remainder of this document.
- (7) Design and install sprinklers in accordance with the sections to which they apply or in accordance with their specific application listing.

A.20.2

Information for the protection of Classes I, II, III, and IV commodities was extrapolated from full-scale fire tests that were performed at different times than the tests that were used to develop the protection for plastic commodities. It is possible that, by selecting certain points from the tables (and after applying the appropriate modifications), the protection specified by 21.4.1.6 exceeds the requirements of Section 21.5. In such situations, the protection specified for plastics, although less than that required by the tables, can adequately protect Class I, II, III, and IV commodities.

This section also allows storage areas that are designed to protect plastics to store Class I, II, III, and IV commodities without a re-evaluation of fire protection systems.

20.2.1

Protection criteria for Group A plastics shall be permitted for the protection of the same storage height and configuration of Class I through Class IV commodities.

20.2.2

CMSA and ESFR sprinklers shall be permitted to protect storage of Class I through Class IV commodities, Group A plastic commodities, miscellaneous storage, and other storage as specified in Chapters 20 through 25 or by other NFPA standards.

20.2.3 Systems with Multiple Hazard Classifications.

For systems with multiple hazard classifications, the hose stream allowance and water supply duration shall be in accordance with 20.15.2 as well as one of the following:

- (1) The water supply requirements for the highest hazard classification within the system shall be used.
- (2) The water supply requirements for each individual hazard classification shall be used in the calculations for the design area for that hazard.
- (3)* For systems with multiple hazard classifications where the higher classification only lies within single rooms less than or equal to 400 ft² (37 m²) in area with no such rooms adjacent, the water supply requirements for the principal occupancy shall be used for the remainder of the system.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_SSD_SR-1177_20.2.docx	For prod use	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 31 12:21:32 EDT 2023

Committee Statement

Committee Statement: The material in the annex is intended to provide guidance to people submitting test data for protecting all types of storage with all types of sprinklers and therefore needs to be in the annex to chapter 20. Section 20.2 appears to be better suited than 20.1 because 20.1 deals with general requirements for storage whereas 20.2 deals specifically with protection criteria for storage.

CC note No. 39-NFPA 13-2023 [Section No. 20.1]

Review newly proposed A.20.1 which describes how to test a sprinkler and determine if A.20.1 is the correct location for this information. 20.1 simply outlines the general storage requirements for this chapter. Perhaps it may be better as annex to section 7.2 Sprinklers or part of Chapter 24.

Response Message: SR-1177-NFPA 13-2023



Second Revision No. 1161-NFPA 13-2023 [Section No. 20.9.1]

20.9.1 Ceiling Slope Sloped Ceilings .

Except as permitted by 20.9.1.1 ~~or~~ 20.9.1.2 , the sprinkler system criteria specified in Chapters 20 through 26 shall apply to buildings with ceiling slopes not exceeding 2 in 12 (16.7 percent).

20.9.1.1* ~~Unobstructed and Obstructed Construction with any Sprinkler Type Protection Options .~~

Where the ceiling slope is greater than 2 in 12 (16.7 percent), storage shall be permitted to be protected by any one of the following methods:

- (1) Protect storage with in-rack sprinklers in accordance with one of the options in Section 25.7 provided that no storage is placed above the highest level of in-rack sprinklers.
- (2) Install a horizontal false ceiling capable of withstanding an uplift force of 3 lb/ft² (15 kg/m²) below the sloped ceiling ~~and~~ supplemented with ceiling sprinklers below.
- (3) Install sprinklers per guidance in Chapters 20 through 26, which permits a ceiling that exceeds 2 in 12.
- (4) For obstructed construction where the ceiling slope does not exceed 4 in 12 and the storage is protected with CMDA sprinkler approach, install sprinklers in every channel.
- (5) For unobstructed construction where the ceiling slope does not exceed 4 in 12, increase the design area of the ceiling sprinklers by 50 percent from the criteria in Chapters 20 through 26 unless that criteria is specifically for sloped ceilings.
- (6) Use the sprinkler system criteria specified in Chapters 20 through 26 for obstructed construction where the ceiling slope does not exceed 4 in 12 and all of the following conditions are met:
 - (a) Purlins or beams supporting the roof deck run across the roof slope.
 - (b) Purlins or beams do exceed 18 in. (450 mm) deep.
 - (c) Purlins do not exceed 5 ft (1.5 m) on center.
 - (d) Bays created by the solid structural members are not more than 40 ft (12 m) on center.
 - (e) Purlin or beam channels are provided with blocking above each solid structural member.

A.20.9.1.1

The intent is to have a structural member that prevents the passage of heat. The member can have holes for penetrations with reasonable clearance and penetration sealant is not expected.

20.9.1.2 ~~Obstructed Construction with ESFR Sprinklers.~~

~~Where the ceiling slope is greater than 2 in 12 (16.7 percent) but does not exceed 4 in 12 (33.3 percent), the ESFR sprinkler system criteria specified in Chapters 20 through 26 shall apply when all the following conditions are satisfied:~~

~~Purlins or beams supporting the roof deck run across the roof slope.~~

~~Purlins or beams do not exceed 18 in. (450 mm) deep.~~

~~Purlins or beams do not exceed 5 ft (1.5 m) on centers.~~

~~Purlins or beams are supported by girders not more than 40 ft (12 m) on centers.~~

~~Purlin or beam channels are firestopped above each girder.~~

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
20.9.1.docx	Revisions for 20.9.1	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Aug 25 20:11:35 EDT 2023

Committee Statement

Committee Statement: Based on the discussion at the First Draft Meeting and a re-evaluation of the information from the FPRF testing program, the following changes are recommended:

1. Return the positioning of standard spray and extended coverage sprinklers with respect to obstructed construction to the 2022 edition rules
2. Allow the user to protect a storage occupancy with a sloped ceiling with the sprinkler location information in Chapter 20 rather than Chapter 10.

This approach has a less dramatic effect on the users of NFPA 13 and is still supported by the data of the test program. Ultimately, this approach is more likely to be more user friendly to the typical design professional and will provide options that were not permitted under the 2022 and previous editions of the standard while retaining the status quo for those familiar with the older rules and still wanting to select sprinkler protection using those parameters.

The term "firestopped" was changed to "blocking" to maintain consistency within the document.

Response Message: SR-1161-NFPA 13-2023

[Public Comment No. 148-NFPA 13-2023 \[Section No. 20.9.1\]](#)



Second Revision No. 1143-NFPA 13-2023 [Section No. 20.10.2]

Global SR-1195

20.10.2

The following unsprinklered combustible concealed spaces shall not require a minimum design area of sprinkler operation of 3000 ft² (280 m²):

- (1) Noncombustible and limited-combustible concealed spaces with minimal combustible loading having no access. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.
- (2) Noncombustible and limited-combustible concealed spaces with limited access and not permitting occupancy or storage of combustibles. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.
- (3) Combustible concealed spaces filled entirely with noncombustible insulation.
- (4) Concealed spaces where rigid materials are used and the exposed surfaces comply with one of the following in the form in which they are installed in the space:
 - (a) The surface materials have a flame spread index of 25 or less and the materials have demonstrated that the flame front does not progress more than 10.5 ft (3.2 m) beyond the centerline of the burners at any time during the 30-minute test period, when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or UL 723, *Test for Surface Burning Characteristics of Building Materials*, extended for an additional 20 minutes in the form in which they are installed in the space
 - (b) The surface materials comply with the requirements of ASTM E2768, *Standard Test Method for Extended Duration Surface Burning Characteristics of Building Materials (30 min Tunnel Test)*

~~Concealed spaces where rigid materials are used and the exposed surfaces have a flame spread index of 25 or less and the materials have demonstrated that the flame does not progress more than 10.5 ft (3.2 m) beyond the centerline of the burners at any time during the 30-minute test period, when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or UL 723, *Test for Surface Burning Characteristics of Building Materials*, extended for an additional 20 minutes in the form in which they are installed in the space.~~

~~Concealed spaces where rigid materials are used and the materials comply with the requirements of ASTM E2768, *Standard Test Method for Extended Duration Surface Burning Characteristics of Building Materials (30 min Tunnel Test)*.~~

- (5) Concealed spaces in which the exposed materials are constructed entirely of fire-retardant-treated wood as defined by NFPA 703.
- (6) Concealed spaces over isolated small compartments not exceeding 55 ft² (5.1 m²) in area.
- (7) Vertical pipe chases under 10 ft² (0.9 m²), provided that in multifloor buildings the chases are firestopped constructed with blocking at each floor using materials equivalent to the floor construction. Such pipe chases shall contain no sources of ignition, piping shall be noncombustible, and pipe penetrations at each floor shall be properly sealed.
- (8) Exterior columns under 10 ft² (0.9 m²) in area formed by studs or wood joists, supporting exterior canopies that are fully protected with a sprinkler system.
- (9) Cavities within unsprinklered wall spaces.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
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20.10.2.docx Revisions for 20.10.2

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Tue Aug 22 08:00:12 EDT 2023

Committee Statement

Committee Statement: 20.10.2(4) and (5) have been revised to match the format of section 19.2.3.1.5.2(5)(a) as the sections are identical. This maintains consistency within the document.

CC note No. 7-NFPA 13-2023 [Section No. 20.10.2]

Review section 20.10.2 (4) and (5) compared to section 19.2.3.1.5.2 (5)(a) and (b). These sections are identical and should match in format. Recommend formatting section 20.10.2(4)(5) like 19.2.3.1.5.2(5)(a) and (b).

Response Message: SR-1143-NFPA 13-2023



Second Revision No. 1144-NFPA 13-2023 [Section No. 20.17.1.2 [Excluding any Sub-Sections]]



Wood pallets, where stored indoors, shall be protected in accordance with one of the following:

- (1) Control mode density/area sprinkler protection as specified in Table 20.17.1.2(a)
- (2) CMSA sprinkler protection in accordance with Table 20.17.1.2(b)
- (3) ESFR sprinkler protection in accordance with Table 20.17.1.2(c)
- (4) Control mode density/area sprinkler protection in accordance with the Ordinary Hazard Group 2 curve and Figure 19.2.3.1.1 Table 19.2.3.1.1 with a hose stream demand of at least 250 gpm (950 L/min) for a duration of at least 60 minutes when pallets are stored no higher than 6 ft (1.8 m) and each pile of no more than four stacks is separated from other pallet piles by at least 8 ft (2.4 m) of clear space or 25 ft (7.6 m) of commodity

Table 20.17.1.2(a) Control Mode Density/Area Sprinkler Protection for Indoor Storage of Idle Wood Pallets

Type of Sprinkler	Location of Storage	Nominal K-Factor	Maximum Storage Height		Maximum Ceiling/Roof Height		Sprinkler Density		Areas of Operation	
			ft	m	ft	m	gpm/ft ²	mm/min	ft ²	m ²
Control mode density/area	On floor	8 (115) or larger	Up to 6	Up to 1.8	20	6.1	0.20	8.2	3000*	280*
	On floor	11.2 (160) or larger	Up to 8	Up to 2.4	30	9.1	0.45	18.3	2500	230
	On floor or rack without solid shelves	11.2 (160) or larger	8 to 12	2.4 to 3.7	30	9.1	0.6	24.5	3500	325
			12 to 20	3.7 to 6.1	30	9.1	0.6	24.5	4500	420
	On floor	16.8 (240) or larger	Up to 20	Up to 6.1	30	9.1	0.6	24.5	2000	185

*The area of sprinkler operation should be permitted to be reduced to 2000 ft² (185 m²) when sprinklers having a nominal K-factor of 11.2 (160) or larger are used or if high-temperature-rated sprinklers with a nominal K-factor of 8.0 (115) are used.

Table 20.17.1.2(b) CMSA Sprinkler Protection for Indoor Storage of Idle Wood Pallets

Storage Arrangement	Commodity Class	Maximum Storage Height		Maximum Ceiling/Roof Height		K-Factor/Orientation	Type of System	Number of Design Sprinklers	Minimum Operating Pressure	
		ft	m	ft	m				psi	bar
On floor	Idle wood pallets	20	6.1	30	9.1	11.2 (160) Upright	Wet	15	25	1.7
							Dry	25	25	1.7
						16.8 (240) Upright	Wet	15	15	1.7
							Dry	25	15	1.7
						19.6 (280) Pendent	Wet	15	16	1.7
						35	10.7	19.6 (280) Pendent	Wet	15
40	12.2	19.6 (280) Pendent	Wet	15	30	2.1				

Table 20.17.1.2(c) ESFR Sprinkler Protection for Indoor Storage of Idle Wood Pallets

<u>Type of Sprinkler (Orientation)</u>	<u>Location of Storage</u>	<u>Nominal K-Factor</u>	<u>Maximum Storage Height</u>		<u>Maximum Ceiling/ Roof Height</u>		<u>Minimum Operating Pressure</u>	
			<u>ft</u>	<u>m</u>	<u>ft</u>	<u>m</u>	<u>psi</u>	<u>bar</u>
ESFR (pendent)	On floor or rack without solid shelves	14.0 (200)	25	7.6	30	9.1	50	3.4
			25	7.6	32	9.8	60	4.1
		16.8 (240)	25	7.6	30	9.1	35	2.4
			25	7.6	32	9.8	42	2.9
		22.4 (320)	35	10.7	40	12.2	52	3.6
			25	7.6	30	9.1	25	1.7
			30	9.1	35	10.7	35	2.4
			35	10.7	40	12.2	40	2.8
		25.2 (360)	25	7.6	30	9.1	15	1.0
			30	9.1	35	10.7	20	1.4
35	10.7		40	12.2	25	1.7		
ESFR (upright)	On floor	14.0 (200)	20	6.1	30	9.1	50	3.4
			20	6.1	35	10.7	75	5.2
		16.8 (240)	20	6.1	30	9.1	35	2.4
			20	6.1	35	10.7	52	3.6

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Tue Aug 22 08:09:09 EDT 2023

Committee Statement

Committee Statement: Figure 19.2.3.1.1 was removed from NFPA 13 During First Revision. The reference to Figure 19.2.3.1.1 has been changed to Table 19.2.3.1.1. In addition, the word "curve" has been removed to reflect the change to single-point density.

