



DELETED

**First Revision No. 1171-NFPA 13-2022 [Detail]**

[Revision to 4.2(1), balloted separately from FR-1170]

4.2* Owner's Certificate.

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

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_AUT_SSD_FDM_4.2_1_FR1171.docx	For staff use only	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Jul 28 10:52:25 EDT 2022

Committee Statement

Committee Statement: The owner or the authorized agent is responsible for providing all of the information required to determine the Hazard Classification. The authorized agent could be a fire protection engineer or a fire protection contractor hired by the owner. The Hazard Classification should be determined by a qualified individual. The proposed text to section (3) clarifies information for water supplies and any potential necessary adjustments. There are several potential variables that may impact a water supply and could influence the sprinkler systems ability to meet the system demand for the life of the system. These variables may require adjustments that would need to be made and implemented at the system design stage. The proposed annex language provides guidance on determining water supply adjustments if needed. The text of (6) was added as the owner or agent will be most familiar with the environment or things that will impact the building environment which could have a direct impact on the sprinkler system.

Response Message: FR-1171-NFPA 13-2022

Public Input No. 356-NFPA 13-2022 [Section No. 4.2]



First Revision No. 1172-NFPA 13-2022 [Detail]

[This is a ballotable detail for a new 4.2(6), balloted separately from FR 1170]

4.2* Owner's Certificate.

The owner(s) of a building or structure where the fire sprinkler system is going to be installed or their authorized agent shall provide the sprinkler system installer with the following information prior to the layout and detailing of the fire sprinkler system [see Figure A.28.1(b)]:

- (6) 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

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_AUT_SSD_FDM_4.2_6_FR1172.docx	For staff use only	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Jul 28 10:58:46 EDT 2022

Committee Statement

Committee Statement: The owner or the authorized agent is responsible for providing all of the information required to determine the Hazard Classification. The authorized agent could be a fire protection engineer or a fire protection contractor hired by the owner. The Hazard Classification should be determined by a qualified individual. The proposed text to section (3) clarifies information for water supplies and any potential necessary adjustments. There are several potential variables that may impact a water supply and could influence the sprinkler systems ability to meet the system demand for the life of the system. These variables may require adjustments that would need to be made and implemented at the system design stage. The proposed annex language provides guidance on determining water supply adjustments if needed. The text of (6) was added as the owner or agent will be most familiar with the environment or things that will impact the building environment which could have a direct impact on the sprinkler system.

Response Message: FR-1172-NFPA 13-2022

Public Input No. 212-NFPA 13-2022 [Section No. 4.2]



First Revision No. 1249-NFPA 13-2022 [Detail]

Add new section and annex

28.3.4.2.3.1*

Where additional sprinklers are carried over to the next branch line, the flow from the sprinklers that create the hydraulically most demanding remote area within the dimension required by 28.3.4.2.1 shall be selected.

A.28.3.4.2.3.1

For most tree and loop systems, the hydraulically most demanding sprinklers will be those closest to the cross main. For gridded systems, the hydraulically most remote sprinklers could end up being any of those along the adjacent branch line, grouped together within the 1.2 length.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 14:44:01 EDT 2022

Committee Statement

Committee Statement: The addition of this requirement codifies what has been inferred in the annex in Figure A.28.2.4.2.1, Figure A. 28.4.3 (15), and others. While in most cases the flow from the sprinklers closest to the cross main may create the hydraulically most demanding area, there may be instances when it doesn't, especially in gridded systems. This new text makes it clear that the additional sprinklers needed to complete the remote area must be proven to be the hydraulically most demanding.

Response Message: FR-1249-NFPA 13-2022

Public Input No. 88-NFPA 13-2021 [Section No. 28.2.4.2]



First Revision No. 1256-NFPA 13-2022 [Detail]

Add new subsection

28.3.4.4.1

Where the design area was increased beyond 12 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 those sprinklers.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 15:20:05 EDT 2022

Committee Statement

Committee Statement: Since storage applications can use sloped ceiling up to and including 4 in 12 now, a pointer was required to help the user understand the calculation requirements.

Response Message: FR-1256-NFPA 13-2022

[Public Input No. 496-NFPA 13-2022 \[New Section after 28.2.4.4\]](#)



First Revision No. 1339-NFPA 13-2022 [Detail]

[Revise the heading of 21.2.2.2 as follows:]

21.2.2.2 **New** System Criteria.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Aug 26 11:56:49 EDT 2022

Committee Statement

Committee Statement: All existing system criteria is addressed by Chapter 30 and no existing system criteria exists in Chapter 21, therefore we do not need to differentiate between new and existing systems any longer.

Response Message: FR-1339-NFPA 13-2022



First Revision No. 1342-NFPA 13-2022 [Detail]

Move the text of existing A.28.2.4.2.4 to the beginning of A.28.2.4.2.5, deleting A.28.2.4.2.4.

A.28.2.4.2.4 [Move text to beginning of A.28.2.4.2.5]

The following steps outline the procedure for calculation in accordance with 28.2.4.2.4:

- (1) Calculate the hydraulic design discharge including those sprinklers within the available floor area.
- (2) Calculate the minimum required discharge by multiplying the required design density times the required minimum design area.
- (3) Subtract the discharge calculated in Step 1 from the discharge calculate in Step 2.
- (4) Where the discharge calculated in Step 3 is greater than 0, the hydraulic design discharge is recalculated including an additional flow equal to that calculated in Step 3. The additional flow is added at the point of connection of the branch line to the cross main furthest from the source.
- (5) Where the discharge calculated in Step 3 is less than or equal to 0, the hydraulic design discharge is as calculated in Step 1.

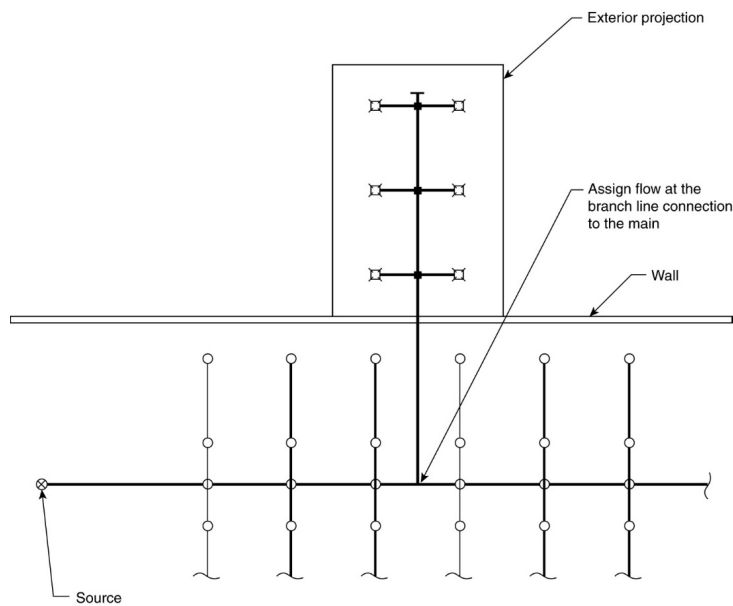
A.28.2.4.2.5

The following steps outline the procedure for calculation in accordance with 28.2.4.2.4:

- (1) Calculate the hydraulic design discharge including those sprinklers within the available floor area.
- (2) Calculate the minimum required discharge by multiplying the required design density times the required minimum design area.
- (3) Subtract the discharge calculated in Step 1 from the discharge calculate in Step 2.
- (4) Where the discharge calculated in Step 3 is greater than 0, the hydraulic design discharge is recalculated including an additional flow equal to that calculated in Step 3. The additional flow is added at the point of connection of the branch line to the cross main furthest from the source.
- (5) Where the discharge calculated in Step 3 is less than or equal to 0, the hydraulic design discharge is as calculated in Step 1.

See Figure A.28.2.4.2.5 for an example of the point of connection for additional flow.

Figure A.28.2.4.2.5 Point of Connection for Additional Flow.



Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_AUT_SSD_FDM_A.28.2.4.2.5.docx	For staff use only	

Submitter Information Verification

Committee: AUT-SSD
Submittal Date: Thu Sep 15 14:50:04 EDT 2022

Committee Statement

Committee Statement: In the 2022 edition, A.28.2.4.2.4 text is inaccurately referenced to 28.2.4.2.4 and should be associated with 28.2.4.2.5. Added text to refer the user to Figure A.28.2.4.2.5 for an example of where to add the additional flow.

Response Message: FR-1342-NFPA 13-2022



First Revision No. 1331-NFPA 13-2022 [New Section after 3.3.19]

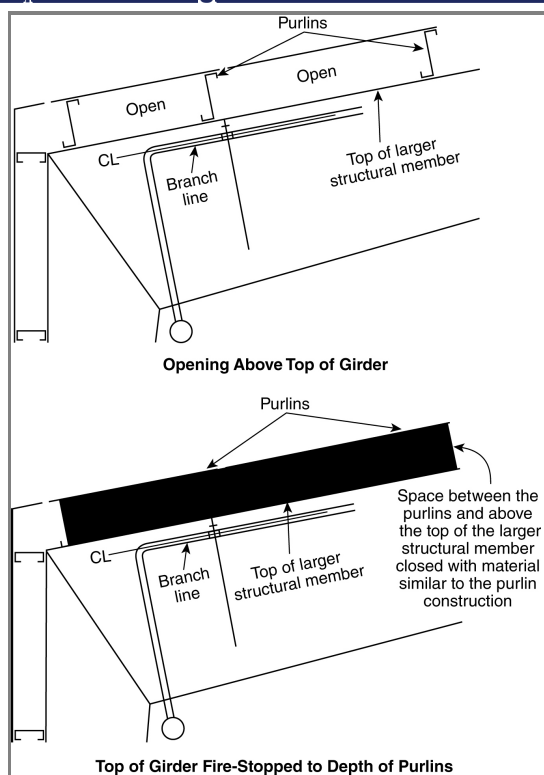
3.3.22* Blocking.

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 to limit the channeling of heat within the structural members. (AUT-SSD)

A.3.3.22 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.3.3.22 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.3.3.22 Example of Blocking at Intersection of Purlins and Girders.



Supplemental Information

File Name
13_3.3.X_Blocking.docx

Description
New added figures.

Approved

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 25 11:15:48 EDT 2022

Committee Statement

Committee Statement: The definition is updated based on the referenced research report.

Response Message: FR-1331-NFPA 13-2022

[Public Input No. 468-NFPA 13-2022 \[New Section after 3.3.80\]](#)



First Revision No. 1173-NFPA 13-2022 [New Section after 4.2]

4.3 Qualified Personnel.

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

- (1) Meets the requirements and training for a given field acceptable to the AHJ
- (2) Is certified by an approved fire protection certification organization
- (3) 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 Jul 28 11:11:35 EDT 2022

Committee Statement

Committee Statement: Work should be done by qualified personnel. The added text is provided to describe what constitutes qualified. This is consistent with other installation standards.

Response Message: FR-1173-NFPA 13-2022

[Public Input No. 604-NFPA 13-2022 \[New Section after 4.2\]](#)



First Revision No. 1170-NFPA 13-2022 [Section No. 4.2]

[Detail FR-1172](#)

[Detail FR-1171](#)

4.2* Owner's Certificate.

The owner(s) of a building or structure where the fire sprinkler system is going to be installed or their authorized agent shall provide the sprinkler system installer with the following information prior to the layout and detailing of the fire sprinkler system *[see Figure A.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) 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
- (3)* ~~Water supply information as identified in 5.2.2~~ Determination and confirmation of the water supply including any necessary adjustments

A.4.2(3)

Where a waterflow test was conducted to provide the water supply information, the raw data from the test should be evaluated to determine if an adjustment is appropriate. The evaluation should be based on knowledge of the water supply and engineering judgment, taking into account daily and seasonal fluctuations, not extreme conditions.

The evaluation can be based on information from the water supply authority, testing, modeling, the fire or building department, or knowledge of the water supply from having worked previously in the jurisdiction. Depending on how much the pressure changes over time at any given location, an adjustment might or might not be appropriate. For mature water supplies (ones where new development in the vicinity is unlikely because available property has been fully developed) with fairly stable water usage, or where the waterflow test was conducted at a time of low pressure already, a very small adjustment or no adjustment at all might be appropriate. For situations where the waterflow test was performed at a time of low demand when it is known that higher demands occur at other times of day or other times of the year, then a larger adjustment would be appropriate.

The evaluation to determine whether an adjustment should be made, and the size of such an adjustment if one is needed should take into account the following variables, which will be applicable to different degrees depending on how and when the test was conducted:

- (1) Maximum daily use of the water supply
- (2) Peak hour demand of the water supply
- (3) Water supply degradation due to planned development
- (4) Time of day the test was conducted
- (5) Time of year the test was conducted
- (6) Elevation of the test location compared to the building where the sprinkler system will be installed
- (7) Elevation of the water supply at the time of the test
- (8) How close the flow generated during the test was to the system demand

There is no single specific adjustment that can be applied to every water supply that would be appropriate for every sprinkler system. The design professional needs to work in conjunction with the authority having jurisdiction to determine an appropriate adjustment. Where an authority having jurisdiction has already determined a specific buffer between test results and the demand of the sprinkler system, there is no intent to add an additional safety factor or safety margin due to this requirement. Instead, the buffer mandated by the authority having jurisdiction serves the purpose of this adjustment.

If an adjustment is determined to be appropriate, it should be applied to the waterflow test data prior to comparison with the sprinkler system demand.

Where the water supply information was obtained from another approved method instead of a waterflow test, that method should take into account daily and seasonal fluctuations, not extreme conditions. It is important to note that adjustments are not intended to handle extreme or catastrophic conditions such as water main breaks. Such extreme conditions are accounted for in NFPA 25 with impairment procedures to follow when systems are out of service.

In the absence of information from the design professional and the authority having jurisdiction, it would be appropriate to make an adjustment to the raw data from a flow test by either obtaining information from the water utility or using an arbitrary adjustment. The value to use for an arbitrary adjustment should be determined through a conversation with the authority having jurisdiction.

- (4)* Any special knowledge of the water supply, including known environmental conditions that might be responsible for corrosion, including microbiologically influenced corrosion (MIC)
- (5) Whether seismic protection is required and the applicable short period response parameter
- (6) 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

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_AUT_SSD_FDM_4.2_3_FR1170.docx	For staff use only	

Submitter Information Verification

Committee: AUT-SSD

Submission Date: Thu Jul 28 09:51:44 EDT 2022

Committee Statement

Committee Statement: The owner or the authorized agent is responsible for providing all of the information required to determine the Hazard Classification. The authorized agent could be a fire protection engineer or a fire protection contractor hired by the owner. The Hazard Classification should be determined by a qualified individual. The proposed text to section (3) clarifies information for water supplies and any potential necessary adjustments. There are several potential variables that may impact a water supply and could influence the sprinkler systems ability to meet the system demand for the life of the system. These variables may require adjustments that would need to be made and implemented at the system design stage. The proposed annex language provides guidance on determining water supply adjustments if needed. The text of (6) was added as the owner or agent will be most familiar with the environment or things that will impact the building environment which could have a direct impact on the sprinkler system.

Response Message: FR-1170-NFPA 13-2022

[Public Input No. 600-NFPA 13-2022 \[New Section after A.4.2\]](#)

[Public Input No. 598-NFPA 13-2022 \[Section No. 4.2\]](#)

[Public Input No. 392-NFPA 13-2022 \[New Section after A.4.2\]](#)

[Public Input No. 391-NFPA 13-2022 \[Section No. 4.2\]](#)



First Revision No. 1271-NFPA 13-2022 [Section No. 4.3.1.4.5]

4.4.1.4.5

Solid shelf racks in accordance with the requirements of Section 20.19 25.4 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 Jul 29 19:03:18 EDT 2022

Committee Statement

Committee Statement: Section reference correction.

Response Message: FR-1271-NFPA 13-2022

Public Input No. 363-NFPA 13-2022 [Section No. 4.3.1.4.5]



First Revision No. 1338-NFPA 13-2022 [Section No. 4.3.1.7]

4.4.1.7 Protection Criteria for Miscellaneous and Low-Piled Storage.

4.4.1.7.1 ~~Protection Criteria for Miscellaneous Storage.~~

4.4.1.7.1

The protection criteria for miscellaneous and low-piled storage protected by ceiling sprinklers only shall be selected from Table 4.4.1.7.1 and 19.2.3.1.1 in accordance with the density/area method of 19.2.3.

Table 4.4.1.7.1 Discharge Criteria for Miscellaneous and Low-Piled Storage Up to 12 ft (3.7 m) in Height

Commodity		Type of Storage	Storage Height		Maximum Ceiling Height		Design from 19.2.3.1.1	Note In-Rack Sprinklers Required	Inside Hose		Ceiling Inlet Capacity
			ft	m	ft	m			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	— <u>No</u>	0, 50, 100	0, 190, 380	25
Class II			≤10	≤3.0	—	—	OH1	— <u>No</u>	0, 50, 100	0, 190, 380	25
Class II			>10 to ≤12	>3.0 to ≤3.7	—	—	OH2	— <u>No</u>	0, 50, 100	0, 190, 380	25
Class III			≤12	≤3.7	—	—	OH2	— <u>No</u>	0, 50, 100	0, 190, 380	25
Class IV			≤10	≤3.0	—	—	OH2	— <u>No</u>	0, 50, 100	0, 190, 380	25
Class IV		Palletized, bin box, shelf, and solid-piled	>10 to ≤12	>3.0 to ≤3.7	32	9.8	OH2	— <u>No</u>	0, 50, 100	0, 190, 380	25
		Single-, double-, or multiple-row rack, and back-to-back shelf storage	>10 to ≤12	>3.0 to ≤3.7	32	9.8	EH1	— <u>No</u>	0, 50, 100	0, 190, 380	50
		Single-, double-, or multiple-row rack	>10 to ≤12	>3.0 to ≤3.7	32	9.8	See Chapter 25.	+1 level of in-rack	0, 50, 100	0, 190, 380	25
Group A Plastic Storage											
Cartoned	Nonexpanded and expanded	Solid-piled, palletized, bin box, shelf, single-, double-, or multiple-row rack, and back-	≤5	≤1.5	—	—	OH2	<u>No</u>	0, 50, 100	0, 190, 380	25
			>5 to ≤10	>1.5 to ≤3.0	15	4.6	EH1	<u>No</u>	0, 50, 100	0, 190, 380	50

<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>Note In-Rack Sprinklers Required</u>	<u>Inside Hose</u>		<u>Co In C</u>
		<u>ft</u>	<u>m</u>	<u>ft</u>	<u>m</u>			<u>gpm</u>	<u>L/min</u>	
	to-back shelf storage	>5 to ≤10	>1.5 to ≤3.0	20	6.1	EH2	<u>No</u>	0, 50, 100	0, 190, 380	50
		>10 to ≤12	>3.0 to ≤3.7	17	5.2	EH2	<u>No</u>	0, 50, 100	0, 190, 380	50
	Solid-piled, palletized, bin box, shelf, and back-to-back shelf storage	>10 to ≤12	>3.0 to ≤3.7	32	9.8	EH2	<u>No</u>	0, 50, 100	0, 190, 380	50
	Single-, double-, or multiple-row rack	>10 to ≤12	>3.0 to ≤3.7	32	9.8	See Chapter 25.	+ 1 level of in-rack	0, 50, 100	0, 190, 380	25
Exposed Nonexpanded and expanded	Solid-piled, palletized, bin box, shelf, single-, double-, or multiple-row rack, and back-to-back shelf storage	≤5	≤1.5	—	—	OH2	<u>No</u>	0, 50, 100	0, 190, 380	25
	Solid-piled, palletized, bin box, shelf, and back-to-back shelf storage	>5 to ≤8	>1.5 to ≤2.4	28	8.5	EH2	<u>No</u>	0, 50, 100	0, 190, 380	50
	Solid-piled, palletized, bin box, shelf, single-, double-, or multiple-row rack,	>5 to ≤10	>1.5 to ≤3.0	15	4.6	EH2	<u>No</u>	0, 50, 100	0, 190, 380	50

<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>Note In-Rack Sprinklers Required</u>	<u>Inside Hose</u>		<u>Co In/ C</u>
		<u>ft</u>	<u>m</u>	<u>ft</u>	<u>m</u>			<u>gpm</u>	<u>L/min</u>	<u>gp</u>
	and back-to-back 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	<u>No</u>	0, 50, 100	0, 190, 380	50
Expanded	Single-, double-, or multiple-row rack	>5 to ≤10	>1.5 to ≤3.0	20	6.1	See Chapter 25.	+1 level of in-rack	0, 50, 100	0, 190, 380	25
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	<u>No</u>	0, 50, 100	0, 190, 380	50
	Single-, double-, or multiple-row rack	>10 to ≤12	>3.0 to ≤3.7	17	5.2	EH2	<u>No</u>	0, 50, 100	0, 190, 380	50
	Single-, double-, or multiple-row rack	>10 to ≤12	>3.0 to ≤3.7	32	9.8	See Chapter 25.	+1 level of in-rack	0, 50, 100	0, 190, 380	25
Tire Storage										
Tires	On floor or on side	>5 to ≤12	>1.5 to ≤3.7	32	9.8	EH1	<u>No</u>	0, 50, 100	0, 190, 380	50
	On floor, on tread, or on side	≤5	≤1.5	—	—	OH2	<u>No</u>	0, 50, 100	0, 190, 380	25
	Single-, double-, or multiple-row racks, on tread	≤5	≤1.5	—	—	OH2	<u>No</u>	0, 50, 100	0, 190, 380	25

Commodity	Type of Storage	Storage Height		Maximum Ceiling Height		Design from 19.2.3.1.1	Note In-Rack Sprinklers Required	Inside Hose		Ceiling Inlet
		ft	m	ft	m			gpm	L/min	
	or on side									
	Single-row rack, portable, on tread or on side	>5 to ≤12	>1.5 to ≤3.7	32	9.8	EH1	No	0, 50, 100	0, 190, 380	50
	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, 190, 380	50
		>5 to ≤12	>1.5 to ≤3.7	32	9.8	See Chapter 25.	+1 level of in-rack	0, 50, 100	0, 190, 380	25
Rolled Paper Storage										
Heavyweight and mediumweight	On end	≤10	≤3.0	30	9.1	OH2	No	0, 50, 100	0, 190, 380	25
Tissue and lightweight	On end	≤10	≤3.0	30	9.1	EH1	No	0, 50, 100	0, 190, 380	25

4.4.1.7.2

The protection criteria for For miscellaneous storage with open frame racks protected by where in-rack sprinklers are required by Table 4.4.1.7.1, in-rack sprinkler protection and ceiling sprinkler design shall be in accordance with 25.2.1.

4.4.1.7.3

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 4.4.1.7.1.

4.4.1.7.4

For low-piled storage with open frame racks where in-rack sprinklers are required by Table 4.4.1.7.1, in-rack sprinkler protection and ceiling sprinkler design shall be in accordance with 25.2.2.

4.4.1.7.5

For low-piled storage having solid shelves, in-rack sprinkler protection in accordance with Section 25.4 shall be required, with corresponding ceiling protection in accordance with 25.2.2.4.1.

4.4.1.7.6

Ceiling sprinkler design shall be in accordance with Section 19.2.

4.4.1.7.7

The maximum design area for miscellaneous and low-piled storage shall not exceed 3000 ft² (280 m²).

4.4.1.7.8 Hose Connections.

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

4.4.1.7.8 Protection Criteria for Low-Piled Storage.

4.4.1.7.8.1

The protection criteria for low-piled storage of Class I through Class IV commodities up to a maximum height of 12 ft (3.7 m) protected by ceiling sprinklers only shall be selected from Table 4.4.1.7.1 and 19.2.3.1.1 in accordance with the density/area method of 19.2.3 .

4.4.1.7.8.2

The protection criteria for low-piled storage of Class I through Class IV commodities up to a maximum height of 12 ft (3.7 m) on open racks protected by in-rack sprinklers shall be in accordance with 25.2.2 .

4.4.1.7.8.3

Low-piled storage of Class I through Class IV commodities up to a maximum height of 12 ft (3.7 m) on solid shelf racks shall be protected with in-rack sprinklers in accordance with Section 20.19 and 25.2.2.2 , with corresponding ceiling sprinkler protection in accordance with 25.2.2.5.1 .

4.4.1.7.8.4

The protection criteria for low-piled storage of Group A plastic commodities up to a maximum height of 5 ft (1.5 m) protected by ceiling sprinklers only shall be selected from Table 4.4.1.7.1 and 19.2.3.1.1 in accordance with the density/area method of 19.2.3 .

4.4.1.7.8.5

The protection criteria for low-piled storage of Group A plastic commodities up to a maximum height of 5 ft (1.5 m) on open racks protected by in-rack sprinklers shall be in accordance with 25.2.2 .

4.4.1.7.8.6

Low-piled storage of Group A plastic commodities up to a maximum height of 5 ft (1.5 m) on solid shelf racks shall be protected with in-rack sprinklers in accordance with Section 20.19 and 25.2.2.2 , with corresponding ceiling sprinkler protection in accordance with 25.2.2.5.2 .

4.4.1.7.8.7

The maximum design area for low-piled storage shall not exceed 3000 ft² (280 m²).

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_AUT_SSD_FDM_4.3.1.7_FR1338.docx	For staff use only	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Aug 26 11:50:40 EDT 2022

Committee Statement

Committee Statement: Simplifies and reorganizes the requirements for miscellaneous storage and low piled storage removing redundancy.

Response Message: FR-1338-NFPA 13-2022

[Public Input No. 220-NFPA 13-2022 \[Section No. 4.3.1.7.1\]](#)

[Public Input No. 287-NFPA 13-2022 \[Section No. 4.3.1.7.1.1\]](#)

[Public Input No. 221-NFPA 13-2022 \[Section No. 4.3.1.7.2\]](#)



First Revision No. 1183-NFPA 13-2022 [Section No. 4.3.4]

4.4.4 Extra Hazard (Group 1) (EH1) Occupancies .

4.4.4.1* Extra Hazard (Group 1) (EH1).

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

- (1) Spaces with very high quantity and combustibility of contents
- (2) Spaces where dust, lint, or other materials are present, introducing the probability of rapidly developing fires

4.4.4.2* Extra Hazard (Group 2) (EH2).

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

- (1) Spaces with very high quantity and combustibility of contents
- (2) Spaces with substantial amounts of combustible or flammable liquids
- (3) Spaces where shielding of combustibles is extensive

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Jul 28 14:15:54 EDT 2022

Committee Statement

Committee Statement: Conforms to manual of style.

Response Message: FR-1183-NFPA 13-2022

Public Input No. 204-NFPA 13-2022 [Sections 4.3.4, 4.3.5]



First Revision No. 1184-NFPA 13-2022 [Section No. 5.1.4]

5.1.4* Water-Supply Treatment .

5.1.4.1 Water Supplies and Environmental Conditions.

Water supplies and environmental conditions shall be evaluated for the existence of microbes and conditions that contribute to microbiologically influenced corrosion (MIC).

5.1.4.1.2

~~Where conditions that contribute to MIC are found, the owner(s) shall notify the sprinkler system installer and develop a plan to treat the system using one of the following methods:~~

~~Install system piping that will not be affected by the MIC microbes~~

~~Treat all water that enters the system using a listed bacterial inhibitor~~

~~Implement an approved plan for monitoring the interior conditions of the pipe at established time intervals and locations~~

~~Install a corrosion monitoring station and monitor at established intervals~~

5.1.4.2 Corrosion.

Water supplies and environmental conditions shall be evaluated for conditions that contribute to unusual corrosive properties.

5.1.4.2.2

~~Where conditions are found that contribute to unusual corrosive properties, the owner(s) shall notify the sprinkler system installer and a plan shall be developed to treat the system using at least one of the following methods:~~

~~Install system piping that is corrosion resistant~~

~~Treat water that enters the system using a listed corrosion inhibitor~~

~~Implement an approved plan for monitoring the interior conditions of the pipe at established intervals and locations~~

~~Install approved corrosion monitoring stations and monitor at established intervals~~

~~Fill dry pipe or preaction systems with at least 98 percent pure nitrogen in lieu of air to mitigate against corrosion~~

~~Use a listed nitrogen generator that is sized and installed in accordance with the manufacturer's instructions~~

5.1.4.3 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.

Supplemental Information

File Name

Description

Approved

13_AUT_SSD_FDM_5.1.4_FR1184.docx

For staff use only

Submitter Information Verification

Committee: AUT-SSD**Submittal Date:** Thu Jul 28 15:17:38 EDT 2022

Committee Statement

Committee Statement: Public input places corrosion information into the correct section and limits text to issues concerning water supplies.**Response Message:** FR-1184-NFPA 13-2022[Public Input No. 341-NFPA 13-2022 \[Section No. 5.1.4\]](#)



First Revision No. 1187-NFPA 13-2022 [New Section after 5.2.2.2]

5.2.2.3*

Where a waterflow test was conducted to provide the water supply information, the date, day of the week, and time of day that the test was conducted shall be recorded with the data.

A.5.2.2.3

It is important to note that not all water supplies have a linear relationship of flow to pressure. As flow demand increases, additional water can be provided into the system through multiple pumps, causing complex geometries to the pressure and flow relationship at any given point in the system. Creating multiple flow conditions during a test and getting as close as possible to the sprinkler system demand will help in gaining a complete understanding of the water supply.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Jul 28 15:26:41 EDT 2022

Committee Statement

Committee Statement: This information is important to know when analyzing your water supply.

Response Message: FR-1187-NFPA 13-2022

[Public Input No. 602-NFPA 13-2022 \[New Section after 5.2.2.2\]](#)

[Public Input No. 394-NFPA 13-2022 \[New Section after 5.2.2\]](#)

[Public Input No. 395-NFPA 13-2022 \[New Section after A.5.2.2.2\]](#)

[Public Input No. 605-NFPA 13-2022 \[New Section after A.5.2.2.2\]](#)



First Revision No. 1275-NFPA 13-2022 [Section No. 19.2.2.3]

19.2.2.3

The pipe schedule method shall be permitted as follows:

~~Additions or modifications to existing pipe schedule systems sized according to the pipe schedules of Section 28.5~~

~~Additions or modifications to existing extra hazard pipe schedule systems~~

- (1) New systems of 5000 ft² (465 m²) or less
- (2) New systems exceeding 5000 ft² (465 m²) where the flows required in Table 19.2.2.1 are available at a minimum residual pressure of 50 psi (3.4 bar) at the highest elevation of sprinkler

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Sat Jul 30 09:10:18 EDT 2022

Committee Statement

Committee Statement: The existing system information is being removed from the standard. In Chapter 30 there will be a reference that states that you can reference legacy editions that were designed using the density/area curves.

Response Message: FR-1275-NFPA 13-2022

[Public Input No. 555-NFPA 13-2022 \[Section No. 19.2.2.3\]](#)



First Revision No. 1192-NFPA 13-2022 [Section No. 19.2.3.1.1]



19.2.3.1.1

The water demand for sprinklers shall be determined only from one of the following, at the discretion of the designer:

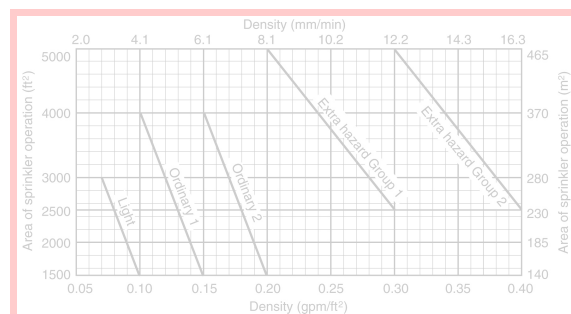
- (1) For new systems, the density/area selected from Table 19.2.3.1.1 in accordance with the density/area method of 19.2.3.2
~~For the evaluation or modification of existing systems, the density/area curves of Figure 19.2.3.1.1 in accordance with the density/area method of 19.2.3.2~~
- (2) The room that creates the greatest demand in accordance with the room design method of 19.2.3.3
- (3) Special design areas in accordance with 19.2.3.4

Table 19.2.3.1.1 Density/Area Criteria

Hazard Classification	Density/Area [gpm/ft² /ft² (mm/min /m²)] Criteria for Situations Where the Design Area is Not Required to be 3000 ft² (280 m²) per 19.2.3.1.5	Density/Area Criteria for Situations Where the Design Area is Required to be 3000 ft² (280 m²) per 19.2.3.1.5
Light Hazard	0.1/1500 or 0.07/3000* (4.1/140 or 2.9/280) 0.1 gpm per ft ² over 1500 ft ² (4.1 mm/min over 140 m ²)	0.07 gpm per ft ² over 3000 ft ² (2.9 mm/min over 280 m ²)
Ordinary Hazard (Group 1)	0.15/1500 or 0.12/3000* (6.1/140 or 4.9/280) 0.15 gpm per ft ² over 1500 ft ² (6.1 mm/min over 140 m ²)	0.12 gpm per ft ² over 3000 ft ² (4.9 mm/min over 280 m ²)
Ordinary Hazard (Group 2)	0.2/1500 or 0.17/3000* (8.1/140 or 6.9/280) 0.2 gpm per ft ² over 1500 ft ² (8.1 mm/min over 140 m ²)	0.17 gpm per ft ² over 3000 ft ² (6.9 mm/min over 280 m ²)
Extra Hazard (Group 1)	0.3/2500 or 0.28/3000* (12.2/230 or 11.4/280) 0.3 gpm per ft ² over 2500 ft ² (12.2 mm/min over 230 m ²)	0.28 gpm per ft ² over 3000 ft ² (11.4 mm/min over 280 m ²)
Extra Hazard (Group 2)	0.4/2500 or 0.38/3000* (16.3/230 or 15.5/280) 0.4 gpm per ft ² over 2500 ft ² (16.3 mm/min over 230 m ²)	0.38 gpm per ft ² over 3000 ft ² (15.5 mm/min over 280 m ²)

*When required by 19.2.3.1.5.

Figure 19.2.3.1.1 Density/Area Curves for the Evaluation or Modification of Existing Systems.



Supplemental Information

File Name

Description

Approved

13_AUT_SSD_FDM_Table19.2.3.1.1_FR1192.docx

For staff use only

Submitter Information Verification

Committee: AUT-SSD**Submittal Date:** Thu Jul 28 15:56:47 EDT 2022

Committee Statement

Committee Statement: The table has been clarified for ease of use and to align with the MOS. The existing system information is being removed from the standard. In Chapter 30 there will be a reference that states that you can reference legacy editions that were designed using the density/area curves.

Response Message: FR-1192-NFPA 13-2022

[Public Input No. 358-NFPA 13-2022 \[Section No. 19.2.3.1.1\]](#)

[Public Input No. 503-NFPA 13-2022 \[Section No. 19.2.3.1.1\]](#)

[Public Input No. 228-NFPA 13-2022 \[Section No. 19.2.3.1.1\]](#)



First Revision No. 1174-NFPA 13-2022 [Section No. 19.2.3.1.5.2]

19.2.3.1.5.2

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

- (1) Noncombustible and limited-combustible concealed spaces with minimal combustible loading having no access, including those 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, including those with small openings such as those used as return air for a plenum
- (3) Combustible concealed spaces filled entirely with noncombustible insulation
- (4)* Light or ordinary hazard occupancies where noncombustible or limited-combustible ceilings are directly attached to the bottom of solid wood joists or solid limited-combustible construction or noncombustible construction to create enclosed joist spaces 160 ft³ (4.5 m³) or less in volume, including space below insulation that is laid directly on top or within the ceiling joists in an otherwise sprinklered concealed space
- (5) 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 ~~been- demonstrated to not propagate fire 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, *Standard for 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)*
- (6) Concealed spaces in which the exposed materials are constructed entirely of fire-retardant-treated wood as defined by NFPA 703
- (7) Concealed spaces over isolated small rooms not exceeding 55 ft² (5.1 m²) in area
- (8) Vertical pipe chases under 10 ft² (0.9 m²), provided that in multifloor buildings the chases are firestopped at each floor using materials equivalent to the floor construction and pipe penetrations at each floor are properly sealed, and where such pipe chases contain no sources of ignition, and piping is noncombustible
- (9) 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
- (10*) Light or ordinary hazard occupancies where noncombustible or limited-combustible ceilings are attached to the bottom of composite wood joists either directly or on to metal channels not exceeding 1 in. (25 mm) in depth, provided the adjacent joist channels are firestopped into volumes not exceeding 160 ft³ (4.5 m³) using materials equivalent to ½ in. (13 mm) gypsum board, and at least 3½ in. (90 mm) of batt insulation is installed at the bottom of the joist channels when the ceiling is attached utilizing metal channels
- (11) Cavities within unsprinklered wall spaces
- (12) Exterior soffits, eaves, overhangs, and decorative frame elements complying with 9.2.1.20.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Jul 28 11:20:31 EDT 2022

Committee Statement

Committee Statement: The revision aligns the text with the language in ASTM E2768.

Response Message: FR-1174-NFPA 13-2022

[Public Input No. 407-NFPA 13-2022 \[Section No. 19.2.3.1.5.2\]](#)



First Revision No. 1272-NFPA 13-2022 [Section No. 19.2.3.2.1]

19.2.3.2.1 Water Supply.

19.2.3.2.1.1

The water supply requirement for sprinklers only shall be calculated from Table 19.2.3.1.1 for new systems and from the density/area curves of Figure 19.2.3.1.1 for the evaluation or modification of existing systems, or from Chapter 27 where density/area criteria are specified for special occupancy hazards.

19.2.3.2.1.2

When using Figure 19.2.3.1.1, the calculations shall satisfy any single point on the appropriate density/area curve.

19.2.3.2.1.3

When using Figure 19.2.3.1.1, it shall not be necessary to meet all points on the selected curves.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Sat Jul 30 08:31:56 EDT 2022

Committee Statement

Committee Statement: The existing system information is being removed from the standard. In Chapter 30 there will be a reference that states that you can reference legacy editions that were designed using the density/area curves.

Response Message: FR-1272-NFPA 13-2022

[Public Input No. 504-NFPA 13-2022 \[Section No. 19.2.3.2.1\]](#)

**First Revision No. 1175-NFPA 13-2022 [Section No. 19.2.3.2.4]****19.2.3.2.4 Sloped Ceilings.**

The system area of operation shall be increased by 30 percent without revising the density when the following types of sprinklers are used on sloped ceilings with a pitch exceeding 1 in 6 (a rise of 2 units in a run of 12 units, a roof slope of 16.7 percent) in nonstorage applications: 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:

~~Spray sprinklers, including extended coverage sprinklers listed in accordance with 11.2.1(4), and quick-response sprinklers~~

~~CMSA sprinklers~~

- (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.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_AUT_SSD_FDM_19.2.3.2.4_FR1175.docx	For staff use only	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Jul 28 11:28:32 EDT 2022

Committee Statement

Committee Statement: The changes have been made based on the research done on sloped ceilings with obstructed construction. The research report can be found at www.nfpa.org, the report is "Protection of Storage Under Sloped Ceilings Phase III: Large Scale Testing Summary and Guidance." This eliminates the 30% increase for obstructed construction between 2 in 12 up to 4 in 12.

Response Message: FR-1175-NFPA 13-2022

Public Input No. 491-NFPA 13-2022 [Section No. 19.2.3.2.4]



First Revision No. 1193-NFPA 13-2022 [Section No. 19.3.1.3]

19.3.1.3

~~Unless the requirements of 19.3.1.4 are met, the~~ The minimum required discharge from each design area sprinkler shall be the greater of the following:

- (1) In accordance with minimum flow rates indicated in the sprinkler listings
- (2) In rooms or compartments greater than 800 ft² (74 m²), calculated based on delivering a minimum of 0.1 gpm/ft² (4.1 mm/min) over the design area in accordance with the provisions of 9.5.2.1
- (3) In rooms or compartments 800 ft² (74 m²) or less calculated based on delivering a minimum of 0.1 gpm/ft² (4.1 mm/min) over the room or the compartment using the area of the room divided by the number of sprinklers in the room

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Jul 28 16:02:57 EDT 2022

Committee Statement

Committee Statement: The lead-in text has been deleted as existing system text is now found in Chapter 30 and this requirement is specific to new systems using the single point method.

Response Message: FR-1193-NFPA 13-2022



First Revision No. 1282-NFPA 13-2022 [Section No. 19.3.1.4]

19.3.1.4

~~For modifications or additions to existing systems equipped with residential sprinklers, the listed discharge criteria less than 0.1 gpm/ft² (4.1 mm/min) shall be permitted to be used.~~

19.3.1.4.1

~~Where replacing residential sprinklers manufactured prior to 2003 that are no longer available from the manufacturer and that are installed using a design density less than 0.05 gpm/ft² (2.0 mm/min), a residential sprinkler with an equivalent K-factor (± 5 percent) shall be permitted to be used provided the currently listed coverage area for the replacement sprinkler is not exceeded.~~

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Sat Jul 30 10:19:41 EDT 2022

Committee Statement

Committee Statement: The existing system information is being removed from the standard. In Chapter 30 there will be a reference that states that you can reference legacy editions that were designed using the density/area curves.

Response Message: FR-1282-NFPA 13-2022

[Public Input No. 505-NFPA 13-2022 \[Section No. 19.3.1.4\]](#)



First Revision No. 1269-NFPA 13-2022 [New Section after 19.4]

19.5 Design Approaches for Supplemental Sprinklers.

When required to be included in the hydraulic calculations in accordance with 28.3.4.7.4.3 , the design approach for supplemental sprinklers shall be permitted to be based on the hazard located directly below the obstruction.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 18:45:12 EDT 2022

Committee Statement

Committee Statement: Provides design criteria for supplemental sprinklers when they are required to be hydraulically calculated in accordance with Chapter 28.

Response Message: FR-1269-NFPA 13-2022



First Revision No. 1235-NFPA 13-2022 [Section No. 20.1]

20.1* General.

This chapter shall provide the necessary steps for identifying commodity, storage arrangements, storage heights, and clearances as well as general protection criteria for storage conditions relative to Chapters 21 through 25.

A.20.1

When sprinklers are being tested at a laboratory for the purposes of determining sprinkler discharge criteria for a specific hazard, the entity sponsoring the testing should request that the laboratory provide them with a report or test data that documents how the tests were conducted and what the results of the tests were, but not include proprietary product design information about the sprinkler. The following information should be included for each test in the report or data package:

- (1) Material(s) being used as the fuel for the fire.
- (2) Dimensional details of test commodity and storage arrangement.
- (3) Nominal height of the stored commodity above the floor.
- (4) Nominal clearance between the top of storage and the ceiling.
- (5) Sprinkler identification number (SIN).
- (6) K-factor of the sprinkler.
- (7) Temperature rating and response characteristics of the sprinkler.
- (8) Distance of the sprinkler deflector (or thermal element) below the ceiling.
- (9) Orientation of the sprinkler (upright, pendent, horizontal).
- (10) Obstructions to sprinklers (if any) including the branch line piping for upright sprinklers.
- (11) Water pressure at sprinkler or flow from sprinkler during test.
- (12) Sprinkler spacing.
- (13) Fire location with respect to upright and pendent sprinkler(s). Typical test locations might include the following (note that tests are not required in all locations):
 - (a) Under one sprinkler
 - (b) Between two sprinklers on the same branch line
 - (c) Between four sprinklers
 - (d) At a dry spot in the sprinkler's spray pattern as identified in flow testing
- (14) Fire location with respect to sidewall sprinkler(s). Test locations that should be considered include the following (note that tests are not required in all locations):
 - (a) At the most remote location from a single sprinkler
 - (b) Centered between two sprinklers at the far point of the coverage area
 - (c) Centered between four sprinklers when sprinklers are on opposite walls spraying into a room or space
 - (d) Directly underneath and behind a single sprinkler
 - (e) On the same wall as the sprinklers, centered between two sprinklers
 - (f) At a dry spot in the sprinkler's spray pattern as identified in flow testing
- (15) Fire test results. The following are examples of successful criteria:
 - (a) The fire does not show evidence of sustained combustion at the far ends of the main test array.
 - (b) The fuel is not completely consumed.
 - (c) The fire does not show evidence of sustained combustion at the outer edges of the target arrays.
 - (d) The average one-minute temperature of a simulated steel structural member installed near the ceiling above ignition does not exceed 1000°F (538°C), or the ceiling temperatures are controlled so that they are below a predetermined

limit.

(e) Sprinklers do not operate at the edge of the protection array.

(16) Number of sprinklers that open during the test, where they were in relation to the fire, and what time they opened after ignition.

(17) Gas temperatures above ignition and near each installed sprinkler.

(18) Description of area or commodity damaged by fire.

(19) Other test conditions or parameters or observations that would help support a decision or limitation on the use of the sprinkler based on this test program.

The entity sponsoring the tests is responsible for proposing appropriate limits to the installation requirements and hazards that their sprinkler can protect based on the parameters of the fire tests and the results of those tests. This recommendation needs to include the following:

(1) The number of sprinklers that would be appropriate for the design area.

(2) The minimum discharge (pressure or flow) necessary from each sprinkler.

(3) The number of sprinklers that operated in the worst-case fire test with an appropriate safety factor applied (typically 1.5) to that number to account for variables not considered during the test program.

(4) An appropriate minimum number of sprinklers can be applied, depending on the hazard being protected.

20.1.1

Miscellaneous and low-piled storage, meeting the criteria of Chapter 4, shall be protected in accordance with the relative occupancy hazard criteria referenced in that section.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_AUT_SSD_FDM_20.1_FR1235.docx	For staff use only	

Submitter Information Verification

Committee: AUT-SSD

Submission Date: Fri Jul 29 12:14:05 EDT 2022

Committee Statement

Committee Statement: Standardized reporting of fire test data is necessary for organizations to make informed decisions on new sprinkler technology and design criteria.

Response Message: FR-1235-NFPA 13-2022

Public Input No. 369-NFPA 13-2022 [New Section after A.20.2.1]



First Revision No. 1199-NFPA 13-2022 [Section No. 20.4.8.1]

20.4.8.1

Unless the requirements of 20.4.3 are met, Group B plastics and or free-flowing Group A plastics shall be protected the same as Class IV commodities.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Jul 28 17:28:11 EDT 2022

Committee Statement

Committee Statement: The current section does not account for mixed commodities and an over classification of unit loads that only contain a percentage of Group B plastics.

Response Message: FR-1199-NFPA 13-2022

Public Input No. 132-NFPA 13-2022 [Sections 20.4.8.1, 20.4.8.2]



First Revision No. 1200-NFPA 13-2022 [Section No. 20.4.11.1]

20.4.12 Baled Cotton.

Baled cotton shall be protected in accordance with Section 26.5. (See *Table A.3.3.16.*)

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Jul 28 17:30:23 EDT 2022

Committee Statement

Committee Statement: This should not be a subsection of Display of Group A plastics and should be its own section.

Response Message: FR-1200-NFPA 13-2022

[Public Input No. 133-NFPA 13-2022 \[Section No. 20.4.11.1\]](#)



First Revision No. 1202-NFPA 13-2022 [Section No. 20.5]

20.5 Equivalent Storage Arrangement.

20.5.1 Movable Racks.

Rack storage in movable racks shall be protected in the same manner as multiple-row racks.

20.5.2 Portable Racks.

Except where otherwise allowed in this standard, portable rack storage shall be protected in the same manner as multiple-row racks.

20.5.3* Rack Storage.

20.5.3.1 Shelving.

20.5.3.1.1

Shelving material that is less than 50 percent open, or placement of loads that block openings that would otherwise serve as the required flue spaces, greater than 20 ft² (1.9 m²) in area shall be treated as solid shelf racks.

20.5.3.1.2 Double-Row Racks.

20.5.3.1.2.1

Unless the requirements of 20.5.3.1.2.2 are met, double-row racks without solid shelves shall be considered racks with solid shelves where longitudinal flue spaces are not provided.

20.5.3.1.2.2

Double-row racks without solid shelves and a longitudinal flue space shall be considered open racks where the storage height does not exceed 25 ft (7.6 m) and transverse flue spaces are provided at maximum 5 ft (1.5 m) intervals.

20.5.3.1.3 Multiple-Row Racks.

Unless the requirements of 20.5.3.1.3.1 or 20.5.3.1.3.2 are met, multiple-row racks without solid shelves shall be considered racks with solid shelves.

20.5.3.1.3.1

Multiple-row racks without solid shelves shall be considered open racks where both transverse and longitudinal flue spaces are provided at maximum 5 ft (1.5 m) intervals.

20.5.3.1.3.2

Multiple-row racks without solid shelves shall be considered open racks where transverse flue spaces are provided at maximum 5 ft (1.5 m) intervals and the rack depth does not exceed 20 ft (6.1 m) between aisles that are a minimum width of 3.5 ft (1.1 m).

20.5.3.2* Slatted Shelves.

Slatted rack shelves shall be considered equivalent to solid rack shelves where the shelving is not considered open rack shelving or where the requirements of 26.4.1.2 or 26.4.1.3 are not met. (See *Section C.20*.)

20.5.4 ~~Plastic Motor Vehicle Components.~~

~~Group A plastic automotive components and associated packaging material consisting of exposed, expanded Group A plastic dunnage, instrument panels, and plastic bumper fascia shall be permitted to be protected in accordance with Section 26.2 .~~

20.6 Aisle and Flue Space Requirements for Storage .

20.6.1 Aisles.

Aisles required by Chapters 21 through 25 shall not be obstructed unless Chapters 21 through 25 include specific guidance allowing obstructions over the aisle.

20.6.2 Flues.**20.6.2.1 Longitudinal Flue Space.****20.6.2.1.1**

For Class I through Class IV and Group A plastic commodities in double-row open racks, a longitudinal flue space shall not be required for storage up to and including 25 ft (7.6 m). (See Section C.13.)

20.6.2.1.2

For Class I through IV and Group A plastic commodities in double-row open racks, a nominal 6 in. (150 mm) longitudinal flue spaces shall be provided in double-row racks for storage over 25 ft (7.6 m).

20.6.2.1.3

For Class I through Class IV and Group A plastic commodities in multiple-row open racks, longitudinal flue spaces shall not be required when all of the following are met:

- (1) Minimum nominal 6 in. (150 mm) wide transverse flue spaces are provided on maximum 5 ft (1.5 m) intervals.
- (2) The rack depth does not exceed 20 ft (6.1 m).
- (3) The minimum aisle width is 3.5 ft (1.1 m).

20.6.2.2 Transverse Flue Space.

Nominal 6 in. (150 mm) transverse flue spaces between loads and at rack uprights shall be maintained in single-row, double-row, and multiple-row racks.

20.6.3

Random variations in the width of flue spaces or in their vertical alignment shall be permitted. (See Section C.26.)

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_AUT_SSD_FDM_20.5_FR1202.docx	For staff use only	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Jul 28 17:59:01 EDT 2022

Committee Statement

Committee Statement: The term equivalent was added as these requirements are things that can be done to be considered equivalent to other requirements. Redundant text was removed, and the section was reorganized. Other editorial corrections were made for consistency. Section 20.6.2.1.3 was added to provide guidance for longitudinal flue spaces for multiple-row racks.

Response Message: FR-1202-NFPA 13-2022

Public Input No. 272-NFPA 13-2022 [Section No. 20.5]

[Public Input No. 448-NFPA 13-2022 \[Section No. 20.5.3.4.1\]](#)

[Public Input No. 135-NFPA 13-2022 \[Section No. 20.5.4\]](#)

[Public Input No. 210-NFPA 13-2022 \[Section No. 20.5.4\]](#)

[Public Input No. 292-NFPA 13-2022 \[Section No. 20.5.4\]](#)

[Public Input No. 449-NFPA 13-2022 \[New Section after 20.5.3.4.1\]](#)



First Revision No. 1207-NFPA 13-2022 [Section No. 20.7]

20.4.13* Plastic Motor Vehicle Components.

20.4.13.1

Group A plastic automotive components and associated packaging material consisting of exposed, expanded Group A plastic dunnage, instrument panels, and plastic bumper fascia shall be permitted to be protected as provided in Section 26.2.

20.4.13.2

Automotive components covered in this section shall not include the storage of air bags, tires, and seats on portable racks.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 08:20:11 EDT 2022

Committee Statement

Committee Statement: The information is more appropriately located in the commodity classes section.

Response Message: FR-1207-NFPA 13-2022

[Public Input No. 134-NFPA 13-2022 \[Section No. 20.7\]](#)



First Revision No. 1208-NFPA 13-2022 [Section No. 20.9.1]

20.9.1 Ceiling Slope.

Except as permitted by 20.9.1.1 or 20.9.1.2, the sprinkler system criteria specified in Chapters 20 through 25 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.

~~The following situations shall permit storage under ceilings with slope exceeding 2 in 12 (16.7 percent): 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:~~

~~Where a specific section in Chapters 20 through 25 permits ceiling slope in excess of 2 in 12 (16.7 percent).~~

~~Where storage is protected with in-rack sprinklers in accordance with one of the options in Section 25.6, provided no storage is placed above the highest level of in-rack sprinklers.~~

- (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.

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:

- (1) Purlins or beams supporting the roof deck run across the roof slope.
- (2) Purlins or beams do not exceed 18 in. (450 mm) deep.
- (3) Purlins or beams do not exceed 5 ft (1.5 m) on centers.
- (4) Purlins or beams are supported by girders not more than 40 ft (12 m) on centers.
- (5) Purlin or beam channels are firestopped above each girder.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_AUT_SSD_FDM_20.9.1_FR1208.docx	For staff use only	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 08:51:22 EDT 2022

Committee Statement

Committee Statement: The criteria are based upon existing NFPA 13 options for protection under sloped ceilings as well as the findings from the Fire Protection Research Foundation report, Protection of Storage Under Sloped Ceilings Phase III: Large-Scale Testing Summary and Guidance.

Response Message: FR-1208-NFPA 13-2022

[Public Input No. 493-NFPA 13-2022 \[Section No. 20.9.1\]](#)

[Public Input No. 185-NFPA 13-2022 \[Section No. 20.9.1\]](#)



First Revision No. 1211-NFPA 13-2022 [Section No. 20.9.3]

20.9.3 Storage Height.

20.9.3.1

The sprinkler system design shall be based on the storage height that routinely or periodically exists in the building and creates the greatest water demand.

20.9.3.2

The storage height shall be measured from the floor level to the top of the commodity.

20.9.3.3

Where storage is placed above doors, the storage height shall be calculated from the base of storage above the door.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 09:18:10 EDT 2022

Committee Statement

Committee Statement: Section 20.9.3.1 addresses the design criteria based upon storage height. The new section 20.9.3.2 provides clarification on how to measure the storage height.

Response Message: FR-1211-NFPA 13-2022

[Public Input No. 81-NFPA 13-2021 \[Section No. 20.9.3\]](#)



First Revision No. 1212-NFPA 13-2022 [Sections 20.9.4.2, 20.9.4.3, 20.9.4.4, 20.9.4.5]

21.1.9

For CMDA criteria where the clearance to ceiling exceeds those identified in Table 21.1.9, the requirements of Table 21.1.9.1 and Table 21.1.9.2 shall apply.

Table 21.1.9 Maximum Clearance from Top of Storage to Ceiling for CMDA Protection Criteria

<u>Commodity</u>	<u>Class I to IV</u>		<u>Group A Plastic</u>	
	<u>ft</u>	<u>m</u>	<u>ft</u>	<u>m</u>
Palletized, solid-piled, bin box, shelf, or back-to-back shelf storage	20-ft (6.1 m)	<u>6.1</u>	20-ft (6.1 m)	<u>6.1</u>
Rack storage up to 25 ft (7.6 m)	20-ft (6.1 m)	<u>6.1</u>	10-ft (3.0 m)	<u>3.0</u>
Rack storage >25 ft (7.6 m)	10-ft (3.0 m)	<u>3.0</u>	10-ft (3.0 m)	<u>3.0</u>

21.1.9.1

Protection of Class I through Class IV commodities using CMDA criteria that exceed the maximum allowable clearance in Table 21.1.9 shall be in accordance with Table 21.1.9.1.

Table 21.1.9.1 Class I Through Class IV Commodities

<u>Storage Configuration</u>	<u>Where the clearance to ceiling exceeds</u>		<u>Protection is based upon the storage height that would result in a clearance to ceiling of...</u>		<u>In-rack Sprinklers*</u>
	<u>ft</u>	<u>m</u>	<u>ft</u>	<u>m</u>	
Palletized, solid-piled, bin box, shelf, or back-to-back shelf storage	20-ft (6.1 m)	<u>6.1</u>	20-ft (6.1 m)	<u>6.1</u>	N/A
Rack storage up to and including 25 ft (7.6 m) in height	20-ft (6.1 m)	<u>6.1</u>	20-ft (6.1 m)	<u>6.1</u>	Permitted as alternative to presumed clearance of 20 ft (6.1 m)
Rack storage over 25 ft (7.6 m) in height	10-ft (3.0 m)	<u>3.0</u>	10-ft (3.0 m)	<u>3.0</u>	Permitted as alternative to presumed clearance of 10 ft (3.0 m)

*When applying the supplemental in-rack sprinkler option, the ceiling density is based upon the given storage height with an assumed acceptable clearance to ceiling. Provide one level of supplemental, quick-response in-rack sprinklers located directly below the top tier of storage and at every flue space intersection.

21.1.9.2

Protection of plastic and rubber commodities with CMDA criteria having clearance exceeding the allowable limits of ~~Table 21.1.9.1~~ Table 21.1.9 shall be in accordance with Table 21.1.9.2.

Table 21.1.9.2 Plastics and Rubber Commodities

<u>Storage Configuration</u>	<u>Where the clearance to ceiling exceeds</u>		<u>Protection is based upon the storage height that would result in a clearance to ceiling of...</u>		<u>In-rack Sprinklers*</u>
	<u>ft</u>	<u>m</u>	<u>ft</u>	<u>m</u>	
Palletized, solid-piled, bin box, shelf, or back-to-back shelf storage	20-ft (6.1 m)	<u>6.1</u>	20-ft (6.1 m)	<u>6.1</u>	N/A
Rack storage up to and including 25 ft (7.6 m) in height	10-ft (3.0 m)	<u>3.0</u>	10-ft (3.0 m)	<u>3.0</u>	Permitted as alternative to presumed clearance of 10 ft (3.0 m)
Rack storage over 25 ft (7.6 m) in height	10-ft (3.0 m)	<u>3.0</u>	N/A		Required

*If in-rack sprinklers are required for the actual storage height with an acceptable clearance to ceiling, in-rack sprinklers are installed as indicated by that criteria. Provide one level of supplemental, quick-response in-rack sprinklers located directly below the top tier of storage and at every flue space intersection.

21.1.9.3

If in-rack sprinklers are required for the actual storage height with an acceptable clearance to ceiling, in-rack sprinklers shall be installed as indicated by that criteria.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_AUT_SSD_FDM_21.1.11_FR1212.docx	For staff use only	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 09:21:34 EDT 2022

Committee Statement

Committee Statement: The information is specific to CMDA sprinklers and belongs in Chapter 21 rather than the general storage requirements chapter.

Response Message: FR-1212-NFPA 13-2022

Public Input No. 136-NFPA 13-2022 [Sections 20.9.4.2, 20.9.4.3, 20.9.4.4, 20.9.4.5]



First Revision No. 1266-NFPA 13-2022 [Sections 20.9.5.1, 20.9.5.2]

20.9.5.1*

~~Manually operated Automatic roof vents or automatic roof vents with operating elements that have a higher temperature classification than the automatic sprinklers shall be permitted shall not be required in areas protected by automatic sprinkler systems .~~

A.20.9.5.1

~~Sprinkler protection criteria are based on the assumption that roof vents and draft curtains are not being used and could be detrimental to the performance of the sprinkler system. If manual roof vents are provided, care should be taken to not open the manual roof vents before the fire has been controlled or suppressed . (See Section C.6.)~~

20.9.5.2

~~Early suppression fast-response (ESFR) sprinklers shall not be used in buildings with automatic heat or smoke vents unless the vents use a high-temperature rated, standard-response operating mechanism Where automatic roof vents are provided, the automatic roof vents shall have a higher temperature rating and a higher RTI than the automatic sprinklers .~~

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 16:43:18 EDT 2022

Committee Statement

Committee Statement: The presence of open roof vents is not considered in the sprinkler system design criteria in NFPA 13 and could detrimentally impact the operation of automatic sprinklers. This concern, while originally added to NFPA 13 for ESFR sprinklers, also exists for other types of automatic sprinklers and the requirements have been revised to include all types of sprinklers. Guidance has been added to the annex to caution against the use of manual roof vents prior to the control or suppression of the fire, which could also interfere with the performance of the automatic sprinkler system. Finally, in situations where automatic roof vents are provided and cannot be eliminated, requirements are provided to reasonably limit the detrimental impact of automatic roof vents on the performance of automatic sprinkler systems by limiting the potential for the roof vents to open automatically during a fire controlled by the sprinkler system.

Response Message: FR-1266-NFPA 13-2022

[Public Input No. 308-NFPA 13-2022 \[New Section after 20.9.5.1\]](#)

[Public Input No. 309-NFPA 13-2022 \[Section No. 20.9.5.2\]](#)



First Revision No. 1214-NFPA 13-2022 [Section No. 20.10.2]

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 have a flame spread index of 25 or less and the materials have ~~been demonstrated to not propagate fire~~ 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, ~~Standard for~~ *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.
- (5) 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)*.
- (6) Concealed spaces in which the exposed materials are constructed entirely of fire-retardant-treated wood as defined by NFPA 703.
- (7) Concealed spaces over isolated small compartments not exceeding 55 ft² (5.1 m²) in area.
- (8) Vertical pipe chases under 10 ft² (0.9 m²), provided that in multifloor buildings the chases are firestopped 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.
- (9) 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.
- (10) Cavities within unsprinklered wall spaces.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 09:34:03 EDT 2022

Committee Statement

Committee Statement: The revised language provides clarification regarding the requirements for not propagating flame spread based upon the applicable tests and provides reference ASTM E2768.

Response FR-1214-NFPA 13-2022

Message:

[Public Input No. 606-NFPA 13-2022 \[Section No. 20.10.2\]](#)

[Public Input No. 408-NFPA 13-2022 \[Section No. 20.10.2\]](#)



First Revision No. 1270-NFPA 13-2022 [New Section after 20.16.3]

20.16.4 Design Approaches for Supplemental Sprinklers.

When required to be included in the hydraulic calculations in accordance with 28.3.4.7.4.3 , the design approach for supplemental sprinklers shall be permitted to be based on the hazard located directly below the obstruction utilizing the bottom plane of the obstruction as the ceiling level.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 18:47:00 EDT 2022

Committee Statement

Committee Statement: Provides design criteria for supplemental sprinklers when they are required to be hydraulically calculated in accordance with Chapter 28.

Response Message: FR-1270-NFPA 13-2022



First Revision No. 1204-NFPA 13-2022 [New Section after 20.18.2.5]

[20.19 Protection of Racks with Solid Shelves.](#)

[20.19.1](#)

[Racks containing solid shelves shall comply with Section 25.4 .](#)

[20.19.2](#)

[Solid shelving requirements shall not apply to a noncombustible product stored with noncombustible storage aids, including pallets, straps, containers, and shelving material.](#)

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Jul 28 18:25:10 EDT 2022

Committee Statement

Committee Statement: The requirements were moved to Chapter 25; therefore, this is a pointer to that location. Additionally, where there is no combustible material in the storage array, sprinkler protection below shelving is not necessary.

Response Message: FR-1204-NFPA 13-2022

[Public Input No. 328-NFPA 13-2022 \[New Section after 20.19.1\]](#)

**First Revision No. 1203-NFPA 13-2022 [Section No. 20.19]****25.3 Protection of Racks with Solid Shelves.****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*.)

25.3.2 Open Racks Combined with In-Rack Sprinklers.

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

25.3.3 Vertical Spacing and Location of In-Rack Sprinklers in Racks with Solid Shelves.**25.3.3.1**

Where CMDA sprinklers are at ceiling level protecting racks with solid shelving that exceeds 20 ft² (1.9 m²) but not 64 ft² (5.9 m²) in area, in-rack sprinklers shall not be required below every shelf but shall be installed below shelves at intermediate levels not more than 6 ft (1.8 m) apart vertically. (See *Section C.11*.)

25.3.3.2

Where CMDA sprinklers are at ceiling level protecting racks with solid shelving that exceeds 64 ft² (5.9 m²) in area or where the levels of storage exceed 6 ft (1.8 m), in-rack sprinklers shall be installed below each level of shelving.

25.3.3.3

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

25.3.3.4

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

25.3.3.5

Where racks with solid shelves obstruct only a portion of an open rack, in-rack sprinklers shall be installed vertically as follows:

- (1) In accordance with 25.3.3.1 and 25.3.3.2 where CMDA sprinklers are installed at ceiling level
- (2) In accordance with 25.3.3.3 where CMSA sprinklers are installed at ceiling level
- (3) In accordance with 25.3.3.4 where ESFR sprinklers are installed at ceiling level

25.3.4 Horizontal Location and Spacing of In-Rack Sprinklers in Racks with Solid Shelves.**25.3.4.1**

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).

25.3.4.2

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).

25.3.4.3

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.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_AUT_SSD_FDM_20.19_FR1203.docx	For staff use only	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Jul 28 18:14:38 EDT 2022

Committee Statement

Committee Statement: The submitter selected the wrong sections in the proposal (20.5 versus 20.19); however, the criteria in section 20.19 more appropriately belongs in section 25.3. All other sections after 25.3 to be renumbered.

Response Message: FR-1203-NFPA 13-2022

[Public Input No. 451-NFPA 13-2022 \[Global Input\]](#)

[Public Input No. 362-NFPA 13-2022 \[Section No. 20.5\]](#)

[Public Input No. 209-NFPA 13-2022 \[Section No. 20.19.1\]](#)



First Revision No. 1283-NFPA 13-2022 [Sections 21.1.5, 21.1.6]

21.1.5*

~~Unless the requirements of 21.1.6 are met, the requirements of Table 21.5.1.1 shall not apply to modifications to existing storage application systems, using sprinklers with K-factors of K-8.0 (115) or less.~~

A.21.1.5

~~Modification of an existing system includes extending sprinkler protection into adjacent areas.~~

21.1.6

~~Where applying the requirements of Table 21.5.1.1 utilizing the design criteria of 0.6 gpm/ft² per 2000 ft² (24.5 mm/min per 185 m²) to existing storage applications, the requirements of 21.1.4 shall apply.~~

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Sat Jul 30 10:21:08 EDT 2022

Committee Statement

Committee Statement: The existing system information is being removed from the standard. In Chapter 30 there will be a reference that states that you can reference legacy editions that were designed using the density/area curves.

Response Message: FR-1283-NFPA 13-2022

[Public Input No. 506-NFPA 13-2022 \[Sections 21.1.5, 21.1.6\]](#)



First Revision No. 1284-NFPA 13-2022 [Section No. 21.1.10.2]

21.1.10.2

~~The calculations shall satisfy any single point on appropriate density/area curves for the evaluation or modification of existing systems.~~

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Sat Jul 30 10:22:12 EDT 2022

Committee Statement

Committee Statement: The existing system information is being removed from the standard. In Chapter 30 there will be a reference that states that you can reference legacy editions that were designed using the density/area curves.

Response Message: FR-1284-NFPA 13-2022

[Public Input No. 507-NFPA 13-2022 \[Section No. 21.1.10.2\]](#)



First Revision No. 1332-NFPA 13-2022 [Section No. 21.2.2.1]

21.2.2.1 General.

21.2.2.1.1

For new systems, ~~21.2.2.2~~ shall be used.

21.2.2.1.2

For the evaluation or modification of existing systems, ~~21.2.2.3~~ shall be permitted to be used.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 25 13:13:49 EDT 2022

Committee Statement

Committee Statement: The existing system information is being removed from the standard. In Chapter 30 a reference has been added that states that you can reference legacy editions that were used to design the system, using the density/area curves.

Response Message: FR-1332-NFPA 13-2022

[Public Input No. 508-NFPA 13-2022 \[Sections 21.2.2.1, 21.2.2.2\]](#)



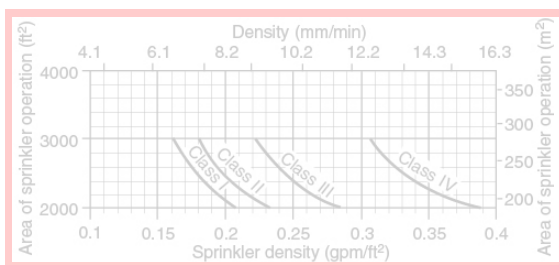
First Revision No. 1285-NFPA 13-2022 [Section No. 21.2.2.3]

21.2.2.3 Evaluation or Modification of Existing Systems.

21.2.2.3.1

For the evaluation or modification of existing systems, where using ordinary temperature-rated sprinklers, a single point shall be selected from the appropriate commodity curve on Figure 21.2.2.3.1.

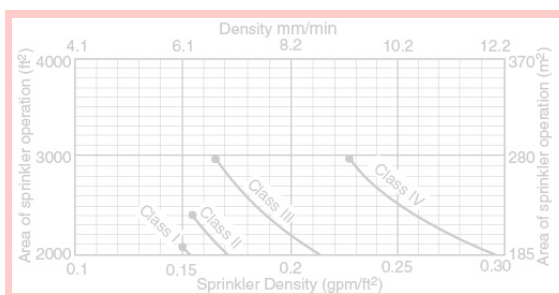
Figure 21.2.2.3.1 For the Evaluation or Modification of Existing Systems, Sprinkler System Design Curves for 20 ft (6.1 m) High Storage — Ordinary Temperature-Rated Sprinklers.



21.2.2.3.2

For the evaluation or modification of existing systems, where using high temperature-rated sprinklers, a single point shall be selected from the appropriate commodity curve on Figure 21.2.2.3.2.

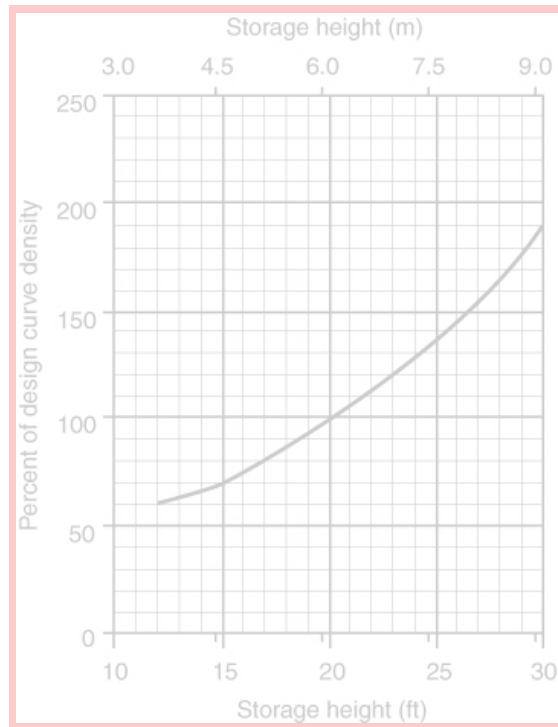
Figure 21.2.2.3.2 For the Evaluation or Modification of Existing Systems, Sprinkler System Design Curves for 20 ft (6.1 m) High Storage — High Temperature-Rated Sprinklers.