CC note No. 38-NFPA 13-2023 [Section No. 20.17]

Review section 20.17.1.2 as Figure 19.2.3.1.1 has been deleted as part of an FR. References to this figure will need to be cleaned up. Suggest removing "or Figure 19.2.3.1.1."

Response Message: SR-1144-NFPA 13-2023



Second Revision No. 1179-NFPA 13-2023 [New Section after 20.17.1.3]

20.17.1.4

Idle wood pallets shall be permitted to be stored in racks when protected in accordance with Section 25.7 using the criteria for exposed expanded plastic commodity hazard.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Sep 01 09:04:29 EDT 2023

Committee Statement

Committee Statement: Standard test commodity for exposed nonexpanded plastic is plastic pallets. Chapter 25.7 offers rack protection schemes that are independent of the ceiling level sprinkler system with applications of exposed expanded commodity classification, a higher hazard. Idle pallets are integral to storage occupancies but few solutions for storage indoors are offered. This will provide more flexibility to the end user to integrate and store pallets within the storage occupancy.

Response Message: SR-1179-NFPA 13-2023



Second Revision No. 1108-NFPA 13-2023 [Section No. 20.17.3.1]

20.17.3.1

Idle pallets shall not be stored on racks or shelves, except where permitted in 20.17.1.3, 20.17.2.3, and 20.17.3.2, and 20.17.3.4 .

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Aug 04 12:50:12 EDT 2023

Committee Statement

Committee Statement: The standard test commodity for exposed nonexpanded plastic is plastic pallets. Chapter 25.7 offers rack protection schemes that are independent of the ceiling level sprinkler system with applications of exposed nonexpanded commodity classification, a higher hazard. Idle pallets are integral to storage occupancies but offer few solutions for storage indoors. This will provide more flexibility to the end user to integrate and store pallets within the storage occupancy.

Response Message: SR-1108-NFPA 13-2023



Second Revision No. 1107-NFPA 13-2023 [New Section after 20.17.3.3]

20.17.3.4

Idle pallets shall be permitted to be stored in racks when protected in accordance with Section 25.7 using criteria for exposed nonexpanded plastic commodity hazard.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Aug 04 12:43:21 EDT 2023

Committee Statement

Committee Statement: Standard test commodity for exposed nonexpanded plastic is plastic pallets. Chapter 25.7 offers rack protection schemes that are independent of the ceiling level sprinkler system with applications of exposed nonexpanded commodity classification, a higher hazard. Idle pallets are integral to storage occupancies but offer few solutions for storage indoors. This will provide more flexibility to the end user to integrate and store pallets within the storage occupancy.

Response Message: SR-1107-NFPA 13-2023



Second Revision No. 1145-NFPA 13-2023 [Section No. 20.19.1]

20.19.1

Racks containing solid shelves shall comply with Section ~~25.4~~ 25.3 .

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Tue Aug 22 08:13:57 EDT 2023

Committee Statement

Committee Statement: The reference to section 25.4 has been revised to reference section 25.3. Section 25.3 is the Protection of Racks with Solid Shelves and is the appropriate section to reference.

CC note No. 8-NFPA 13-2023 [Section No. 20.19]

Section 20.19.1 references 25.4. Verify this is the correct section. Section 25.3 refers to "Protection of Racks with Solid Shelves"

Response Message: SR-1145-NFPA 13-2023



Second Revision No. 1162-NFPA 13-2023 [Section No. 23.2.3]

23.2.3

Where ~~nonstructural baffles are installed in accordance with 14.2.9.4.2 , and ESFR sprinklers are spaced less than the minimum distances required by 14.2.8.3 and the minimum areas required by 14.2.8.3 in accordance with 14.2.4.3 permitted and nonstructural baffles are installed in accordance with 14.2.8.4.2(1) to compensate~~ , the design area shall cover a minimum of 768 ft² (71 m²).

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Aug 25 20:32:01 EDT 2023

Committee Statement

Committee Statement: The references to 14.2.9.3 (minimum distance from walls) are incorrect. Wording has been provided which allows for the references to be removed entirely.

CC note No. 11-NFPA 13-2023 [Section No. 23.2.3]

Review reference in 23.2.3 as it appears it should change from "14.2.9.3" to "14.2.9.4."



Second Revision No. 1086-NFPA 13-2023 [Section No. 25.2.1.4.1]

25.2.1.4.1

Where in-rack sprinklers are installed in accordance with this chapter to protect miscellaneous rack storage of Class I through Class IV commodities, Group A plastic commodities, and rubber tires up to and including 12 ft (3.7 m) in height under a maximum 32 ft (9.8 m) high ceiling, the ceiling-level sprinkler design criteria shall be a 0.20 gpm/ft² (0.8.2 mm/min) density over a 1500 ft² (140 m²) area of ceiling-level sprinkler operation.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 03 18:54:13 EDT 2023

Committee Statement

Committee Statement: The additional zero and comma is an error. It should be 8.2 only

Response Message: SR-1086-NFPA 13-2023

[Public Comment No. 104-NFPA 13-2023 \[Section No. 25.2.1.4.1\]](#)



Second Revision No. 1087-NFPA 13-2023 [Section No. 25.2.2.4.1]

25.2.2.4.1

Where in-rack sprinklers are installed in accordance with this section to protect low-piled rack storage of Class I through Class IV and Group A plastic commodities, that ~~does~~ do not meet the definition of *miscellaneous storage*, the ceiling-level design shall be a 0.20 gpm/ft² (0.8.2 mm/min) density over a 1500 ft² (140 m²) area of ceiling-level sprinkler operation.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 03 18:55:18 EDT 2023

Committee Statement

Committee Statement: No need for additional zero and comma . it should be 8.2 only

Response Message: SR-1087-NFPA 13-2023

[Public Comment No. 103-NFPA 13-2023 \[Section No. 25.2.2.4.1\]](#)



Second Revision No. 1183-NFPA 13-2023 [Section No. 25.3.1]

25.3.1 General.

The requirements in this chapter for the installation of in-rack sprinklers shall apply to racks with solid shelves except as modified in this section. (~~See Section C.8 .~~)

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Sep 01 12:12:16 EDT 2023

Committee Statement

Committee Statement: C.8 now references 20.15. The reference to C.8 has been removed from 25.3.1.

CC note No. 42-NFPA 13-2023 [Section No. C.8]

Review C.8 and verify the correct cross reference. Should it be 20.19 or 25.3.1?

Response Message: SR-1183-NFPA 13-2023



Second Revision No. 1088-NFPA 13-2023 [Section No. 25.4.2.1.2.1(A)]



(A)

For single-, double-, and multiple-row rack storage of exposed nonencapsulated Class I through Class IV commodities stored over 12 ft (3.7 m) and up to and including 25 ft (7.6 m) in height, the ceiling-level sprinkler design in terms of density [gpm/ft² (mm/min)] over a 2000 ft² (186 m²) area of ceiling-level sprinkler operation, with the provision of in-rack sprinklers, shall be in accordance with the following:

- (1) For exposed nonencapsulated Class I commodities, see Table 25.4.2.1.2.1(A)(a)
- (2) For exposed nonencapsulated Class II commodities, see Table 25.4.2.1.2.1(A)(b)
- (3) For exposed nonencapsulated Class III commodities, see Table 25.4.2.1.2.1(A)(c)
- (4) For exposed nonencapsulated Class IV commodities, see Table 25.4.2.1.2.1(A)(d)

Table 25.4.2.1.2.1(A)(a) CMDA Ceiling-Level Sprinkler Design Requirements for Exposed Nonencapsulated Class I Commodities Stored Over 12 ft (3.7 m) and Up to 25 ft (7.6 m) in Height Supplemented with In-Rack Sprinklers

<u>Maximum Storage Height ft (m)</u>	<u>Maximum Ceiling Height ft (m)</u>	<u>Storage Arrangement</u>	<u>Aisle Width ft (m)</u>	<u>No. of In-Rack Sprinkler Levels Installed</u>	<u>Ceiling Sprinkler System Design</u> <u>[gpm/ft²/2000 ft² (mm/min/186 185 m²)]</u>	
					<u>High-Temperature-Rated Sprinklers</u>	<u>Ordinary- or Intermediate-Temperature-Rated Sprinklers</u>
15 (4.6)	35 (10.7)	Single- and double-row racks	8 (2.4)	1	0.15 (6.1)	0.15 (6.1)
				More than 1 but not every tier level	0.15 (6.1)	0.15 (6.1)
				Every tier level	0.15 (6.1)	0.15 (6.1)
			4 (1.2)	1	0.15 (6.1)	0.15 (6.2 1)
				More than 1 but not every tier level	0.15 (6.1)	0.15 (6.1)
				Every tier level	0.15 (6.1)	0.15 (6.1)
		Multiple-row racks	Any	1	0.15 (6.1)	0.15 (6.2 1)
				More than 1 but not every tier level	0.15 (6.1)	0.15 (6.1)
				Every tier level	0.15 (6.1)	0.15 (6.1)
18 (5.5)	38 (11.6)	Single- and double-row racks	8 (2.4)	1	0.16 (6.5)	0.18 (7.4 3)
				More than 1 but not every tier level	0.15 (6.1)	0.15 (6.1)

<u>Maximum Storage Height ft (m)</u>	<u>Maximum Ceiling Height ft (m)</u>	<u>Storage Arrangement</u>	<u>Aisle Width ft (m)</u>	<u>No. of In-Rack Sprinkler Levels Installed</u>	<u>Ceiling Sprinkler System Design</u> <u>[gpm/ft²/2000 ft²</u> <u>(mm/min/186 185 m²)</u>		
					<u>High-Temperature-Rated Sprinklers</u>	<u>Ordinary- or Intermediate-Temperature-Rated Sprinklers</u>	
25 (7.6)	45 (13.7)	Single- and double-row racks	4 (1.2)	Every tier level	0.15 (6.1)	0.15 (6.1)	
				1	0.20 (8.2)	0.22 (8.8 9.0)	
				More than 1 but not every tier level	0.16 (6.5)	0.17 (7.0 6.9)	
			Multiple-row racks	Any	Every tier level	0.15 (6.1)	0.15 (6.1)
					1	0.20 (8.2)	0.22 (8.8 9.0)
					More than 1 but not every tier level	0.16 (6.5)	0.18 (7.3)
		Multiple-row racks	4 (1.2)	Every tier level	0.15 (6.1)	0.15 (6.1)	
				1	0.23 (9.4)	0.26 (10.6)	
				More than 1 but not every tier level	0.18 (7.3)	0.20 (8.2)	
			Multiple-row racks	Any	Every tier level	0.15 (6.1)	0.15 (6.1)
					1	0.23 (9.4)	0.26 (10.6)
					More than 1 but not every tier level	0.18 (7.3)	0.20 (8.2)

Table 25.4.2.1.2.1(A)(b) CMDA Ceiling-Level Sprinkler Design Requirements for Exposed Nonencapsulated Class II Commodities Stored Over 12 ft (3.7 m) and Up to 25 ft (7.6 m) in Height Supplemented with In-Rack Sprinklers

<u>Maximum Storage Height ft (m)</u>	<u>Maximum Ceiling Height ft (m)</u>	<u>Storage Arrangement</u>	<u>Aisle Width ft (m)</u>	<u>No. of In-Rack Sprinkler Levels Installed</u>	<u>Ceiling Sprinkler System Design</u> <u>[gpm/ft²/2000 ft²</u> <u>(mm/min/486 185 m²)</u>	
					<u>High-Temperature-Rated Sprinklers</u>	<u>Ordinary- or Intermediate-Temperature-Rated Sprinklers</u>
15 (4.6)	35 (10.7)	Single- and double-row racks	8 (2.4)	1	0.15 (6.1)	0.15 (6.1)
				More than 1 but not every tier level	0.15 (6.1)	0.15 (6.1)
				Every tier level	0.15 (6.1)	0.15 (6.1)
			4 (1.2)	1	0.15 (6.1)	0.18 (7.3)
				More than 1 but not every tier level	0.15 (6.1)	0.15 (6.1)
				Every tier level	0.15 (6.1)	0.15 (6.1)
		Multiple-row racks	Any	1	0.15 (6.1)	0.18 (7.3)
				More than 1 but not every tier level	0.15 (6.1)	0.15 (6.1)
				Every tier level	0.15 (6.1)	0.15 (6.1)
18 (5.5)	38 (11.6)	Single- and double-row racks	8 (2.4)	1	0.18 (7.3)	0.20 (8.2)
				More than 1 but not every tier level	0.15 (6.1)	0.16 (6.5)
				Every tier level	0.15 (6.1)	0.15 (6.1)
			4 (1.2)	1	0.21 (8.6)	0.26 (10.6)
				More than 1 but not every tier level	0.17 (7.0 6.9)	0.20 (8.2)
				Every tier level	0.15 (6.1)	0.15 (6.1)
		Multiple-row racks	Any	1	0.21 (8.6)	0.26 (10.6)
				More than 1 but not every tier level	0.17 (7.0 6.9)	0.20 (8.2)
				Every tier level	0.15 (6.1)	0.15 (6.1)

<u>Maximum Storage Height ft (m)</u>	<u>Maximum Ceiling Height ft (m)</u>	<u>Storage Arrangement</u>	<u>Aisle Width ft (m)</u>	<u>No. of In-Rack Sprinkler Levels Installed</u>	<u>Ceiling Sprinkler System Design</u> [gpm/ft ² /2000 ft ² (mm/min/186 185 m ²)]	
					<u>High-Temperature-Rated Sprinklers</u>	<u>Ordinary- or Intermediate-Temperature-Rated Sprinklers</u>
25 (7.6)	45 (13.7)	Single- and double-row racks	8 (2.4)	1	0.21 (8.6)	0.24 (9.8)
				More than 1 but not every tier level	0.17 (7.0 6.9)	0.19 (7.7)
				Every tier level	0.15 (6.1)	0.15 (6.1)
			4 (1.2)	1	0.25 (10.2)	0.30 (12.2)
				More than 1 but not every tier level	0.20 (8.2)	0.24 (9.8)
				Every tier level	0.15 (6.1)	0.18 (7.3)
		Multiple-row racks	Any	1	0.25 (10.2)	0.30 (12.2)
				More than 1 but not every tier level	0.20 (8.2)	0.24 (9.8)
				Every tier level	0.15 (6.1)	0.18 (7.3)

Table 25.4.2.1.2.1(A)(c) CMDA Ceiling-Level Sprinkler Design Requirements for Exposed Nonencapsulated Class III Commodities Stored Over 12 ft (3.7 m) and Up to 25 ft (7.6 m) in Height Supplemented with In-Rack Sprinklers

<u>Maximum Storage Height ft (m)</u>	<u>Maximum Ceiling Height ft (m)</u>	<u>Storage Arrangement</u>	<u>Aisle Width ft (m)</u>	<u>No. of In-Rack Sprinkler Levels Installed</u>	<u>Ceiling Sprinkler System Design</u> [gpm/ft ² /2000 ft ² (mm/min/186 185 m ²)]	
					<u>High-Temperature-Rated Sprinklers</u>	<u>Ordinary- or Intermediate-Temperature-Rated Sprinklers</u>
15 (4.6)	35 (10.7)	Single- and double-row racks	8 (2.4)	1	0.15 (6.1)	0.17 (7.0 6.9)
				More than 1 but not every tier level	0.15 (6.1)	0.15 (6.1)
				Every tier level	0.15 (6.1)	0.15 (6.1)
			4 (1.2)	1	0.17 (7.0 6.9)	0.20 (8.2)

<u>Maximum Storage Height ft (m)</u>	<u>Maximum Ceiling Height ft (m)</u>	<u>Storage Arrangement</u>	<u>Aisle Width ft (m)</u>	<u>No. of In-Rack Sprinkler Levels Installed</u>	<u>Ceiling Sprinkler System Design</u> <u>[gpm/ft²/2000 ft² (mm/min/186 185 m²)]</u>			
					<u>High-Temperature-Rated Sprinklers</u>	<u>Ordinary- or Intermediate-Temperature-Rated Sprinklers</u>		
				More than 1 but not every tier level	0.15 (6.1)	0.16 (6.5)		
				Every tier level	0.15 (6.1)	0.15 (6.1)		
				Multiple-row racks	Any	1	0.17 (7.0 6.9)	0.20 (8.2)
						More than 1 but not every tier level	0.15 (6.1)	0.16 (6.5)
						Every tier level	0.15 (6.1)	0.15 (6.1)
				Single- and double-row racks	8 (2.4)	1	0.21 (8.6)	0.23 (9.3 9.4)
		More than 1 but not every tier level	0.17 (7.0 6.9)			0.19 (7.7)		
		Every tier level	0.15 (6.1)			0.15 (6.1)		
		18 (5.5)	38 (11.6)	Single- and double-row racks	4 (1.2)	1	0.24 (9.8)	0.28 (11.4)
More than 1 but not every tier level	0.19 (7.7)					0.22 (9.0)		
Every tier level	0.15 (6.1)					0.17 (7.0 6.9)		
Multiple-row racks	Any			1	0.24 (9.8)	0.28 (11.4)		
				More than 1 but not every tier level	0.19 (7.7)	0.22 (9.0)		
				Every tier level	0.15 (6.1)	0.17 (7.0 6.9)		
25 (7.6)	45 (13.7)	Single- and double-row racks	8 (2.4)	1	0.25 (10.2)	0.28 (11.4)		
				More than 1 but not every tier level	0.20 (8.2)	0.22 (9.0)		
				Every tier level	0.15 (6.1)	0.17 (7.0 6.9)		
		4 (1.2)	1	0.29 (11.8)	0.33 (13.4)			

<u>Maximum Storage Height ft (m)</u>	<u>Maximum Ceiling Height ft (m)</u>	<u>Storage Arrangement</u>	<u>Aisle Width ft (m)</u>	<u>No. of In-Rack Sprinkler Levels Installed</u>	<u>Ceiling Sprinkler System Design</u> [gpm/ft ² /2000 ft ² (mm/min/186 185 m ²)]			
					<u>High-Temperature-Rated Sprinklers</u>	<u>Ordinary- or Intermediate-Temperature-Rated Sprinklers</u>		
				More than 1 but not every tier level	0.23 (9.3 9.4)	0.26 (10.6)		
				Every tier level	0.17 (7.0 6.9)	0.20 (8.2)		
				1	0.29 (11.8)	0.33 (13.4)		
				Multiple-row racks	Any	More than 1 but not every tier level	0.23 (9.3 9.4)	0.26 (10.6)
						Every tier level	0.17 (7.0 6.9)	0.20 (8.2)
						1	0.29 (11.8)	0.33 (13.4)

Table 25.4.2.1.2.1(A)(d) CMDA Ceiling-Level Sprinkler Design Requirements for Exposed Nonencapsulated Class IV Commodities Stored Over 12 ft (3.7 m) and Up to 25 ft (7.6 m) in Height Supplemented with In-Rack Sprinklers

<u>Maximum Storage Height ft (m)</u>	<u>Maximum Ceiling Height ft (m)</u>	<u>Storage Arrangement</u>	<u>Aisle Width ft (m)</u>	<u>No. of In-Rack Sprinkler Levels Installed</u>	<u>Ceiling Sprinkler System Design</u> [gpm/ft ² /2000 ft ² (mm/min/186 185 m ²)]	
					<u>High-Temperature-Rated Sprinklers</u>	<u>Ordinary- or Intermediate-Temperature-Rated Sprinklers</u>
15 (4.6)	35 (10.7)	Single- and double-row racks	8 (2.4)	1	0.19 (7.7)	0.22 (9.0)
				More than 1 but not every tier level	0.15 (6.1)	0.18 (7.3)
				Every tier level	0.15 (6.1)	0.15 (6.1)
			4 (1.2)	1	0.23 (9.3 9.4)	0.27 (11.0)
				More than 1 but not every tier level	0.18 (7.3)	0.21 (8.6)
				Every tier level	0.15 (6.1)	0.16 (6.5)
		Multiple-row	Any	1	0.23 (9.3 9.4)	0.27 (11.0)

<u>Maximum Storage Height ft (m)</u>	<u>Maximum Ceiling Height ft (m)</u>	<u>Storage Arrangement</u>	<u>Aisle Width ft (m)</u>	<u>No. of In-Rack Sprinkler Levels Installed</u>	<u>Ceiling Sprinkler System Design</u> [gpm/ft ² /2000 ft ² (mm/min/486 185 m ²)]	
					<u>High-Temperature-Rated Sprinklers</u>	<u>Ordinary- or Intermediate-Temperature-Rated Sprinklers</u>
		racks		More than 1 but not every tier level	0.18 (7.3)	0.21 (8.6)
				Every tier level	0.15 (6.1)	0.16 (6.5)
18 (5.5)	38 (11.6)	Single- and double-row racks	8 (2.4)	1	0.27 (11.0)	0.31 (12.6)
				More than 1 but not every tier level	0.22 (9.0)	0.25 (10.2)
				Every tier level	0.16 (6.5)	0.19 (7.7)
			4 (1.2)	1	0.33 (13.4)	0.38 (15.5)
				More than 1 but not every tier level	0.26 (10.6)	0.30 (12.2)
				Every tier level	0.20 (8.2)	0.23 (9.3 9.4)
		Multiple-row racks	Any	1	0.33 (13.4)	0.38 (15.5)
				More than 1 but not every tier level	0.26 (10.6)	0.30 (12.2)
				Every tier level	0.20 (8.2)	0.23 (9.3 9.4)
25 (7.6)	45 (13.7)	Single- and double-row racks	8 (2.4)	1	0.32 (13.0)	0.37 (15.1)
				More than 1 but not every tier level	0.26 (10.6)	0.30 (12.2)
				Every tier level	0.19 (7.7)	0.22 (8.9 9.0)
			4 (1.2)	1	0.39 (15.9)	0.45 (18.3)
				More than 1 but not every tier level	0.31 (12.6)	0.36 (14.7)
				Every tier level	0.23 (9.3 4)	0.27 (10.9 11.0)

<u>Maximum Storage Height ft (m)</u>	<u>Maximum Ceiling Height ft (m)</u>	<u>Storage Arrangement</u>	<u>Aisle Width ft (m)</u>	<u>No. of In-Rack Sprinkler Levels Installed</u>	<u>Ceiling Sprinkler System Design</u> [gpm/ft ² /2000 ft ² (mm/min/186 185 m ²)]	
					<u>High-Temperature-Rated Sprinklers</u>	<u>Ordinary- or Intermediate-Temperature-Rated Sprinklers</u>
		Multiple-row racks	Any	2	0.39 (15.9)	0.45 (18.3)
				More than 2 but not every tier level	0.31 (12.6)	0.36 (14.7)
				Every tier level	0.23 (9.3 9.4)	0.27 (10.9 11.0)

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 03 18:56:03 EDT 2023

Committee Statement

Committee Statement: Metric updates.

Response Message: SR-1088-NFPA 13-2023

Public Comment No. 102-NFPA 13-2023 [Section No. 25.4.2.1.2.1(A)]



Second Revision No. 1089-NFPA 13-2023 [Section No. 25.5.1]

25.5.1 Protection of Racks with Solid Shelves.

25.5.1.1 General.

25.5.1.1.1

The requirements of this chapter for the installation of in-rack sprinklers within open rack configurations shall apply to racks with solid shelves except as modified in this section.

25.5.1.1.2

CMSA ceiling-level sprinkler design criteria shall be an applicable option for open racks combined with in-rack sprinklers installed in accordance with the criteria for solid shelving.

25.5.1.2 Horizontal Location and Spacing of In-Rack Sprinklers in Racks with Solid Shelves.

25.5.1.2.1

Where racks with solid shelves contain storage of Class I through Class IV commodities, the maximum allowable horizontal spacing of in-rack sprinklers shall be 10 ft (3.0 m).

25.5.1.2.2

Where racks with solid shelves contain storage of Group A plastic commodities, the maximum allowable horizontal spacing of in-rack sprinklers shall be 5 ft (1.5 m).

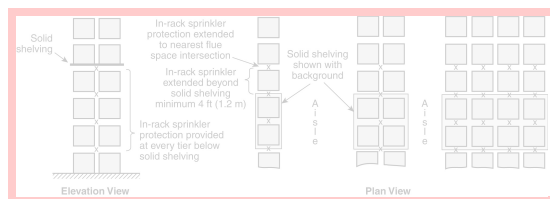
25.5.1.2.3*

Where racks with solid shelves obstruct only a portion of an open rack, in-rack sprinklers shall be extended beyond the end of the solid shelf a minimum of 4 ft (1.2 m) to the nearest flue space intersection.

A.25.5.1.2.3

See Figure A.25.5.1.2.3 for an example showing the installation of in-rack sprinklers within racks having solid shelves that obstruct only a portion of an open rack protected by CMSA ceiling-level sprinklers.

Figure A.25.5.1.2.3 Example of Horizontal and Vertical In-Rack Sprinkler Installation When Only a Portion of an Open Rack, Protected by CMSA Ceiling-Level Sprinklers, is Obstructed by Solid Shelving.



25.5.1.3 Vertical Location and Spacing of In-Rack Sprinklers in Racks with Solid Shelves.

25.5.1.3.1

Where CMSA ceiling-level sprinklers protect racks with solid shelving, in-rack sprinklers shall be installed beneath all tiers under the highest solid shelf.

25.5.1.3.2

Where racks with solid shelves obstruct only a portion of an open rack, in-rack sprinklers shall be installed in accordance with 25.5.1.3.1 – (See Figure A.25.5.1.2.3.)

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 03 19:04:13 EDT 2023

Committee Statement

Committee Statement: Section 25.5.1 has been deleted as it is redundant to 25.3.

Response Message: SR-1089-NFPA 13-2023

[Public Comment No. 211-NFPA 13-2023 \[Section No. 25.5.1\]](#)



Second Revision No. 1090-NFPA 13-2023 [Section No. 25.6.1]

25.6.1 Protection of Racks with Solid Shelves.

25.6.1.1 General.

25.6.1.1.1

The requirements of this chapter for the installation of in-rack sprinklers within open rack configurations shall apply to racks with solid shelves except as modified in this section.