21.2.2.3.3

The densities selected in accordance with 21.2.2.3.1 or 21.2.2.3.2 shall be modified in accordance with Figure 21.2.2.3.3 without revising the design area.

Figure 21.2.2.3.3 For the Evaluation or Modification of Existing Systems, Ceiling Sprinkler Density vs. Storage Height.

**21.2.2.3.4**

In the case of metal bin boxes with face areas not exceeding 16 ft² (1.5 m²) and metal closed shelves with face areas not exceeding 16 ft² (1.5 m²), the area of application shall be permitted to be reduced by 33 percent, provided the minimum requirements of 21.2.2.3.5 and 21.2.2.3.6 are met.

21.2.2.3.5

For storage greater than 12 ft (3.7 m), the design density shall not be less than 0.15 gpm/ft² (6.1 mm/min), and the design area shall not be less than 2000 ft² (185 m²) for wet systems or 2600 ft² (240 m²) for dry systems for any commodity, class, or group.

21.2.2.3.6

For storage greater than 12 ft (3.7 m), the sprinkler design density for any given area of operation for a Class III or Class IV commodity, calculated in accordance with 21.2.2, shall not be less than the density for the corresponding area of operation for ordinary hazard Group 2.

21.2.2.3.7

For back-to-back shelf storage, the design density shall be taken from Figure 21.2.2.3.1 for storage greater than 12 ft (3.7 m) and up to 15 ft (4.6 m) with no reduction for design density referenced in Figure 21.2.2.3.3.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Sat Jul 30 10:23:47 EDT 2022

Committee Statement

Committee Statement: The existing system information is being removed from the standard. In Chapter 30 there will be a reference that states that you can reference legacy editions that were designed using the density/area curves.

Response Message: FR-1285-NFPA 13-2022

[Public Input No. 509-NFPA 13-2022 \[Section No. 21.2.2.3\]](#)



First Revision No. 1310-NFPA 13-2022 [Section No. 21.4.1.1]

21.4.1.1* General.

Ceiling sprinkler water demand for new systems shall be determined in accordance with 21.4.1.2 ~~21.4.1.2.2.1~~ for single- and double-row racks or 21.4.1.5 and 21.4.1.3 ~~21.4.1.3.2.1~~ for multiple-row racks. (See Section C.14.)

21.4.1.1.1

~~Ceiling sprinkler water demand for new systems shall be determined in accordance with 21.4.1.2.2.1 for single- and double-row racks or 21.4.1.6 and 21.4.1.3.2.1 for multiple-row racks. (See Section C.14 .)~~

21.4.1.1.2

~~Ceiling sprinkler water demand for the evaluation or modification of existing systems shall be permitted to be determined in accordance with 21.4.1.2.3 for single- and double-row racks or 21.4.1.3.1.2 and 21.4.1.3.2.2 for multiple-row racks. (See Section C.14 .)~~

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Mon Aug 15 13:57:01 EDT 2022

Committee Statement

Committee Statement: The existing system information is being removed from the standard. In Chapter 30 there will be a reference that states that you can reference legacy editions that were designed using the density/area curves.

Response Message: FR-1310-NFPA 13-2022

[Public Input No. 512-NFPA 13-2022 \[Section No. 21.4.1.1\]](#)



First Revision No. 1276-NFPA 13-2022 [Section No. 21.4.1.2.1]

21.4.1.2.1 ~~New Systems Criteria for Single or Double-Row Rack Storage of Class I Through Class IV Commodities Stored Over 12 ft (3.7 m) Up to and Including 25 ft (7.6 m) in Height.~~

21.4.1.2.1

For single- or double-row racks for Class I, Class II, Class III, or Class IV commodities, encapsulated or nonencapsulated, the ceiling sprinkler water demand in terms of density [gpm/ft² (mm/min)] and area of sprinkler operation [ft² (m²) of ceiling or roof] shall be selected from the criteria in Table 21.4.1.2.1(a) through Table 21.4.1.2.1(e) that are appropriate for each commodity and configuration and shall be modified as appropriate by 21.4.1.4.

Table 21.4.1.2.1(a) Single- or Double-Row Racks — Storage Height Up to and Including 15 ft (4.6 m) [gpm/ft² (mm/min)]

<u>Commodity Class</u>	<u>Encapsulated</u>	<u>In-Rack Sprinklers Mandatory</u>	<u>Aisles ft (m)</u>	<u>High-Temperature-Rated Sprinkler</u>	<u>Ordinary-Temperature-Rated Sprinkler</u>
I	No	No	4 (1.2)	0.19 (7.7)	0.22 (9.0)
			8 (2.4)	0.17 (6.9)	0.20 (8.1)
	Yes	No	4 (1.2)	0.33 (13.4) ^a	0.33 (13.4) ^b
			8 (2.4)	0.28 (11.4)	0.32 (13.0)
II	No	No	4 (1.2)	0.23 (9.4)	0.26 (10.6)
			8 (2.4)	0.20 (8.2)	0.22 (9.0)
	Yes	No	4 (1.2)	0.33 (13.4) ^a	0.33 (13.4) ^b
			8 (2.4)	0.28 (11.4)	0.32 (13.0)
III	No	No	4 (1.2)	0.26 (10.6)	0.29 (11.8)
			8 (2.4)	0.22 (9.0)	0.25 (10.2)
	Yes	Yes	4 (1.2)	See Chapter 25.	
			8 (2.4)		
IV	No	No	4 (1.2)	0.35 (14.3)	0.36 (14.7) ^c
			8 (2.4)	0.30 (12.2)	0.34 (13.9)
	Yes	Yes	4 (1.2)	See Chapter 25.	
			8 (2.4)		

^aDesign area is 2400 ft² (220 m²).

^bDesign area is 4000 ft² (370 m²).

^cDesign area is 3000 ft² (280 m²).

Table 21.4.1.2.1(b) Single- or Double-Row Racks — Storage Height Greater Than 15 ft (4.6 m) Up to and Including 18 ft (5.5 m) [gpm/ft² (mm/min)]

<u>Commodity Class</u>	<u>Encapsulated</u>	<u>In-Rack Sprinklers Mandatory</u>	<u>Aisles ft (m)</u>	<u>High-Temperature-Rated Sprinkler</u>	<u>Ordinary-Temperature-Rated Sprinkler</u>
I	No	No	4 (1.2)	0.27 (11.0)	0.31 (12.6)
			8 (2.4)	0.25 (10.2)	0.28 (11.4)
	Yes	No	4 (1.2)	0.47 (19.2) ^a	0.47 (19.2) ^b
			8 (2.4)	0.40 (16.3)	0.46 (18.7)
II	No	No	4 (1.2)	0.32 (13.0)	0.37 (15.1)
			8 (2.4)	0.28 (11.4)	0.31 (12.6)
	Yes	No	4 (1.2)	0.47 (19.2) ^a	0.47 (19.2) ^b
			8 (2.4)	0.40 (16.3)	0.46 (18.7)
III	No	No	4 (1.2)	0.37 (15.1)	0.42 (17.1)

<u>Commodity Class</u>	<u>Encapsulated</u>	<u>In-Rack Sprinklers Mandatory</u>	<u>Aisles ft (m)</u>	<u>High-Temperature-Rated Sprinkler</u>	<u>Ordinary-Temperature-Rated Sprinkler</u>
			8 (2.4)	0.31 (12.6)	0.36 (14.7)
	Yes	Yes	4 (1.2)	See Chapter 25.	
			8 (2.4)		
IV	No	No	4 (1.2)	0.49 (20.0)	0.51 (20.8) ^c
			8 (2.4)	0.42 (17.1)	0.48 (19.6)
	Yes	Yes	4 (1.2)	See Chapter 25.	
			8 (2.4)		

^aDesign area is 2400 ft² (220 m²).

^bDesign area is 4000 ft² (370 m²).

^cDesign area is 3000 ft² (280 m²).

Table 21.4.1.2.1(c) Single- or Double-Row Racks — Storage Height Greater Than 18 ft (5.5 m) Up to and Including 20 ft (6.1 m) [gpm/ft² (mm/min)]

<u>Commodity Class</u>	<u>Encapsulated</u>	<u>In-Rack Sprinklers Mandatory</u>	<u>Aisles ft (m)</u>	<u>High-Temperature-Rated Sprinkler</u>	<u>Ordinary-Temperature-Rated Sprinkler</u>
I	No	No	4 (1.2)	0.32 (13.0)	0.37 (15.1)
			8 (2.4)	0.29 (11.8)	0.33 (13.4)
	Yes	No	4 (1.2)	0.55 (22.4) ^a	0.55 (22.4) ^b
			8 (2.4)	0.47 (19.1)	0.54 (21.9)
II	No	No	4 (1.2)	0.38 (15.5)	0.44 (17.9)
			8 (2.4)	0.33 (13.5)	0.37 (15.1)
	Yes	No	4 (1.2)	0.55 (22.4) ^a	0.55 (22.4) ^b
			8 (2.4)	0.47 (19.1)	0.54 (21.9)
III	No	No	4 (1.2)	0.43 (17.5)	0.49 (19.9)
			8 (2.4)	0.37 (15.1)	0.42 (17.1)
	Yes	Yes	4 (1.2)	See Chapter 25.	
			8 (2.4)		
IV	No	No	4 (1.2)	0.58 (23.7)	0.60 (24.5) ^c
			8 (2.4)	0.50 (20.4)	0.57 (23.2)
	Yes	Yes	4 (1.2)	See Chapter 25.	
			8 (2.4)		

^aDesign area is 2400 ft² (220 m²).

^bDesign area is 4000 ft² (370 m²).

^cDesign area is 3000 ft² (280 m²).

Table 21.4.1.2.1(d) Single- or Double-Row Racks — Storage Height Greater Than 20 ft (6.1 m) Up to and Including 22 ft (6.7 m) [gpm/ft² (mm/min)]

<u>Commodity Class</u>	<u>Encapsulated</u>	<u>In-Rack Sprinklers</u>	<u>Aisles ft (m)</u>	<u>High-Temperature-</u>	<u>Ordinary-Temperature-</u>
------------------------	---------------------	---------------------------	----------------------	--------------------------	------------------------------

		<u>Mandatory</u>		<u>Rated Sprinkler</u>	<u>Rated Sprinkler</u>
I	No	No	4 (1.2)	0.42 (17.1)	0.48 (19.6)
			8 (2.4)	0.38 (15.5)	0.43 (17.5)
	Yes	Yes	4 (1.2)	See Chapter 25.	
			8 (2.4)		
II	No	No	4 (1.2)	0.49 (20.0)	0.57 (23.2)
			8 (2.4)	0.43 (17.5)	0.48 (19.6)
	Yes	Yes	4 (1.2)	See Chapter 25.	
			8 (2.4)		
III	No	No	4 (1.2)	0.56 (22.8)	0.64 (26.1)
			8 (2.4)	0.48 (19.6)	0.55 (22.4)
	Yes	Yes	4 (1.2)	See Chapter 25.	
			8 (2.4)		
IV	No	No	4 (1.2)	0.75 (30.5)	0.78 (31.7)*
			8 (2.4)	0.65 (26.5)	0.74 (30.1)
	Yes	Yes	4 (1.2)	See Chapter 25.	
			8 (2.4)		

*Design area is 3000 ft² (280 m²).

Table 21.4.1.2.1(e) Single- or Double-Row Racks — Storage Height Greater Than 22 ft (6.7 m) Up to and Including 25 ft (7.6 m) [gpm/ft² (mm/min)]

<u>Commodity Class</u>	<u>Encapsulated</u>	<u>In-Rack Sprinklers Mandatory</u>	<u>Aisles ft (m)</u>	<u>High-Temperature-Rated Sprinkler</u>	<u>Ordinary-Temperature-Rated Sprinkler</u>
I	No	No	4 (1.2)	0.56 (22.8)	0.65 (26.9)
			8 (2.4)	0.51 (20.8)	0.58 (23.6)
	Yes	Yes	4 (1.2)	See Chapter 25.	
			8 (2.4)		
II	No	No	4 (1.2)	0.67 (27.3)	0.77 (31.3)
			8 (2.4)	0.58 (23.7)	0.65 (26.5)
	Yes	Yes	4 (1.2)	See Chapter 25.	
			8 (2.4)		
III	No	No	4 (1.2)	0.75 (30.5)	0.86 (34.9)
			8 (2.4)	0.65 (26.5)	0.74 (30.1)
	Yes	Yes	4 (1.2)	See Chapter 25.	
			8 (2.4)		
IV	No	Yes	4 (1.2)	See Chapter 25.	
			8 (2.4)		
	Yes	Yes	4 (1.2)	See Chapter 25.	
			8 (2.4)		

21.4.1.2.2

The requirements in 21.4.1.2.1 shall apply to portable racks arranged in the same manner as single- or double-row racks.

21.4.1.2.3

Unless otherwise indicated in Table 21.4.1.2.1(a) through Table 21.4.1.2.1(e), the minimum design area shall be 2000 ft² (185 m²).

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Sat Jul 30 09:27:15 EDT 2022

Committee Statement

Committee Statement: The existing system information is being removed from the standard. In Chapter 30 there will be a reference that states that you can reference legacy editions that were designed using the density/area curves.

Response Message: FR-1276-NFPA 13-2022

[Public Input No. 513-NFPA 13-2022 \[Section No. 21.4.1.2.1\]](#)



First Revision No. 1286-NFPA 13-2022 [Section No. 21.4.1.2.2]

21.4.1.2.2 ~~Evaluation or Modification of Existing Systems for Single or Double-Row Rack Storage of Class I Through Class IV Commodities Stored Over 12 ft (3.7 m) Up to and Including 25 ft (7.6 m) in Height.~~

21.4.1.2.2.1*

For single- or double-row racks for Class I, Class II, Class III, or Class IV commodities, encapsulated or nonencapsulated in single- or double-row racks, ceiling sprinkler water demand in terms of density $[gpm/ft^2 \text{ } (mm/min)]$ and area of sprinkler operation $[ft^2 \text{ } (m^2)]$ of ceiling or roof shall be selected from the density/area curves of Figure 21.4.1.2.2.1(a) through Figure 21.4.1.2.2.1(e) that are appropriate for each commodity and configuration as shown in Table 21.4.1.2.2.1 and shall be modified as appropriate by 21.4.1.7.

Figure 21.4.1.2.2.1(a) Sprinkler System Design Curves — 20 ft (6.1 m) High Rack Storage — Class I Nonencapsulated Commodities — Conventional Pallets.

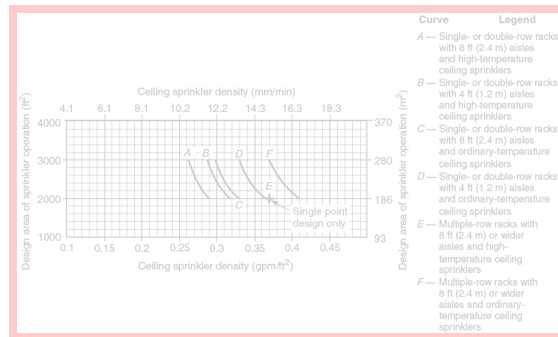


Figure 21.4.1.2.2.1(b) Sprinkler System Design Curves — 20 ft (6.1 m) High Rack Storage — Class II Nonencapsulated Commodities — Conventional Pallets.

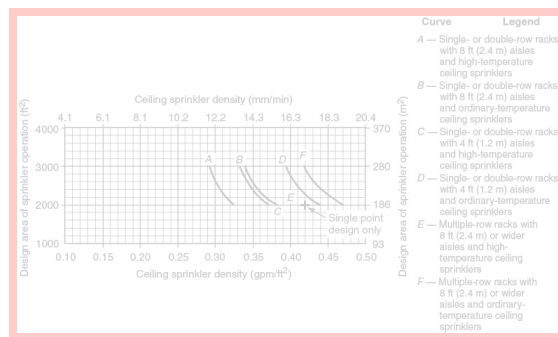


Figure 21.4.1.2.2.1(c) Sprinkler System Design Curves — 20 ft (6.1 m) High Rack Storage — Class III Nonencapsulated Commodities — Conventional Pallets.

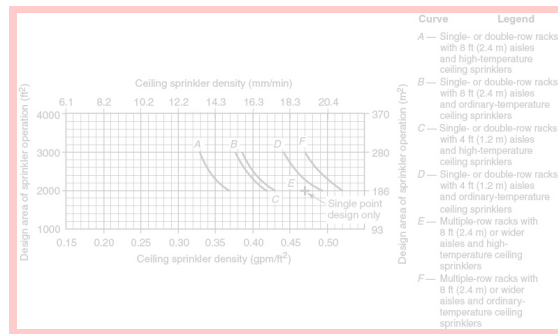


Figure 21.4.1.2.2.1(d) Sprinkler System Design Curves — 20 ft (6.1 m) High Rack Storage — Class IV Nonencapsulated Commodities — Conventional Pallets.

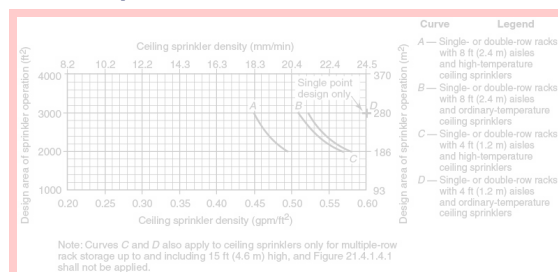


Figure 21.4.1.2.2.1(e) Single or Double Row Racks — 20 ft (6.1 m) High Rack Storage — Sprinkler System Design Curves — Class I and Class II Encapsulated Commodities — Conventional Pallets.

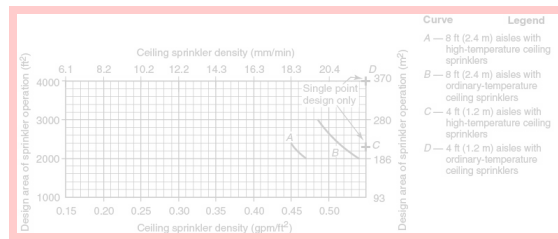


Table 21.4.1.2.2.1 Single or Double Row Racks — Storage Height Over 12 ft (3.7 m) Up to and Including 25 ft (7.6 m)

Height	Commodity Class	Encapsulated	Aisles*		Ceiling Sprinkler Water Demand		
			ft	m	Figure	Curves	Apply Figure 21.4.1.7.1
Over 12 ft (3.7 m) up to and including 20 ft (6.1 m)	I	No	4	1.2	21.4.1.2.2.1(a)	—B and D	Yes
			8	2.4		A and C	
		Yes	4	1.2	21.4.1.2.2.1(e)	—C and D	Yes
			8	2.4		A and B	
	II	No	4	1.2	21.4.1.2.2.1(b)	—C and D	Yes
			8	2.4		A and B	
		Yes	4	1.2	21.4.1.2.2.1(e)	—C and D	Yes
			8	2.4		A and B	
	III	No	4	1.2	21.4.1.2.2.1(c)	—C and D	Yes
			8	2.4		A and B	
		Yes	4	1.2	In-rack sprinklers required. See Chapter 25.	NA	NA
			8	2.4		NA	
Over 20 ft (6.1 m) up to and including 22 ft (6.7 m)	I	No	4	1.2	21.4.1.2.2.1(a)	—A and C	Yes
			8	2.4		B and D	
		Yes	4	1.2	In-rack sprinklers required. See Chapter 25.	NA	NA
			8	2.4		NA	

Height	Commodity Class	Encapsulated	Aisles*		Ceiling Sprinkler Water Demand		
			ft	m	Figure	Curves	Apply Figure 21.4.1.7.1
	II	No	4	1.2	21.4.1.2.2.1(b)	-C and D	Yes
			8	2.4		A and B	
		Yes	4	1.2	In-rack sprinklers required. See Chapter 25.	NA	NA
			8	2.4			
	III	No	4	1.2	21.4.1.2.2.1(c)	-C and D	Yes
			8	2.4		A and B	
		Yes	4	1.2	In-rack sprinklers required. See Chapter 25.	NA	NA
			8	2.4			
	IV	No	4	1.2	21.4.1.2.2.1(d)	-C and D	Yes
			8	2.4		A and B	
		Yes	4	1.2	In-rack sprinklers required. See Chapter 25.	NA	NA
			8	2.4			
Over 22 ft (6.7 m) up to and including 25 ft (7.6 m)	I	No	4	1.2	21.4.1.2.2.1(a)	-A and C	Yes
			8	2.4		B and D	
		Yes	4	1.2	In-rack sprinklers required. See Chapter 25.	NA	NA
			8	2.4			
	II	No	4	1.2	21.4.1.2.2.1(b)	-C and D	Yes
			8	2.4		A and B	
		Yes	4	1.2	In-rack sprinklers required. See Chapter 25.	NA	NA
			8	2.4			
	III	No	4	1.2	21.4.1.2.2.1(c)	C and D	Yes
			8	2.4		A and B	
		Yes	4	1.2	In-rack sprinklers required. See Chapter 25.	NA	NA
			8	2.4			
	IV	No	4	1.2	In-rack sprinklers required. See Chapter 25.	NA	NA
			8	2.4			
		Yes	4	1.2	In-rack	NA	NA
			8	2.4			

Height	Commodity Class	Encapsulated	Aisles*		Ceiling Sprinkler Water Demand		
			ft	m	Figure	Curves	Apply Figure 21.4.1.7.1
			8	2.4	sprinklers required. See Chapter 25.		

NA: Not applicable.

*See 21.4.1.2.3 for interpolation of aisle widths.

A.21.4.1.2.2.1

Data indicate that the sprinkler protection criteria in Figure 21.4.1.2.2.1(a) through Figure 21.4.1.2.2.1(e) are ineffective, by themselves, for rack storage with solid shelves, if the required flue spaces are not maintained. Use of Figure 21.4.1.2.2.1(a) through Figure 21.4.1.2.2.1(e), along with the additional provisions that are required by this standard, can provide acceptable protection.

21.4.1.2.2.2

The requirements in 21.4.1.2.2.1 shall apply to portable racks arranged in the same manner as single- or double-row racks.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Sat Jul 30 10:25:31 EDT 2022

Committee Statement

Committee Statement: The existing system information is being removed from the standard. In Chapter 30 there will be a reference that states that you can reference legacy editions that were designed using the density/area curves.

Response Message: FR-1286-NFPA 13-2022

[Public Input No. 515-NFPA 13-2022 \[Section No. 21.4.1.2.2\]](#)



First Revision No. 1333-NFPA 13-2022 [Section No. 21.4.1.3.1]

21.4.1.3.1 New System Criteria — Rack Depth Up to and Including 16 ft (4.9 m), Aisles 8 ft (2.4 m) or Wider, Storage Height Over 12 ft (3.7 m) Up to and Including 25 ft (7.6 m).

21.4.1.3.1

For Class I, Class II, Class III, or Class IV commodities, encapsulated or nonencapsulated, ceiling sprinkler water demand in terms of density [gpm/ft² (mm/min)] and area of sprinkler operation [ft² (m²) of ceiling or roof] shall be selected from the criteria in Table 21.4.1.3.1(a) through Table 21.4.1.3.1(e) that are appropriate for each commodity and configuration and shall be modified as appropriate by 21.4.1.4.

Table 21.4.1.3.1(a) Multiple-Row Racks — Rack Depth Up to and Including 16 ft (4.9 m), Aisles 8 ft (2.4 m) or Wider, Storage Height Up to and Including 15 ft (4.6 m) [gpm/ft² (mm/min)]

<u>Commodity Class</u>	<u>Encapsulated</u>	<u>In-Rack Sprinklers Mandatory</u>	<u>High-Temperature-Rated Sprinkler</u>	<u>Ordinary-Temperature-Rated Sprinkler</u>
I	No	No	0.22 (9.0)	0.25 (10.2)
	Yes	No	0.28 (11.4)	0.31 (12.6)
II	No	No	0.25 (10.2)	0.28 (11.4)
	Yes	No	0.32 (13.0)	0.35 (14.3)
III	No	No	0.28 (11.4)	0.31 (12.6)
	Yes	Yes	See Chapter 25.	
IV	No	Yes	See Chapter 25.	
	Yes	Yes	See Chapter 25.	

Table 21.4.1.3.1(b) Multiple-Row Racks — Rack Depth Up to and Including 16 ft (4.9 m), Aisles 8 ft (2.4 m) or Wider, Storage Height Above 15 ft (4.6 m) Up to and Including 18 ft (5.5 m) [gpm/ft² (mm/min)]

<u>Commodity Class</u>	<u>Encapsulated</u>	<u>In-Rack Sprinklers Mandatory</u>	<u>High-Temperature-Rated Sprinkler</u>	<u>Ordinary-Temperature-Rated Sprinkler</u>
I	No	No	0.31 (12.6)	0.35 (14.3)
	Yes	No	0.39 (15.9)	0.44 (17.9)
II	No	No	0.36 (14.7)	0.40 (16.3)
	Yes	No	0.45 (18.3)	0.50 (20.4)
III	No	No	0.40 (16.3)	0.44 (17.9)
	Yes	Yes	See Chapter 25.	
IV	No	Yes	See Chapter 25.	
	Yes	Yes	See Chapter 25.	

Table 21.4.1.3.1(c) Multiple-Row Racks — Rack Depth Up to and Including 16 ft (4.9 m), Aisles 8 ft (2.4 m) or Wider, Storage Height Above 18 ft (5.5 m) Up to and Including 20 ft (6.1 m) [gpm/ft² (mm/min)]

<u>Commodity Class</u>	<u>Encapsulated</u>	<u>In-Rack Sprinklers Mandatory</u>	<u>High-Temperature-Rated Sprinkler</u>	<u>Ordinary-Temperature-Rated Sprinkler</u>
I	No	No	0.37 (15.1)	0.41 (16.7)
	Yes	No	0.46 (18.7)	0.51 (20.8)
II	No	No	0.42 (17.1)	0.47 (19.2)
	Yes	No	0.53 (21.6)	0.59 (24.0)
III	No	No	0.47 (19.1)	0.52 (21.2)
	Yes	Yes	See Chapter 25.	

<u>Commodity Class</u>	<u>Encapsulated</u>	<u>In-Rack Sprinklers Mandatory</u>	<u>High-Temperature-Rated Sprinkler</u>	<u>Ordinary-Temperature-Rated Sprinkler</u>
IV	No	Yes	See Chapter 25.	
	Yes	Yes	See Chapter 25.	

Table 21.4.1.3.1(d) Multiple-Row Racks — Rack Depth Up to and Including 16 ft (4.9 m), Aisles 8 ft (2.4 m) or Wider, Storage Height Above 20 ft (6.1 m) Up to and Including 22 ft (6.7 m) [gpm/ft² (mm/min)]

<u>Commodity Class</u>	<u>Encapsulated</u>	<u>In-Rack Sprinklers Mandatory</u>	<u>High-Temperature-Rated Sprinkler</u>	<u>Ordinary-Temperature-Rated Sprinkler</u>
I	No	No	0.48 (19.6)	0.53 (21.6)
	Yes	Yes	See Chapter 25.	
II	No	Yes	See Chapter 25.	
	Yes	Yes	See Chapter 25.	
III	No	Yes	See Chapter 25.	
	Yes	Yes	See Chapter 25.	
IV	No	Yes	See Chapter 25.	
	Yes	Yes	See Chapter 25.	

Table 21.4.1.3.1(e) Multiple-Row Racks — Rack Depth Up to and Including 16 ft (4.9 m), Aisles 8 ft (2.4 m) or Wider, Storage Height Above 22 ft (6.7 m) Up to and Including 25 ft (7.6 m) [gpm/ft² (mm/min)]

<u>Commodity Class</u>	<u>Encapsulated</u>	<u>In-Rack Sprinklers Mandatory</u>	<u>High-Temperature-Rated Sprinkler</u>	<u>Ordinary-Temperature-Rated Sprinkler</u>
I	No	No	0.65 (26.5)	0.72 (29.3)
	Yes	Yes	See Chapter 25.	
II	No	Yes	See Chapter 25.	
	Yes	Yes	See Chapter 25.	
III	No	Yes	See Chapter 25.	
	Yes	Yes	See Chapter 25.	
IV	No	Yes	See Chapter 25.	
	Yes	Yes	See Chapter 25.	

21.4.1.3.2

The protection criteria in accordance with 21.4.1.3.1 shall apply to portable racks arranged in the same manner as multiple-row racks.

21.4.1.3.3

Unless otherwise indicated in Table 21.4.1.3.1(a) through Table 21.4.1.3.1(e), the minimum design area shall be 2000 ft² (185 m²).

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 25 13:16:09 EDT 2022

Committee Statement

Committee Statement: The existing system information is being removed from the standard. In Chapter 30 a reference has been added that states that you can reference legacy editions that were used to design the system, using the density/area curves.

Response Message: FR-1333-NFPA 13-2022

[Public Input No. 516-NFPA 13-2022 \[Section No. 21.4.1.3.1\]](#)



First Revision No. 1334-NFPA 13-2022 [Section No. 21.4.1.3.2]

21.4.1.3.2 ~~Evaluation or Modification of Existing Systems — Rack Depth Up to and Including 16 ft (4.9), Aisles 8 ft (2.4) or Wider, Storage Height Over 12 ft (3.7 m) Up to and Including 25 ft (7.6 m).~~

~~21.4.1.3.2.1 Multiple-Row Racks — Rack Depth Up to and Including 16 ft (4.9 m) with Aisles 8 ft (2.4 m) or Wider.~~

For Class I, Class II, Class III, or Class IV commodities, encapsulated or nonencapsulated, ceiling sprinkler water demand in terms of density [gpm/ft² (mm/min)] and area of sprinkler operation [ft² (m²) of ceiling or roof] shall be selected from the density/area curves of Figure 21.4.1.2.2.1(a) through Figure 21.4.1.2.2.1(e) that are appropriate for each commodity and configuration as shown in Table 21.4.1.3.2.1 and shall be modified as appropriate by 21.4.1.7.

Table 21.4.1.3.2.1 Multiple-Row Racks — Rack Depth Up to and Including 16 ft (4.9 m), Aisles 8 ft (2.4 m) or Wider, and Storage Height Over 12 ft (3.7 m) Up to 25 ft (7.6 m)

Height	Commodity Class	Encapsulated	Ceiling Sprinkler Water Demand			
			Figure	Curves	Apply Figure 21.4.1.7.1	1.25 × Density
Over 12 ft (3.7 m) up to and including 15 ft (4.6 m)	I	No	21.4.1.2.2.1(a)	E and F	Yes	No
		Yes	21.4.1.2.2.1(a)	E and F		Yes
	II	No	21.4.1.2.2.1(b)	E and F	Yes	No
		Yes	21.4.1.2.2.1(b)	E and F	-	Yes
	III	No	21.4.1.2.2.1(c)	E and F	Yes	No
		Yes	In-rack sprinklers required. See Chapter 25.	NA	NA	NA
	IV	No	In-rack sprinklers required. See Chapter 25.	NA	No	No
		Yes	In-rack sprinklers required. See Chapter 25.	NA	NA	NA
	I	No	21.4.1.2.2.1(a)	E and F	Yes	No
		Yes	21.4.1.2.2.1(a)	E and F		Yes
Over 15 ft (4.6 m) up to and including 20 ft (6.1 m)	II	No	21.4.1.2.2.1(b)	E and F	Yes	No
		Yes	21.4.1.2.2.1(b)	E and F		Yes
	III	No	21.4.1.2.2.1(c)	E and F	Yes	No
		Yes	In-rack sprinklers required. See Chapter 25.	NA	NA	NA
	IV	No				
		Yes				
	I	No	21.4.1.2.2.1(a)	E and F	Yes	No
		Yes	In-rack sprinklers required. See Chapter 25.	NA	NA	NA
Over 20 ft (6.1 m) up to and including 25 ft (7.6 m)	II	No				
		Yes				
	III	No				
		Yes				
	IV	No				
		Yes				

NA: Not applicable.

21.4.1.3.2.2

~~The protection criteria in accordance with 21.4.1.3.2.1 shall apply to portable racks arranged in the same manner as multiple-row racks.~~

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 25 13:20:22 EDT 2022

Committee Statement

Committee Statement: The existing system information is being removed from the standard. In Chapter 30 a reference has been added that states that you can reference legacy editions that were used to design the system, using the density/area curves.

Response Message: FR-1334-NFPA 13-2022

[Public Input No. 517-NFPA 13-2022 \[Section No. 21.4.1.3.2\]](#)

**First Revision No. 1273-NFPA 13-2022 [Section No. 21.4.1.4.1]**

21.4.1.4.1 ~~New System Criteria — Rack Depth Over 16 ft (4.9 m) or Aisles More Narrow Than 8 ft (2.4 m), Storage Height Over 12 ft (3.7 m) Up to and Including 25 ft (7.6 m).~~

21.4.1.4.1

For Class I, Class II, Class III, or Class IV commodities, encapsulated or nonencapsulated, storage height up to and including 15 ft. (4.6 m), the ceiling sprinkler water demand in terms of density [gpm/ft² (mm/min)] and area of sprinkler operation [ft² (m²) of ceiling or roof] appropriate for each commodity and configuration shall be selected from Table 21.4.1.4.1 and shall be modified as appropriate by 21.4.1.4.

Table 21.4.1.4.1 Multiple-Row Racks — Rack Depth Over 16 ft (4.9 m) or Aisles Narrower Than 8 ft (2.4 m), Storage Height Up to and Including 15 ft (4.6 m)

<u>Commodity Class</u>	<u>Encapsulated</u>	<u>In-Rack Sprinklers Mandatory</u>	<u>High-Temperature-Rated Sprinkler</u>	<u>Ordinary-Temperature-Rated Sprinkler</u>
I	No	No	0.22 (9.0)	0.25 (10.2)
	Yes	No	0.28 (11.4)	0.31 (12.6)
II	No	No	0.25 (10.2)	0.28 (11.4)
	Yes	No	0.32 (13.0)	0.35 (14.3)
III	No	No	0.28 (11.4)	0.31 (12.6)
	Yes	Yes	See Chapter 25.	
IV	No	Yes	See Chapter 25.	
	Yes	Yes	See Chapter 25.	

21.4.1.4.2

Encapsulated or nonencasulated Class I through Class IV commodities stored over 15 ft (4.6 m) shall be in accordance with Chapter 25.

21.4.1.4.3

The protection criteria in accordance with 21.4.1.4.1 shall apply to portable racks arranged in the same manner as multiple-row racks.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Sat Jul 30 08:52:15 EDT 2022

Committee Statement

Committee Statement: The existing system information is being removed from the standard. In Chapter 30 there will be a reference that states that you can reference legacy editions that were designed using the density/area curves.

Response Message: FR-1273-NFPA 13-2022

[Public Input No. 518-NFPA 13-2022 \[Section No. 21.4.1.4.1\]](#)



First Revision No. 1335-NFPA 13-2022 [Section No. 21.4.1.5]

21.4.1.5 ~~Evaluation or Modification of Existing Systems — Rack Depth Over 16 ft (4.9 m) or Aisles More Narrow Than 8 ft (2.4 m), Storage Height Over 12 ft (3.7 m) Up to and Including 25 ft (7.6 m).~~

21.4.1.5.1

For Class I, Class II, Class III, or Class IV commodities, encapsulated or nonencapsulated, ceiling sprinkler water demand in terms of density [gpm/ft² (mm/min)] and area of sprinkler operation [ft² (m²) of ceiling or roof] shall be selected from the density/area curves of Figure 21.4.1.2.2.1(a) through Figure 21.4.1.2.2.1(e) that are appropriate for each commodity and configuration as shown in Table 21.4.1.5.1 and shall be modified as appropriate by 21.4.1.7.