25.6.1.1.2

ESFR ceiling-level sprinkler design criteria shall be an applicable option for open racks combined with in-rack sprinklers installed in accordance with the criteria for solid shelving.

25.6.1.2 Horizontal Location and Spacing of In-Rack Sprinklers in Racks with Solid Shelves.

25.6.1.2.1

Where racks with solid shelves contain storage of Class I through Class IV commodities, the maximum allowable horizontal spacing of in-rack sprinklers shall be 10 ft (3.0 m).

25.6.1.2.2

Where racks with solid shelves contain storage of Group A plastic commodities, the maximum allowable horizontal spacing of in-rack sprinklers shall be 5 ft (1.5 m).

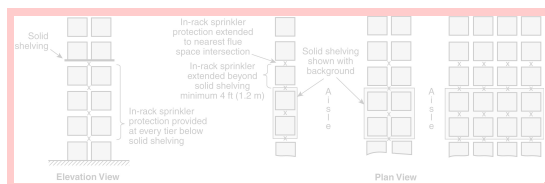
25.6.1.2.3*

Where racks with solid shelves obstruct only a portion of an open rack, in-rack sprinklers shall be extended beyond the end of the solid shelf a minimum of 4 ft (1.2 m) to the nearest flue space intersection.

A.25.6.1.2.3

See Figure A.25.6.1.2.3 for an example showing the installation of in-rack sprinklers within racks having solid shelves that obstruct only a portion of an open rack protected by ESFR ceiling-level sprinklers.

Figure A.25.6.1.2.3 Example of Horizontal and Vertical In-Rack Sprinkler Installation When Only a Portion of an Open Rack, Protected by ESFR Ceiling-Level Sprinklers, is Obstructed by Solid Shelving.



25.6.1.3 Vertical Location and Spacing of In-Rack Sprinklers in Racks with Solid Shelves.

25.6.1.3.1

Where ESFR ceiling-level sprinklers protect racks with solid shelving, in-rack sprinklers shall be installed beneath all tiers under the highest solid shelf.

25.6.1.3.2

Where racks with solid shelves obstruct only a portion of an open rack, in-rack sprinklers shall be installed in accordance with 25.6.1.3.1 - (See Figure A.25.6.1.2.3.)

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 03 19:06:22 EDT 2023

Committee Statement

Committee Statement: Section 25.6.1 has been deleted as it is redundant to 25.3.

Response Message: SR-1090-NFPA 13-2023

[Public Comment No. 210-NFPA 13-2023 \[Section No. 25.6.1\]](#)



Second Revision No. 1178-NFPA 13-2023 [Section No. 25.7.2.3.1]



25.7.2.3.1

The maximum horizontal distance between in-rack sprinklers shall be in accordance with Table 25.7.2.3.1 in combination with Figure 25.7.2.3.1(a) through Figure 25.7.2.3.1(f).

Table 25.7.2.3.1 Maximum Horizontal Spacing of In-Rack Sprinklers

<u>Rack Type</u>	<u>Option 1</u>	<u>Option 2a and Option 2b</u>	<u>Option 3</u>
Single-row racks	5 ft (1.5 m)	4.5 ft (1.4 m)	10 ft (3.0 m)
	[See Figure 25.7.2.3.1(a).]	[See Figure 25.7.2.3.1(b), Figure 25.7.2.3.1(c), and Figure 25.7.2.3.1(d).]	[See Figure 25.7.2.3.1(e) and Figure 25.7.2.3.1(f).]
Double-row racks	5 ft (1.5 m) at each rack face	4.5 ft (1.4 m) at each rack face*	Not required at the rack face
	10 ft (3.0 m) within the longitudinal flue space	4.5 ft (1.4 m) within the longitudinal flue space	10 ft (3.0 m) within the longitudinal flue space
	[See Figure 25.7.2.3.1(a).]	[See Figure 25.7.2.3.1(b), Figure 25.7.2.3.1(c), and Figure 25.7.2.3.1(d).]	[See Figure 25.7.2.3.1(e) and Figure 25.7.2.3.1(f).]
Multiple-row racks	5 ft (1.5 m) at each rack face and at each alternating rack bay	8 ft 6 in. (2.6 m) at each rack face 4.5 ft (1.4 m) in-between rack faces	10 ft (3.0 m) at each rack face 10 ft (3.0 m) in-between rack faces
	10 ft (3.0 m) between in-rack sprinkler at every other rack bay	[See Figure 25.7.2.3.1(b), Figure 25.7.2.3.1(c), and Figure 25.7.2.3.1(d).]	[See Figure 25.7.2.3.1(e) and Figure 25.7.2.3.1(f).]
	[See Figure 25.7.2.3.1(a).]		

Note: Option 1, Option 2a, Option 2b, and Option 3 are in reference to those listed in Table 25.7.2.2.

*The maximum horizontal distance between in-rack sprinklers is permitted to be increased to 8.5 ft (2.6 m) when the maximum distance between transverse flue spaces does not exceed 4.25 ft (1.3 m).

Figure 25.7.2.3.1(a) Option 1 — In-Rack Sprinkler Arrangements for Class I through Class IV and Group A Plastic Commodities.

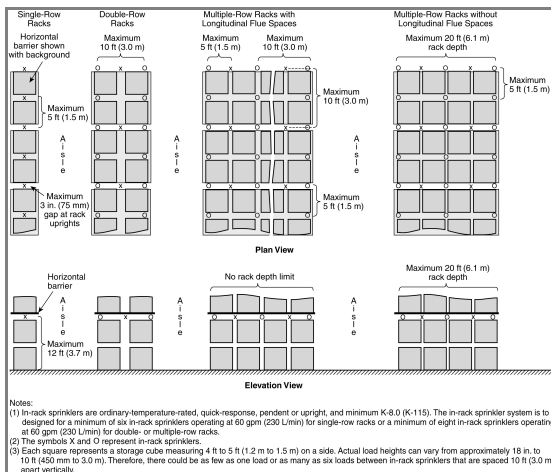


Figure 25.7.2.3.1(b) Option 2a — In-Rack Sprinkler Arrangements for Class I through Class IV and Carton Group A Plastic Commodities, Maximum 30 ft (9.1 m) Vertical Increments.

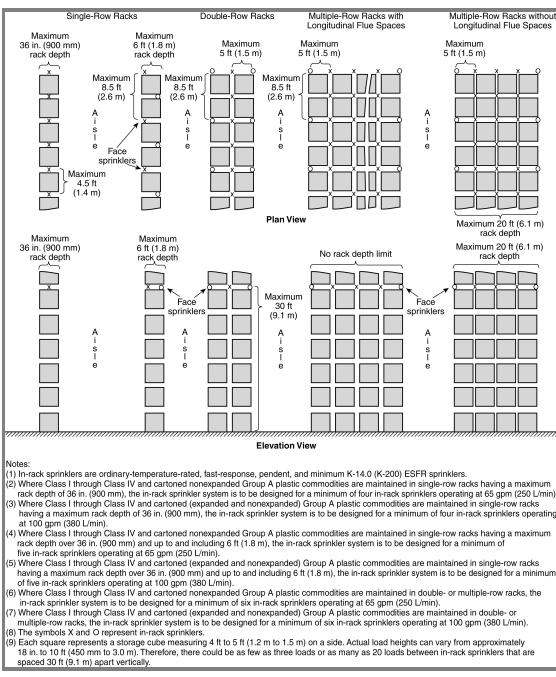


Figure 25.7.2.3.1(c) Option 2b — In-Rack Sprinkler Arrangements for Class I through Class IV and Group A Plastic Commodities, Maximum 30 ft (9.1 m) Vertical Increments.

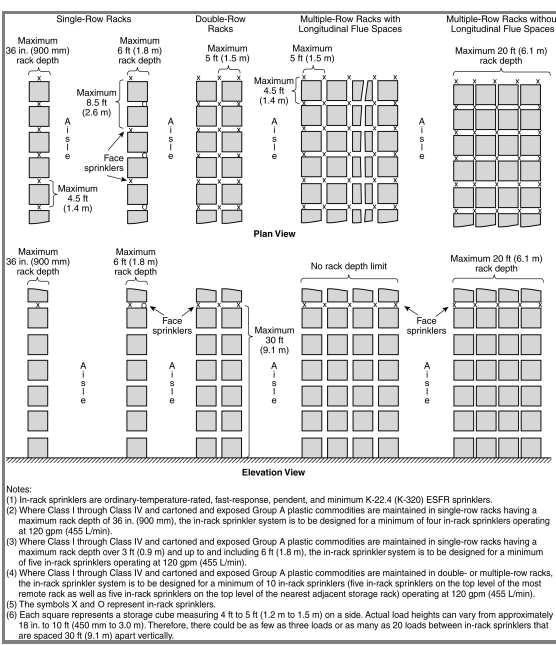


Figure 25.7.2.3.1(d) Option 2b — In-Rack Sprinkler Arrangements for Class I through Class IV and Cartoned Group A Plastic Commodities, Maximum 40 ft (12.2 m) Vertical Increments.

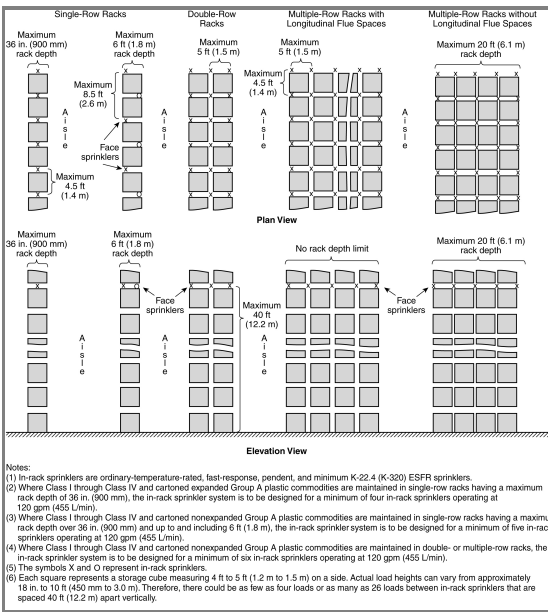


Figure 25.7.2.3.1(e) Option 3 — In-Rack Sprinkler Arrangements for Class I through Class IV and Cartoned Group A Plastic Commodities, Maximum 30 ft (9.1 m) Vertical Increments.

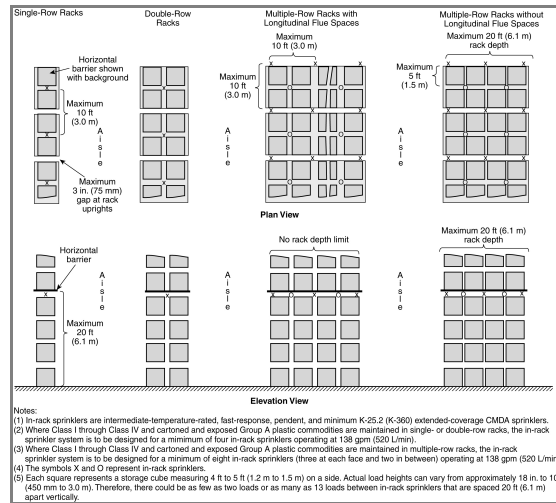
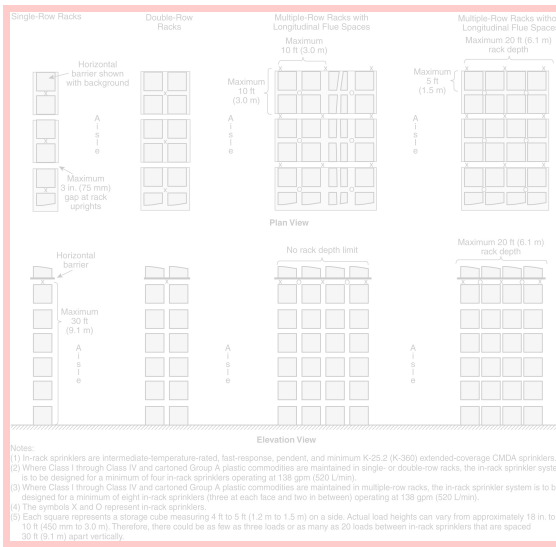
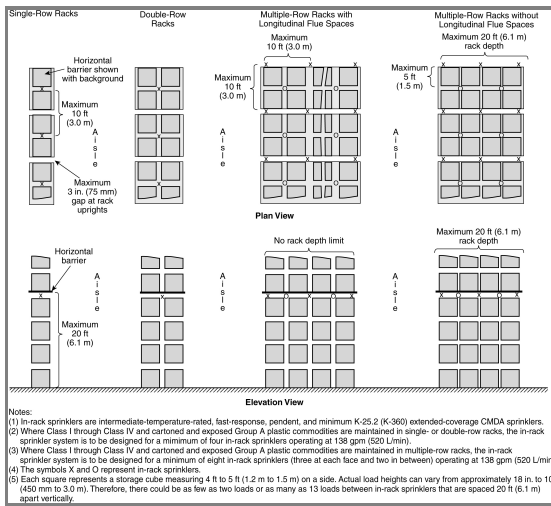


Figure 25.7.2.3.1(f) Option 3 — In-Rack Sprinkler Arrangements for Class I through Class IV and Group A Plastic Commodities, Maximum 20 ft (6.1 m) Vertical Increments.