Table 21.4.1.5.1 Multiple-Row Racks — Rack Depth Over 16 ft (4.9 m) or Aisles Narrower Than 8 ft (2.4 m), Storage Height Over 12 ft (3.7 m) Up to and Including 25 ft (7.6 m)

Height	Commodity Class	Encapsulated	Ceiling Sprinkler Water Demand			
			Figure	Curves	Apply Figure 21.4.1.7.1	1.25 × Density
Over 12 ft (3.7 m) up to and including 15 ft (4.6 m)	I	No	21.4.1.2.2.1(a)	E and F	Yes	No
		Yes	21.4.1.2.2.1(a)	E and F		Yes
	II	No	21.4.1.2.2.1(b)	E and F	Yes	No
		Yes	21.4.1.2.2.1(b)	E and F		Yes
	III	No	21.4.1.2.2.1(c)	E and F	Yes	No
		Yes	In-rack sprinklers required. See Chapter 25.	NA	NA	NA
	IV	No	In-rack sprinklers required. See Chapter 25.	NA	No	No
		Yes	In-rack sprinklers required. See Chapter 25.	NA	NA	NA
	I	No	In-rack sprinklers required. See Chapter 25.	NA	NA	NA
		Yes				
Over 15 ft (4.6 m) up to and including 20 ft (6.1 m)	II	No				
		Yes				
	III	No				
		Yes				
	IV	No				
		Yes				
Over 20 ft (6.1 m) up to and including 25 ft (7.6 m)	I	No	In-rack sprinklers required. See Chapter 25.	NA	NA	NA
		Yes				
	II	No				
		Yes				
	III	No				
		Yes				
	IV	No				
		Yes				

NA: Not applicable.

21.4.1.5.2

~~The protection criteria in accordance with 21.4.1.5.1 shall apply to portable racks arranged in the same manner as multiple-row racks.~~

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 25 13:29:03 EDT 2022

Committee Statement

Committee Statement: The existing system information is being removed from the standard. In Chapter 30 a reference has been added that states that you can reference legacy editions that were used to design the system, using the density/area curves.

Response Message: FR-1335-NFPA 13-2022

[Public Input No. 519-NFPA 13-2022 \[Section No. 21.4.1.5\]](#)

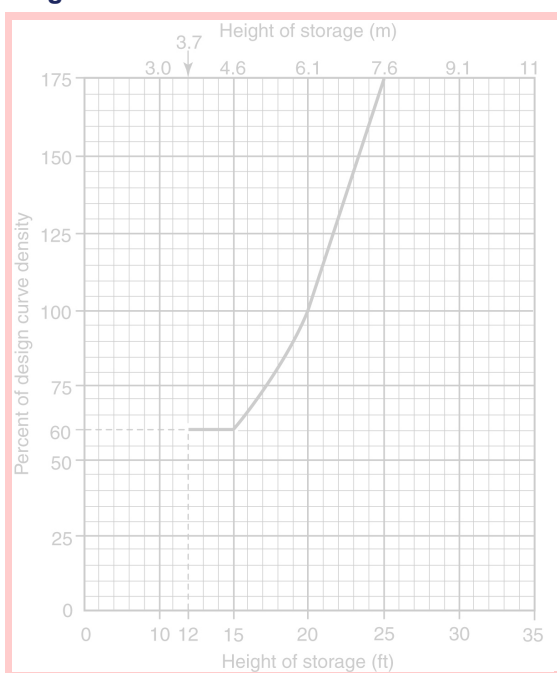


First Revision No. 1336-NFPA 13-2022 [Section No. 21.4.1.7.1]

21.4.1.7.1

For the evaluation or modification of an existing system with storage height over 12 ft (3.7 m) up to and including 25 ft (7.6 m) protected with ceiling sprinklers only, densities obtained from design curves shall be adjusted in accordance with Figure 21.4.1.7.1.

Figure 21.4.1.7.1 Evaluation or Modification of Existing System's Ceiling Sprinkler Density vs. Storage Height.



Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 25 13:33:35 EDT 2022

Committee Statement

Committee Statement: The existing system information is being removed from the standard. In Chapter 30 a reference has been added that states that you can reference legacy editions that were used to design the system, using the density/area curves.

Response Message: FR-1336-NFPA 13-2022

[Public Input No. 520-NFPA 13-2022 \[Section No. 21.4.1.7.1\]](#)



First Revision No. 1219-NFPA 13-2022 [New Section after 23.2.2]

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 14.2.9.3 and the minimum areas required by 14.2.8.3 in accordance with 14.2.4.3 , the design area shall cover a minimum of 768 ft^2 (71 m^2).

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 10:59:49 EDT 2022

Committee Statement

Committee Statement: With the allowance of baffles in ESFR installations, it is necessary to reinsert the minimum area requirements that were in previous editions of the standard when artificial baffles are installed.

Response Message: FR-1219-NFPA 13-2022

[Public Input No. 52-NFPA 13-2021 \[New Section after 23.2.2\]](#)



First Revision No. 1218-NFPA 13-2022 [Section No. 23.3.1]

23.3.1

Protection of palletized, solid-piled, or rack storage of Class I through Class IV and Group A commodities shall be in accordance with Table 23.3.1.

Table 23.3.1 ESFR Sprinkler Ceiling-Only Options for Solid Pile; Palletized; and Single-, Double-, and Multiple-Row Rack Storage

<u>Commodity^a</u>	<u>Maximum Ceiling/Roof Height</u>		<u>Maximum Storage Height</u>		<u>ESFR Sprinklers — Pendent Orientation</u> <u>Minimum Operating Pressure</u> <u>psi (bar)</u>				<u>ESFR Sprinklers — Upright Orientation</u> <u>Minimum Operating Pressure</u> <u>psi (bar)</u>	
					<u>Nominal K-Factors</u>				<u>Nominal K-Factors</u>	
	<u>ft</u>	<u>m</u>	<u>ft</u>	<u>m</u>	<u>14 (200)</u>	<u>16.8 (240)</u>	<u>22.4 (320)</u>	<u>25.2 (360)</u>	<u>14 (200)</u>	<u>16.8 (240)</u>
Class I through Class IV and cartoned nonexpanded Group A plastics	25	7.6	<u>20</u>	<u>6.1</u>	50 (3.4) ^b	35 (2.4) ^b	25 (1.7) ^b	15 (1.0) ^b	50 (3.4) ^b	35 (2.4) ^b
	30	9.1	<u>25</u>	<u>7.6</u>	50 (3.4)	35 (2.4)	25 (1.7)	15 (1.0)	50 (3.4)	35 (2.4)
	35	10.7	<u>30</u>	<u>9.1</u>	75 (5.2) ^b	52 (3.6) ^b	35 (2.4)	20 (1.4)	75 (5.2)	52 (3.6)
	40	12.2	<u>35</u>	<u>10.7</u>	—	52 (3.6)	<u>40 (2.8)</u> ^b	25 (1.7)	—	—
	45	13.7	<u>40</u>	<u>12.2</u>	—	—	40 (2.8)	40 (2.8)	—	—
Cartoned expanded Group A plastics	25	7.6	<u>20</u>	<u>6.1</u>	50 (3.4) ^b	35 (2.4) ^b	<u>35 (2.4)</u> ^b	<u>35 (2.4)</u> ^b	50 (3.4) ^b	35 (2.4) ^b
	30	9.1	<u>25</u>	<u>7.6</u>	50 (3.4) ^b	35 (2.4) ^b	<u>35 (2.4)</u> ^b	<u>35 (2.4)</u> ^b	50 (3.4)	35 (2.4)
	35	10.7	<u>30</u>	<u>9.1</u>	—	—	<u>75 (5.2)</u> ^b	<u>60 (4.1)</u> ^b	—	—
	40	12.2	<u>35</u>	<u>10.7</u>	—	—	<u>75 (5.2)</u> ^b	<u>60 (4.1)</u> ^b	—	—
	45	13.7	<u>40</u>	<u>12.2</u>	—	—	—	—	—	—
Exposed nonexpanded, Group A plastics	25	7.6	<u>20</u>	<u>6.1</u>	50 (3.4) ^b	35 (2.4) ^b	<u>35 (2.4)</u> ^b	<u>35 (2.4)</u> ^b	—	—
	30	9.1	<u>25</u>	<u>7.6</u>	50 (3.4)	35 (2.4)	<u>35 (2.4)</u> ^b	<u>35 (2.4)</u> ^b	—	—
	35	10.7	<u>30</u>	<u>9.1</u>	—	—	<u>75 (5.2)</u> ^b	<u>60 (4.1)</u> ^b	—	—
	40	12.2	<u>35</u>	<u>10.7</u>	—	—	75 (5.2)	60 (4.1)	—	—
	45	13.7	<u>40</u>	<u>12.2</u>	In-rack sprinklers required. See Chapter 25.	In-rack sprinklers required. See Chapter 25.	—	—	—	—

<u>Commodity^a</u>	<u>Maximum Ceiling/Roof Height</u>		<u>Maximum Storage Height</u>		<u>ESFR Sprinklers — Pendent Orientation</u> <u>Minimum Operating Pressure</u> psi (bar)				<u>ESFR Sprinklers — Upright Orientation</u> <u>Minimum Operating Pressure</u> psi (bar)	
					<u>Nominal K-Factors</u>				<u>Nominal K-Factors</u>	
	<u>ft</u>	<u>m</u>	<u>ft</u>	<u>m</u>	<u>14 (200)</u>	<u>16.8 (240)</u>	<u>22.4 (320)</u>	<u>25.2 (360)</u>	<u>14 (200)</u>	<u>16.8 (240)</u>
Exposed expanded Group A plastics	25	7.6	<u>20</u>	<u>6.1</u>	—	—	—	30 (2.0) ^c or 60 (4.1) ^d	—	—
	30	9.1	<u>25</u>	<u>7.6</u>	—	—	—	30 (2.0) ^{b,c} or 60 (4.1) ^d	—	—
	<u>32</u>	<u>9.8</u>	<u>—</u>	<u>—</u>	—	—	—	—	—	—
	35	10.7	<u>30</u>	<u>9.1</u>	—	—	—	60 (4.1) ^{c,d}	—	—
	40	12.2	<u>35</u>	<u>10.7</u>	—	—	—	60 (4.1) ^{b,e,c,d}	—	—
	45	13.7	<u>40</u>	<u>12.2</u>	—	—	—	—	—	—
<p>^aSee 20.3.2 for information regarding protection of lower hazard commodities with higher hazard criteria.</p> <p>^b These options are based on the testing criteria of the higher hazard and have not been specifically tested.</p> <p>^{b,c} These options apply when all requirements in Section 27.4 23.4 are applied including vertical barriers.</p> <p>^{e,d} This option applies to palletized and solid pile storage in a closed array.</p>										

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_AUT_SSD_FDM_23.3.1_FR1218.xlsx	For staff use only	

Submitter Information Verification

Committee: AUT-SSD
Submission Date: Fri Jul 29 10:53:37 EDT 2022

Committee Statement

Committee Statement: Maximum storage heights have been added back into the table as they are the maximum storage heights utilized in the large-scale fire tests that determined the design criteria. Additionally, the reference was corrected in note (b) and design

schemes that protect higher hazards were filled in blank cells to protect less hazardous arrangements.

The extrapolation of discharge criteria was also reduced for 25 and 30 ft storage of Group A plastics (excluding exposed expanded) to have the same discharge pressure as the K-16.8 sprinkler.

Response FR-1218-NFPA 13-2022
Message:

[Public Input No. 552-NFPA 13-2022 \[Section No. 23.3.1\]](#)

[Public Input No. 452-NFPA 13-2022 \[Section No. 23.3.1\]](#)

[Public Input No. 411-NFPA 13-2022 \[Section No. 23.3.1\]](#)

[Public Input No. 323-NFPA 13-2022 \[Section No. 23.3.1\]](#)



First Revision No. 1220-NFPA 13-2022 [Section No. 24.2.1]

24.2.1

Protection of palletized and solid-piled storage of Class I through Class IV and cartoned nonexpanded plastic commodities shall be permitted to be protected in accordance with Table 24.2.1.

Table 24.2.1 Extended Coverage, CMSA [K-factor 25.2 (360)] Sprinkler Design Criteria for Palletized and Solid-Piled Storage of Class I Through Class IV and Cartoned Nonexpanded Plastic Commodities

<u>Storage Arrangement</u>	<u>Commodity Class</u>	<u>Maximum Storage Height*</u>		<u>Maximum Ceiling/Roof Height</u>		<u>K-Factor/Orientation</u>	<u>Type of System</u>	<u>Number of Design Sprinklers</u>	<u>Minimum Openings Per Sprinkler</u>
		<u>ft</u>	<u>m</u>	<u>ft</u>	<u>m</u>				
Palletized and solid-piled	Class I through Class IV, encapsulated and nonencapsulated, and cartoned nonexpanded plastics	20	6.1	30	9.1	25.2 (360) Upright/pendent	Wet	6	3 (2)
		20	6.1	30	9.1	25.2 (360) Upright/pendent	Wet	6	3 (2)
		25	7.6	30	9.1	25.2 (360) Upright/pendent	Wet	6	3 (2)
		25	7.6	30	9.1	25.2 (360) Upright/pendent	Wet	6	3 (2)
		25	7.6	35	10.7	25.2 (360) Upright/pendent	Wet	8	4 (2)
		25	7.6	35	10.7	25.2 (360) Upright	Wet	8	4 (2)

<u>Storage Arrangement</u>	<u>Commodity Class</u>	<u>Maximum Storage Height*</u>		<u>Maximum Ceiling/Roof Height</u>		<u>K-Factor/ Orientation</u>	<u>Type of System</u>	<u>Number of Design Sprinklers</u>	<u>M Op Pr</u>
		<u>ft</u>	<u>m</u>	<u>ft</u>	<u>m</u>				
		30	9.1	35	10.7	25.2 (360) Upright/ pendent	Wet	8	(2)
		30	9.1	35	10.7	25.2 (360) Upright	Wet	8	(2)

*A minimum clearance of 5 ft (1.5 m) shall be provided from sprinkler deflector to the top of storage.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 11:06:31 EDT 2022

Committee Statement

Committee Statement: The performance of extended coverage sprinklers during fire testing is particularly sensitive to a low clearance test condition. The 5 ft clearance value appears to be consistent with the fire test data that was submitted to support this design criteria.

Response Message: FR-1220-NFPA 13-2022

Public Input No. 409-NFPA 13-2022 [Section No. 24.2.1]



First Revision No. 1222-NFPA 13-2022 [Section No. 24.3.1]

24.3.1

Protection of single-, double-, and multiple-row racks without solid shelves of Class I through Class IV and cartoned nonexpanded plastic commodities shall be permitted to be protected in accordance with Table 24.3.1.

Table 24.3.1 Extended Coverage, CMSA [K-Factor 25.2 (360)] Sprinkler Design Criteria for Single-, Double-, and Multiple-Row Racks Without Solid Shelves of Class I Through Class IV and Cartoned Nonexpanded Plastic Commodities

<u>Storage Arrangement</u>	<u>Commodity Class</u>	<u>Maximum Storage Height*</u>		<u>Maximum Ceiling/Roof Height</u>		<u>K-Factor/Orientation</u>	<u>Type of System</u>	<u>Number of Design Sprinklers</u>	<u>Minimum Open Protection</u>
		<u>ft</u>	<u>m</u>	<u>ft</u>	<u>m</u>				
Single-, double-, and multiple-row racks without solid shelves (no open-top containers)	Class I through Class IV, encapsulated and nonencapsulated, and cartoned nonexpanded plastics	20	6.1	30	9.1	25.2 (360) Upright/pendent	Wet	6	3 (2)
		20	6.1	30	9.1	25.2 (360) Upright/pendent	Wet	6	3 (2)
		25	7.6	30	9.1	25.2 (360) Upright/pendent	Wet	6	3 (2)
		25	7.6	30	9.1	25.2 (360) Upright/pendent	Wet	6	3 (2)
		25	7.6	35	10.7	25.2 (360) Upright/pendent	Wet	8	4 (2)
		25	7.6	35	10.7	25.2 (360) Upright	Wet	8	4 (2)

<u>Storage Arrangement</u>	<u>Commodity Class</u>	<u>Maximum Storage Height*</u>		<u>Maximum Ceiling/Roof Height</u>		<u>K-Factor/ Orientation</u>	<u>Type of System</u>	<u>Number of Design Sprinklers</u>	<u>M Op Pr</u>
		<u>ft</u>	<u>m</u>	<u>ft</u>	<u>m</u>				
		30	9.1	35	10.7	25.2 (360) Upright/ pendent	Wet	8	(2)
		30	9.1	35	10.7	25.2 (360) Upright	Wet	8	(2)

*A minimum clearance of 5 ft (1.5 m) shall be provided from sprinkler deflector to the top of storage.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 11:09:49 EDT 2022

Committee Statement

Committee Statement: The performance of extended coverage sprinklers during fire testing is particularly sensitive to a low clearance test condition. The 5 ft clearance value appears to be consistent with the fire test data that was submitted to support this design criteria.

Response Message: FR-1222-NFPA 13-2022

Public Input No. 410-NFPA 13-2022 [Section No. 24.3.1]



First Revision No. 1223-NFPA 13-2022 [Section No. 24.3.2]

24.3.2

Protection of Class I through Class IV and cartoned nonexpanded plastic commodities stored on single-, double-, or multiple-row racks without solid shelves or solid-piled, palletized, storage arrangements shall be permitted to be protected in accordance with Table 24.3.2 or Table 24.3.2(b).

Table 24.3.2 CMSA K-25.2 (K-360) Upright Standard Coverage Sprinkler Design Criteria for Single-, Double-, and Multiple-Row Racks Without Solid Shelves and Solid-Piled, Palletized Storage Arrangement of Class I Through IV and Cartoned Nonexpanded Plastic Commodities

Storage Arrangement	Commodity Class	Maximum Storage Height		Maximum Ceiling/Roof Height		K-Factor/Orientation	System Type	Number of Sprinklers
		ft	m	ft	m			
Solid-piled, palletized, and single-, double-, and multiple-row racks without solid shelves (no open-top containers)	Class I-IV encapsulated and nonencapsulated, and cartoned nonexpanded plastics	25	7.6	30	9.1	25.2 (360) Upright	Wet	1
						25.2 (360) Pendent		

Table 24.3.2(b) CMSA K-25.2 (K-360) Pendent Standard Coverage Sprinkler Design Criteria for Single-, Double-, and Multiple-Row Racks Without Solid Shelves and Solid-Piled, Palletized Storage Arrangement of Class I Through IV and Cartoned Nonexpanded Plastic Commodities

Storage Arrangement	Commodity Class	Maximum Storage Height		Maximum Ceiling/Roof Height		K-Factor/Orientation	System Type	Number of Sprinklers
		ft	m	ft	m			
Solid-piled, palletized, and single-, double-, and multiple-row racks without solid shelves (no open-top containers)	Class I-IV encapsulated and nonencapsulated, and cartoned nonexpanded plastics	25	7.6	30	9.1	25.2 (360) Pendent	Wet	

Supplemental Information

File Name
13_AUT_SSD_FDM_24.3.2_FR1223.jpg

Description
For staff use only

Approved

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 11:12:24 EDT 2022

Committee Statement

Committee Statement: Values in the two separate tables were combined for clarity.

Response Message: FR-1223-NFPA 13-2022

[Public Input No. 98-NFPA 13-2021 \[Section No. 24.3.2\]](#)



First Revision No. 1277-NFPA 13-2022 [Section No. 24.3.3 [Excluding any Sub-Sections]]

Protection of open rack storage of Class I through Class III commodities with dry pipe systems using standard response upright sprinkler design criteria and high-temperature-rated sprinklers shall be in accordance with Table 24.3.3.

Table 24.3.3 Standard Response Upright Sprinkler Design Criteria for Open Rack Storage of Class I Through Class III Commodities (Using High-Temperature-Rated Sprinklers)

<u>Storage Arrangement</u>	<u>Commodity Class</u>	<u>Maximum Storage Height</u>		<u>Maximum Ceiling/Roof Height</u>		<u>K-Factor</u>	<u>Type of System</u>	<u>Number of Design Sprinklers</u>	<u>Minimum Operating Pressure</u>	
		<u>ft</u>	<u>m</u>	<u>ft</u>	<u>m</u>				<u>psi</u>	<u>bar</u>
Rack storage without solid shelves (no open-top containers)	Class I, Class II, or Class III	35	10.7	40	12.2	25.2 (360)	Dry	24	15*	1.0*
		40	12.2	45	13.7	25.2 (360)	Dry	12	50†	3.4†
		45	13.7	50	15.2	33.6 (480)	Dry	15	50†	3.4†
		50	15.2	55	16.7	33.6 (480)	Dry	16	50†	3.4†

*25-second water delivery time maximum.

†20-second water delivery time maximum. For the 12-sprinkler design incorporate a 500 gpm (1900 L/min) hose stream allowance and a 90-minute duration.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Sat Jul 30 09:44:46 EDT 2022

Committee Statement

Committee Statement: While this design is based on 12 sprinklers the test results demonstrate that it is not meeting a suppression type of performance and a hose allowance of 500 gpm (1900 L/min) and a 90 minute duration is appropriate.

Response Message: FR-1277-NFPA 13-2022



First Revision No. 1278-NFPA 13-2022 [Section No. 24.4.1]

24.4.1

The minimum water supply requirements for a hydraulically designed sprinkler system shall be determined by adding the hose stream allowance from ~~Table 20.15.2.6~~ 20.15.2.6 to the water supply for sprinklers obtained from this chapter.

24.4.1.1

The water supply requirements for a hydraulically designed sprinkler system shall be available for the minimum duration specified in ~~Table 20.15.2.6~~ 20.15.2.6.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Sat Jul 30 09:47:55 EDT 2022

Committee Statement

Committee Statement: It is more appropriate to reference the section rather than the table.

Response Message: FR-1278-NFPA 13-2022



First Revision No. 1311-NFPA 13-2022 [Section No. 25.1.2]

25.1.2 Chapter Organization.

This chapter is shall be organized as follows:

- (1) Section 25.1 contains general requirements for the entire chapter.
- (2) Section 25.2 contains requirements for the protection of miscellaneous and low-piled rack storage using in-rack sprinklers.
- (3) Section 25.3 contains requirements for in-rack sprinkler protection with solid shelves.
- (4) Section 25.4 contains requirements for in-rack sprinkler protection in combination with CMDA ceiling-level sprinklers.
- (5) Section 25.5 contains requirements for in-rack sprinkler protection in combination with CMSA ceiling-level sprinklers.
- (6) Section 25.6 contains requirements for in-rack sprinkler protection in combination with ESFR ceiling-level sprinklers.
- (7) Section 25.7 contains requirements for in-rack sprinkler protection independent of ceiling-level sprinklers.

~~Section 25.8 contains requirements for the evaluation or modification of existing protection for miscellaneous and low-piled rack storage using in-rack sprinklers.~~

~~Section 25.9 contains requirements for the evaluation or modification of existing protection for CMDA ceiling-level sprinkler rack storage protection of Class I through Class IV commodities over 12 ft (3.7 m) and up to and including 25 ft (7.6 m) using in-rack sprinklers.~~

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Mon Aug 15 14:41:49 EDT 2022

Committee Statement

Committee Statement: The information provided in Sections 25.1.2(7) and 25.1.2(8) is being deleted due to a proposal to relocate the requirements in Sections 25.7 and 25.8 into Chapter 30. See the proposals specific to Section 30.4.6.

Response Message: FR-1311-NFPA 13-2022

Public Input No. 523-NFPA 13-2022 [Section No. 25.1.2]

**First Revision No. 1233-NFPA 13-2022 [Sections 25.1.7.7, 25.1.7.8, 25.1.7.9]****25.1.7.7**

~~Where rack storage of Class I through Class IV commodities is up to and including 25 ft (7.6 m), in-rack sprinklers shall be permitted to be installed horizontally without regard to rack uprights. (See Section C.17 .)~~

[See FR-1232](#)

25.1.7.7

~~Where rack storage is over 25 ft (7.6 m) in height, in~~ In-rack sprinklers shall be a minimum 3 in. (75 mm) radially from the side of rack uprights. ([See Section C.17 .](#))

25.1.7.8

~~Where rack storage is over 25 ft (7.6 m) in height and will be protected by face sprinklers, the~~ [Face](#) sprinklers shall be located within the rack a minimum 3 in. (75 mm) from rack uprights and no more than 18 in. (450 mm) from the aisle face of storage.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_AUT_SSD_FDM_25.1.7.7_FR1233.docx	For staff use only	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 12:04:36 EDT 2022

Committee Statement

Committee Statement: The annex note to 25.1.7.8 suggested providing 3 in. radial clearance from all rack uprights regardless of the commodity or storage height. This change brings the annex note into the body and uses enforceable language.

Response Message: FR-1233-NFPA 13-2022

[Public Input No. 293-NFPA 13-2022 \[New Section after 25.1.7.7\]](#)



First Revision No. 1176-NFPA 13-2022 [Section No. 25.2.1.4.3]

25.2.1.4.3

The sprinkler system criteria specified in this chapter for miscellaneous storage shall ~~not be limited to a ceiling slope of 2 in 12 (16.7 percent)~~ be permitted for both horizontal and sloped ceilings .

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Jul 28 12:19:59 EDT 2022

Committee Statement

Committee Statement: The proposed language clarifies that any sloped ceiling is allowed for miscellaneous storage. Horizontal and sloped ceilings are defined terms.

Response Message: FR-1176-NFPA 13-2022

[Public Input No. 177-NFPA 13-2022 \[Section No. 25.2.1.4.3\]](#)



First Revision No. 1177-NFPA 13-2022 [Section No. 25.2.2.4.2]

25.2.2.4.2

The sprinkler system criteria specified in this chapter for low-piled storage shall ~~not be limited to a ceiling slope of 2 in 12 (16.7 percent).~~ be permitted for both horizontal and sloped ceilings.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Jul 28 12:21:17 EDT 2022

Committee Statement

Committee Statement: The proposed language clarifies that any sloped ceiling is allowed for low-piled storage. Horizontal and sloped ceilings are defined terms.

Response Message: FR-1177-NFPA 13-2022

[Public Input No. 178-NFPA 13-2022 \[Section No. 25.2.2.4.2\]](#)



First Revision No. 1267-NFPA 13-2022 [Section No. 25.2.2.5]

25.2.2.5 ~~Ceiling Sprinkler Design in Combination with In-Rack Sprinklers for Low-Piled Storage with Solid Shelves.~~

25.2.2.5.1

~~For low-piled rack storage with solid shelves of Class I through Class IV commodities up to and including 12 ft (3.7 m) in height that does not meet the definition of miscellaneous storage, the ceiling-level sprinkler design shall be permitted to be a 0.20 gpm/ft² (0.8.2 mm/min) density over a 1500 ft² (140 m²) area of ceiling-level sprinkler operation where the in-rack sprinklers are installed in accordance with Section 25.3 .~~

25.2.2.5.2

~~For low-piled rack storage with solid shelves of Group A plastic commodities up to and including 5 ft (1.5 m) in height that does not meet the definition of miscellaneous storage, the ceiling-level sprinkler design shall be permitted to be a 0.20 gpm/ft² (0.8.2 mm/min) density over a 1500 ft² (140 m²) area of ceiling-level sprinkler operation where the in-rack sprinklers are installed in accordance with Section 25.3 .~~

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 18:26:42 EDT 2022

Committee Statement

Committee Statement: Simplifies and reorganizes the requirements for miscellaneous storage and low piled storage removing redundancy with Chapter 4.

Response Message: FR-1267-NFPA 13-2022

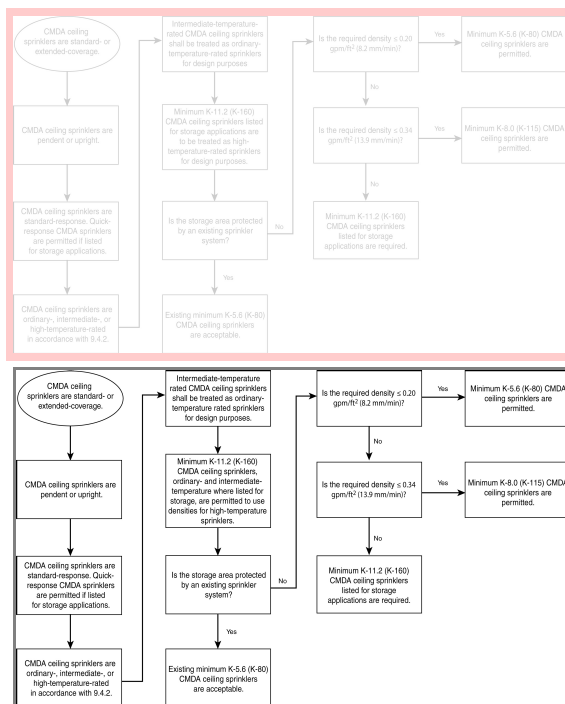


First Revision No. 1216-NFPA 13-2022 [Section No. 25.3.1.3]

25.4.1.3 CMDA Ceiling-Level Sprinkler Characteristics.

CMDA Ceiling-level sprinkler characteristics in combination with in-rack sprinklers shall be in accordance with Figure 25.4.1.3.

Figure 25.4.1.3 CMDA Ceiling-Level Sprinkler Characteristics in Combination with In-Rack Sprinklers.



Supplemental Information

File Name	Description	Approved
13_AUT_SSD_FDM_25.3.1.3_FR1216.JPG	For staff use only	

Submitter Information Verification

Committee: AUT-SSD
Submittal Date: Fri Jul 29 10:15:14 EDT 2022

Committee Statement

Committee Statement: The revision removes the requirement to treat 11.2 or large as high temperature, as high temperature may be more onerous than using ordinary temperature in some cases.

Response Message: FR-1216-NFPA 13-2022

[Public Input No. 230-NFPA 13-2022 \[Section No. 25.3.1.3\]](#)



First Revision No. 1231-NFPA 13-2022 [Section No. 25.5.4.3]

25.6.4.3

The design area applicable to the ceiling-level design options listed in Table 25.6.4.1 shall consist of ~~the most hydraulically demanding area of 12 sprinklers, consisting of four sprinklers on each of the three branch lines~~ comply with Section 23.2 .

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 12:00:27 EDT 2022

Committee Statement

Committee Statement: The deleted text is in 23.2 and therefore this removes redundancy.

Response Message: FR-1231-NFPA 13-2022

Public Input No. 299-NFPA 13-2022 [Section No. 25.5.4.3]



First Revision No. 1237-NFPA 13-2022 [Section No. 25.6.2.3.1]

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

Rack Type	Option 1	Option 2a and Option 2b	Option 3
Single-row racks	5 ft (1.5 m)	4.5 ft (1.4 m)	10 ft (3.0 m)
	[See Figure 25.6 7.2.3.1(a).]	[See Figure 25.6 7.2.3.1(b), Figure 25.6 7.2.3.1(c), and Figure 25.6 7.2.3.1(d).]	[See Figure 25.6 7.2.3.1(e) and Figure 25.6 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 25.6 7.2.3.1(a).]	[See Figure 25.6 7.2.3.1(b), Figure 25.6 7.2.3.1(c), and Figure 25.6 7.2.3.1(d).]	[See Figure 25.6 7.2.3.1(e) and Figure 25.6 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 25.6 7.2.3.1(b), Figure 25.6 7.2.3.1(c), and Figure 25.6 7.2.3.1(d).]	[See Figure 25.6 7.2.3.1(e) and Figure 25.6 7.2.3.1(f).]
	[See Figure 25.6 7.2.3.1(a).]		

Note: Option 1, Option 2a, Option 2b, and Option 3 are in reference to those listed in Table 25.6 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) In-Rack Sprinkler Arrangements for Class I through Class IV and Group A Plastic Commodities.

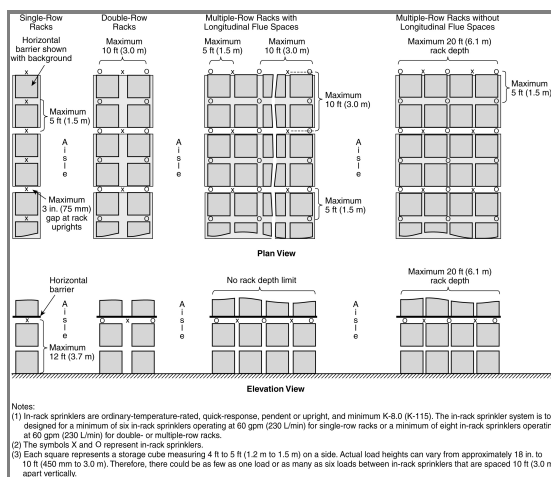


Figure 25.7.2.3.1(b) In-Rack Sprinkler Arrangements for Class I through Class IV and Cartoned Group A Plastic Commodities, Maximum 30 ft (9.1 m) Vertical Increments.

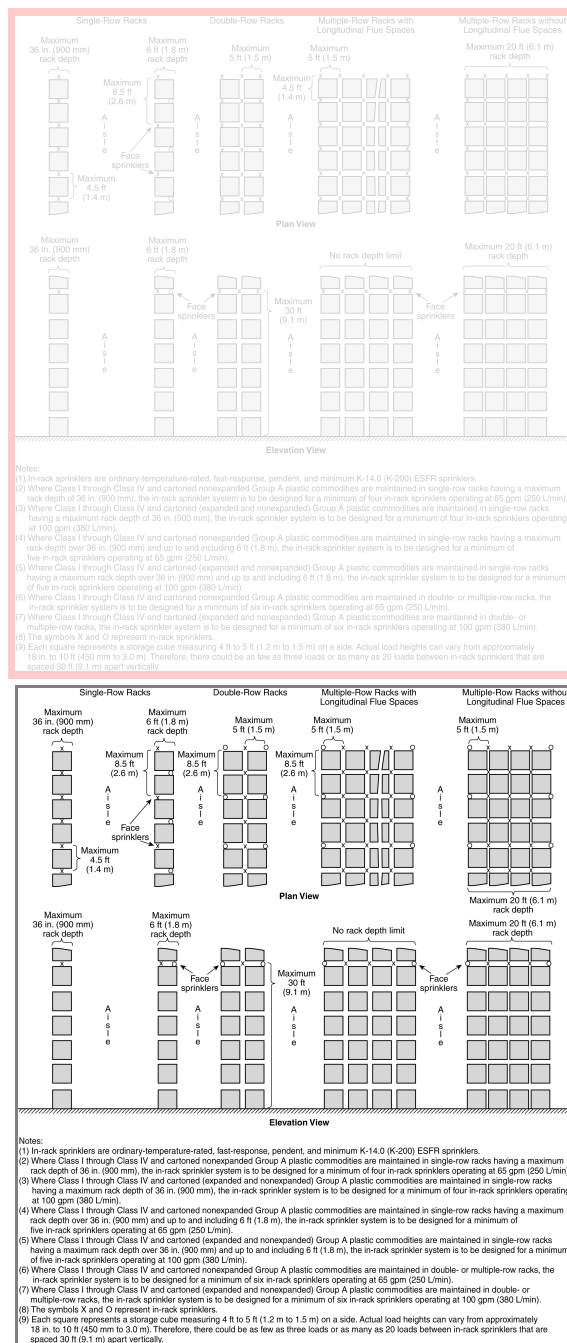


Figure 25.7.2.3.1(c) In-Rack Sprinkler Arrangements for Class I through Class IV and Group A Plastic Commodities, Maximum 30 ft (9.1 m) Vertical Increments.

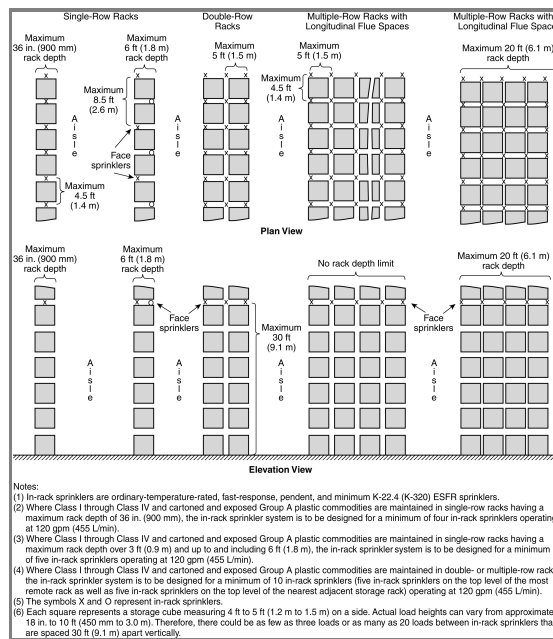


Figure 25.7.2.3.1(d) In-Rack Sprinkler Arrangements for Class I through Class IV and Cartoned Group A Plastic Commodities, Maximum 40 ft (12.2 m) Vertical Increments.

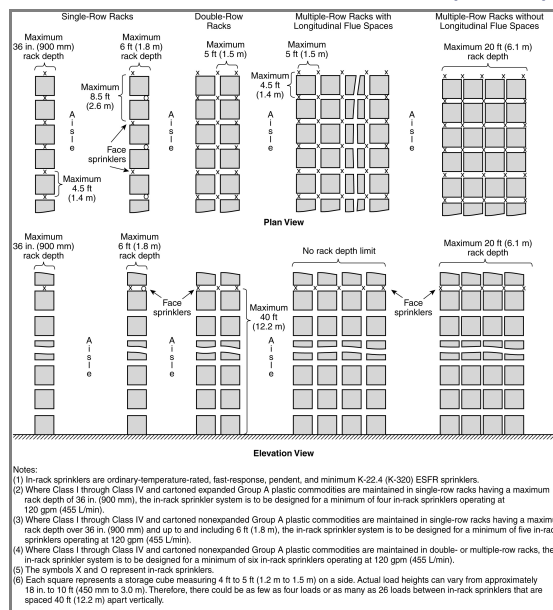


Figure 25.7.2.3.1(e) In-Rack Sprinkler Arrangements for Class I through Class IV and Cartoned Group A Plastic Commodities, Maximum 30 ft (9.1 m) Vertical Increments.

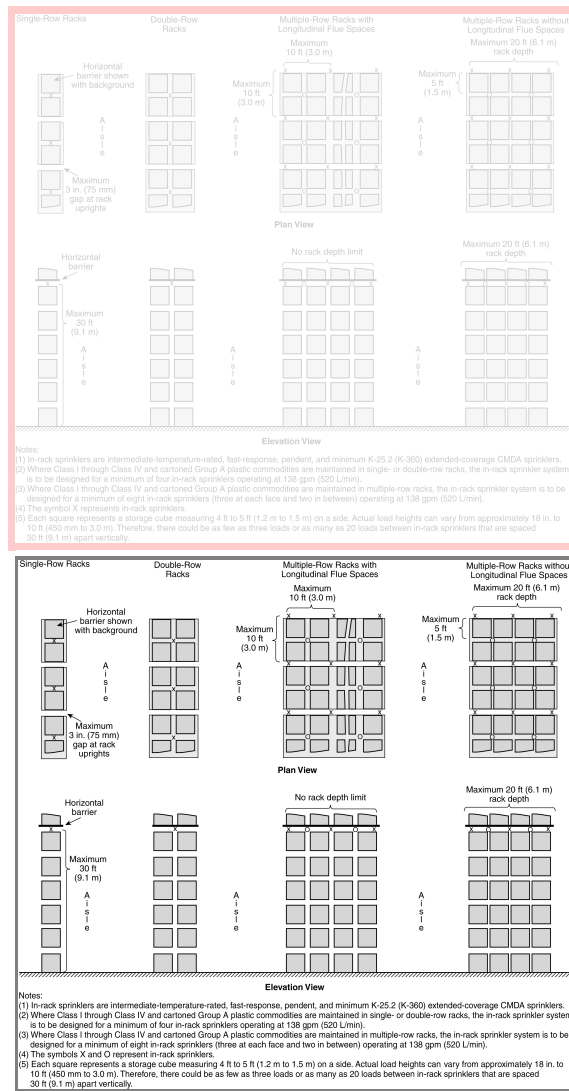
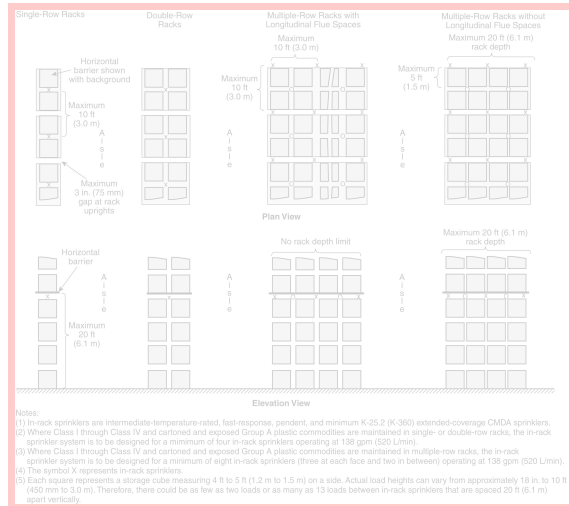
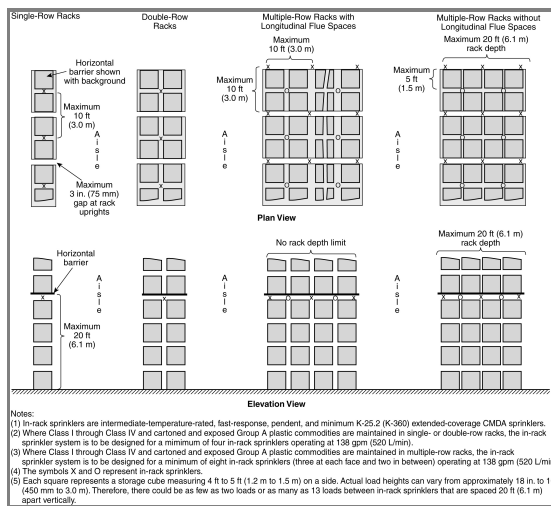


Figure 25.7.2.3.1(f) In-Rack Sprinkler Arrangements for Class I through Class IV and Group A Plastic Commodities, Maximum 20 ft (6.1 m) Vertical Increments.





Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_AUT_SSD_FDM_25.6.2.3.1_FR1237_FINAL.pdf	For staff use only	

Submitter Information Verification

Committee: AUT-SSD
Submittal Date: Fri Jul 29 13:25:38 EDT 2022

Committee Statement

Committee Statement: The in-rack sprinklers are indicated with both X and O and the note to the figure should indicate that. Figure 25.6.2.3.1(b) was revised to align with the 2016 edition figure.

Response Message: FR-1237-NFPA 13-2022

[Public Input No. 453-NFPA 13-2022 \[Global Input\]](#)

[Public Input No. 454-NFPA 13-2022 \[Global Input\]](#)

[Public Input No. 455-NFPA 13-2022 \[Global Input\]](#)



First Revision No. 1229-NFPA 13-2022 [Section No. 25.6.3.1]

25.7.3.1 In-Rack Sprinkler System Requirements.

Regardless of the number of in-rack sprinkler levels installed, the in-rack sprinkler system design, in terms of the number of operating sprinklers at a minimum flow from the most remote in-rack sprinkler, shall be in accordance with Table 25.7.3.1.

Table 25.7.3.1 In-Rack Sprinkler System Design for Options 1, 2a, 2b, and 3

<u>IRAS Option</u>	<u>Commodity Hazard</u>	<u>Maximum In-Rack Sprinkler Vertical Interval ft (m)</u>	<u>In-Rack Sprinkler K-factor</u>	<u>In-Rack Sprinkler System Design, No. of IRAS @ Minimum Flow, gpm (L/min)</u>			
				<u>Single-Row Racks up to 3 ft (0.9 m) Deep</u>	<u>Single-Row Racks over 3 ft (0.9 m) and up to 6 ft (1.8 m) Deep</u>	<u>Double-Row Racks</u>	<u>Multiple-Row Racks^a</u>
1	Class I–IV and Group A plastic (Cartoned cartoned and exposed) commodities	12 (3.7)	Minimum K-8.0 (K-115)	6 @ 60 (227)	6 @ 60 (227)	8 @ 60 (227)	8 @ 60 (227)
2a	Class I–IV and cartoned nonexpanded Group A plastics	30 (9.1)	Minimum K-14.0 (K-200) Pendent ESFR	4 @ 65 (250)	5 @ 65 (250)	6 @ 65 (250)	6 @ 65 (250)
2a	Cartoned expanded Group A plastics (Also, Class I–IV and cartoned nonexpanded Group A plastics) Class I–IV, cartoned Group A plastics (both nonexpanded and expanded), and exposed nonexpanded Group A plastics	30 (9.1)	Minimum K-14.0 (K-200) pendent ESFR	4 @ 100 (380)	5 @ 100 (380)	6 @ 100 (380)	6 @ 100 (380)
2b	Exposed group A plastic commodities (Also, class I–IV and cartoned Group A plastics) Class I–IV, and Group A plastics (nonexpanded and expanded as well as cartoned and exposed)	30 (9.1)	Minimum K-22.4 (K-320) pendent ESFR	4 @ 120 (455)	5 @ 120 (455)	5 and 5 ^b * @ 120 (455)	5 and 5 ^b * @ 120 (455)
2b	Class I–IV and cartoned nonexpanded Group A plastics	40 (12.2)	Minimum K-22.4 (K-320) pendent ESFR	4 @ 120 (455)	5 @ 120 (455)	6 @ 120 (455)	6 @ 120 (455)

<u>IRAS Option</u>	<u>Commodity Hazard</u>	<u>Maximum In-Rack Sprinkler Vertical Interval ft (m)</u>	<u>In-Rack Sprinkler K-factor</u>	<u>In-Rack Sprinkler System Design, No. of IRAS @ Minimum Flow, gpm (L/min)</u>			
				<u>Single- Row Racks up to 3 ft (0.9 m) Deep</u>	<u>Single- Row Racks over 3 ft (0.9 m) and up to 6 ft (1.8 m) Deep</u>	<u>Double- Row Racks</u>	<u>Multiple- Row Racks^a</u>
3	Class I–IV and cartoned (Nonexpanded and expanded) Group A plastic commodities	30 (9.1)	K25.2 (K-360) pendent extended coverage	4 @ 138 (520)	4 @ 138 (520)	4 @ 138 (520)	8 ^{e,†} @ 138 (520)
3	Exposed group A plastic commodities (Also, Class I–IV and cartoned Group A plastics)	20 (6.1)	K25.2 (K-360) pendent extended coverage	4 @ 138 (520)	4 @ 138 (520)	4 @ 138 (520)	8 ^{e,†} @ 138 (520)

Notes : Option 1, Option 2a, Option 2b, and Option 3 are in reference to those listed in Table 25.6.2.2 25.7.2.2 .

^a For maximum rack depths of 16 ft (4.9 m) for Option 2 and Option 3.

^b * This represents five sprinklers in the most remote rack as well as five sprinklers in the nearest adjacent rack when exposed expanded Group A plastics are being protected .

^{e,†} This represents three sprinklers at each rack face and the two sprinklers in-between them.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_AUT_SSD_FDM_25.6.3.1_FR1229.docx	For staff use only	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 11:52:59 EDT 2022

Committee Statement

Committee Statement: Table notes were updated to reflect new requirements for multi-row rack depth added in the 2022 edition.

Response Message: FR-1229-NFPA 13-2022

Public Input No. 456-NFPA 13-2022 [Section No. 25.6.3.1]



First Revision No. 1228-NFPA 13-2022 [New Section after 25.6.3.2.2]

25.7.3.2.3

Where there is no storage above the highest level of in-rack sprinklers, the ceiling-level sprinkler system shall be in accordance with Chapter 19 and not consider the contents of the racking structure.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 11:49:58 EDT 2022

Committee Statement

Committee Statement: A new section was added to add a pointer back to Chapter 19 when no storage is above the level of in-racks.

Response Message: FR-1228-NFPA 13-2022

Public Input No. 102-NFPA 13-2021 [Section No. 25.6.3.2]



First Revision No. 1337-NFPA 13-2022 [Sections 25.7, 25.8]

25.8 Evaluation or Modification of Existing Protection for Miscellaneous and Low-Piled Rack Storage Using In-Rack Sprinklers.

25.8.1 Miscellaneous Rack Storage.

25.8.1.1 Scope.

This section shall apply to miscellaneous rack storage up to and including 12 ft (3.7 m) in height of Class I through Class IV commodities, Group A plastic commodities and rubber tires.

25.8.1.2 In-Rack Sprinkler Design for Miscellaneous Storage.

Where in-rack sprinklers are installed in accordance with Section 25.4 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, the in-rack sprinkler design shall be based on the hydraulically most demanding four adjacent in-rack sprinklers using a minimum flow of 22 gpm (83 L/min) from the hydraulically most remote in-rack sprinkler.

25.8.1.3 Horizontal Spacing of In-Rack Sprinklers for Miscellaneous Storage.

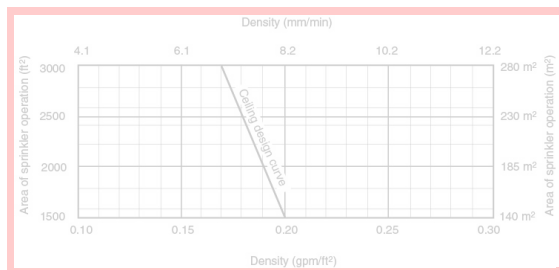
The maximum allowable horizontal spacing of in-rack sprinklers is 10 ft (3.0 m).

25.8.1.4 Ceiling Sprinkler Design in Combination with In-Rack Sprinklers for Miscellaneous Storage.

25.8.1.4.1

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 in accordance with Figure 25.8.1.4.1.

Figure 25.8.1.4.1 CMDA Ceiling-Level Sprinkler Design Criteria for Miscellaneous Storage Protected with One Level of In-Rack Sprinklers.



25.8.1.4.2

Installation criteria as permitted by this standard and design criteria and modifiers as permitted by the density/area method of Section 19.1 for ordinary hazard Group 2 occupancies shall be applicable.

25.8.1.4.3

The sprinkler system criteria specified in this chapter for miscellaneous storage shall not be limited to a ceiling slope of 2 in 12 (16.7 percent).

25.8.1.5 Hose Connections.

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

25.8.2 Low-Piled Rack Storage.**25.8.2.1 Scope.**

This section shall apply to any of the following situations:

Rack storage of Class I through Class IV commodities up to and including 12 ft (3.7 m) in height

* Rack storage of Group A plastic commodities up to and including 5 ft (1.5 m) in height

25.8.2.2 In-Rack Sprinkler Design for Low-Piled Storage.

Where in-rack sprinklers are installed in accordance with Section 25.4 to protect low-piled rack storage of Class I through Class IV commodities up to and including 12 ft (3.7 m) in height and low-piled rack storage of Group A plastic commodities up to and including 5 ft (1.5 m) in height, the in-rack sprinkler design shall be based on the hydraulically most demanding four adjacent in-rack sprinklers using a minimum flow of 22 gpm (83 L/min) from the hydraulically most remote in-rack sprinkler.

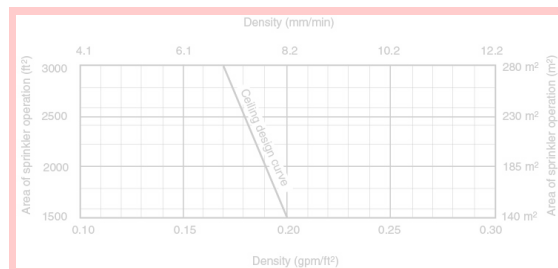
25.8.2.3 Horizontal Spacing of In-Rack Sprinklers for Low-Piled Storage.

The maximum allowable horizontal spacing of in-rack sprinklers is 10 ft (3.0 m).

25.8.2.4 Ceiling Sprinkler Design in Combination with In-Rack Sprinklers for Low-Piled Storage.**25.8.2.4.1**

Where in-rack sprinklers are installed in accordance with Section 25.4 to protect low-piled rack storage of Class I through Class IV and Group A plastic commodities that does not meet the definition of miscellaneous storage, the ceiling-level design shall be in accordance with Figure 25.8.2.4.1.

Figure 25.8.2.4.1 CMDA Ceiling-Level Sprinkler Design Criteria for Low-Piled Storage Protected with One Level of In-Rack Sprinklers.

**25.8.2.4.2**

The sprinkler system criteria specified in this chapter for low-piled storage shall not be limited to a ceiling slope of 2 in 12 (16.7 percent).

25.8.2.5 Ceiling Sprinkler Design in Combination with In-Rack Sprinklers for Low-Piled Storage with Solid Shelves.**25.8.2.5.1**

For low-piled rack storage with solid shelves of Class I through Class IV commodities up to and including 12 ft (3.7 m) in height that does not meet the definition of miscellaneous storage, the ceiling-level sprinkler design shall be permitted to be in accordance with Figure 25.8.2.4.1 where the in-rack sprinklers are installed in accordance with Section 25.3.

25.8.2.5.2

For low-piled rack storage with solid shelves of Group A plastic commodities up to and including 5 ft (1.5 m) in height that does not meet the definition of miscellaneous storage, the ceiling-level sprinkler design shall be permitted to be in accordance with Figure 25.8.2.4.1 where the in-rack sprinklers are installed in accordance with Section 25.3.

25.8 Evaluation or Modification of Existing CMDA Ceiling-Level Sprinkler Rack Storage Protection of Class I through Class IV Commodities Over 12 ft (3.7 m) and Up to and Including 25 ft (7.6 m) in Height Using In-Rack Sprinklers.

25.8.1 General.

25.8.1.1 In-Rack Sprinkler Protection in Combination with CMDA Ceiling-Level Sprinklers.

25.8.1.1.1

Unless indicated otherwise, the guidelines from Section 25.1 for in-rack sprinklers shall apply to Section 25.8.

25.8.1.1.2

The in-rack sprinkler system design, in terms of number of operating sprinklers at a minimum flow from the most remote in-rack sprinkler, in combination with CMDA ceiling-level sprinklers shall be in accordance with Table 25.8.1.1.2.

Table 25.8.1.1.2 Design Criteria for In-Rack Sprinklers in Combination with CMDA Ceiling-Level Sprinklers for Class I through Class IV Commodities Stored Over 12 ft (3.7 m) and Up to and Including 25 ft (7.6 m)

Commodity Classification	Rack Type	No. of IRAS Levels	IRAS Design, No. of IRAS @ gpm (L/min)
Class I, Class II or Class III	Open	1	6 @ 22 (83)
		More than 1	10 (5 in-rack sprinklers on top 2 in-rack sprinkler levels) @ 22 (83)
	Solid shelves	1	6 @ 30 (114)
		More than 1	10 (5 in-rack sprinklers on top 2 in-rack sprinkler levels) @ 30 (114)
Class IV	Open	1	8 @ 22 (83)
		More than 1	10 (5 in-rack sprinklers on top 2 in-rack sprinkler levels) @ 22 (83)
	Solid shelves	1	8 @ 30 (114)
		More than 1	14 (7 in-rack sprinklers on top 2 in-rack sprinkler levels) @ 30 (114)

25.8.1.2 CMDA Ceiling-Level Sprinkler Protection in Combination with In-Rack Sprinklers.

25.8.1.2.1

Unless indicated otherwise, the guidelines from Section 25.1 for CMDA ceiling-level sprinklers shall apply to Section 25.8.

25.8.1.2.2

CMDA ceiling-level sprinkler design criteria, in combination with in-rack sprinklers, for rack storage over 12 ft (3.7 m) and up to and including 25 ft (7.6 m) in height of Class I through Class IV commodities shall be in accordance with the following:

For the storage of exposed nonencapsulated Class I, Class II, Class III, or Class IV commodities, see 25.8.2.2

For the storage of exposed encapsulated, or cartoned (nonencapsulated or encapsulated) Class I, Class II, Class III, or Class IV commodities, see 25.8.3.2

25.8.1.2.3

The use of quick-response CMDA sprinklers for storage applications shall be permitted when listed for such use.

25.8.1.2.4

The water supply for sprinklers only shall be determined from the density/area requirements of this chapter.

25.8.1.2.5

The calculations shall satisfy any single point on appropriate density/area curves.

25.8.1.2.6

The ceiling-level sprinkler system design area shall meet the requirements of 28.3.4.2.1.

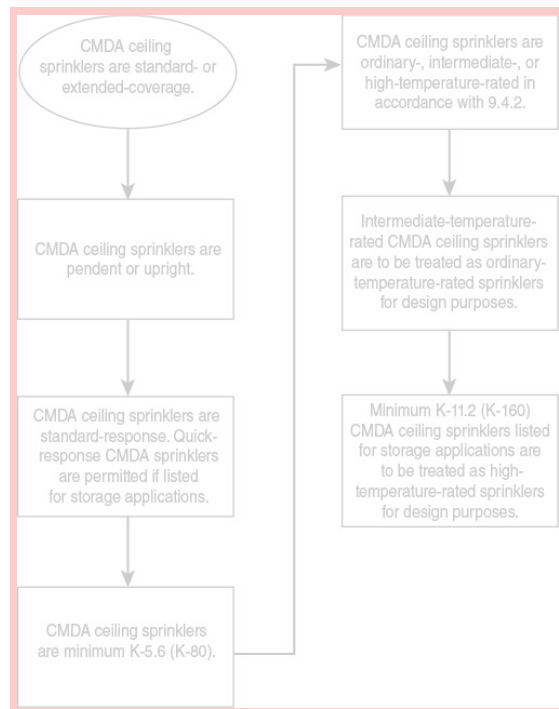
25.8.1.2.7

The minimum design density shall not be less than 0.15 gpm/ft^2 (6.1 mm/min) after all adjustments are made.

25.8.1.2.8 CMDA Ceiling-Level Sprinkler Characteristics.

CMDA Ceiling-level sprinkler characteristics in combination with in-rack sprinklers shall be in accordance with Figure 25.8.1.2.8.

Figure 25.8.1.2.8 CMDA Ceiling-Level Sprinkler Characteristics in Combination with In-Rack Sprinklers.



25.8.2 Exposed Nonencapsulated Class I, Class II, Class III, or Class IV Commodities Stored Up to and Including 25 ft (7.6 m) in Height.

~~25.8.2.1* – In-Rack Sprinkler Arrangements and Designs for Exposed Nonencapsulated Class I, Class II, Class III, or Class IV Commodities Stored Up to and Including 25 ft (7.6 m) in Height.~~

~~A.25.8.2.1 –~~

~~Spacing of sprinklers on branchlines in racks in the various tests demonstrates that maximum spacing as specified is proper.~~

~~25.8.2.1.1 –~~

~~Where 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 will be protected by in-rack sprinklers, the following levels of in-rack sprinklers shall be required:~~

~~One level of in-rack sprinklers where Class I through Class IV commodities are stored in single- or double-row racks up to and including 25 ft (7.6 m)~~

~~One level of in-rack sprinklers where Class IV commodities are stored in multiple-row racks up to and including 20 ft (6.1 m)~~

~~Two levels of in-rack sprinklers where Class IV commodities are stored in multiple-row racks over 20 ft (6.1 m) and up to and including 25 ft (7.6 m)~~

25.8.2.1.2 –

Where rack storage of exposed nonencapsulated Class I or Class II commodities stored over 12 ft (3.7 m) and up to and including 25 ft (7.6 m) in height will be protected by in-rack sprinklers, in-rack sprinkler arrangements and designs shall be selected from Figure 25.8.2.1.2(a) through Figure 25.8.2.1.2(c) – (See Section 25.3 for racks with solid shelving.)

Figure 25.8.2.1.2(a) In-Rack Sprinkler Arrangements for Exposed Nonencapsulated Class I or Class II Commodities Stored to a Maximum Height of 25 ft (7.6 m) with One Level of In-Rack Sprinklers.

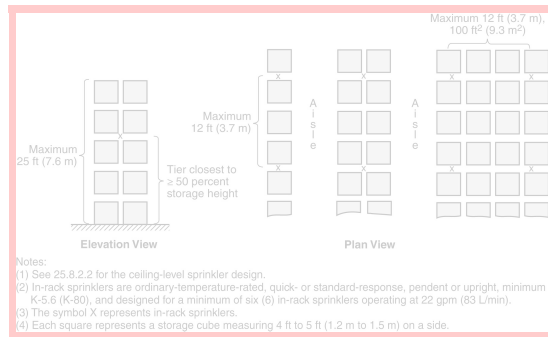


Figure 25.8.2.1.2(b) In-Rack Sprinkler Arrangements for Exposed Nonencapsulated Class I or Class II Commodities Stored to a Maximum Height of 25 ft (7.6 m) with More Than One Level of In-Rack Sprinklers (Not at Each Tier Level).

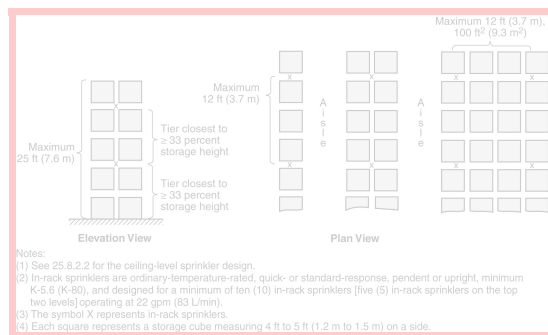
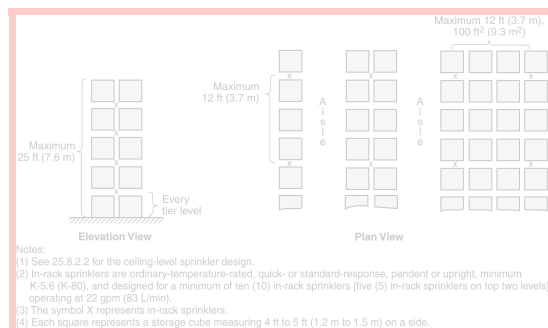


Figure 25.8.2.1.2(c) In-Rack Sprinkler Arrangements for Exposed Nonencapsulated Class I or Class II Commodities Stored to a Maximum Height of 25 ft (7.6 m) with In-Rack Sprinklers at Each Tier Level.



25.8.2.1.3 –

Where rack storage of exposed nonencapsulated Class III commodities stored over 12 ft (3.7 m) and up to and including 25 ft (7.6 m) in height will be protected by in-rack sprinklers, in-rack sprinkler arrangements and designs shall be selected from Figure 25.8.2.1.3(a) through Figure 25.8.2.1.3(c) – (See Section 25.3 for racks with solid shelving.)

Figure 25.8.2.1.3(a) In-Rack Sprinkler Arrangements for Exposed Nonencapsulated Class III Commodities Stored to a Maximum Height of 25 ft (7.6 m) with One Level of In-Rack Sprinklers.

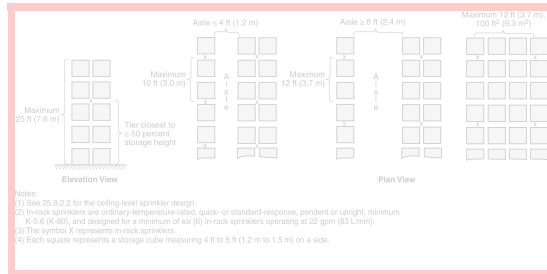


Figure 25.8.2.1.3(b) In-Rack Sprinkler Arrangements for Exposed Nonencapsulated Class III Commodities Stored to a Maximum Height of 25 ft (7.6 m) with More Than One Level of In-Rack Sprinklers (Not at Each Tier Level).

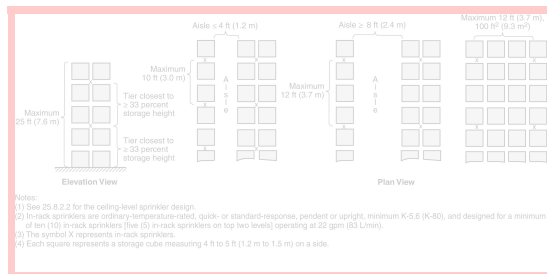
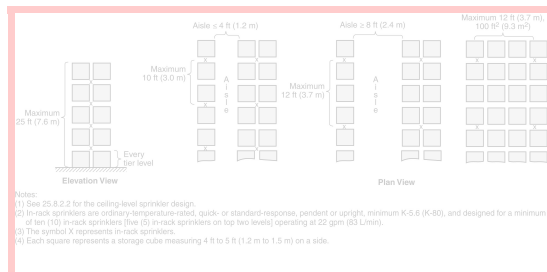


Figure 25.8.2.1.3(c) In-Rack Sprinkler Arrangements for Exposed Nonencapsulated Class III Commodities Stored to a Maximum Height of 25 ft (7.6 m) with In-Rack Sprinklers at Each Tier Level.



25.8.2.1.4 –

Where rack storage of exposed nonencapsulated Class IV commodities stored over 12 ft (3.7 m) and up to and including 25 ft (7.6 m) in height in single- and double-row racks will be protected by in-rack sprinklers, in-rack sprinkler arrangements and designs shall be selected from Figure 25.8.2.1.4(a) through Figure 25.8.2.1.4(c) – (See Section 25.3 for racks with solid shelving.)

Figure 25.8.2.1.4(a) In-Rack Sprinkler Arrangements for Exposed Nonencapsulated Class IV Commodities Stored to a Maximum Height of 25 ft (7.6 m) in Single- and Double-Row Racks with One Level of In-Rack Sprinklers.

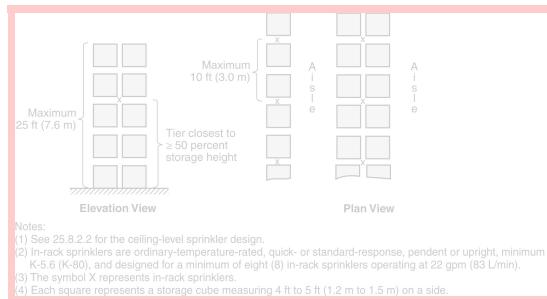


Figure 25.8.2.1.4(b) In-Rack Sprinkler Arrangements for Exposed Nonencapsulated Class IV Commodities Stored to a Maximum Height of 25 ft (7.6 m) in Single- and Double-Row Racks with More Than One Level of In-Rack Sprinklers (Not at Each Tier Level).

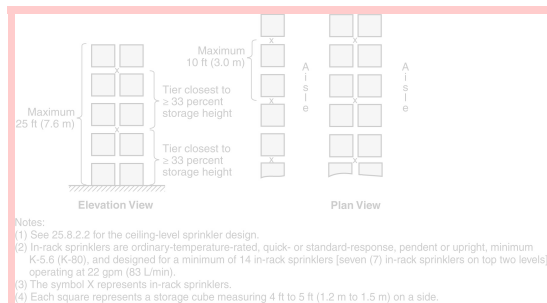
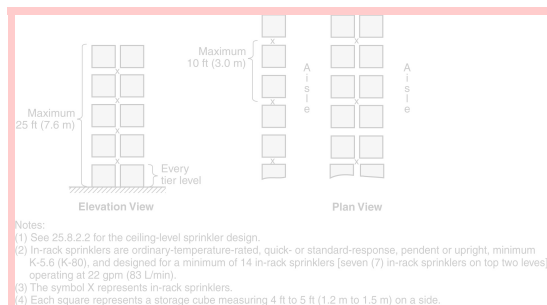


Figure 25.8.2.1.4(c) In-Rack Sprinkler Arrangements for Exposed Nonencapsulated Class IV Commodities Stored to a Maximum Height of 25 ft (7.6 m) in Single- and Double-Row Racks with In-Rack Sprinklers at Each Tier Level.



25.8.2.1.5 –

Where rack storage of exposed nonencapsulated Class IV commodities stored over 12 ft (3.7 m) and up to and including 20 ft (6.1 m) in height in multiple-row racks will be protected by in-rack sprinklers, in-rack sprinkler arrangements and designs shall be selected from Figure 25.8.2.1.5(a) through Figure 25.8.2.1.5(c) – (See Section 25.3 for racks with solid shelving.)

Figure 25.8.2.1.5(a) In-Rack Sprinkler Arrangements for Exposed Nonencapsulated Class IV Commodities Stored to a Maximum Height of 20 ft (6.1 m) in Multiple-Row Racks with One Level of In-Rack Sprinklers.

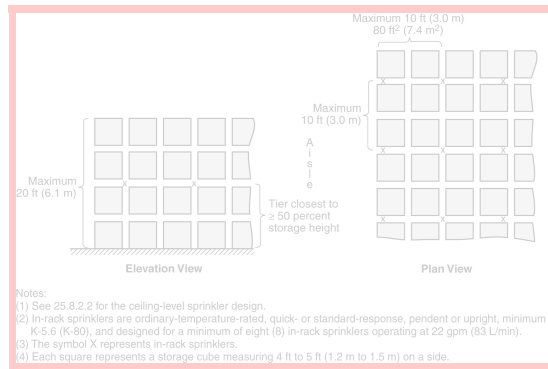


Figure 25.8.2.1.5(b) In-Rack Sprinkler Arrangements for Exposed Nonencapsulated Class IV Commodities Stored to a Maximum Height of 20 ft (6.1 m) in Multiple-Row Racks with More Than One Level of In-Rack Sprinklers.

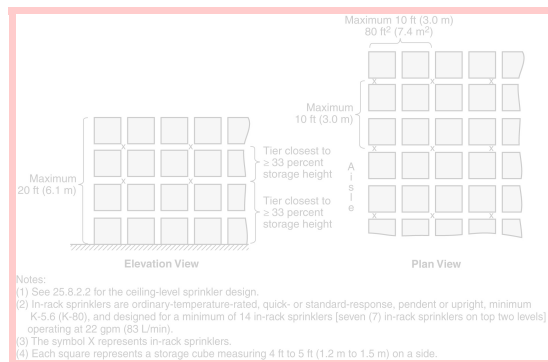
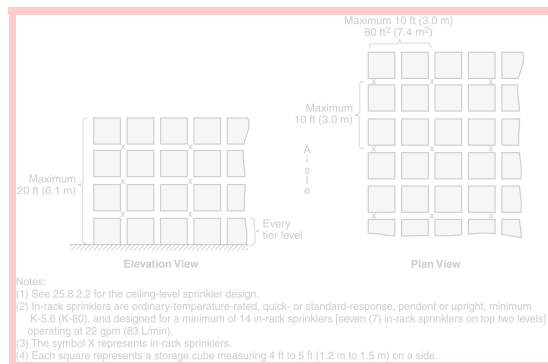


Figure 25.8.2.1.5(c) In-Rack Sprinkler Arrangements for Exposed Nonencapsulated Class IV Commodities Stored to a Maximum Height of 20 ft (6.1 m) in Multiple-Row Racks with In-Rack Sprinklers at Each Tier Level.