Supplemental Information

File Name

Figures_25.7.2.3.1.pdf

Description

For editorial use. See Figure 25.7.2.3.1(d) for location to add "maximum 10 ft (3.0 m)" dimension.

Approved

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Sep 01 08:19:28 EDT 2023

Committee Statement

Committee Statement: To enhance usability and readability, options correlating to Table 25.7.2.3.1 have been added in the Figure names.

Response Message: SR-1178-NFPA 13-2023



Second Revision No. 1104-NFPA 13-2023 [Section No. 26.2]

26.2 Plastic Motor Vehicle Components.

Group A plastic automotive components and associated packaging material shall be permitted to be protected in accordance with Table 26.2. (See [A.20.4.13](#).)

Table 26.2 ESFR Sprinkler Design Criteria K-25.2 (360) for Portable Racks (Closed Array) Without Solid Shelves Containing Automotive Components and Associated Packaging Material

<u>Maximum Storage Height</u>		<u>Maximum Ceiling/Roof Height</u>		<u>Type of System</u>	<u>Maximum Sprinkler Spacing^a</u>		<u>Number of Design Sprinklers by Minimum Operating Pressure^{b,c}</u>		<u>Maximum Deflector Distance Below Ceiling^d</u>		<u>Hose Stream Allowance</u>		<u>Water Supply Duration (hours)</u>
<u>ft</u>	<u>m</u>	<u>ft</u>	<u>m</u>		<u>ft²</u>	<u>m²</u>	<u>psi</u>	<u>bar</u>	<u>in.</u>	<u>mm</u>	<u>gpm</u>	<u>L/min</u>	
25	7.6	35	10.7	Wet	100	9.3	16 at 37 psi	16 at 2.5 bar	18	450	500	1900	2

Note: Closed array means the portable rack array is tightly nested without any flue spaces.

^aSprinkler spacing can exceed 100 ft² (9.3 m²) where sprinklers are listed for larger spacing.

^bSystem hydraulic design is also capable of delivering a discharge density of 0.60 gpm/ft² (24.4 mm/min) over the most hydraulically remote 4000 ft² (370 m²) area.

^cThe design area consists of the hydraulically most demanding 16 sprinklers with five sprinklers on three branch lines and one sprinkler on the fourth branch line.

^dMaximum deflector distance below ceiling is permitted to exceed 18 in. (450 mm) where sprinklers are listed for greater distances.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Aug 04 12:10:39 EDT 2023

Committee Statement

Committee Statement: This is a pointer to annex text that used to be associated with A.26.2. To avoid duplication, we are pointing the user to where it is now found in A.20.4.13.

Response Message: SR-1104-NFPA 13-2023

[Public Comment No. 83-NFPA 13-2023 \[New Section after A.26.1.1\]](#)



Second Revision No. 1148-NFPA 13-2023 [Section No. 27.6]

27.6 Dipping, Coating, and Printing Processes Using Ignitable (Flammable or Combustible) Liquids.

Fire sprinkler systems for the protection of dipping, coating, and printing processes using ignitable (flammable or combustible) liquids shall be designed and installed in accordance with this standard and NFPA 34.

Submitter Information Verification

Committee: AUT-SSD

Submission Date: Tue Aug 22 08:31:03 EDT 2023

Committee Statement

Committee Statement: For consistency amongst NFPA documents, the title has been revised from "Flammable and Combustible Liquids" to "Ignitable (Flammable or Combustible) Liquids."

CC note No. 41-NFPA 13-2023 [Section No. 27.6]

Suggest changing section title to "Ignitable (Flammable or Combustible) Liquids."
This aligns the section title with the text.

Response Message: SR-1148-NFPA 13-2023



Second Revision No. 1079-NFPA 13-2023 [Section No. 28.2]

28.2 Approved Storage Floor Plan.

28.2.1

An approved storage floor plan shall be provided showing all areas of the building designed for storage in accordance with the following sections of this standard: Where required by the locally adopted fire code, an approved storage floor plan shall be provided.

~~Chapters 20 through 26~~

~~4.4.1.6 for miscellaneous tire storage~~

28.2.2*

The approved storage floor plan shall be mounted in an approved location. An approved storage floor plan that documents the permissible use of the storage area, based on the occupancy classification and the design basis of the automatic sprinkler system, shall be provided and mounted in an approved location. [1: 34.1.3]

A.28.2.2

~~The approved storage floor plan should be of sufficient size to be legible. An approved working plan that includes the needed information can be used rather than creating a separate storage floor plan. It is recommended to have the approved storage floor plan laminated or protected by a similar means, and to mount it close to the sprinkler riser or other approved location.~~

The plan should be of sufficient size to be legible. Typical content to be included on the floor plan ~~should~~ might include but should not be limited to, the following, ~~as applicable~~ :

- (1) Locations, dimensions, and height limits of piled, palletized, and rack storage
- (2) Commodity classification permitted to be stored in each area
- (3) Required clearances between top of storage and sprinkler deflectors
- (4) Required clearances between top of storage and ceiling
- (5) Aisle dimensions between storage arrays
- (6) Location of any required fire department access doors
- (7) Location of valves controlling ceiling and in-rack sprinkler water supplies

[1 :A.34.1.3]

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
28.2.docx		
28.2_SR-1079_for_prod_use.docx	For prod use	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 03 12:49:05 EDT 2023

Committee Statement

Committee Statement: The requirements for the approved storage floor plan have been extracted from NFPA 1 to emphasize the fire code requirements. Language has been added to make the requirements "where applicable."

Response Message: SR-1079-NFPA 13-2023



Second Revision No. 1091-NFPA 13-2023 [Section No. 28.3.4.2.1]

28.3.4.2.1*

Where the design is based on the density/area method, the design area shall be a rectangular area having a dimension parallel to the branch lines ~~in accordance with one of the following: at least 1.4 times the square root of the area of sprinkler operation (A) used, which shall permit the inclusion of sprinklers on both sides of the cross main.~~

~~For unobstructed construction with ceiling or roof slopes greater than 2 in 12, the dimension parallel to the branch line shall be at least 1.4 times the square root of the area of sprinkler operation (A) used, which shall permit the inclusion of sprinklers on both sides of the cross main.~~

~~For obstructed construction with ceiling or roof slopes greater than 4 in 12, the dimension parallel to the branch line shall be at least 1.4 times the square root of the area of sprinkler operation (A) used, which shall permit the inclusion of sprinklers on both sides of the cross main.~~

~~For all other situations, the dimension parallel to the branch line shall be at least 1.2 times the square root of the area of sprinkler operation (A) used, which shall permit inclusion of sprinklers on both sides of the cross main.~~

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
28.3.4.2.1_SR_1091.docx	For editorial use	

Submitter Information Verification

Committee: AUT-SSD
Submittal Date: Thu Aug 03 19:09:45 EDT 2023

Committee Statement

Committee Statement: Upon re-evaluation of the data from the FPRF program, it has been determined that the 1.4 shape factor is not necessary due to the 50% increase to the design area, which causes the dimension parallel to the branch line to be large enough to account for the sprinklers that will open during a fire.

Response Message: SR-1091-NFPA 13-2023

[Public Comment No. 88-NFPA 13-2023 \[Section No. 28.3.4.2.1\]](#)



Second Revision No. 1157-NFPA 13-2023 [Section No. 28.3.4.4 [Excluding any Sub-Sections]]

For ESFR sprinklers, the design area shall be in accordance with ~~23.2.2~~, ~~23.2.3~~, the applicable sections in Chapters 23 and ~~25.6.3.3~~ 25.

Submitter Information Verification

Committee: AUT-SSD

Submission Date: Tue Aug 22 11:50:33 EDT 2023

Committee Statement

Committee Statement: Adding the revisions to say chapter 23 and chapter 25 insures additional sections that need to be referenced are not missed.

CC note No. 13-NFPA 13-2023 [Section No. 28.3.4.4]

Review the references in 28.3.4.4 to verify that they are correct. It appears that 25.6.4 and 23.5 may be missing.

Response Message: SR-1157-NFPA 13-2023



Second Revision No. 1092-NFPA 13-2023 [Section No. 28.3.4.4.1]

28.3.4.4.1

Where the design area was increased ~~beyond 12 to 18~~ sprinklers due to the slope of the ceiling or roof, the design area shall be calculated in accordance with ~~28.3.4.2~~ with the design area (A) ~~being the number of sprinklers multiplied by the actual floor area covered by these sprinklers~~ five sprinklers on the most demanding three branch lines and the three most demanding sprinklers on the next most demanding branch line .

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
28.2.4.4.1_SR_1092.docx	For editorial use.	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 03 19:11:43 EDT 2023

Committee Statement

Committee Statement: This provides specific instruction on how to calculate 18 sprinklers in the design area when the area is increased due to slope.

Response Message: SR-1092-NFPA 13-2023

[Public Comment No. 89-NFPA 13-2023 \[Section No. 28.3.4.4.1\]](#)



Second Revision No. 1149-NFPA 13-2023 [Section No. 28.3.4.7.2.1]

28.3.4.7.2.1

The sprinklers in these small compartments shall be capable of discharging the minimum density appropriate for the hazard they protect in accordance with ~~Figure 19.2.3.1.1~~ Table 19.2.3.1.1.

Submitter Information Verification

Committee: AUT-SSD

Submission Date: Tue Aug 22 09:03:49 EDT 2023

Committee Statement

Committee Statement: Figure 19.2.3.1.1 was removed from NFPA 13 During First Revision. The reference to Figure 19.2.3.1.1 has changed to Table 19.2.3.1.1.

CC note No. 9-NFPA 13-2023 [Section No. 28.3.4.7.2.1]

Review section 28.3.4.7.2.1 as Figure 19.2.3.1.1 has been deleted as part of an FR. References to this figure will need to be cleaned up. Suggest changing "or Figure 19.2.3.1.1" to "table 19.2.3.1.1."

Response Message: SR-1149-NFPA 13-2023



Second Revision No. 1093-NFPA 13-2023 [Section No. 28.3.4.7.4.3(A)]

(A)*

The number of supplemental sprinklers shall include up to a maximum of four adjacent sprinklers attached to a branch line.

A.28.3.4.7.4.3(A)

If there is a single line of sprinklers installed under the obstruction, then four sprinklers on the same branch line should be included in the hydraulic calculations. If, however, there is more than one line of sprinklers installed under the obstruction, then the hydraulic calculations should account for two sprinklers on two lines.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 03 19:14:27 EDT 2023

Committee Statement

Committee Statement: Annex language is being added to help explain which sprinklers to include in the hydraulic design when there is more than one line of sprinklers being installed under an obstruction.

Response Message: SR-1093-NFPA 13-2023

[Public Comment No. 203-NFPA 13-2023 \[Section No. 28.3.4.7.4.3\(A\)\]](#)

[Public Comment No. 204-NFPA 13-2023 \[New Section after A.28.3.4.7.3\]](#)



Second Revision No. 1170-NFPA 13-2023 [Section No. 28.3.4.8.1]

[Detail SR-1171](#)

[Detail SR-1172](#)

[Detail SR-1169](#)

28.3.4.8.1

Pipe friction loss shall be calculated in accordance with the Hazen–Williams formula with C values from Table 28.3.4.8.1, as follows:

- (1) Pipe, fittings, flexible sprinkler hose fittings, and devices such as valves, meters, flow switches, ~~in pipes 2 in. (50 mm) or less in size~~, and strainers shall be included, and elevation changes that affect the sprinkler discharge shall be calculated.
- (2) Tie-in drain piping shall not be included in the hydraulic calculations.
- (3) Losses for a tee or a cross shall be calculated where flow direction change occurs based on the equivalent pipe length of the piping segment in which the fitting is included.
- (4) The tee at the top of a riser nipple shall be included in the branch line, the tee at the base of a riser nipple shall be included in the riser nipple, and the tee or cross at a cross main–feed main junction shall be included in the cross main.
- (5) Losses for straight-through flow in a tee or cross shall not be included.
- (6) The loss of reducing elbows based on the equivalent length value of the smallest outlet shall be calculated.
- (7) The equivalent length value for the standard elbow on any abrupt 90-degree turn, such as the screw-type pattern, shall be used.
- (8) The equivalent length value for a fitting with a bushing shall be the same as for a similarly sized and configured reducing fitting.
- (9) The equivalent length value for the long-turn elbow on any sweeping 90-degree turn, such as a flanged, welded, or mechanical joint-elbow type, shall be used. (See *Table 28.3.3.1.1.*)
- (10) Losses shall be permitted to be excluded for tapered reducers.
- (11) Losses shall be permitted to be excluded for a fitting with or without a bushing, directly connected to a sprinkler, except as required in 28.3.3.1.2 and 28.3.3.4.
- (12) Losses for flexible sprinkler hose fittings shall be based upon the number of bends referenced in the listing for the hose length.
- (13) Losses through a pressure-reducing valve shall be included based on the normal inlet pressure condition, and pressure loss data from the manufacturer's literature shall be used.
- (14) In new systems, an increased C value of 120 shall be permitted where nitrogen is provided in accordance with 8.2.10.
- (15) In new systems, an increased C value of 120 shall be permitted where vacuum pressure is provided in accordance with Section 8.11 .
- (16) In new systems, an increased C value of 120 shall be permitted where a vapor corrosion inhibitor is provided in accordance with 8.2.11 .