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 an area of ceiling-level sprinkler operation [ft² (186 m²)], with the provision of in-rack sprinklers, shall be determined from Table 25.8.2.2.1 and Figure 25.8.2.2.1(a) through Figure 25.8.2.2.1(d) :

Table 25.8.2.2.1 Determining Appropriate Ceiling-Level Protection Criteria Figure and Curve for 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)

Commodity	Maximum Storage Height	Storage Arrangement	Aisle Width ft (m)	Minimum No. of In-Rack Sprinkler Levels Required	Appropriate Figure and Curve		
					Figure	Ceiling Sprinkler Temperature Rating	
						High	Ordinary or Intermediate
Class I	Over 12 ft (3.7 m) and up to and including 25 ft (7.6 m)	Single- and double-row racks	8 (2.4)	1 level	25.8.2.2.1(a)	A	B
			4 (1.2)			C	D
		Multiple-row racks	Any			C	D
Class II	Over 12 ft (3.7 m) and up to and including 25 ft (7.6 m)	Single- and double-row racks	8 (2.4)	1 level	25.8.2.2.1(b)	A	B
			4 (1.2)			C	D
		Multiple-row racks	Any			C	D
Class III	Over 12 ft (3.7 m) and up to and including 25 ft (7.6 m)	Single- and double-row racks	8 (2.4)	1 level	25.8.2.2.1(c)	A	B
			4 (1.2)			C	D
		Multiple-row racks	Any			C	D
Class IV	Over 12 ft (3.7 m) and up to and including 20 ft (6.1 m)	Single- and double-row racks	8 (2.4)	1 level	25.8.2.2.1(d)	A	B
			4 (1.2)			C	D
		Multiple-row racks	Any			C	D
	Over 20 ft (6.1 m) and up to and including 25 ft (7.6 m)	Single- and double-row racks	8 (2.4)	1 level	25.8.2.2.1(d)	A	B
			4 (1.2)			C	D
		Multiple-row racks	Any	2 levels		C	D

Figure 25.8.2.2.1(a) CMDA Sprinkler System Design Curves — 20 ft (6.1 m) High Rack Storage — Exposed Nonencapsulated Class I Commodities — Conventional Pallets.

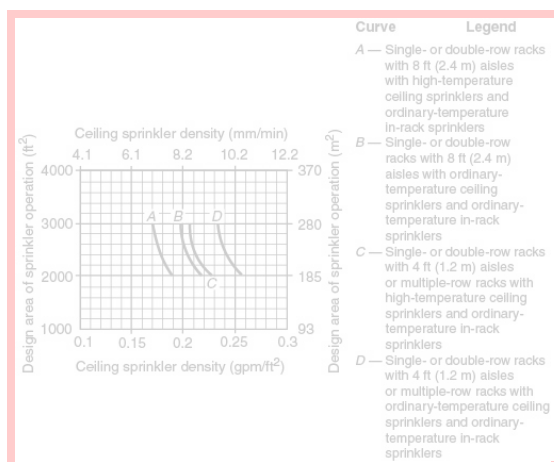


Figure 25.8.2.2.1(b) CMDA Sprinkler System Design Curves — 20 ft (6.1 m) High Rack Storage — Exposed Nonencapsulated Class II Commodities — Conventional Pallets.

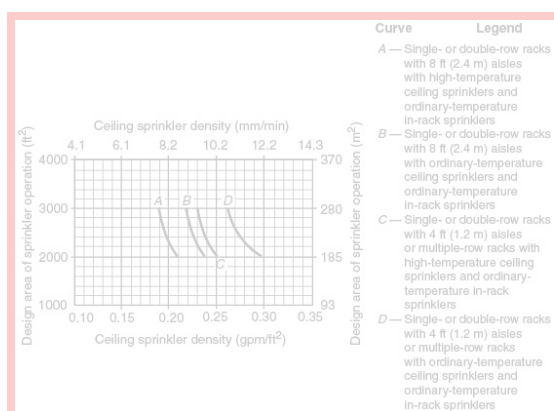


Figure 25.8.2.2.1(c) CMDA Sprinkler System Design Curves — 20 ft (6.1 m) High Rack Storage — Exposed Nonencapsulated Class III Commodities — Conventional Pallets.

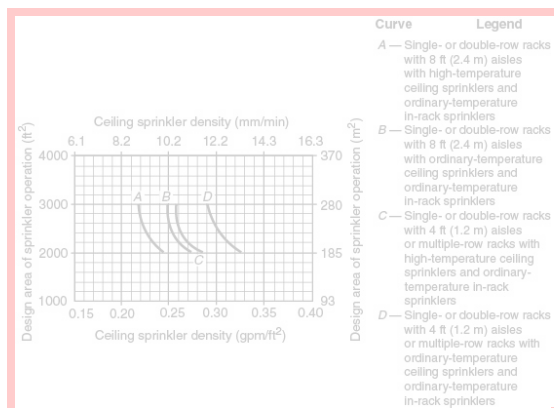
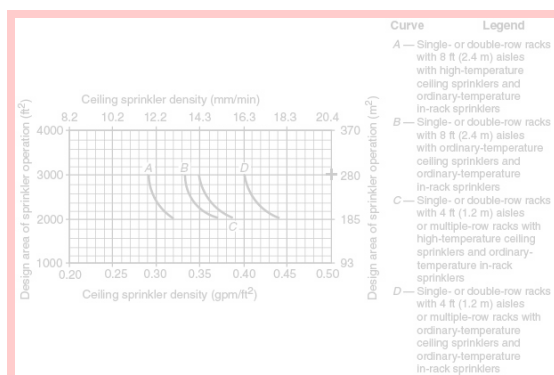


Figure 25.8.2.2.1(d) CMDA Sprinkler System Design Curves — 20 ft (6.1 m) High Rack Storage — Exposed Nonencapsulated Class IV Commodities — Conventional Pallets.



A.25.8.2.2.1 –

Bulkheads are not a substitute for sprinklers in racks. Their installation does not justify reduction in sprinkler densities or design operating areas as specified in the design curves. Data indicate that the sprinkler protection criteria in Table 25.8.2.2.1 are ineffective, by themselves, for rack storage with solid shelves if the required flue spaces are not maintained. Use of Table 25.8.2.2.1, along with the additional provisions that are required by this standard, can provide acceptable protection. It is not the intent that an in-rack sprinkler be installed above the top tier of storage when utilizing in-rack sprinklers at each tier level.

25.8.2.2.2* – Ceiling-Level Sprinkler Density Adjustments.

A.25.8.2.2.2 –

The adjustments in 25.8.2.2.2 apply to solid shelves where the minimum required level of in-rack sprinklers from an open rack option is exceeded.

25.8.2.2.2.1* –

Design densities obtained from the appropriate figure and curve specified in Table 25.8.2.2.1 for single- and double-row racks shall be selected to correspond to aisle width as follows. (See Section C.15.) :

The density given for 8 ft (2.4 m) wide aisles shall be applied to aisles wider than 8 ft (2.4 m).

For aisle widths between 4 ft (1.2 m) and 8 ft (2.4 m), the rules for 4 ft (1.2 m) aisle width shall be used or direct linear interpolation between the densities shall be permitted.

The density given for 4 ft (1.2 m) wide aisles shall be applied to aisles narrower than 4 ft (1.2 m) down to 3 1/2 ft (1.1 m).

Where aisles are narrower than 3 1/2 ft (1.1 m), racks shall be considered to be multiple-row racks.

A.25.8.2.2.2.1 –

The aisle width and the depth of racks are determined by material handling methods. The widths of aisles should be considered in the design of the protection system. Storage in aisles can render protection ineffective and should be discouraged.

25.8.2.2.2.2* – Density Adjustment.

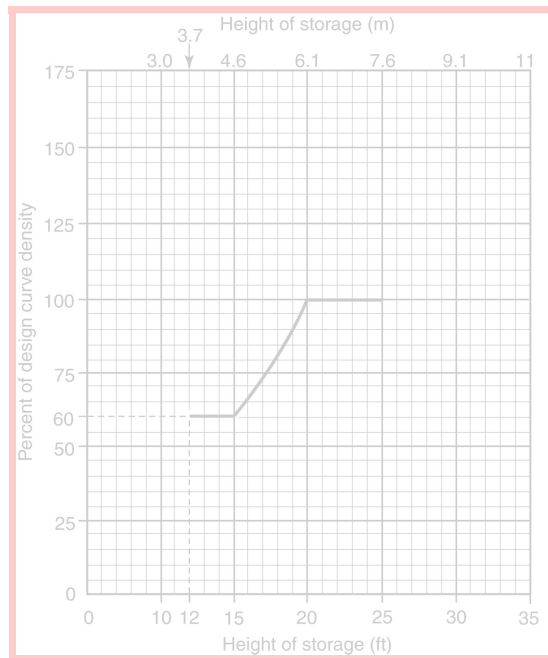
A.25.8.2.2.2.2 –

Data indicate that the sprinkler protection criteria in Figure 25.8.2.2.1(a) through Figure 25.8.2.2.1(d) are ineffective, by themselves, for rack storage with solid shelves if the required free spaces are not maintained. Use of Figure 25.8.2.2.1(a) through Figure 25.8.2.2.1(d), as specified by Table 25.8.2.2.1, along with the additional provisions that are required by this standard can provide acceptable protection.

(A) –

The ceiling-level sprinkler design criteria in terms of density [gpm/ft^2 (mm/min)] and area of sprinkler operation [ft^2 (m^2)] of ceiling or roof obtained from the appropriate density/area curves of Figure 25.8.2.2.1(a) through Figure 25.8.2.2.1(d) shall be modified as appropriate by Figure 25.8.2.2.2(A) for storage height.

Figure 25.8.2.2.2(A) Allowable Adjustments to CMDA Ceiling-Level Sprinkler Densities Due to Storage Height Up to 25 ft (7.6 m).

**(B) –**

Paragraph 25.8.2.2.2.2(A) shall apply to portable racks arranged in the same manner as single, double, or multiple row racks. (See Section C.14.)

25.8.2.2.2.3 –

Where in-rack sprinklers are being installed within racks of 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 protected with CMDA sprinklers at ceiling level along with the minimum number of required in-rack sprinkler levels, densities obtained from design curves shall be adjusted in accordance with Figure 25.8.2.2.2.2(A) :

25.8.2.2.2.4 –

Where in-rack sprinklers are being installed within racks of 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 protected with CMDA sprinklers at ceiling level along with more than one level of in-rack sprinklers (not in every tier), densities obtained from design curves adjusted in accordance with Figure 25.8.2.2.2.2(A) shall be permitted to be reduced an additional 20 percent as indicated in Table 25.8.2.2.2.4.

Table 25.8.2.2.2.4 Adjustment to Ceiling-Level Sprinkler Density Due to Storage Height and In-Rack Sprinklers

Storage Height	Apply Figure 25.8.2.2.2.2(A)?	In-Rack Sprinklers Levels Installed	Permitted Ceiling-Level Sprinkler Density Adjustment Due to In-Rack Sprinklers
Over 12 ft (3.7 m) and up to and including 20 ft (6.1 m)	Yes	Minimum required	None
		More than required but not at each tier level	Reduce density 20 percent from that indicated for minimum required levels of in-rack sprinklers
		Each tier level	Reduce density 40 percent from that indicated for minimum required levels of in-rack sprinklers
Over 20 ft (6.1 m) and up to and including 25 ft (7.6 m)	No	Minimum required	None
		More than required but not at each tier level	Reduce density 20 percent from that indicated for minimum required levels of in-rack sprinklers
		Each tier level	Reduce density 40 percent from that indicated for minimum required levels of in-rack sprinklers

25.8.2.2.2.5* –

Where in-rack sprinklers are being installed within racks of 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 protected with CMDA sprinklers at ceiling level along with in-rack sprinklers at each tier level, densities obtained from design curves and adjusted in accordance with Figure 25.8.2.2.2.2(A) shall be permitted to be reduced an additional 40 percent as indicated in Table 25.8.2.2.2.4.

A.25.8.2.2.2.5 –

It is not the intent that an in-rack sprinkler be installed above the top tier of storage when utilizing in-rack sprinklers at each tier level.

25.8.2.2.3 – Excessive Clearance from Top of Storage.**25.8.2.2.3.1 –**

The ceiling-level sprinkler design obtained from the appropriate figure and curve specified in Table 25.8.2.2.1 shall be based on a maximum clearance from top of storage to ceiling of 20 ft (6.1 m).

25.8.2.2.3.2 –

Where the clearance of 25.8.2.2.3.1 exceeds 20 ft (6.1 m), one of the following two options shall be implemented:

The ceiling design shall be determined from the appropriate figure and curve specified in Table 25.8.2.2.1 using a theoretical storage height that does not exceed 25 ft (7.6 m) and results in a clearance to ceiling of 20 ft (6.1 m).

If not already provided, the in-rack sprinkler arrangement shall be supplemented with one level of quick-response in-rack sprinklers located directly below the top tier level of storage and at every flue space intersection.

25.8.3 – Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class I, Class II, Class III, or Class IV Commodities Stored Up to and Including 25 ft (7.6 m) in Height.

25.8.3.1* – In-Rack Sprinkler Arrangements and Designs for Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class I, Class II, Class III, or Class IV Commodities Stored Up to and Including 25 ft (7.6 m) in Height.

A.25.8.3.1 –

Spacing of sprinklers on branchlines in racks in the various tests demonstrates that maximum spacing as specified is proper.

25.8.3.1.1 –

Where rack storage of exposed encapsulated or cartoned (nonencapsulated or encapsulated) 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 will be protected by in-rack sprinklers, the following levels of in-rack sprinklers shall be required:

One level of in-rack sprinklers where Class I through Class IV commodities are stored in single or double row racks up to and including 25 ft (7.6 m)

One level of in-rack sprinklers where Class IV commodities are stored in multiple-row racks up to and including 20 ft (6.1 m)

Two levels of in-rack sprinklers where Class IV commodities are stored in multiple-row racks over 20 ft (6.1 m) and up to and including 25 ft (7.6 m)

25.8.3.1.2 –

Where rack storage of exposed encapsulated or cartoned (nonencapsulated or encapsulated) Class I or Class II commodities stored over 12 ft (3.7 m) and up to and including 25 ft (7.6 m) in height will be protected by in-rack sprinklers, in-rack sprinkler arrangements and designs shall be selected from Figure 25.8.3.1.2(a) through Figure 25.8.3.1.2(c). (See Section 25.3 for racks with solid shelving.)

Figure 25.8.3.1.2(a) In-Rack Sprinkler Arrangements for Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class I or Class II Commodities Stored to a Maximum Height of 25 ft (7.6 m) with One Level of In-Rack Sprinklers.

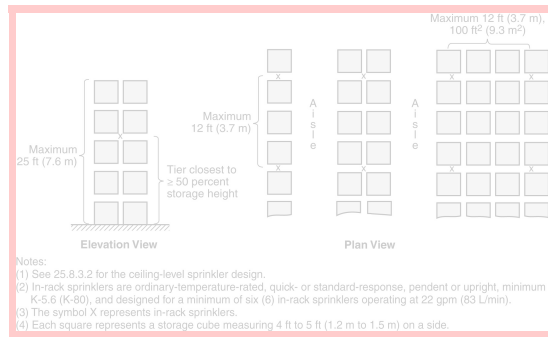


Figure 25.8.3.1.2(b) In-Rack Sprinkler Arrangements for Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class I or Class II Commodities Stored to a Maximum Height of 25 ft (7.6 m) with More Than One Level of In-Rack Sprinklers (Not at Each Tier Level).

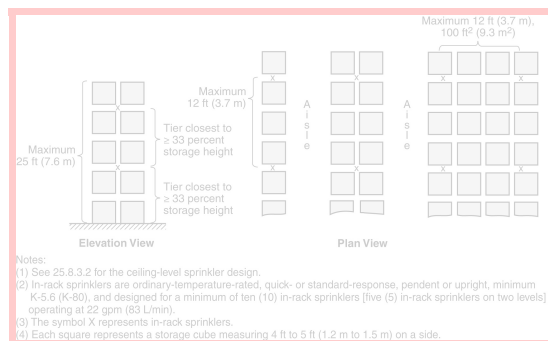
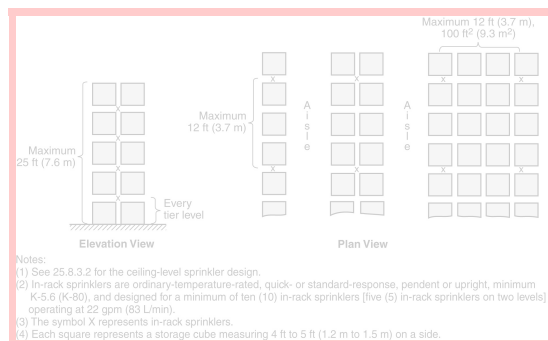


Figure 25.8.3.1.2(c) In-Rack Sprinkler Arrangements for Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class I or Class II Commodities Stored to a Maximum Height of 25 ft (7.6 m) with In-Rack Sprinklers at Each Tier Level.



25.8.3.1.3 –

Where rack storage of exposed encapsulated or cartoned (nonencapsulated or encapsulated) Class III commodities stored over 12 ft (3.7 m) and up to and including 25 ft (7.6 m) in height will be protected by in-rack sprinklers, in-rack sprinkler arrangements and designs shall be selected from 25.8.3.1.3(a) through 25.8.3.1.3(c) – (See Section 25.3 for racks with solid shelving.)

Figure 25.8.3.1.3(a) In-Rack Sprinkler Arrangements for Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class III Commodities Stored to a Maximum Height of 25 ft (7.6 m) with One Level of In-Rack Sprinklers.

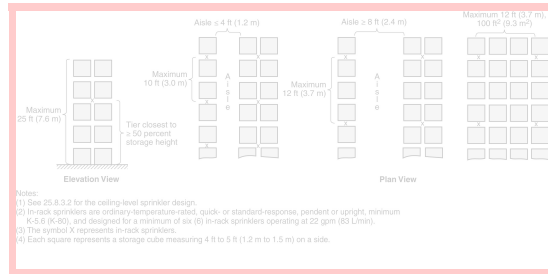


Figure 25.8.3.1.3(b) In-Rack Sprinkler Arrangements for Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class III Commodities Stored to a Maximum Height of 25 ft (7.6 m) with More Than One Level of In-Rack Sprinklers (Not at Each Tier Level).

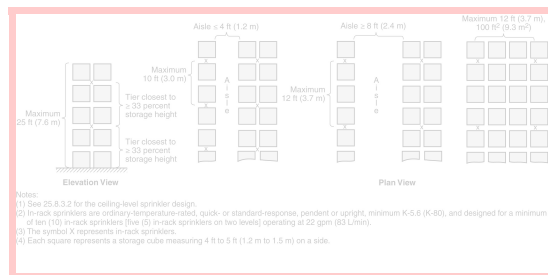
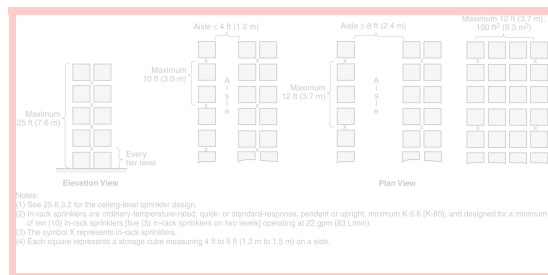


Figure 25.8.3.1.3(c) In-Rack Sprinkler Arrangements for Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class III Commodities Stored to a Maximum Height of 25 ft (7.6 m) with In-Rack Sprinklers at Each Tier Level.



25.8.3.1.4 –

Where rack storage of exposed encapsulated or cartoned (nonencapsulated or encapsulated) Class IV commodities stored over 12 ft (3.7 m) and up to and including 25 ft (7.6 m) in height in single- and double-row racks will be protected by in-rack sprinklers, in-rack sprinkler arrangements and designs shall be selected from Figure 25.8.3.1.4(a) through Figure 25.8.3.1.4(c). (See Section 25.3 for racks with solid shelving.)

Figure 25.8.3.1.4(a) In-Rack Sprinkler Arrangements for Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class IV Commodities Stored to a Maximum Height of 25 ft (7.6 m) in Single- and Double-Row Racks with One Level of In-Rack Sprinklers.

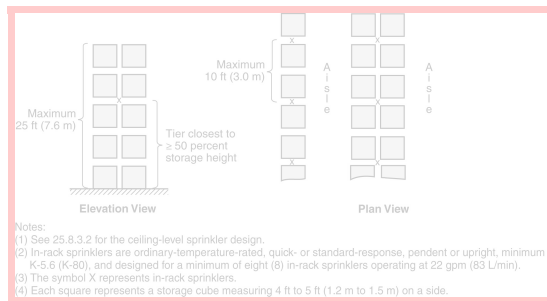


Figure 25.8.3.1.4(b) In-Rack Sprinkler Arrangements for Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class IV Commodities Stored to a Maximum Height of 25 ft (7.6 m) in Single- and Double-Row Racks with More Than One Level of In-Rack Sprinklers (Not at Each Tier Level).

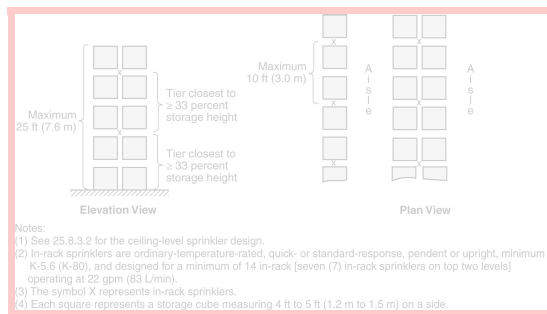
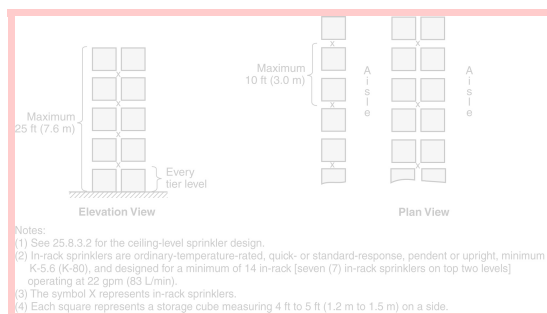


Figure 25.8.3.1.4(c) In-Rack Sprinkler Arrangements for Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class IV Commodities Stored to a Maximum Height of 25 ft (7.6 m) in Single- and Double-Row Racks with In-Rack Sprinklers at Each Tier Level.



25.8.3.1.5 –

Where rack storage of exposed encapsulated or cartoned (nonencapsulated or encapsulated) Class IV commodities stored over 12 ft (3.7 m) and up to and including 20 ft (6.1 m) in height in multiple-row racks will be protected by in-rack sprinklers, in-rack sprinkler arrangements and designs shall be selected from Figure 25.8.3.1.5(a) through Figure 25.8.3.1.5(c). (See Section 25.3 for racks with solid shelving.)

Figure 25.8.3.1.5(a) In-Rack Sprinkler Arrangements for Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class IV Commodities Stored to a Maximum Height of 20 ft (6.1 m) in Multiple-Row Racks with One Level of In-Rack Sprinklers.

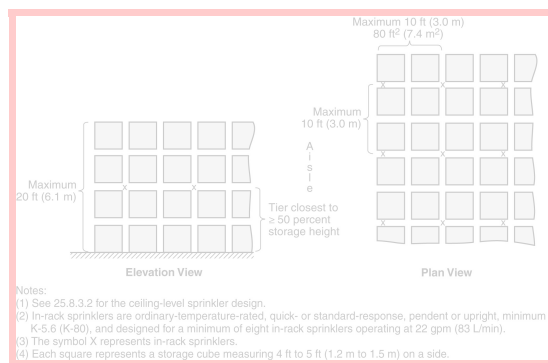


Figure 25.8.3.1.5(b) In-Rack Sprinkler Arrangements for Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class IV Commodities Stored to a Maximum Height of 20 ft (6.1 m) in Multiple-Row Racks with More Than One Level of In-Rack Sprinklers.

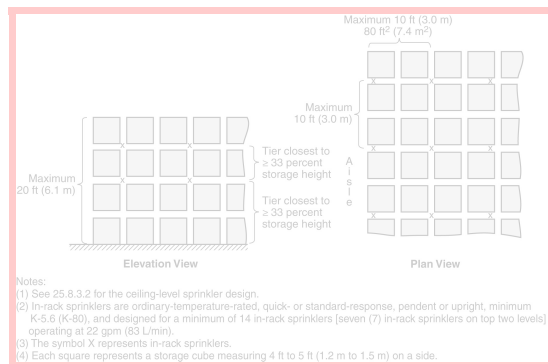
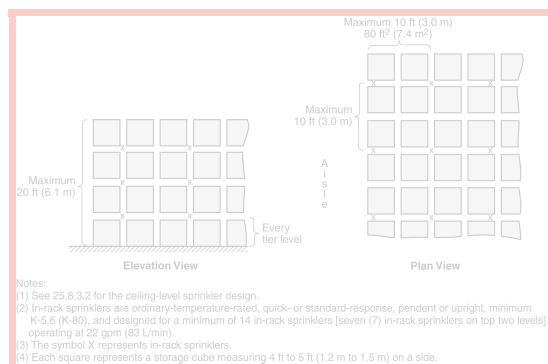


Figure 25.8.3.1.5(c) In-Rack Sprinkler Arrangements for Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class IV Commodities Stored to a Maximum Height of 20 ft (6.1 m) in Multiple-Row Racks with In-Rack Sprinklers at Each Tier Level.



25.8.3.1.6 —

Where rack storage of exposed encapsulated or cartoned (nonencapsulated or encapsulated) Class IV commodities stored over 20 ft (6.1 m) and up to and including 25 ft (7.6 m) in height in multiple-row racks will be protected by in-rack sprinklers, in-rack sprinkler arrangements and designs shall be selected from Figure 25.8.3.1.6(a) or Figure 25.8.3.1.6(b). (See Section 25.3 for racks with solid shelving.)

Figure 25.8.3.1.6(a) In-Rack Sprinkler Arrangements for Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class IV Commodities Stored Over 20 ft (6.1 m) and Up to a Maximum Height of 25 ft (7.6 m) in Multiple-Row Racks with Two Levels of In-Rack Sprinklers.

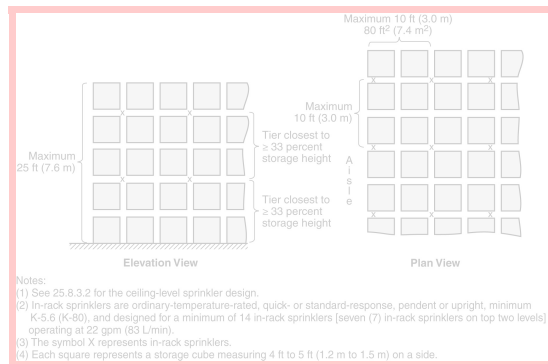
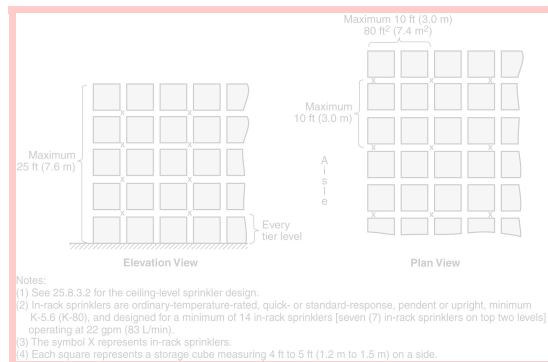


Figure 25.8.3.1.6(b) In-Rack Sprinkler Arrangements for Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class IV Commodities Stored Over 20 ft (6.1 m) and Up to a Maximum Height of 25 ft (7.6 m) in Multiple-Row Racks with In-Rack Sprinklers at Each Tier Level.



25.8.3.2 —CMDA Ceiling-Level Sprinkler Designs for Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class I, Class II, Class III, or Class IV Commodities Stored Up to and Including 25 ft (7.6 m) in Height in Combination with In-Rack Sprinklers.

25.8.3.2.1* –

For single-, double-, and multiple-row rack storage of exposed encapsulated or cartoned (nonencapsulated or encapsulated) 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 $[gpm/ft^2 \text{ } (mm/min)]$ over an area of ceiling-level sprinkler operation $[ft^2 \text{ } (186 \text{ m}^2)]$, with the provision of in-rack sprinklers, shall be determined from Table 25.8.3.2.1 and Figure 25.8.3.2.1(a) through Figure 25.8.3.2.1(g) :

Table 25.8.3.2.1 Determining Appropriate Ceiling-Level Protection Criteria Figure and Curve for Rack Storage of Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class I Through Class IV Commodities Stored Over 12 ft (3.7 m) and Up to and Including 25 ft (7.6 m)

Commodity	Maximum Storage Height	Storage Arrangement	Aisle Width ft (m)	Minimum No. of In-Rack Sprinkler Levels Required	Appropriate Figure and Curve		
					Figure	Ceiling Sprinkler Temperature Rating	
						High	Ordinary or Intermediate
Class I	Over 12 ft (3.7 m) and up to and including 25 ft (7.6 m)	Single- and double-row racks	8 (2.4)	1 level	25.8.3.2.1(e)	A	B
			4 (1.2)			C	D
		Multiple-row racks	Any		25.8.3.2.1(a)	C	D
Class II	Over 12 ft (3.7 m) and up to and including 25 ft (7.6 m)	Single- and double-row racks	8 (2.4)	1 level	25.8.3.2.1(e)	A	B
			4 (1.2)			C	D
		Multiple-row racks	Any		25.8.3.2.1(b)	C	D
Class III	Over 12 ft (3.7 m) and up to and including 25 ft (7.6 m)	Single- and double-row racks	8 (2.4)	1 level	25.8.3.2.1(f)	A	B
			4 (1.2)			C	D
		Multiple-row racks	Any		25.8.3.2.1(c)	C	D
Class IV	Over 12 ft (3.7 m) and up to and including 20 ft (6.1 m)	Single- and double-row racks	8 (2.4)	1 level	25.8.3.2.1(g)	A	B
			4 (1.2)			C	D
		Multiple-row racks	Any		25.8.3.2.1(d)	A	B
	Over 20 ft (6.1 m) and up to and including 25 ft (7.6 m)	Single- and double-row racks	8 (2.4)	1 level	25.8.3.2.1(g)	A	B
			4 (1.2)			C	D
		Multiple-row racks	Any	2 levels	25.8.3.2.1(d)	A	B

Figure 25.8.3.2.1(a) CMDA Sprinkler System Design Curves — 20 ft (6.1 m) High Rack Storage — Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class I Commodities in Multiple-Row Racks — Conventional Pallets.

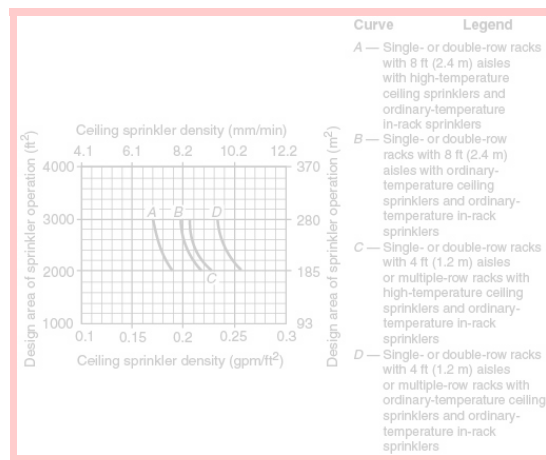


Figure 25.8.3.2.1(b) CMDA Sprinkler System Design Curves — 20 ft (6.1 m) High Rack Storage — Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class II Commodities in Multiple-Row Racks — Conventional Pallets.

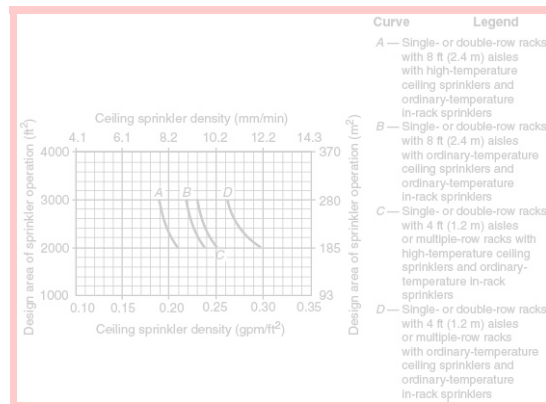


Figure 25.8.3.2.1(c) CMDA Sprinkler System Design Curves — 20 ft (6.1 m) High Rack Storage — Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class III Commodities in Multiple-Row Racks — Conventional Pallets.

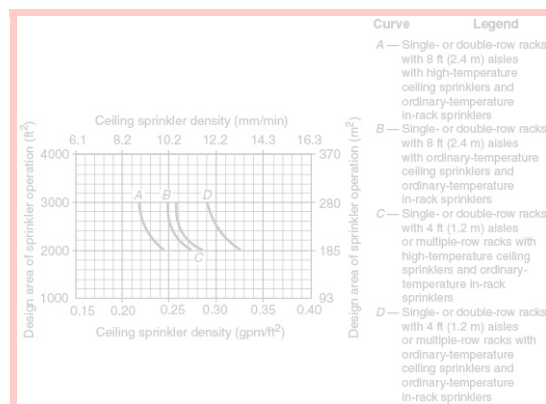


Figure 25.8.3.2.1(d) CMDA Sprinkler System Design Curves — 20 ft (6.1 m) High Rack Storage — Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class IV Commodities in Multiple-Row Racks — Conventional Pallets.

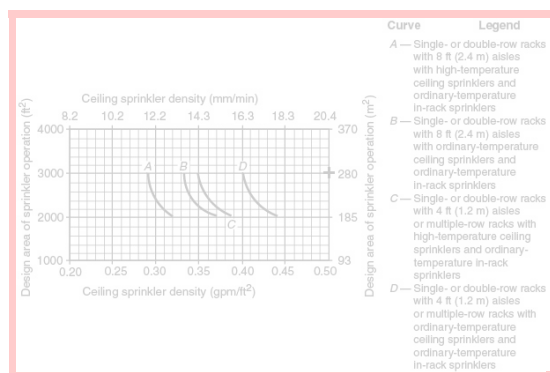


Figure 25.8.3.2.1(e) CMDA Sprinkler System Design Curves — Single or Double-Row Racks — 20 ft (6.1 m) High Rack Storage — Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class I and Class II Commodities — Conventional Pallets.

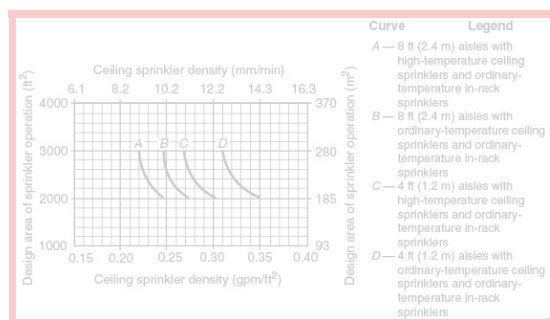


Figure 25.8.3.2.1(f) CMDA Sprinkler System Design Curves — Single or Double-Row Racks — 20 ft (6.1 m) High Rack Storage — Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class III Commodities — Conventional Pallets.

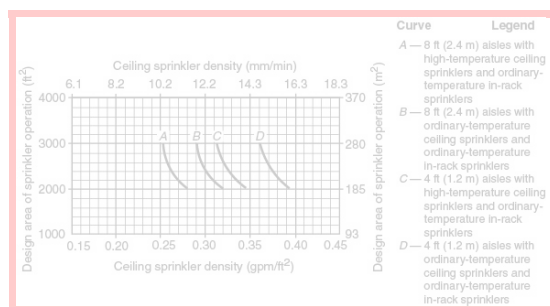
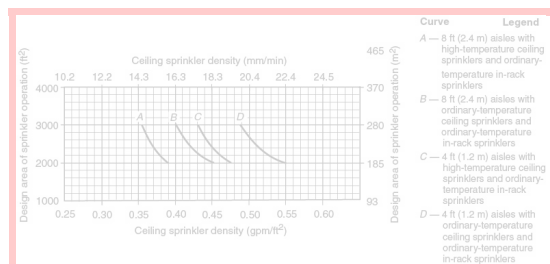


Figure 25.8.3.2.1(g) CMDA Sprinkler System Design Curves — Single or Double-Row Racks — 20 ft (6.1 m) High Rack Storage — Exposed Encapsulated or Cartoned (Nonencapsulated or Encapsulated) Class IV Commodities — Conventional Pallets.



A.25.8.3.2.1 –

Bulkheads are not a substitute for sprinklers in racks. Their installation does not justify reduction in sprinkler densities or design operating areas as specified in the design curves. Data indicate that the sprinkler protection criteria obtained from Table 25.8.3.2.1 are ineffective, by themselves, for rack storage with solid shelves if the required flue spaces are not maintained. Use of Table 25.8.3.2.1, along with the additional provisions that are required by this standard, can provide acceptable protection. It is not the intent that an in-rack sprinkler be installed above the top tier of storage when utilizing “in-rack sprinklers at each tier level.”

25.8.3.2.2* – Ceiling-Level Sprinkler Density Adjustments.**A.25.8.3.2.2 –**

The adjustments in 25.8.3.2.2 apply to solid shelves where the minimum required level of in-rack sprinklers from an open rack option is exceeded.

25.8.3.2.2.1* –

Design densities obtained from the appropriate figure and curve specified in Table 25.8.3.2.1 for single- and double-row racks shall be selected to correspond to aisle width as follows (see Section C.15):

The density given for 8 ft (2.4 m) wide aisles shall be applied to aisles wider than 8 ft (2.4 m).

For aisle widths between 4 ft (1.2 m) and 8 ft (2.4 m), the rules for 4 ft (1.2 m) aisle width shall be used, or direct linear interpolation between the densities shall be permitted.

The density given for 4 ft (1.2 m) wide aisles shall be applied to aisles narrower than 4 ft (1.2 m) down to 3 1/2 ft (1.1 m).

Where aisles are narrower than 3 1/2 ft (1.1 m), racks shall be considered to be multiple-row racks.

A.25.8.3.2.2.1 –

The aisle width and the depth of racks are determined by material-handling methods. The widths of aisles should be considered in the design of the protection system. Storage in aisles can render protection ineffective and should be discouraged.

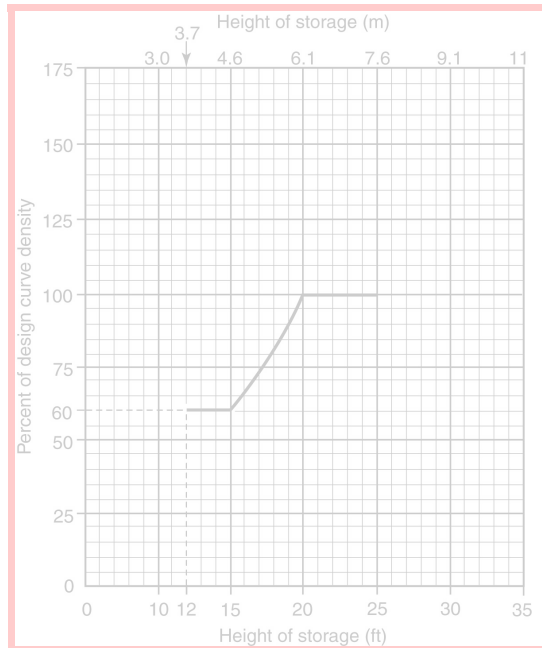
25.8.3.2.2.2* –**A.25.8.3.2.2.2 –**

Data indicate that the sprinkler protection criteria in Figure 25.8.3.2.1(a) through Figure 25.8.3.2.1(d) are ineffective, by themselves, for rack storage with solid shelves, if the required flue spaces are not maintained. Use of Figure 25.8.2.2.1(a) through Figure 25.8.2.2.1(d), as specified by Table 25.8.3.2.1, along with the additional provisions that are required by this standard, can provide acceptable protection.

(A) –

The ceiling-level sprinkler design criteria in terms of density [gpm/ft² (mm/min)] and area of sprinkler operation [ft² (m²)] of ceiling or roof obtained from the appropriate density/area curves of Figure 25.8.3.2.1(a) through Figure 25.8.3.2.1(d) shall be modified as appropriate by Figure 25.8.3.2.2.2(A) for storage height.

Figure 25.8.3.2.2.2(A) Allowable Adjustments to CMDA Ceiling-Level Sprinkler Densities Due to Storage Height Up to 25 ft (7.6 m).

**(B) –**

Paragraph 25.8.3.2.2.2(A) shall apply to portable racks arranged in the same manner as single, double or multiple row racks. (See Section C.14.)

25.8.3.2.2.3 –

Where in-rack sprinklers are being installed within racks of Class I through Class IV commodities stored over 12 ft (3.7 m) up to and including 25 ft (7.6 m) in height protected with CMDA sprinklers at ceiling level along with the minimum number of required in-rack sprinkler levels, densities obtained from design curves shall be adjusted in accordance with Figure 25.8.3.2.2.2(A) and then be multiplied by the density multiplier indicated in Table 25.8.3.2.1.

25.8.3.2.2.4 –

Where in-rack sprinklers are being installed within racks of 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 protected with CMDA sprinklers at ceiling level along with more than one level of in-rack sprinklers (not in every tier), densities obtained from design curves adjusted in accordance with Figure 25.8.3.2.2.2(A) and then multiplied by the density multiplier indicated in Table 25.8.3.2.4 shall be permitted to be reduced an additional 20 percent as indicated in Table 25.8.3.2.2.4.

Table 25.8.3.2.2.4 Adjustment to Ceiling-Level Sprinkler Density Due to Storage Height and In-Rack Sprinklers

Storage Height	Apply Figure 25.8.3.2.2.2(A)?	In-Rack Sprinklers Levels Installed	Permitted Ceiling-Level Sprinkler Density Adjustment Due to In-Rack Sprinklers
Over 12 ft (3.7 m) and up to and including 20 ft (6.1 m)	Yes	Minimum required	None
		More than required but not at each tier level	Reduce density 20 percent from that indicated for minimum required levels of in-rack sprinklers
		Each tier level	Reduce density 40 percent from that indicated for minimum required levels of in-rack sprinklers
Over 20 (6.1) and up to and including 25 (7.6)	No	Minimum required	None
		More than required but not at each tier level	Reduce density 20 percent from that indicated for minimum required levels of in-rack sprinklers
		Each tier level	Reduce density 40 percent from that indicated for minimum required levels of in-rack sprinklers

25.8.3.2.2.5* –

Where in-rack sprinklers are being installed within racks of 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 protected with CMDA sprinklers at ceiling level along with in-rack sprinklers at each tier level, densities obtained from design curves and adjusted in accordance with Figure 25.8.3.2.2.2(A) shall be permitted to be reduced an additional 40 percent as indicated in Table 25.8.3.2.2.4.

A.25.8.3.2.2.5 –

It is not the intent that an in-rack sprinkler be installed above the top tier of storage when utilizing in-rack sprinklers at each tier level.

25.8.3.2.3 – Excessive Clearance from Top of Storage.**25.8.3.2.3.1 –**

The ceiling-level sprinkler design obtained from the appropriate figure and curve specified in Table 25.8.3.2.1 shall be based on a maximum clearance from top of storage to ceiling of 20 ft (6.1 m).

25.8.3.2.3.2 –

~~Where the clearance of 25.8.3.2.3.1 exceeds 20 ft (6.1 m), one of the following two options shall be implemented:~~

~~The ceiling design shall be determined from the appropriate figure and curve specified in Table 25.8.3.2.1 using a theoretical storage height that does not exceed 25 ft (7.6 m) and results in a clearance to ceiling of 20 ft (6.1 m).~~

~~If not already provided, the in-rack sprinkler arrangement shall be supplemented with one level of quick response in-rack sprinklers located directly below the top tier level of storage and at every flue space intersection.~~

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Aug 25 13:50:04 EDT 2022

Committee Statement

Committee Statement: The existing system information is being removed from the standard. In Chapter 30 a reference has been added that states that you can reference legacy editions that were used to design the system, using the density/area curves.

Response Message: FR-1337-NFPA 13-2022

[Public Input No. 525-NFPA 13-2022 \[Section No. 25.8\]](#)

[Public Input No. 180-NFPA 13-2022 \[Section No. 25.7.2.4.2\]](#)

[Public Input No. 179-NFPA 13-2022 \[Section No. 25.7.1.4.3\]](#)

[Public Input No. 524-NFPA 13-2022 \[Section No. 25.7\]](#)

**First Revision No. 1238-NFPA 13-2022 [Section No. 26.4.1.3]****26.4.1.3**

A wet pipe system that is designed to provide K-14.0 (200) ESFR sprinklers operating at a minimum of 50 psi (3.4 bar), K-16.8 (240) ESFR sprinklers operating at a minimum of 32 psi (2.2 bar), or K-25.2 (360) ESFR sprinklers operating at a minimum of 15 psi (1.0 bar) shall be permitted to protect single- and double-row racks with slatted rack shelving where all of the following conditions are met:

- (1) The protected commodities shall be limited to Class I through Class IV, Group B plastics, Group C plastics, cartoned (expanded and nonexpanded) Group A plastics, and exposed (nonexpanded) Group A plastics.
- (2) Slats in slatted rack shelving shall be a minimum nominal 2 in. (50 mm) thick by maximum nominal 6 in. (150 mm) wide with the slats held in place by spacers that maintain a minimum 2 in. (50 mm) opening between each slat.
- (3) ~~Longitudinal flue spaces shall not be required~~ at least 6 in. (150 mm) wide shall be provided for double-row racks.
- (4) Transverse flue spaces at least 3 in. (75 mm) wide shall be provided at least every 10 ft (3.0 m) horizontally.
- (5) The aisle widths shall be at least 7½ ft (2.3 m).
- (6) The maximum roof height shall be 30 ft (9.1 m).
- (7) The maximum storage height shall be 20 ft (6.1 m).
- (8) Solid plywood or similar materials shall not be placed on the slatted shelves so that they block the 2 in. (50 mm) spaces between slats, nor shall they be placed on the wire mesh shelves.
- (9) There shall be no slatted shelf levels in the rack above 12 ft (3.7 m).
- (10) Open rack shelving using wire mesh shall be permitted for shelf levels above 12 ft (3.7 m).

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 13:31:06 EDT 2022

Committee Statement

Committee Statement: The original test criteria for these storage arrangements did not include testing with ESFR sprinklers. The changes as shown are necessary to apply the use of ESFR sprinklers.

Response Message: FR-1238-NFPA 13-2022

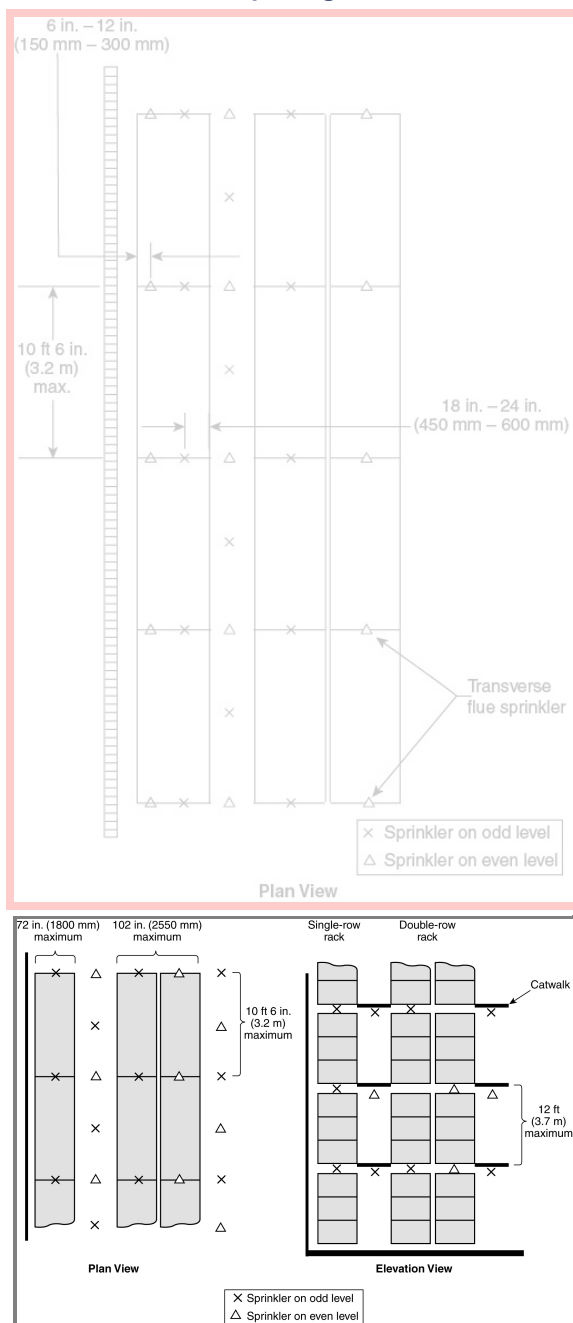
Public Input No. 457-NFPA 13-2022 [Section No. 26.4.1.3]



First Revision No. 1240-NFPA 13-2022 [Section No. 26.6.6.4 [Excluding any Sub-Sections]]

Sprinklers shall be provided in transverse flue spaces in accordance with 26.6.6.4.1 and 26.6.6.4.2 and Figure 26.6.6.4.

Figure 26.6.6.4 Sprinkler Location and Spacing in Transverse Flues.



Supplemental Information

File Name

Description

Approved

13_AUT_SSD_FDM_26.6.6.4_FR1240_FINAL.pdf

For staff use only

Submitter Information Verification**Committee:** AUT-SSD**Submittal Date:** Fri Jul 29 13:37:45 EDT 2022**Committee Statement**

Committee Statement: The in-rack sprinklers in the single row racks should all be within the 18" to 24" location to the face of the rack on each level. The figure needs to be changed to illustrate this location.

Response Message: FR-1240-NFPA 13-2022



First Revision No. 1239-NFPA 13-2022 [Section No. 26.6.6.4.1.2]

26.6.6.4.1.2

For single-row racks, sprinklers installed in the transverse flues shall be ~~staggered horizontally such that the sprinkler at first level is installed~~ not less than 18 in. (450 mm) but not greater than 24 in. (600 mm) from the face of the rack on the catwalk side.

(A)

~~At the next level, the sprinkler in the transverse flue shall be located not less than 6 in. (150 mm) but not greater than 12 in. (300 mm) from the back face of the rack.~~

(B)

~~This staggering shall be repeated throughout all catwalk levels.~~

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 13:35:47 EDT 2022

Committee Statement

Committee Statement: The in-rack sprinklers in the single row racks should all be within the 18" to 24" location to the face of the rack on each level. Also see change to Figure 26.6.6.4.

Response Message: FR-1239-NFPA 13-2022

[Public Input No. 458-NFPA 13-2022 \[Section No. 26.6.6.4.1.1\]](#)



First Revision No. 1241-NFPA 13-2022 [New Section after 26.6.6.4.2.1]

26.6.6.4.2.2

Where only one catwalk level has been installed, both the “X” and “Δ” in-rack sprinklers as shown in Figure 26.6.6.4 shall be installed.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 13:39:50 EDT 2022

Committee Statement

Committee Statement: Where only one catwalk level is installed, it is necessary to add two rows of sprinklers in order to protect to the far face of the double or multi-row rack.

Response Message: FR-1241-NFPA 13-2022

Public Input No. 459-NFPA 13-2022 [Section No. 26.6.6.4.2.1]



First Revision No. 1242-NFPA 13-2022 [Section No. 27.2]

27.2 Flammable and Combustible Liquids.

Fire sprinkler systems for the protection of ignitable (flammable and combustible) liquids shall be designed and installed in accordance with this standard and NFPA 30.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 13:42:10 EDT 2022

Committee Statement

Committee Statement: NFPA 30 revised the terminology to read as shown in the body of the standard with ignitable being the preferred term and flammable and combustible following in parenthesis. However, the title of NFPA 30 didn't change. This FR correlates NFPA 13 with NFPA 30.

Response Message: FR-1242-NFPA 13-2022

[Public Input No. 225-NFPA 13-2022 \[Section No. 27.2\]](#)



First Revision No. 1243-NFPA 13-2022 [Section No. 27.6]

27.6 Dipping, Coating, and Printing Processes Using 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

Submittal Date: Fri Jul 29 13:43:45 EDT 2022

Committee Statement

Committee Statement: NFPA 34 revised the terminology to read as shown in the body of the standard with ignitable being the preferred term and flammable and combustible following in parenthesis. However, the title of NFPA 34 didn't change. This proposed text correlates NFPA 13 with NFPA 34.

Response Message: FR-1243-NFPA 13-2022

[Public Input No. 226-NFPA 13-2022 \[Section No. 27.6\]](#)



**First Revision No. 1244-NFPA 13-2022 [Section No. 28.1.3 [Excluding any
Sub-Sections]]**

Working plans shall be drawn to an indicated scale, on sheets of uniform size, with a plan of each floor, and shall show those items from the following list that pertain to the design of the system:

- (1) Name and address of building being protected
- (2) Name, telephone number, and address of installing contractor
- (3) Point of compass and graphic scale indications on drawings and details as applicable
- (4)* Full height cross section or schematic diagram, including structural member information as required for clarity

A.28.1.3(4)

It might not be necessary to show details of the structural member(s) in every cross section or schematic. However, it is important to show details of the structural members when they have an impact on sprinkler performance such as with ESFR sprinklers or when the structural member creates an obstruction to the spray patterns of sprinklers.

- (5) Location of all partitions that extend to or are within a minimum of 18 in. (450 mm) to the finished ceiling or exposed deck above
- (6) Location of all fire-rated partitions, fire barriers, draft stops, and draft curtains
- (7) Identification of all rooms and spaces, regardless of occupancy or use
- (8) Identification and labeling of all spaces, above and below ceilings, where sprinklers will be omitted, including appropriate citation of the section(s) of this standard for such omission(s)
- (9) Location of all fixtures, diffusers, lights, and devices installed in or mounted to the ceiling structure, regardless of the ceiling type (i.e., finished or exposed to structure)
- (10) Label finished or exposed ceiling heights for each space, including those that are sloped greater than 2 in 12 (16.7 percent)
- (11)* Location and identification of major mechanical, plumbing, and electrical equipment installed above or below the ceiling spaces if sprinkler protection is being provided for those areas
- (12)* Location and identification of all major structural members, and identification and labeling of construction types (i.e., obstructed or unobstructed) for each space or portion thereof in the building, as applicable
- (13)* Location and identification of concealed spaces, regardless of combustibility, and of architectural and/or structural features not shown or easily identifiable in the floor plan or reflected ceiling plan views
- (14) Water source(s) supply information, including the following:
 - (a) Location
 - (b) Type
 - (c) Size
 - (d) Dimensions
 - (e) Capacity
 - (f) Configuration
 - (g) Elevation
 - (h) Static pressure
 - (i) Flow rate

- (j) Residual pressure
 - (k) Flow test locations, dates, and sources (i.e., city or private)
 - (l) Any adjustments from the raw data required by the engineer of record (i.e., owner's certificate) or the water authority, if applicable
 - (m) Size of city main in street and whether dead end or circulating; if dead end, direction and distance to nearest circulating main; and city main test results and system elevation relative to test hydrant
 - (n) Private fire service main sizes, lengths, locations, weights, materials, point of connection to city main; the sizes, types, and locations of valves, valve indicators, regulators, meters, and valve pits; and the depth that the top of the pipe is laid below grade
- (15) Information from the owner's certificate required by Section 4.2, including the edition of this standard being used
- (16) Identification and labeling of design criteria for each room and/or space as shown on building plan, including the following:
- (a) Hazard classification associated with each room or space
 - (b) Identification and location of all rooms and spaces intended for storage, including the following:
 - i. Commodity classification
 - ii. * Storage type and configuration
 - iii. Height of storage for each dedicated room or space
 - iv. Type of packaging to be used
- (17) Identification and labeling of all sprinkler systems, including type and overall area protected by each system
- (18) Location and labeling for the size, dimension, elevation, and type of all major sprinkler system components, including the following (*see 28.1.3.1*):
- (a) Pipe, fittings, valves, and test and drain locations
 - (b) Sprinkler legend, per system, including the following:
 - i. Orientation
 - ii. Finish
 - iii. Manufacturer
 - iv. Model
 - v. SIN number
 - vi. K-factor
 - vii. Temperature rating
 - viii. Response type
 - ix. Quantity of each
 - x. If extended coverage or residential type, spacing utilized for this application
 - xi. Sprinkler wrench model number(s)
 - (c) Manufacturer, model, length, maximum number of bends, and minimum bend radius and corresponding K-factor applied to flexible sprinkler hose
- (19) Location and labeling of all system flushing, forward flow, water flow alarm, and test and drain locations
- (20) Location and labeling of sprinkler system riser(s) and, if applicable, standpipe location(s)

- (21) Location and labeling of fire department connections
- (22) Location and labeling of hydraulic calculation information, including the following:
 - (a) Graphic indication of each area of operation, including a description of any allowed density or area modifications applied
 - (b) Labeling of all node locations that correspond to each hydraulic calculation
- (23) Location and labeling of seismic system components, including the following:
 - (a) Zones of influence
 - (b) Bracing and restraint assemblies
 - (c) Flexible couplings and penetration clearances
 - (d) Maximum spacing of components
 - (e) Design angle category(ies)
- (24) Sprinkler system details and information for other system components necessary for the complete installation, including the following:
 - (a) Hanger and/or hanger assemblies intended to be used throughout
 - (b) Total system volume for dry and double interlock preaction systems
 - (c) Hydraulic calculation summary information, including the following:
 - i. Method of calculation
 - ii. Total water and pressure required
 - iii. Hose demand
 - (d) Special information, settings, or values required for ongoing inspection, testing, and maintenance and system use, including the following:
 - i. Pressure regulating device features and means for conducting a flow test
 - ii. Dry pipe, preaction, and/or deluge systems
 - iii. Location of all low point drains
 - iv. Information regarding antifreeze solution used

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 13:49:10 EDT 2022

Committee Statement

Committee Statement: A full height cross section or schematic of the building was included in the 2019 edition but was deleted in the 2022 edition. It is important to have this cross section or schematic to provide clarity for the AHJ and the installer.

Important information about the underground supply piping was included in the 2019 edition but was deleted in the 2020 edition. Two new subsections were added to the water supply source information with the text taken from the 2019 edition.

A new requirement was added to the sprinkler legend section for the model numbers of each sprinkler wrench needed for proper installation of the sprinklers listed.

A typo was corrected in item 24) b).

The location of any low point drains should be noted on the working plans.

Added explanatory text to new item (4) to help the designer and the AHJ understand when structural details will be needed for clarity.

Response
Message: FR-1244-NFPA 13-2022

[Public Input No. 53-NFPA 13-2021 \[Section No. 28.1.3 \[Excluding any Sub-Sections\]\]](#)

[Public Input No. 191-NFPA 13-2022 \[Section No. 28.1.3 \[Excluding any Sub-Sections\]\]](#)

[Public Input No. 355-NFPA 13-2022 \[Section No. 28.1.3 \[Excluding any Sub-Sections\]\]](#)



First Revision No. 1246-NFPA 13-2022 [New Section after 28.1.4]

28.2* Approved Storage Floor Plan.

A.28.2

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.

Typical content to be included on the floor plan should include 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

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:

- (1) Chapters 20 through 26
- (2) 4.4.1.6 for miscellaneous tire storage

28.2.2

The approved storage floor plan shall be mounted in an approved location.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 14:05:26 EDT 2022

Committee Statement

Committee Statement: NFPA 1 section 34.1.3 and the IFC now requires this storage floor plan. As the installation standard NFPA 13 should include the criteria for this additional plan. This plan provides fire department easy access to storage configuration when needed. The plan also gives the owner a way of monitoring storage modifications through the life of the building. This would not be applicable to spec warehouse as a storage plan is not available until it is leased.

Response Message: FR-1246-NFPA 13-2022

[Public Input No. 366-NFPA 13-2022 \[New Section after A.28.1\]](#)

[Public Input No. 365-NFPA 13-2022 \[New Section after 28.2\]](#)



First Revision No. 1251-NFPA 13-2022 [Sections 28.2.4.2.1, 28.2.4.2.2, 28.2.4.2.3]

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 ~~at least 1.2 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.~~ in accordance with one of the following:

- (1) For unobstructed construction with ceiling or roof slopes greater than 2 in 12, the dimension parallel to the branch line shall be at least 1.2 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.
- (2) 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.
- (3) 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.

28.3.4.2.2

Any fractional sprinkler shall be carried to the next higher whole sprinkler.

28.3.4.2.3

In systems having branch lines with an insufficient number of sprinklers to fulfill the 1.2 or 1.4 requirement, the design area shall be extended to include sprinklers on adjacent branch lines supplied by the same cross main.

[Detail FR-1249](#)

28.3.4.2.3.1*

Where additional sprinklers are carried over to the next branch line, the flow from the sprinklers that create the hydraulically most demanding remote area within the dimension required by 28.3.4.2.1 shall be selected.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_AUT_SSD_FDM_28.2.4.2_FR1251.docx	For staff use only	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 14:46:34 EDT 2022

Committee Statement

Committee Statement: Computer simulations and full-scale fire tests as documented in the report entitled Protection of Storage Under Sloped Ceilings Phase III: Large-Scale Testing Summary and Guidance, written based on a project supported by the Fire Protection Research

Foundation, have demonstrated that fire control can be achieved with sprinklers protecting storage under ceilings up to and including a slope of 4 in 12.

Response FR-1251-NFPA 13-2022
Message:

[Public Input No. 494-NFPA 13-2022 \[Section No. 28.2.4.2\]](#)



First Revision No. 1254-NFPA 13-2022 [Sections 28.2.4.3.1, 28.2.4.3.2, 28.2.4.3.3]

28.3.4.3.1

For CMSA sprinklers, the design area shall be a rectangular area having a dimension parallel to the branch lines at determined in accordance with least 1.2 times the square root of the area protected by the number of sprinklers to be included in the design area. The design area protected by the number of sprinklers to be used by the 1.2 rule shall be based on the maximum allowable area per sprinkler . 28.3.4.2 with the design area (A) being calculated by multiplying the required number of sprinklers by the actual floor area covered by those sprinklers. .

28.3.4.3.2

Any fractional sprinkler shall be carried to the next higher whole sprinkler.

28.3.4.3.3

In systems having branch lines with an insufficient number of sprinklers to fulfill the 1.2 dimension along the branch line requirement, the design area shall be extended to include sprinklers on adjacent branch lines supplied by the same cross main.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 15:05:13 EDT 2022

Committee Statement

Committee Statement: This change more accurately describes the method to be used when determining the remote area shape for CMSA sprinklers. The change in 28.2.4.3.3 was made in the event that the dimension along the branch line is different than the 1.2 currently required.

Response Message: FR-1254-NFPA 13-2022

Public Input No. 495-NFPA 13-2022 [Section No. 28.2.4.3]



First Revision No. 1255-NFPA 13-2022 [Section No. 28.2.4.4]

28.3.4.4 ESFR Sprinkler Method.

For ESFR sprinklers, the design area shall consist of the most hydraulically demanding area of 12 sprinklers, consisting of 4 sprinklers on each of three branch lines, unless other specific numbers of design sprinklers are required in other sections of this standard be in accordance with 23.2.2 , 23.2.3 , and 25.6.3.3 .

[Detail FR-1256](#)

28.3.4.4.1

Where the design area was increased beyond 12 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 those sprinklers.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 15:08:31 EDT 2022

Committee Statement

Committee Statement: Not all ESFR systems have a design area that includes 4 sprinklers on 3 branch lines. The change to reference specific sections provides the user with the information needed to determine the correct design area.

Response Message: FR-1255-NFPA 13-2022

[Public Input No. 300-NFPA 13-2022 \[Section No. 28.2.4.4\]](#)



First Revision No. 1268-NFPA 13-2022 [Section No. 28.2.4.7.3]

28.3.4.7.3*

The requirements of 28.3.4.7.1 and 28.3.4.7.1.1 to include every sprinkler in the design area shall not apply where sprinklers are provided above and below obstructions.

28.3.4.7.3.1

~~Sprinklers under the obstruction shall not be required to be included in the hydraulic calculation of the ceiling sprinklers.~~

28.3.4.7.3.1

~~Where the piping to sprinklers under obstructions follows the same sizing pattern as the branch lines, no additional hydraulic calculations shall be required for sprinklers under obstructions.~~

28.3.4.7.4 Supplemental Sprinklers.

28.3.4.7.4.1

~~Sprinklers~~ Supplemental sprinklers under the obstruction shall not be required to be included in the hydraulic calculation of the ceiling sprinklers.

28.3.4.7.4.2

Where the piping to sprinklers under obstructions follows the same sizing pattern as the branch lines, no additional hydraulic calculations shall be required for sprinklers under obstructions.

28.3.4.7.4.3

Where the requirements of 28.3.4.7.4.2 are not met, a level of supplemental sprinklers shall be calculated to verify pipe sizes.

(A)

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

(B)

For density/area applications, the area of coverage of each sprinkler shall only include the footprint of the obstruction it is protecting.

(C)

For density/area applications, the design criteria shall be in accordance with Section 19.5 .

(D)

For CMSA and ESFR sprinklers, the discharge pressure shall be in accordance with 20.16.4 .

(E)

The level of supplemental sprinklers shall not be required to be balanced with the overhead system.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 18:33:23 EDT 2022

Committee Statement

Committee Statement: New sections provide guidance on how to hydraulically calculate supplemental sprinklers that do not follow the same sizing pattern as the overhead system.

Response Message: FR-1268-NFPA 13-2022

[Public Input No. 431-NFPA 13-2022 \[Section No. 28.2.4.7.3\]](#)

[Public Input No. 430-NFPA 13-2022 \[New Section after 19.4\]](#)

[Public Input No. 587-NFPA 13-2022 \[Global Input\]](#)



First Revision No. 1261-NFPA 13-2022 [Section No. 28.2.4.8.1]

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, 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 for flexible sprinkler hose fittings and 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 maximum 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 8.2.108.2.6.9 .

Table 28.3.4.8.1 Hazen–Williams C Values

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

<u>Pipe or Tube</u>	<u>C Value*</u>
Concrete	140

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

†Nitrogen supply shall be installed in accordance with ~~8.2.6.9~~ 8.2.10 .

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 15:54:50 EDT 2022

Committee Statement

Committee Statement: Flexible sprinkler hose fittings have a significant pressure loss that needs to be included in the system's hydraulic calculation.

Response Message: FR-1261-NFPA 13-2022

[Public Input No. 231-NFPA 13-2022 \[Section No. 28.2.4.8.1\]](#)



First Revision No. 1248-NFPA 13-2022 [Section No. 28.2.4.12]

28.3.4.12 Maximum Operating Pressure.

For sprinklers in extra hazard occupancies, ~~palletized, solid-piled, bin box, back-to-back shelf storage, shelf storage, or rack storage,~~ or designed in accordance with Chapters 20 through 26, the maximum operating pressure of any sprinkler shall be 175 psi (12 bar).

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 14:29:55 EDT 2022

Committee Statement

Committee Statement: This section should only point to the storage design chapters. Sprinklers installed to meet the requirements of miscellaneous or low-piled storage should be permitted to exceed 175 psi if they are rated for such pressures.

Response Message: FR-1248-NFPA 13-2022

[Public Input No. 55-NFPA 13-2021 \[Section No. 28.2.4.12\]](#)



First Revision No. 1262-NFPA 13-2022 [Section No. 28.4]

28.5 Hydraulic Calculation Forms and Reports .

28.5.1 General Handwritten Hydraulic Calculation Forms .

~~Hydraulic calculations shall be prepared on form sheets that include a summary sheet, detailed worksheets, and a graph sheet. [See Figure A.28.4.2(a) , Figure A.28.4.3 , and Figure A.28.4.4 for copies of typical forms.]~~

28.5.1.1 General.

~~Hydraulic Handwritten hydraulic calculations shall be prepared on form sheets that include a summary sheet, detailed worksheets, and a graph sheet. [See Figure A.28.5.1.2(a), Figure A.28.5.1.3, and Figure A.28.5.1.4 for copies of typical forms.]~~

28.5.1.2* Summary Sheet.

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

~~Date~~

~~Location~~

~~Name of owner and occupant~~

~~Building number or other identification~~

~~Description of hazard (for storage applications, the commodity classification, storage height, and rack configuration shall be included)~~

~~Name and address of contractor or designer~~

~~Name of approving agency~~

~~System design requirements, as follows:~~

~~Design area of water application, ft^2 (m^2).~~

~~Minimum rate of water application (density), gpm/ft^2 (mm/min). Where sprinklers are listed with minimum water application in gpm (L/min) or pressure in psi (bar), the minimum rate of water application shall be indicated in gpm (L/min) or pressure, psi (bar).~~

~~Area per sprinkler, ft^2 (m^2).~~

~~Total water requirements as calculated, including allowance for inside hose, outside hydrants, and water curtain and exposure sprinklers~~

~~Allowance for in-rack sprinklers, gpm (L/min)~~

~~Limitations (dimension, flow, and pressure) on extended coverage or other listed special sprinklers~~

28.5.1.3* Detailed Worksheets.

Detailed worksheets or computer printout sheets shall contain the following information included in 28.5.2.6

Sheet number

Sprinkler description and discharge constant (K)

Hydraulic reference points

Flow in gpm (L/min)

Pipe size

Pipe lengths, center-to-center of fittings

Equivalent pipe lengths for fittings and devices

Friction loss in psi/ft (bar/m) of pipe

Total friction loss between reference points

In-rack sprinkler demand balanced to ceiling demand

Elevation head in psi (bar) between reference points

Required pressure in psi (bar) at each reference point

Velocity pressure and normal pressure if included in calculations

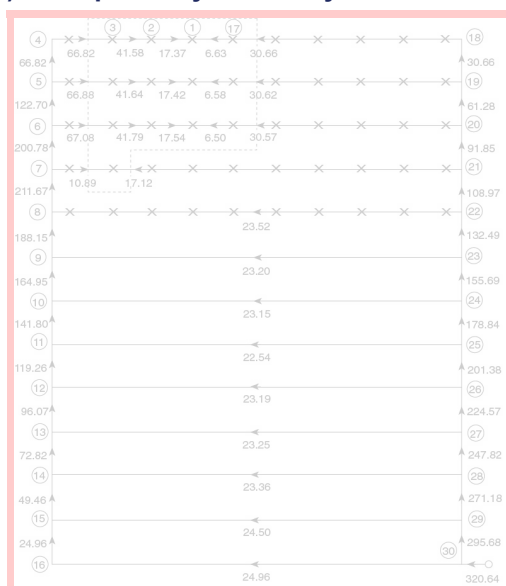
Notes to indicate starting points or reference to other sheets or to clarify data shown

- * Diagram to accompany gridded system calculations to indicate flow quantities and directions for lines with sprinklers operating in the remote area

A.28.4.3(15) –

See Figure A.28.4.3(15) .