Table 28.3.4.8.1 Hazen–Williams C Values

<u>Pipe or Tube</u>	<u>C Value^a</u>
Unlined cast or ductile iron	100
Black steel (dry systems including preaction)	100
Black steel (wet systems including deluge)	120
Black steel (dry system including preaction) using nitrogen ^b	120
<u>Black steel (dry system including preaction) using vacuum pressure^c</u>	<u>120</u>
<u>Black steel (dry system including preaction) using a vapor corrosion inhibitor^d</u>	<u>120</u>
Galvanized steel (dry systems including preaction)	100
Galvanized steel (wet systems including deluge)	120

<u>Pipe or Tube</u>	<u>C Value^{*a}</u>
Galvanized steel (dry systems including preaction) using nitrogen ^{†b}	120
<u>Galvanized steel (dry systems including preaction) using vacuum pressure^c</u>	<u>120</u>
<u>Galvanized steel (dry systems including preaction) using a vapor corrosion inhibitor^d</u>	<u>120</u>
Plastic all (listed)	150
Cement-lined cast- or ductile iron	140
Copper tube, brass or stainless steel	150
Asbestos cement	140
Concrete	140

^{*a}The authority having jurisdiction is permitted to allow other C values.

^{†b}Nitrogen supply shall be installed in accordance with 8.2.10.

^cVacuum pressure shall be installed in accordance with Section 8.11.

^dVapor corrosion inhibitor shall be installed in accordance with 8.2.11.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Tue Aug 29 16:20:30 EDT 2023

Committee Statement

Committee Statement: It is important that the flow losses for flexible sprinkler hose fittings be included in the hydraulic calculations as the flow losses can be significant.

Response Message: SR-1170-NFPA 13-2023

Public Comment No. 124-NFPA 13-2023 [Section No. 28.3.4.8.1]

Public Comment No. 170-NFPA 13-2023 [Section No. 28.3.4.8.1]



Second Revision No. 1163-NFPA 13-2023 [Section No. 28.5.1.2]

28.5.1.2* Summary Sheet.

The summary sheet shall contain the ~~following~~ information included in 28.5.2.2, where applicable.

A.28.5.1.2

See Figure A.28.5.1.2(a) through Figure A.28.5.1.2(d).

Figure A.28.5.1.2(a) Summary Sheet.

Hydraulic Calculations

for

ABC Company, employee garage

7499 Franklin Road

Charleston, SC

Contract No. 4001

Date 1-7-08

Design data:

Occupancy classification ORD, GR, 1

Density 0.15 gpm/ft² (6.1 mm/min/m²)

Area of application 1500 ft² (139 m²)

Coverage per sprinkler 130 ft² (12.1 m²)

Special sprinklers _____

No. of sprinklers calculated 12

In-rack demand _____

Hose streams 250 gpm (950 lpm)

Total water required 510.4 gpm (1930 lpm)
including hose streams

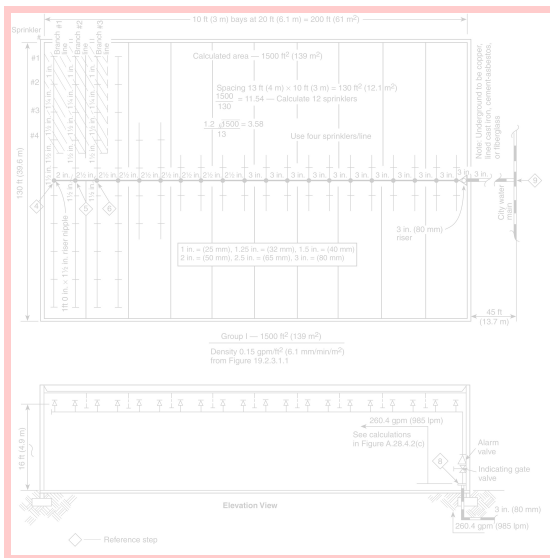
Name of contractor _____

Name of designer _____

Address _____

Authority having jurisdiction _____

Figure A.28.5.1.2(b) Hydraulic Calculation Example (Plan View and Elevation View).



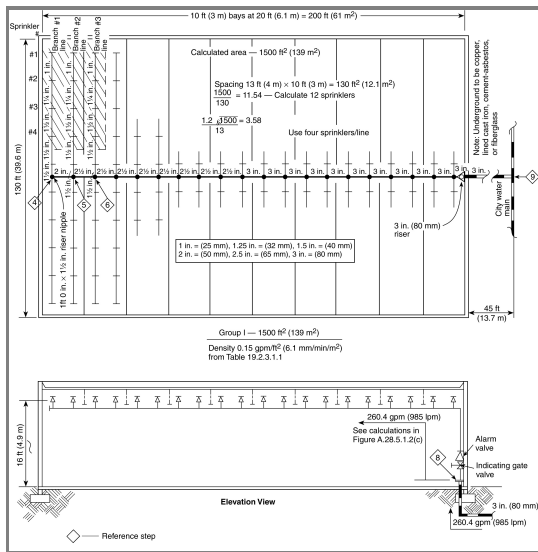
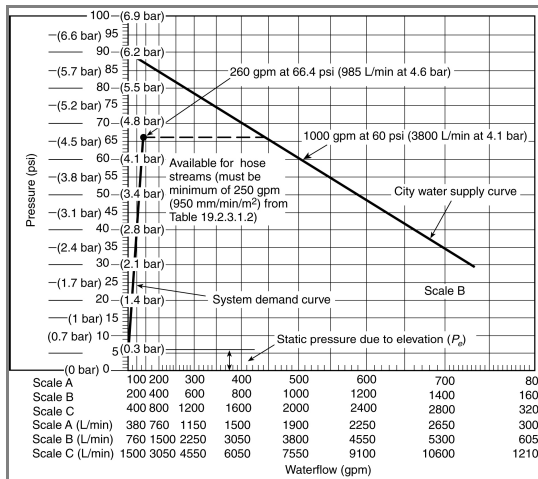


Figure A.28.5.1.2(c) Hydraulic Calculations.

Contract Name - GROUP 1 1500 ft² (139 m²)										Sheet 2 of 3	
Step No.	Nozzle Ident. and Location	Flow in gpm (lpm)	(mm) Pipe Size	Pipe Fittings and Devices	Eqv. Pipe Length (ft)	Friction Loss psi Foot	Pressure (bar)	Normal Pressure	D = 0.15 gpm/ft² Notes	Ref. Step	
1	BL-1	q	1 in. (25 mm)	L 15 (4.6)	L 15 (4.6)	C=120	P ₁ 12.1 P ₂	P ₁	Q = 130 x 0.15 = 19.5 (74 bar)		
2		Q (74)					P ₁ 1.6 P ₂	P ₁	P = (19.5/5.6)² = 12.1 psi (0.83 bar)		
3		q (78.4)	1/2 in. (12.5 mm)	F	L 15 (4.6)	0.124	P ₁ 13.7 P ₂	P ₁	q = 5.6 √13.7		
4		Q (152.2)					P ₁ 1.6 P ₂	P ₁			
5		q (83)	1/2 in. (12.5 mm)	F	L 15 (4.6)	0.125	P ₁ 15.3 P ₂	P ₁	q = 5.6 √15.3	4	
6		Q (235.1)					P ₁ 1.7 P ₂	P ₁			
7	DN RN	q (27.4)	1/2 in. (12.5 mm)	2T-16	L 15 (4.6)	0.131	P ₁ 17.0 P ₂	P ₁	q = 5.6 √17	5	
8		Q (52.5)					P ₁ 0.4 P ₂	P ₁	P ₂ = 1 x 0.433		
9	CM TO BL-2	q (32.5)	2 in. (50 mm)	F	L 15 (4.6)	0.236	P ₁ 26.0 P ₂	P ₁	K = 26.2 / 26		
10		Q (62.5)					P ₁ 0.7 P ₂	P ₁	K = 16.71		
11	BL-2 CM TO BL-3	q (326.7)	2 1/2 in. (63 mm)	F	L 15 (4.6)	0.07	P ₁ 26.7 P ₂	P ₁	q = 16.71 √26.7	6	
12		Q (649.2)					P ₁ 1.1 P ₂	P ₁			
13	BL-3 CM	q (325.5)	2 1/2 in. (63 mm)	F	L 15 (4.6)	0.107	P ₁ 27.8 P ₂	P ₁	q = 16.7 √27.8		
14		Q (649.2)					P ₁ 16.2 P ₂	P ₁			
15	CM TO FIS	q (259.6)	3 in. (80 mm)	E5 AV15 GV1	L 15 (4.6)	0.231	P ₁ 44.0 P ₂	P ₁	P ₂ = 15 x 0.433	8	
16		Q (519.2)					P ₁ 6.5 P ₂	P ₁			
17	THROUGH UNDERGROUND TO CITY MAIN	q (259.6)	3 in. (80 mm)	E5 GV1	L 15 (4.6)	0.231	P ₁ 61.7 P ₂	P ₁	F = F ₂₀ x 1.51 x F ₁ F ₁ = (2.30/0.3069) x 0.869 = 0.869 F = 21 x 1.51 x 0.869 F = 27.6	9	
18		Q (519.2)					P ₁ 11.2 P ₂	P ₁			
19		q					P ₁ 66.4 P ₂	P ₁			
20		Q					P ₁ P ₂	P ₁			
21		q					P ₁ P ₂	P ₁			
22		Q					P ₁ P ₂	P ₁			
23		q					P ₁ P ₂	P ₁			
24		Q					P ₁ P ₂	P ₁			

Figure A.28.5.1.2(d) Hydraulic Graph.



Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Aug 25 20:41:59 EDT 2023

Committee Statement

Committee Statement: A list is not included in 28.5.1.2, therefore the word "following" has been removed. Figure 19.2.3.1.1 was deleted during first revision. Figure 19.2.3.1.1 has been changed to Table 19.2.3.1.1. Note that the CC note incorrectly referenced Figure A.28.3.5.1.2(b). The correct reference is A.28.5.1.2(B).

CC note No. 48-NFPA 13-2023 [Section No. 28.5]

Review 28.5.1.2 for consistency with 28.5.1.3 and 28.5.1.4 and remove the word "following."

CC note No. 10-NFPA 13-2023 [Section No. A.28.5.1.2

Review section Figure A.28.3.5.1.2(b) as Figure 19.2.3.1.1 has been deleted as part of an FR. References to this figure will need to be cleaned up. Suggest changing "or Figure 19.2.3.1.1" to "table 19.2.3.1.1."

Response Message: SR-1163-NFPA 13-2023



Second Revision No. 1102-NFPA 13-2023 [Section No. A.4.4.4.2]

A.4.3.4.2

Extra hazard (Group 2) occupancies include occupancies having uses and conditions similar to the following:

- (1) Asphalt saturating
- (2) Flammable liquids spraying
- (3) Flow coating
- (4) Manufactured home or modular building assemblies (where finished enclosure is present and has combustible interiors)
- (5) Open oil quenching
- (6) Plastics manufacturing
- (7) Solvent cleaning
- (8) Varnish and paint dipping
- (9) Car stackers and car lift systems with two cars stacked vertically and using ceiling-only protection
- (10) Diesel fire pump houses and rooms containing pump drivers and fuel tanks

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Aug 04 11:26:54 EDT 2023

Committee Statement

Committee Statement: Provides clarification that the extra hazard classification for two level car stackers is based on protecting with ceiling only protection.

Response Message: SR-1102-NFPA 13-2023

[Public Comment No. 67-NFPA 13-2023 \[Section No. A.4.4.4.2\]](#)



Second Revision No. 1103-NFPA 13-2023 [Section No. A.20.4.1]



A.20.4.1

See Table A.20.4.1.

Table A.20.4.1 Examples of Class I Commodities

<u>Product Heading</u>	<u>Product</u>
Batteries	Dry cells (excludes lithium, lithium-ion, and other similar exotic metals or combustible electrolyte); without blister packing (if blister packed refer to commodity classification definitions)
	Vehicle; small (e.g., automobile); wet (excludes lithium-ion and other cells containing combustible electrolyte) cells
Empty Containers	Noncombustible
Flammable/Combustible Liquids	Liquids; up to 20 percent alcohol (e.g., alcoholic beverages, flavoring extracts); metal, glass or ceramic containers
	Liquids; up to 20 percent alcohol (e.g., alcoholic beverages, flavoring extracts); up to 5 gal (20 L) plastic bottles or jars
Food Products — Frozen	Frozen foods; nonwaxed or nonplastic packaging
Food Products — Non-Frozen	Foods (coffee, fish products, fruit, meat products, nuts, poultry, etc.); metal cans
	Fruits and vegetables (noncombustible semi-liquids); crushed; plastic containers up to 5 gal (20 L)
	Fruits and vegetables; fresh; wood spacers, non-plastic trays or containers
	Meat; fresh; no plastic packaging; exposed
	Milk; paper containers, or plastic bottles or jars up to 5 gal (20 L) plastic bottles or jars
	Salt; bagged
Furniture and Bedding	Furniture; metal (e.g., file cabinets or desks with plastic trim); cartoned
Housing Materials/Appliances	Appliances; major (e.g., stoves, refrigerators); no appreciable plastic interior or exterior trim; cartoned <u>exposed</u>
	Gypsum board
	Paint; water-based (latex); friction-top metal containers; cartoned
Miscellaneous	Motors; electric
	Transformer; dry or empty (i.e., void of oil)
Noncombustible Liquids	Liquids or semi liquids; PET containers greater than 5 gal (20 L) having a nominal wall thickness greater than 0.25 in. (6 mm)
	Liquids or semi-liquids (e.g., crushed fruits and vegetables); plastic containers up to 5 gal (20 L) capacity
	Liquids; cardboard drink boxes, plastic-coated, wax-coated, and/or aluminum-lined; exposed or on corrugated carton trays with plastic sheeting
	Liquids; glass bottles or jars; cartoned
Plastic/Rubber	Plastics; stored in fully closed and solid (no openings), metal containers
Powders/Pills	Powders; noncombustible free-flowing powdered or granular materials (cement, calcium chloride, clay, iron oxide, sodium chloride, sodium silicate, etc.); bagged
	Powders; noncombustible; glass bottles or jars; cartoned
Wire/Cable/Spools	Wire; bare; metal spools, exposed

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Aug 04 11:41:21 EDT 2023

Committee Statement

Committee Statement: Their is contradiction in tables A.20.4(B) And description of Housing materials in next tables Table A..20.4.1 and Table A.20.4.2 .

In tables Table A.20.4.1 and Table A.20.4.2 . both showing "Appliances; major (e.g., stoves, refrigerators) ; no appreciable plastic interior or exterior trim; cartoned" while in table A.20.4.1 it should be exposed not cartoned to be in compliance with table A.20.4(B) for both exposed / cartooned .

Response Message: SR-1103-NFPA 13-2023

[Public Comment No. 90-NFPA 13-2023 \[Section No. A.20.4.1\]](#)



Second Revision No. 1105-NFPA 13-2023 [Section No. A.20.4.13]

A.20.4.13

Exposed, expanded Group A plastic dunnage, instrument panels, and plastic bumper facia ~~were~~ where the automotive components with their related packaging that were utilized in the fire tests. This test commodity used in the large-scale sprinklered fire test proved to be the worst challenge per the large-scale calorimeter tests of available components. See *Technical Report of Fire Testing of Automotive Parts in Portable Storage Racking*, prepared by Underwriters Laboratories, Project 99NK29106, NC4004, January 5, 2001, and *Commodity Hazard Comparison of Expanded Plastic in Portable Bins and Racking*, Project 99NK29106, NC4004, September 8, 2000.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Aug 04 12:17:17 EDT 2023

Committee Statement

Committee Statement: Editorial correction.

Response Message: SR-1105-NFPA 13-2023



Second Revision No. 1106-NFPA 13-2023 [Section No. A.28.1]



A.28.1

Preliminary plans should be submitted for review to the authority having jurisdiction prior to the development of working plans [see Figure A.28.1(a)]. The preliminary plans can be part of the construction documents submitted in order to obtain a building permit. However, working drawings in accordance with Section 28.1 should be submitted and approved prior to the installation of system equipment. Preliminary plans should include as much information as is required to provide a clear representation of the hazard to be protected, the system design concept, the proposed water supply configuration, and the building construction information pertinent to the system layout and detailing.

The owner's information certificate, shown in Figure A.28.1(b), should be used to obtain a declaration of the intended use of the occupancy to be protected.

Drawings that accompany the certificate should include the following:

- (1) Name of owner and occupant
- (2) Location, including street address
- (3) Point of compass
- (4) Construction and occupancy of each building
- (5) Building height in feet
- (6) Waterflow test information and, if a waterflow test of the city main is available, indicate the following:
 - (a) Date and time of the test
 - (b) Name of party that conducted the test
 - (c) Location of the hydrants where the flow was taken and where static and residual pressure readings were recorded (see A.5.2.2)
 - (d) Size and configuration of mains supplying the hydrants
 - (e) Size and number of open hydrant butts that ~~flowed~~ were flowed
 - (f) Results of the test
 - (g) Any required adjustments to water flow test information
- (7) Building features such as combustible concealed spaces, floor openings, areas subject to freezing, and areas from which it is intended to omit sprinkler protection
- (8) Proposed location and approximate size, if a water supply employing pumps or tanks is contemplated
- (9) Name and address of party submitting the preliminary plans
- (10) Tentative location of major piping, including mains underground, risers, overhead mains, and fire department connections
- (11) The need for seismic protection and the applicable design spectral response acceleration at short periods (S_{DS}).

Figure A.28.1(a) Typical Preliminary Plan.

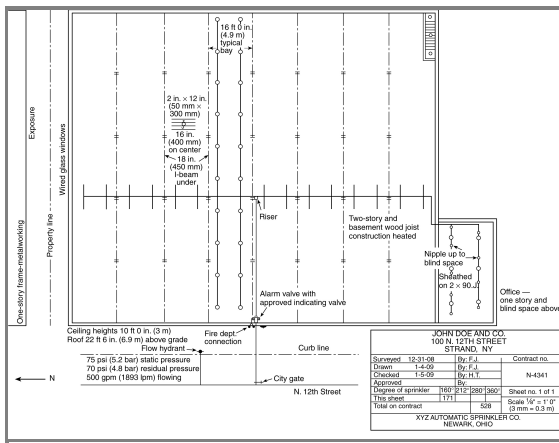


Figure A.28.1(b) Owner's Information Certificate.

OWNER'S INFORMATION CERTIFICATE

Name/address of property to be protected with sprinkler protection:

Name of owner: _____

Existing or planned construction is:
 Fire resistive or noncombustible
 Wood frame or ordinary (masonry walls with wood beams)
 Unknown

Describe the intended use of the building:

Note regarding speculative buildings: The design and installation of the fire sprinkler system is dependent on an accurate description of the likely use of the building. Without specific information, assumptions will need to be made that will limit the actual use of the building. Make sure that you communicate any and all use considerations to the fire sprinkler contractor in this form and that you abide by all limitations regarding the use of the building based on the limitations of the fire sprinkler system that is eventually designed and installed.

Is the system installation intended for one of the following special occupancies:

Aircraft hangar	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Fixed guideway transit system	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Race track stable	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Marine terminal, pier, or wharf	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Airport terminal	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Aircraft engine test facility	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Power plant	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Water-cooling tower	<input type="checkbox"/> Yes	<input type="checkbox"/> No

If the answer to any of the above is "yes," the appropriate NFPA standard should be referenced for sprinkler density/area criteria.

Indicate whether any of the following special materials are intended to be present:

Flammable or combustible liquids	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Aerosol products	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Nitrate film	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Pyroxylin plastic	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Compressed or liquefied gas cylinders	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Liquid or solid oxidizers	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Organic peroxide formulations	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Idle pallets	<input type="checkbox"/> Yes	<input type="checkbox"/> No

If the answer to any of the above is "yes," describe type, location, arrangement, and intended maximum quantities.

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OWNER'S INFORMATION CERTIFICATE

Name/address of property to be protected with sprinkler protection: _____

Name of owner: _____

Existing or planned construction is:
 Fire resistive or noncombustible
 Wood frame or ordinary (masonry walls with wood beams)
 Unknown

Describe the intended use of the building: _____

Note regarding speculative buildings: The design and installation of the fire sprinkler system is dependent on an accurate description of the likely use of the building. Without specific information, assumptions will need to be made that will limit the actual use of the building. Make sure that you communicate any and all use considerations to the fire sprinkler contractor in this form and that you abide by all limitations regarding the use of the building based on the limitations of the fire sprinkler system that is eventually designed and installed.

Is the system installation intended for one of the following special occupancies:

Aircraft hangar	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Fixed guideway transit system	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Race track stable	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Marine terminal, pier, or wharf	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Airport terminal	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Aircraft engine test facility	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Power plant	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Water-cooling tower	<input type="checkbox"/> Yes	<input type="checkbox"/> No

If the answer to any of the above is "yes," the appropriate NFPA standard should be referenced for sprinkler density/area criteria.

Indicate whether any of the following special materials are intended to be present:

Flammable or combustible liquids	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Aerosol products	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Nitrate film	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Pyroxylin plastic	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Compressed or liquefied gas cylinders	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Liquid or solid oxidizers	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Organic peroxide formulations	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Idle pallets	<input type="checkbox"/> Yes	<input type="checkbox"/> No

If the answer to any of the above is "yes," describe type, location, arrangement, and intended maximum quantities.

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Indicate whether the protection is intended for one of the following specialized occupancies or areas:

Spray area or mixing room	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Solvent extraction	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Laboratory using chemicals	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Oxygen-fuel gas system for welding or cutting	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Acetylene cylinder charging	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Production or use of compressed or liquefied gases	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Commercial cooking operation	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Class A hyperbaric chamber	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Cleanroom	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Incinerator or waste handling system	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Linen handling system	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Industrial furnace	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Water-cooling tower	<input type="checkbox"/> Yes	<input type="checkbox"/> No

If the answer to any of the above is "yes," describe type, location, arrangement, and intended maximum quantities.

Will there be any storage of products over 12 ft (3.7 m) in height? Yes No
 If the answer is "yes," describe product, intended storage arrangement, and height.

Will there be any storage of plastic, rubber, or similar products over 5 ft (1.5 m) high except as described above?
 Yes No
 If the answer is "yes," describe product, intended storage arrangement, and height.

Is there any special information concerning the water supply? Yes No
 If the answer is "yes," provide the information, including known environmental conditions that might be responsible for corrosion, including microbiologically influenced corrosion (MIC).
 Determine and confirm the water supply including any necessary adjustments: _____

Is seismic protection required? Yes No
 Provide short-period spectral response parameter: _____

I certify that I have knowledge of the intended use of the property and that the above information is correct.

Signature of owner's representative or agent: _____ Date: _____

Name of owner's representative or agent completing certificate (print): _____

Relationship and firm of agent (print): _____

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Indicate whether the protection is intended for one of the following specialized occupancies or areas:

Spray area or mixing room	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Solvent extraction	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Laboratory using chemicals	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Oxygen-fuel gas system for welding or cutting	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Acetylene cylinder charging	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Production or use of compressed or liquefied gases	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Commercial cooking operation	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Class A hyperbaric chamber	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Cleanroom	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Incinerator or waste handling system	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Linen handling system	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Industrial furnace	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Water-cooling tower	<input type="checkbox"/> Yes	<input type="checkbox"/> No

If the answer to any of the above is "yes," describe type, location, arrangement, and intended maximum quantities.

Will there be any storage of products over 12 ft (3.7 m) in height? Yes No

If the answer is "yes," describe product, intended storage arrangement, and height.

Will there be any storage of plastic, rubber, or similar products over 5 ft (1.5 m) high except as described above?

Yes No

If the answer is "yes," describe product, intended storage arrangement, and height.

Is there any special information concerning the water supply? Yes No

If the answer is "yes," provide the information, including known environmental conditions that might be responsible for corrosion, including microbiologically influenced corrosion (MIC).

Determine and confirm the water supply including any necessary adjustments: _____

Is seismic protection required? Yes No

Provide short-period spectral response parameter: _____

I certify that I have knowledge of the intended use of the property and that the above information is correct.

Signature of owner's representative or agent: _____ Date: _____

Name of owner's representative or agent completing certificate (print): _____

Relationship and firm of agent (print): _____

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Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
A.28.1_SR_1106.docx	For editorial use	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Aug 04 12:19:43 EDT 2023

Committee Statement

Committee Statement: The seismic requirements were added as required in the owner's certificate. The water supply adjustments were added to indicate any required adjustments to align with what is required in the body of the standard.

Response Message: SR-1106-NFPA 13-2023

Public Comment No. 100-NFPA 13-2023 [Section No. A.28.1]



Second Revision No. 1181-NFPA 13-2023 [Section No. C.8]

C.8 [20.19 20.15]

In all valid tests with double-row racks, sprinkler water supplies were shut off at approximately 60 minutes. In only one test did the last sprinkler operate in excess of 30 minutes after ignition; the last sprinkler operated in excess of 25 minutes in three tests, with the majority of tests involving the last sprinkler operating within 20 minutes.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Sep 01 11:54:30 EDT 2023

Committee Statement

Committee Statement: The reference to 20.19 is incorrect. The reference to "20.19" has been corrected to "20.15."

CC note No. 42-NFPA 13-2023 [Section No. C.8]

Review C.8 and verify the correct cross reference. Should it be 20.19 or 25.3.1?

Response Message: SR-1181-NFPA 13-2023



Second Revision No. 1152-NFPA 13-2023 [Section No. C.11]

C.11 [20.19, 25.3.3.1]

Test 98 with solid shelves 24 ft (7.3 m) long and 7½ ft (2.3 m) deep at each level produced total destruction of the commodity in the main rack and jumped the aisle. Density was 0.3 gpm/ft² (12.2 mm/min) from the ceiling sprinklers only. Test 108 with shelves 24 ft (7.3 m) long and 3½ ft (1.0 m) deep and with a 6 in. (150 mm) longitudinal flue space and one level of sprinklers in the rack resulted in damage to most of the commodity in the main rack but did not jump the aisle. Density from ceiling sprinklers was 0.375 gpm/ft² (15.3 mm/min), and rack sprinklers discharged at 15 psi (1.0 bar).

These tests did not yield sufficient information to develop a comprehensive protection standard for solid shelf racks. Items such as increased ceiling density, use of bulkheads, other configurations of sprinklers in racks, and limitation of shelf length and depth should be considered.

Where such rack installations exist or are contemplated, the damage potential should be considered, and sound engineering judgment should be used in designing the protection system.

Test 98, with solid shelving obstructing both the longitudinal and transverse flue space, produced unsatisfactory results and indicates a need for sprinklers at each level in such a rack structure.

Test 147 was conducted with ceiling sprinklers only. Density was 0.45 gpm/ft² (18.3 mm/min) with a sprinkler spacing of 100 ft² (9 m²). A total of 47 sprinklers opened, and 83 percent of the commodity was consumed. The fire jumped both aisles and spread to both ends of the main and target racks. The test was considered unsuccessful.

Test 148 was conducted with ceiling sprinklers and in-rack sprinklers. In-rack sprinklers were provided at each level (top of first, second, and third tiers) and were located in the longitudinal flue. They were directly above each other and 24 ft (7.3 m) on center or 22 ft (6.7 m) on each side of the ignition flue. Ceiling sprinkler discharge density was 0.375 gpm/ft² (15.3 mm/min). In-rack sprinkler discharge pressure was 30 psi (2.1 bar). A total of 46 ceiling sprinklers and three in-rack sprinklers opened, and 34 percent of the commodity was consumed. The fire consumed most of the material between the in-rack sprinklers and jumped both aisles.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Tue Aug 22 09:27:50 EDT 2023

Committee Statement

Committee Statement: C.11 was revised to add an additional reference of 25.3.3.1. The reference to 20.19 is correct and should remain.

CC note No. 43-NFPA 13-2023 [Section No. C.11]

Review C.11 and verify the correct cross reference. Should it be 20.19 or 25.3.3.1?

**Response
Message:**

SR-1152-NFPA 13-2023



Second Revision No. 1153-NFPA 13-2023 [Section No. C.13]

C.13 [~~20.6.2.11~~ 20.6.2.1.1]

Test 80 was conducted to determine the effect of closing back-to-back longitudinal 6 in. (150 mm) flue spaces in conventional pallet racks. Test results indicated fewer sprinklers operating than with the flue space open, and, as such, no minimum back-to-back clearance is necessary if the transverse flue space is kept open.

Tests 145 and 146 were conducted to investigate the influence of longitudinal and transverse flue dimensions in double-row racks without solid shelves. Results were compared with Tests 65 and 66. Flue dimensions in Tests 65, 66, 145, and 146 were 6 in. (150 mm), 6 in. (150 mm), 3 in. (75 mm), and 12 in. (300 mm), respectively. All other conditions were the same.

In Tests 65, 66, 45, and 48, sprinklers operated compared with Tests 59 and 58 for Tests 145 and 146, respectively. Fire damage in Tests 145 and 146 was somewhat less than in Tests 65 and 66; 2100 ft³ (59 m³) and 1800 ft³ (51 m³) in Tests 145 and 146, respectively, versus 2300 ft³ (65 m³) and 2300 ft³ (65 m³) in Tests 65 and 66, respectively, of combustible material were consumed.

Test results indicate narrow flue spaces of about 3 in. (75 mm) allow reasonable passage of sprinkler water down through the racks.

Tests 96 and 107, on multiple-row racks, used 6 in. (150 mm) transverse flue spaces. The water demand recommended in the standard is limited to those cases with nominal 6 in. (150 mm) transverse flues in vertical alignment.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Tue Aug 22 09:35:17 EDT 2023

Committee Statement

Committee Statement: Section 20.6.2.11 was corrected to 20.6.2.1.1.

CC note No. 44-NFPA 13-2023 [Section No. C.13]

Review C.13 and verify the correct cross reference. Should it be 20.6.2.1.1?

Response Message: SR-1153-NFPA 13-2023



Second Revision No. 1154-NFPA 13-2023 [Section No. C.14]

C.14 [21.4.1.1.1 and 21.4.1.1.2]

Tests 65 and 66, compared with Test 69, and Test 93, compared with Test 94, indicated a reduction in areas of application of 44.5 percent and 45.5 percent, respectively, with high-temperature-rated sprinklers as compared with ordinary-temperature-rated sprinklers. Other extensive Factory Mutual tests produced an average reduction of 40 percent. Design curves are based on this area reduction. In constructing the design curves, the high-temperature curves above 3600 ft² (335 m²) of application, therefore, represent 40 percent reductions in area of application of the ordinary-temperature curves in the 6000 ft² to 10,000 ft² (555 m² to 930 m²) range.

Test 84 indicated the number of intermediate-temperature-rated sprinklers operating is essentially the same as ordinary-temperature-rated sprinklers.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Tue Aug 22 09:43:00 EDT 2023

Committee Statement

Committee Statement: Section 21.4.1.1.2 was removed with the organization of chapter 30 (Existing System Modifications or Evaluation). Reference to 21.4.1.1.2 has been removed. 21.4.1.1.1 was corrected to 21.4.1.1.

CC note No. 45-NFPA 13-2023 [Section No. C.14]

Review C.14 and verify the correct cross reference. Should it be 21.4.1.1?

Response Message: SR-1154-NFPA 13-2023



Second Revision No. 1155-NFPA 13-2023 [Section No. C.15]

C.15 [21.4.1.2.3 and ~~25.3.2.2.2.1(B)~~ 25.4.2.2.2.1(B)]

Tests were not conducted with aisles wider than 8 ft (2.4 m) or narrower than 4 ft (1.2 m). It is, therefore, not possible to determine whether lower ceiling densities should be used for aisle widths greater than 8 ft (2.4 m) or if higher densities should be used for aisle widths less than 4 ft (1.2 m).

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Tue Aug 22 09:48:41 EDT 2023

Committee Statement

Committee Statement: Section "25.4.2.2.2.1(B)" was corrected to "25.4.2.2.2.1(B)."

CC note No. 46-NFPA 13-2023 [Section No. C.15]

Review C.15 and verify the correct cross reference. Should it be 21.4.1.2.4 and 25.4.2.2.2.1(B)?

Response Message: SR-1155-NFPA 13-2023



Second Revision No. 1158-NFPA 13-2023 [Section No. C.23]

C.23 [15.4.3.1.1 25.4.3.1.1.1 and 25.4.3.1.1.1 25.4.3.2.1.1]

The recommended use of ordinary-temperature-rated sprinklers at ceiling for storage higher than 25 ft (7.6 m) was determined by the results of fire test data. A test with high-temperature-rated sprinklers and 0.45 gpm/ft² (18.3 mm/min) density resulted in fire damage in the two top tiers just within acceptable limits, with three ceiling sprinklers operating. A test with 0.45 gpm/ft² (18.3 mm/min) density and ordinary-temperature-rated sprinklers produced a dramatic reduction in fire damage with four ceiling sprinklers operating.

The four ordinary-temperature-rated ceiling sprinklers operated before the first of the three high-temperature-rated ceiling sprinklers. In both tests, two in-rack sprinklers at two levels operated at approximately the same time. The high-temperature-rated sprinklers were at all times fighting a larger fire with less water than the ordinary-temperature-rated ceiling sprinklers.

Tests 115 and 119 compare ceiling sprinkler density of 0.3 gpm/ft² (12.2 mm/min) with 0.45 gpm/ft² (18.3 mm/min). Damage patterns coupled with the number of boxes damaged in the main rack suggest that the increase in density produces improved control, particularly in the area above the top tier of in-rack sprinklers.

Tests 119 and 122 compare ceiling sprinkler temperature ratings of 286°F (141°C) and 165°F (74°C). A review of the number of boxes damaged and the firespread patterns indicates that the use of ordinary-temperature-rated ceiling sprinklers on a rack configuration that incorporates in-rack sprinklers dramatically reduces the amount of firespread. Considering that in-rack sprinklers in the tests for storage over 25 ft (7.6 m) operated prior to ceiling sprinklers, it would seem that the installation of in-rack sprinklers converts an otherwise rapidly developing fire, from the standpoint of ceiling sprinklers, to a slower developing fire with a lower rate of heat release.

In the 20 ft (6.1 m) high test series, ceiling sprinklers operated before in-rack sprinklers. In the 30 ft (9.1 m) high series, ceiling sprinklers operated after in-rack sprinklers. The 50 ft (15 m) high test did not operate ceiling sprinklers. Ceiling sprinklers would, however, be needed if fire occurred in upper levels.

The results of these tests indicate the effect of in-rack sprinklers on storage higher than 25 ft (7.6 m). From the ceiling sprinkler operation standpoint, a fire with an expected high heat release rate was converted to a fire with a much lower heat release rate.

Since the fires developed slowly and opened sprinklers at two levels in the racks, only a few ceiling sprinklers were needed to establish control. Thus, the sprinkler operating area does not vary with height for storage over 25 ft (7.6 m) or for changes in sprinkler temperature rating and density.

All tests with sprinklers in racks were conducted using nominal ½ in. (15 mm) orifice size sprinklers of ordinary temperature.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Tue Aug 22 12:53:05 EDT 2023

Committee Statement

Committee References corrected to 25.4.3.1.1.1 and 25.4.3.2.1.1?

Statement:

Correlating Committee Note No. 47-NFPA 13-2023 [Section No. C.23]

Review C.23 and verify the correct cross reference. Should it be 25.4.3.1.1 and 25.4.3.2.1.1?

Response Message: SR-1158-NFPA 13-2023



Second Revision No. 1180-NFPA 13-2023 [New Section after C.26]



C.27 [19.2.3.2.5]

Publicly available large-scale fire testing for simulated Ordinary Hazard Group 1 and Group 2 type occupancies were used to establish the requirements of 19.2.3.2.5 and are available in the following two documents:

- (1) [Nam, Soonil; Antonio Braga; Hsiang-Cheng Kung; and Joan M. A. Troup, "Fire Protection for Non-Storage Occupancies with High Ceiling Clearances," Fire Safety Science — Proceedings of the 7th International Symposium, International Association for Fire Safety Science, 2002, pp. 493–504. \[www.iafss.org/publications/fss/7/493/view/fss_7-493.pdf\]\(http://www.iafss.org/publications/fss/7/493/view/fss_7-493.pdf\)](#)
- (2) [Nam, S., "Fire Protection at High Ceiling Clearance Facilities," International Association for Fire Safety Science, 2007. \[www.iafss.org/publications/aofst/7/84/view/aofst_7-84.pdf\]\(http://www.iafss.org/publications/aofst/7/84/view/aofst_7-84.pdf\)](#)

Table C.27 summarizes selected data from these reports. There are also additional tests reported in the 2014 Suppression Detection conference proceedings available from the NFPA Library.

Table C.27 Large-Scale Test Data for High Ceilings over Non-Storage Occupancies

Test No.	Test Sponsored By	Research Report Date and Test Number	Test Commodity	Storage Height		Aisle Width Between Main and Target Arrays ft (m)	Occupancy Hazard Classification	Ceiling Height		Sprinkler K-Factor
				ft	(m)			ft	(m)	
-	-	-	-	ft	(m)	-	-	ft	(m)	-
1	FM Global	2002 Test 2 and 2007 Test 1	Class II	~ 8	2.3	DNA	OH 1	58	17.7	K-5.6 (K-80)
2	FM Global	2002 Test 1 and 2007 Test 2	Class II	~ 8	2.3	DNA	OH 1	58	17.7	K-8.0 (K-115)
3	FM Global	2007 Test 3	Cartoned nonexpanded Group A Plastics	~ 6	1.8	DNA	OH 2	60	18.3	K-8.0 (K-115)
4	FM Global	2007 Test 4	Cartoned nonexpanded Group A Plastics	~ 6	1.8	DNA	OH 2	60	18.3	K-8.0 (K-115)
5	FM Global	2002 Test 3 and 2007 Test 5	Cartoned nonexpanded Group A Plastics	~ 6	1.8	5 (1.5)	OH 2	58	17.7	K-8.0 (K-115)
6	FM Global	2002 Test 4 and 2007 Test 6	Cartoned nonexpanded Group A Plastics	~ 6	1.8	5 (1.5)	OH 2	60	18.3	K-11.2 (K-160)
7	FM Global	2007 Test 7	Cartoned nonexpanded Group A Plastics	~ 6	1.8	5 (1.5)	OH 2	60	18.3	K-11.2 (K-160)

<u>Test No.</u>	<u>Test Sponsored By</u>	<u>Research Report Date and Test Number</u>	<u>Test Commodity</u>	<u>Storage Height</u>		<u>Aisle Width Between Main and Target Arrays ft (m)</u>	<u>Occupancy Hazard Classification</u>	<u>Ceiling Height</u>		<u>Sprinkler K-Factor</u>
				<u>ft</u>	<u>(m)</u>			<u>ft</u>	<u>(m)</u>	
-	-	-	-	<u>ft</u>	<u>(m)</u>	-	-	<u>ft</u>	<u>(m)</u>	-
8	FM Global	2002 Test 5	Cartoned nonexpanded Group A Plastics	~6	1.8	5 (1.5)	OH 2	60	18.3	K-25.2E (K-360E)
9	FM Global	2010 Test 3	Cartoned nonexpanded Group A Plastics	~6	1.8	DNA	OH2	30	9.1	K-11.2E (K-160E)
10	FM Global	2010 Test 5	Cartoned nonexpanded Group A Plastics	~6	1.8	DNA	OH2	30	9.1	K-14.0E (K-200E)
11	FM Global	2010 Test 9	Cartoned nonexpanded Group A Plastics	~6	1.8	DNA	OH2	45	13.7	K-5.6 (K-80)

Note: The commodity classification and heights are representative of the fire load present in the specific occupancies noted in the table and are not indicative of high- or low-piled storage.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
C.27_SR_1180.docx		
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Submitter Information Verification

Committee: AUT-SSD
Submittal Date: Fri Sep 01 10:36:44 EDT 2023

Committee Statement

Committee Statement: The revisions for protecting non-storage occupancies under ceilings more than 30 ft. (9.1 m) high are based on large-scale fire tests primarily conducted by FM Global. This material added to Annex C provides a summary of the FM Global test data used in support of these changes.

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