Figure A.28.4.3(15) Example of Hydraulically Remote Area — Grid System.



Combined K -factor calculations for sprinklers on drops, armovers, or sprigs where calculations do not begin at the sprinkler

28.5.1.4* Graph Sheet.

A graphic representation of the complete hydraulic calculation shall be plotted on semiexponential graph paper ($Q^{1.85}$) and shall include the following: information in 28.5.2.3

~~Water supply curve~~

~~Sprinkler system demand~~

~~Hose allowance (where applicable)~~

~~In-rack sprinkler demand (where applicable)~~

28.5.2 Computer-Generated Hydraulic Calculation Reports.**28.5.2.1*** General.**28.5.2.1.1**

~~Hydraulic Computer-generated hydraulic calculation reports~~ calculations shall ~~be prepared on form sheets that~~ include a summary sheet, a graph sheet, a water supply analysis, a node analysis, and detailed worksheets.

28.5.2.1.2

Figure 28.5.2.1.2(a) Summary Sheet.

HYDRAULIC CALCULATIONS for

Project name: _____

Location: _____

Drawing no.: _____ Date: _____

Design

Remote area number: _____

Remote area location: _____

Occupancy classification: _____

Density: _____ gpm/ft² (mm/min)

Area of application: _____ ft² (m²)

Coverage per sprinkler: _____ ft² (m²)

Type of sprinklers calculated: _____

No. of sprinklers calculated: _____

In-rack demand: _____

Hose streams: _____

Total water required (including hose streams): _____ gpm (mm/min) @ _____ psi (bar)

Type of system: _____

Volume of dry or preaction system: _____ gal (l)

Water supply information

Date: _____

Location: _____

Source: _____

Name of contractor: _____

Address: _____

Phone number: _____

Name of designer: _____

Authority having jurisdiction: _____

Notes: (Include peaking information or gridded systems here.) _____

© 2024 National Fire Protection Association

NFPA 13

Figure 28.5.2.1.2(b) Graph Sheet.

FLOW TEST SUMMARY SHEET
N^{1.85}

Contract name and number: _____

Pressure (psi)

150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0

0 100 150 200 250 300 350 400 450 500 550 575
(0) (380) (570) (760) (950) (1150) (1325) (1500) (1700) (1900) (2080) (2175)

Flow: gpm (lpm)

Pressure (bar)

10.3
9.7
9.0
8.3
7.6
6.9
6.2
5.5
4.8
4.1
3.4
2.7
2.1
1.4
0.7

Notes: _____

© 2021 National Fire Protection Association NFPA 13

FLOW TEST SUMMARY SHEET
N^{1.85}

Contract name and number: _____

Pressure (psi)

150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0

0 100 150 200 250 300 350 400 450 500 550 575
(0) (380) (570) (760) (950) (1150) (1325) (1500) (1700) (1900) (2080) (2175)

Flow: gpm (lpm)

Pressure (bar)

10.3
9.7
9.0
8.3
7.6
6.9
6.2
5.5
4.8
4.1
3.4
2.7
2.1
1.4
0.7

Notes: _____

© 2024 National Fire Protection Association NFPA 13

Figure 28.5.2.1.2(c) Supply and Node Analysis Sheet.

SUPPLY ANALYSIS						
Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
Data	Data	Data	Data	Data	Data	Data

NODE ANALYSIS					
Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data

© 2021 National Fire Protection Association NFPA 13

SUPPLY ANALYSIS						
Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
Data	Data	Data	Data	Data	Data	Data

NODE ANALYSIS					
Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data
Data	Data	Data	Data	Data	Data

© 2024 National Fire Protection Association NFPA 13

Figure 28.5.2.1.2(d) Detailed Worksheet.

Job name: _____

Sheet number: _____

PIPE INFORMATION									
Node 1	Elev 1 (ft) (m)	K- Factor	Flow added --- this step (g)	Nominal ID	Fittings-- quantity and length	L ft (m)	C Factor	total (P _T)	Notes
Node 2			Total flow (Q)	Actual ID		F ft (m)	F _p per foot (m) (psi) (bar)	elev (P _p)	
						T ft (m)		friect (P _p)	
data 1	data 1	data 1	data 1	data	data	data	data	data 1	data
data 2	data 2		data	data	data	data	data	data	
data 1	data 1	data 1	data 1	data	data	data	data	data 1	data
data 2	data 2		data	data	data	data	data	data	
data 1	data 1	data 1	data 1	data	data	data	data	data 1	data
data 2	data 2		data	data	data	data	data	data	
data 1	data 1	data 1	data 1	data	data	data	data	data 1	data
data 2	data 2		data	data	data	data	data	data	
data 1	data 1	data 1	data 1	data	data	data	data	data 1	data
data 2	data 2		data	data	data	data	data	data	
data 1	data 1	data 1	data 1	data	data	data	data	data 1	data
data 2	data 2		data	data	data	data	data	data	
data 1	data 1	data 1	data 1	data	data	data	data	data 1	data
data 2	data 2		data	data	data	data	data	data	
data 1	data 1	data 1	data 1	data	data	data	data	data 1	data
data 2	data 2		data	data	data	data	data	data	
data 1	data 1	data 1	data 1	data	data	data	data	data 1	data
data 2	data 2		data	data	data	data	data	data	

© 2021 National Fire Protection Association

NFPA 13

Job name: _____

Sheet number: _____

PIPE INFORMATION									
Node 1	Elev 1 (ft) (m)	K- Factor	Flow added --- this step (g)	Nominal ID	Fittings-- quantity and length	L ft (m)	C Factor	total (P _T)	Notes
Node 2			Total flow (Q)	Actual ID		F ft (m)	F _p per foot (m) (psi) (bar)	elev (P _p)	
						T ft (m)		friect (P _p)	
data 1	data 1	data 1	data 1	data	data	data	data	data 1	data
data 2	data 2		data	data	data	data	data	data	
data 1	data 1	data 1	data 1	data	data	data	data	data 1	data
data 2	data 2		data	data	data	data	data	data	
data 1	data 1	data 1	data 1	data	data	data	data	data 1	data
data 2	data 2		data	data	data	data	data	data	
data 1	data 1	data 1	data 1	data	data	data	data	data 1	data
data 2	data 2		data	data	data	data	data	data	
data 1	data 1	data 1	data 1	data	data	data	data	data 1	data
data 2	data 2		data	data	data	data	data	data	
data 1	data 1	data 1	data 1	data	data	data	data	data 1	data
data 2	data 2		data	data	data	data	data	data	
data 1	data 1	data 1	data 1	data	data	data	data	data 1	data
data 2	data 2		data	data	data	data	data	data	
data 1	data 1	data 1	data 1	data	data	data	data	data 1	data
data 2	data 2		data	data	data	data	data	data	

© 2024 National Fire Protection Association

NFPA 13

28.5.2.2 Summary Sheet.

The summary sheet as shown in Figure 28.5.2.1.2(a) shall contain the following information, where applicable:

- (1) Project name and date
- (2) Location (including street address)
- (3) Owner or expected occupant of space being designed
- (4) Name, address, and phone number of installing contractor
- (5) Name and phone number of designer
- (6) Authority having jurisdiction
- (7) Standard or document system is being designed to, including the edition of the document
- (8) Design area number and location
- (9) Drawing or sheet number where design area is located
- (10) Occupancy or commodity classification and information
- (11) For storage applications (including miscellaneous), additional information including storage height, ceiling height, storage configuration, aisle width, orientation of upright or pendent, sprinkler K-factor and sprinkler temperature, and the table and or curve utilized in the design
- (12) System type, including the system volume with type of protection system indicated in the notes
- (13) Sprinkler type, including coverage and response type
- (14) Slope of roof or ceiling within the design area
- (15) System design requirements, as follows:
 - (a) Design area of application, ft^2 (m^2)
 - (b) Minimum rate of water application (density), gpm/ft^2 (mm/min)
 - (c) Area per sprinkler, ft^2 (m^2)
 - (d) Number of sprinklers calculated
- (16) Total water requirements as calculated, including allowance for inside hose, outside hydrants, water curtain, and exposure sprinklers, and allowance for in-rack sprinklers, gpm (L/min)
- (17) Ceiling height if used for quick response sprinkler reduction
- (18) Elevation of highest calculated sprinkler
- (19) Water supply information, including the following:
 - (a) Date and time of test
 - (b) Location of the test and flow hydrant(s)
 - (c) Source of the water for the flow test
 - (d) Elevation of the test hydrant relative to the finished floor
 - (e) Size of fire pump, gpm @ psi (L/min @ bar)
 - (f) Size of on-site water tank
- (20) Notes that include peaking information for calculations performed by a computer program, type of preaction system, limitations (dimension, flow, and pressure) on extended-coverage or other listed special sprinklers, system type, including the system volume

28.5.2.3 Graph Sheet.

A graphic representation of the complete hydraulic calculation shall be plotted on semiexponential graph paper ($Q^{1.85}$) as shown in Figure 28.5.2.1.2(b) and shall include the following:

- (1) Water supply curve
- (2) Sprinkler system demand
- (3) Hose demand (where applicable)
- (4) In-rack sprinkler demand (where applicable)
- (5) Additional pressures supplied by a fire pump or other source (when applicable)

28.5.2.4 Supply Analysis.

Information summarized from the graph sheet as shown in Figure 28.5.2.1.2(c) shall include the following:

- (1) Node tag at the source
- (2) Static pressure [psi (bar)] available at the source
- (3) Residual pressure [psi (bar)] available at the source
- (4) Total flow [gpm (L/min)] available at the source
- (5) Available pressure [psi (bar)] at the source when the total calculated demand is flowing
- (6) Total calculated demand [gpm (L/min)] at the source
- (7) Required pressure [psi (bar)] when flowing total calculated demand

28.5.2.5 Node Analysis.

Organized information as shown in Figure 28.5.2.1.2(c) regarding the node tags given to each hydraulic reference point on the system as indicated on the shop drawings shall include the following information:

- (1) Node tag for each specific point on the system used in the hydraulic calculations
- (2) Elevation in ft (m) of each node tag
- (3) K-factor of flowing nodes (such as sprinklers)
- (4) Hose allowance in gpm (L/min) requirements for the node tag
- (5) Pressure in psi (bar) at the node
- (6) Discharge in gpm (L/min) calculated at the node
- (7) Notes that indicate any special requirements for the node

28.5.2.6 Detailed Worksheets.

Detailed worksheets as shown in Figure 28.5.2.1.2(d) or computer printout sheets shall contain the following information:

- (1) Sheet number
- (2) Hydraulic reference points used in each step
- (3) Elevation in ft (m) at each hydraulic reference point
- (4) Sprinkler description and discharge constant (*K*) for the flowing reference point
- (5) Flow in gpm (L/min) for the flowing reference point (when applicable)
- (6) Total flow in gpm (L/min) through each step
- (7) Nominal pipe size in in. (mm)
- (8) Actual internal diameter of pipe in in. (mm)
- (9) Quantity and length in ft (m) of each type of fitting and device
- (10) Pipe lengths in ft (m), center-to-center of fittings
- (11) Equivalent pipe lengths in ft (m) of fittings and devices for the step
- (12) Total equivalent length in ft (m) of pipes and fitting for the step
- (13) C-factor used in each step
- (14) Friction loss in psi/ft (bar/m) of pipe
- (15) Sum of the pressures from the previous step (starting pressure at beginning)
- (16) Elevation head in psi (bar) between reference points
- (17) Total friction loss in psi (bar) between reference points
- (18) Required pressure in psi (bar) at each reference point
- (19) Notes and other information shall include the following:
 - (a) Velocity pressure and normal pressure if included in calculations
 - (b) In-rack sprinkler demand balanced to ceiling demand
 - (c) Notes to indicate starting points or reference to other sheets or to clarify data shown
 - (d) Diagram to accompany gridded system calculations to indicate flow quantities and directions for lines with sprinklers operating in the remote area
 - (e) Combined K-factor calculations for sprinklers on drops, armovers, or sprigs where calculations do not begin at the sprinkler
 - (f) The pressure [psi/(bar)] loss assigned the backflow device when included on a system
 - (g) Friction factor and Reynolds number when the Darcy–Weisbach equation is used

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_AUT_SSD_FDM_28.4_FR1262.docx	For staff use only	

Submitter Information Verification

Committee: AUT-SSD

Submission Date: Fri Jul 29 15:59:34 EDT 2022

Committee Statement

Committee Statement: The two separate lists in sections 28.4 and 28.4.5 of data to be included in hydraulic calculation forms and reports were mostly redundant, but in some cases included different ways of describing the same information. Section 28.4.1 includes examples of handwritten calculations forms while section 28.4.5 was specific to computer generated hydraulic calculations reports. The entire section 28.4 was retitled and reorganized into a handwritten form section and a computer-generated report section. Redundant data were deleted by cross-reference.

Response Message: FR-1262-NFPA 13-2022

[Public Input No. 54-NFPA 13-2021 \[Sections 28.4.2, 28.4.3, 28.4.4\]](#)

**First Revision No. 1263-NFPA 13-2022 [Section No. 28.5.1.2]****28.6.1.2**

~~Sprinkler systems having sprinklers with K-factors other than 5.6 nominal, listed piping material other than that covered in Table 7.3.1.1, extra hazard Group 1 and Group 2 systems, and exposure protection systems shall be hydraulically calculated. The following sprinkler systems shall not be permitted to be pipe schedule:~~

- ~~(1) Sprinkler systems~~ Those having sprinklers with K-factors other than nominal 5.6 nominal
- ~~(2) Those having listed piping materials other than that those covered in Table 7.3.1.1~~
- ~~(3) Those having listed fittings other than what is covered in Table 7.4.1~~
- ~~(4) Extra hazard Group 1 and Group 2 systems, and~~
- ~~(5) Exposure protection systems shall be hydraulically calculated~~

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_AUT_SSD_FDM_28.5.1.2_FR1263.docx	For staff use only	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 16:13:26 EDT 2022

Committee Statement

Committee Statement: This section was broken down into a list for clarity, and new text was added as item (3) to address listed fittings.

Response Message: FR-1263-NFPA 13-2022

Public Input No. 75-NFPA 13-2021 [Section No. 28.5.1.2]



First Revision No. 1325-NFPA 13-2022 [New Section after 30.3.7]

30.4* Evaluation of Existing Systems. (AUT-SSD)

A.30.4

Fire protection systems are designed and installed based on a specific set of circumstances and building uses. For example, the volume of water needed for a sprinkler system to control a fire in the built environment is based upon the intended use of the facility known at the time the sprinkler system was designed and installed. Revisions to properties used for storage represent one of the most common scenarios that impact the ability of systems to provide adequate protection. Some of the most common changes include raising the storage height, changing the storage method arrangement such as adding racks, installing solid shelves in rack structures, or decreasing the aisle widths between racks. Changes in product packaging with the use of foam inserts, bubble wrap, or other plastics or encapsulated storage can significantly increase the fire hazard. Changing from wood pallets to plastic pallets, converting to the use of plastic bin boxes, or revising or adding material handling systems such as conveyors could severely impact the effectiveness of the fire protection systems.

The following are some examples of when existing system evaluations should be conducted:

- (1) Tenant changes or process changes
- (2) Occupancy or storage changes
- (3) Fire pump replacements
- (4) Water supply changes
- (5) Backflow preventers replaced or added
- (6) Replacing missing hydraulic information signs with no existing records

30.4.1* General.

Where changes in the occupancy, hazard, water supply, storage commodity, storage arrangement, building modification, or other condition that affects the installation criteria of the system are identified, the existing system shall be evaluated based on the current hazard and water supply.

A.30.4.1

When conducting an existing system evaluation, the following should be considered:

- (1) The current available water supply including any necessary adjustments as required by 30.4.2
- (2) The current occupancy classification or commodity classification and maximum permitted storage height and configuration as required by Section 4.2
- (3) The appropriate design based on the occupancy using the original building approved design edition of NFPA 13
- (4) Hydraulic calculations performed in accordance with Chapter 28 based on existing sprinkler plans or survey of the existing piping and spacing layout

30.4.2* Evaluation.

Evaluation of existing systems shall be in accordance with one of the following methods:

- (1) As a new system in accordance with this edition of the standard
- (2) In accordance with the edition of NFPA 13 utilized in the design and installation of the system

A.30.4.2

Evaluation of existing systems is in references to the adequacy of the pipe schedule hazard classification and design densities (in the case of CMDA systems), as well as the number of sprinklers and pressures calculated with ESFR and CMSA sprinklers or systems. The evaluation of existing systems is not limited to storage applications but encompasses all occupancies. This section provides users with two options for evaluation of existing systems. The first option would be to treat the system as new by applying and using the nonexistent requirements in the current edition. The second option is to apply the edition of NFPA 13 that the sprinkler system was originally designed under.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Wed Aug 24 13:31:12 EDT 2022

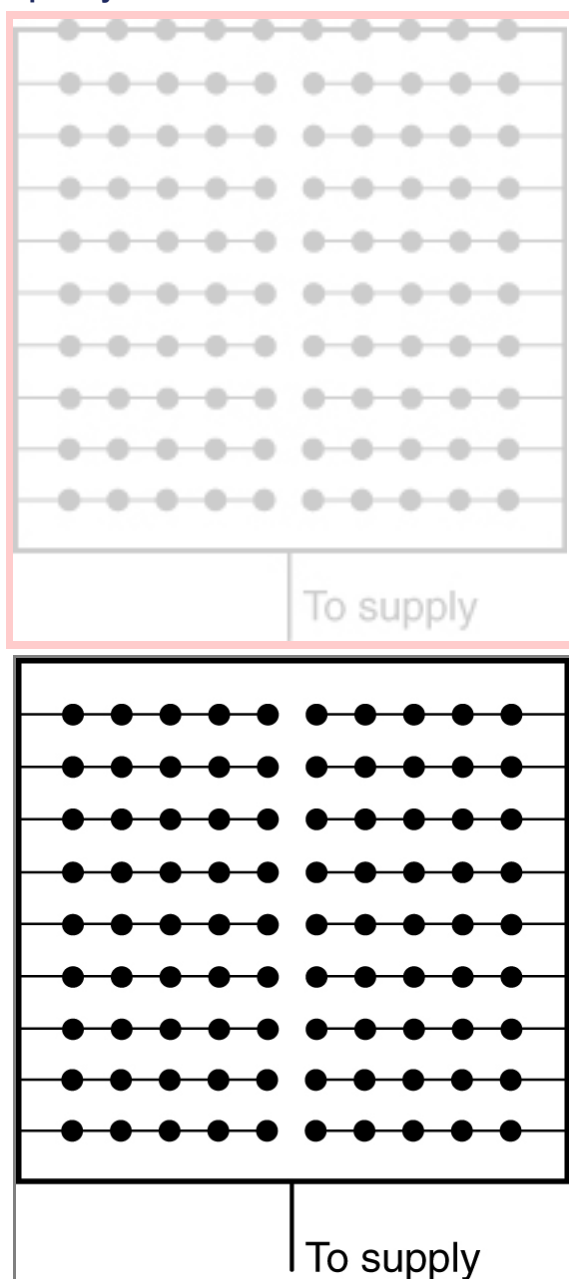
Committee Statement

Committee Statement: The existing system information is being removed from the standard. In Chapter 30 a reference has been added that states that you can reference legacy editions that were used to design the system, using the density/area curves.

Response Message: FR-1325-NFPA 13-2022

**First Revision No. 1179-NFPA 13-2022 [Section No. A.3.3.216.6]****A.3.3.221.6** Looped Sprinkler System.

See [Figure A.3.3.221.6](#) [Figure A.3.3.217.6](#) . (AUT-SSD)

Figure A.3.3.221.6 Looped System.**Submitter Information Verification**

Committee: AUT-SSD

Submittal Date: Thu Jul 28 13:12:32 EDT 2022

Committee Statement

Committee Statement: To better depict a loop system the sprinklers have been removed from the top pipe in the figure.

Response Message: FR-1179-NFPA 13-2022

Public Input No. 16-NFPA 13-2021 [Section No. A.3.3.216.6]



First Revision No. 1180-NFPA 13-2022 [Section No. A.4.3.3.1]

A.4.4.3.1

Ordinary hazard (Group 1) occupancies include occupancies having uses and conditions similar to the following:

- (1) Automobile showrooms
- (2) Bakeries
- (3) Beverage manufacturing
- (4) Canneries
- (5) Dairy products manufacturing and processing
- (6) Electric fire pump room
- (7) Electronic plants
- (8) Glass and glass products manufacturing
- (9) Laundries
- (10) Restaurant service areas
- (11) Porte cocheres
- (12) Mechanical rooms

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Jul 28 13:15:52 EDT 2022

Committee Statement

Committee Statement: Adding "Electric fire pump rooms" to the Ordinary Hazard Group 1 list is consistent with the hazard classification from section 4.14.1.4 of the 2022 edition of NFPA 20 (Fire Pumps).

Response Message: FR-1180-NFPA 13-2022

[Public Input No. 314-NFPA 13-2022 \[Section No. A.4.3.3.1\]](#)



First Revision No. 1181-NFPA 13-2022 [Section No. A.4.3.5]

A.4.4.4.2

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 2 two cars stacked vertically
- (10) Diesel fire pump houses and rooms containing pump drivers and fuel tanks

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Jul 28 13:32:30 EDT 2022

Committee Statement

Committee Statement: Adding "Diesel Fire Pump Houses and Rooms containing pump drivers and fuel tanks" to the Extra Hazard Group 2 list is consistent with the hazard classification from section 4.14.1.3 of the 2022 edition of NFPA 20 (Fire Pumps). Section 4.14.1.3 from NFPA 20 also includes the fuel tank.

Response Message: FR-1181-NFPA 13-2022

[Public Input No. 64-NFPA 13-2021 \[Section No. A.4.3.5\]](#)

[Public Input No. 533-NFPA 13-2022 \[New Section after A.4.3.5\]](#)



First Revision No. 1196-NFPA 13-2022 [Section No. A.5.2.2]

A.5.2.2

Care should be taken in making water tests to be used in designing or evaluating the capability of sprinkler systems. The water supply tested should be representative of the supply that might be available at the time of a fire. For example, testing of public water supplies should be done at times of normal demand on the system. Public water supplies are likely to fluctuate widely from season to season and even within a 24-hour period. Allowance should be made for seasonal or daily fluctuations, ~~for drought conditions, for possibility of interruption by flood, or for ice conditions in winter~~. Testing of water supplies also normally used for industrial use should be done while water is being drawn for industrial use. The range of industrial-use demand should be taken into account. In special situations where the domestic water demand could significantly reduce the sprinkler water supply, an increase in the size of the pipe supplying both the domestic and sprinkler water can be justified. Where adjustments are appropriate, the adjustments should be coordinated with the AHJ prior to the development of the working plans by the contractor.

Future changes in water supplies should be considered. For example, a large, established, urban supply is not likely to change greatly within a few years. However, the supply in a growing suburban industrial park might deteriorate quite rapidly as greater numbers of plants draw more water.

Dead-end mains should be avoided, if possible, by arranging for mains supplied from both directions. When private fire service mains are connected to dead-end public mains, each situation should be examined to determine if it is practical to request the water utility to loop the mains in order to obtain a more reliable supply.

Testing of Water Supply. To determine the value of public water as a supply for automatic sprinkler systems, it is generally necessary to make a flow test to determine how much water can be discharged at a residual pressure at a rate sufficient to give the required residual pressure under the roof (with the volume flow hydraulically translated to the base of the riser) — that is, a pressure head represented by the height of the building plus the required residual pressure.

The proper method of conducting this test is to use two hydrants in the vicinity of the property. The static pressure should be measured on the hydrant in front of or nearest to the property and the water allowed to flow from the hydrant next nearest the property, preferably the one farthest from the source of supply if the main is fed only one way. The residual pressure will be that indicated at the hydrant where water is not flowing.

Referring to Figure A.5.2.2, the method of conducting the flow tests is as follows:

- (1) Attach the gauge to the hydrant (A) and obtain static pressure.
- (2) Either attach a second gauge to the hydrant (B) or use the pitot tube at the outlet. Have hydrant (B) opened wide and read pressure at both hydrants.
- (3) Use the pressure at (B) to compute the gallons flowing and read the gauge on (A) to determine the residual pressure or that which will be available on the top line of sprinklers in the property.

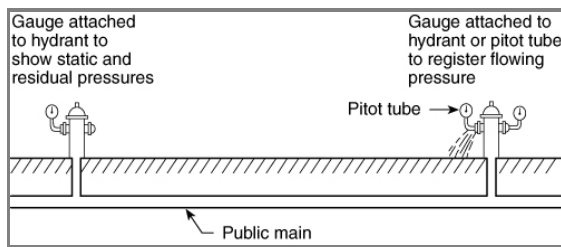
Water pressure in pounds per square inch for a given height in feet equals height multiplied by 0.433.

In making flow tests, whether from hydrants or from nozzles attached to hose, always measure the size of the orifice. While hydrant outlets are usually 2½ in. (65 mm), they are sometimes smaller and occasionally larger. Underwriters Laboratories play pipe is 1⅞ in. (28.6 mm) and 1¾ in. (44.5 mm) with the tip removed, but occasionally nozzles will be 1 in. (25.4 mm) or 1¼ in. (31.8 mm), and with the tip removed the opening can be only 1½ in. (38.1 mm).

The pitot tube should be held approximately one-half the diameter of the hydrant or nozzle opening away from the opening. It should be held in the center of the stream, except that in using hydrant outlets the stream should be explored to ascertain the average pressure.

For further information on water supply testing, see NFPA 291.

Figure A.5.2.2 Method of Conducting Flow Tests.



Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Jul 28 16:37:22 EDT 2022

Committee Statement

Committee Statement: It is important to coordinate any water supply adjustments that are going to be made with the AHJ prior to performing the hydraulic calculations and submitting plans, where such adjustments are necessary.

Response Message: FR-1196-NFPA 13-2022

[Public Input No. 393-NFPA 13-2022 \[Section No. A.5.2.2\]](#)

[Public Input No. 601-NFPA 13-2022 \[Section No. A.5.2.2\]](#)



First Revision No. 1197-NFPA 13-2022 [Section No. A.5.2.2.2]

A.5.2.2.2

An adjustment to the waterflow test data to account for daily and seasonal fluctuations, ~~possible interruption by flood or ice conditions~~, large simultaneous industrial use, future demand on the water supply system, or any other condition that could affect the water supply should be made as appropriate.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Jul 28 17:10:56 EDT 2022

Committee Statement

Committee Statement: These are examples of extreme conditions that are not considered in a normal water supply analysis.

Response Message: FR-1197-NFPA 13-2022

[Public Input No. 603-NFPA 13-2022 \[Section No. A.5.2.2.2\]](#)



First Revision No. 1198-NFPA 13-2022 [Section No. A.19.3.1.2.1]

A.19.3.1.2.2

In order for the minimum eight sprinkler requirement for the size of the remote area to not be extended to the adjacent area, the qualifying concealed space must be separated by the entire fire-rated assembly. Such assemblies often have combustible structural members separating the exterior membranes that can create a concealed combustible space that can qualify for omitting sprinkler protection. If the fire-rated assembly is the qualifying concealed space, an interior fire would greatly reduce the assigned fire-rated duration.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Thu Jul 28 17:12:37 EDT 2022

Committee Statement

Committee Statement: Re-numbering corrects the reference to the standard.

Response Message: FR-1198-NFPA 13-2022

[Public Input No. 50-NFPA 13-2021 \[Section No. A.19.3.1.2.1\]](#)



First Revision No. 1227-NFPA 13-2022 [Section No. A.20.4.3]

A.20.4.3

See Table A.20.4.3.

Table A.20.4.3 Examples of Class III Commodities

<u>Product Heading</u>	<u>Product</u>
Film Rolls, Including Photographic	Film; 35 mm metal film cartridges in polyethylene cans; cartoned
	Photographic paper; sheets; bagged in polyethylene; cartoned
Flammable/Combustible Liquids	Aerosol; Level 1
Food Products — Frozen	Frozen foods; plastic trays
Food Products — Non-Frozen	Butter (stick or whipped spread) or margarine (up to 50 percent oil)
	Dry foods (such as baked goods, candy, cereals, cheese, chocolate, cocoa, coffee, grains, granular sugar, nuts, etc.); bagged or cartoned
	Meat; fresh; plastic trays
Furniture and Bedding	Furniture; wood (doors, windows, cabinets, etc.); no plastic coverings or foam cushioning
	Box spring; standard (minimal plastic materials)
Housing Materials/Appliances	Appliances; no appreciable plastic exterior trim (interior of unit can have appreciable plastic)
	Roofing shingles; asphalt-coated fiberglass
Miscellaneous	Charcoal; standard (non-mineral spirit impregnated); bagged
	Leather; finished products (e.g., shoes, jackets, gloves, bags, luggage, belts)
	Shock absorbers; plastic dust cover
	Tobacco products; cartoned
Paper Products	Cartons (i.e., cardboard flats); corrugated; unassembled in neat piles
	Cellulosic paper products; nonwax-coated (e.g., books, cardboard games, cartoned tissue products, magazines, newspapers, paper cups, paper plates, paper towels, plastic-coated paper food containers, stationery)
	Rolled; medium or heavyweight; in storage racks or on-side
	Tissue products; plastic-wrapped; cartoned
Plastic/Rubber	Melamine (melamine formaldehyde)
	PCTFE (polychlorotrifluoroethylene)
	Phenolic
	PTFE (polytetrafluoroethylene)
	PVC (polyvinyl chloride) products, up to 20 percent plasticizer
	PVC resins; bagged
	PVDC (polyvinylidene chloride)
	PVDF (polyvinylidene fluoride)
	Urea (urea formaldehyde)
Textile Materials/Products	Cloth; natural fibers; baled
	Clothing; natural fibers (e.g., wool, cotton) and viscose

<u>Product Heading</u>	<u>Product</u>
	Cotton; cartoned
	Diapers; cotton or linen
	Fabric; synthetic (except rayon and nylon); up to 50/50 blend
	Thread or yarn; synthetic (except rayon and nylon); up to 50/50 blend; wood or paper spools
Wire/Cable/Spools	Spools; wood; empty
Wood Products	Wood products (e.g., fiberboard, lumber, particle board, plywood, pressboard with smooth ends and edges); unbundled or non-solid blocks
	Wood products (e.g., toothpicks, clothespins and hangers)

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_AUT_SSD_FDM_A.20.4.3_FR1227.docx	For staff use only	

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 11:42:44 EDT 2022

Committee Statement

Committee Statement: The table incorrectly identifies synthetic textiles as Class III commodities when they should be Group A in accordance with Table A.20.4(b). The commodities are already included in Table A.20.4.5.1 as examples of Group A Plastics.

Response Message: FR-1227-NFPA 13-2022

Public Input No. 222-NFPA 13-2022 [Section No. A.20.4.3]



First Revision No. 1226-NFPA 13-2022 [Section No. A.24.1]

A.24.1

The intent of this chapter is to provide protection options for the commodity hazards and storage arrangements outlined in Chapters 20 through 25 based on the characteristics of the sprinkler, such as K-factor, orientation, RTI rating, sprinkler spacing type and temperature rating, and using a design format of number of sprinklers at a minimum operating pressure. The protection options offered in this chapter will be based on the results of full-scale fire testing, as outlined in A.24.2 or A.24.3, while incorporating a minimum 50 percent safety factor into the number of sprinklers provided in the design. The intent of this chapter is to offer protection options using sprinklers having a nominal K-factor of 11.2 (160) or higher.

Nothing in this chapter is intended to limit the development and use of equivalency or new technology applications under the provisions of Section 1.5 or Section 1.7 .

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 11:39:24 EDT 2022

Committee Statement

Committee Statement: Clarifies that chapter 24 should not limit advancements in technology.

Response Message: FR-1226-NFPA 13-2022

Public Input No. 570-NFPA 13-2022 [Section No. A.24.1]



First Revision No. 1280-NFPA 13-2022 [Section No. A.25.1.1.1]

A.25.1.1.1

The following information should be obtained prior to using Chapter 25 to assist in determining the proper protection options provided in the chapter:

- (1) Commodity classification of the storage, using Chapter 20
- (2) If Class I through Class IV, whether the commodity is exposed and nonencapsulated, exposed and encapsulated, or cartoned
- (3) The maximum storage height and ceiling height for the storage area
- (4) Rack type (i.e., fixed-in-place, portable, or moveable) in which the storage will be maintained
- (5) Aisle width between storage racks
- (6) Depth of the storage racks
- (7) Rack arrangements (i.e., single-, double-, or multiple-row racks) in which the storage will be maintained
- (8) Whether solid shelves will be present and, if applicable, shelf size

Fire testing of in-rack sprinkler protection schemes described in Chapter 25 have generally demonstrated improved fire protection compared to the ceiling-only sprinkler protection schemes described in Chapters 21 through 24. Lower ceiling temperatures and a reduced amount of smoke/combustion products developed during the fire control or suppression process has typically been observed during fire testing of these in-rack sprinkler systems. A reduction in the amount of smoke/combustion product generation provides greater visibility for the fire service while achieving final extinguishment.

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Sat Jul 30 09:56:01 EDT 2022

Committee Statement

Committee Statement: This additional text in the annex provides additional information for property owners and other stakeholders to consider when selecting the fire sprinkler protection scheme.

Response Message: FR-1280-NFPA 13-2022



First Revision No. 1232-NFPA 13-2022 [Section No. A.25.1.7.8]

A.25.1.7.8

~~Where rack storage is up to and including 25 ft (7.6 m) in height, in-rack sprinklers should be a minimum 3 in. (75 mm) radially from the side of rack uprights.~~

Submitter Information Verification

Committee: AUT-SSD

Submittal Date: Fri Jul 29 12:02:52 EDT 2022

Committee Statement

Committee Statement: The annex note provides no additional value and simply restates the requirements of the standard.

Response Message: FR-1232-NFPA 13-2022



First Revision No. 1264-NFPA 13-2022 [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 flood
 - (f) Results of the test
- (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

Figure A.28.1(a) Typical Preliminary Plan.

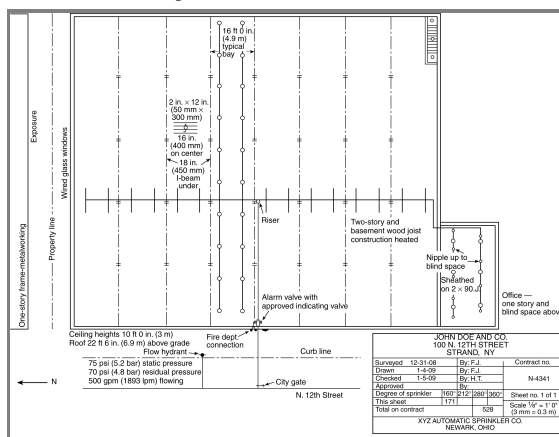


Figure A.28.1(b) Owner's Information Certificate.

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	☐ Yes	☐ No
Fixed guideway transit system	☐ Yes	☐ No
Race track stable	☐ Yes	☐ No
Marine terminal, pier, or wharf	☐ Yes	☐ No
Airport terminal	☐ Yes	☐ No
Aircraft engine test facility	☐ Yes	☐ No
Power plant	☐ Yes	☐ No
Water-cooling tower	☐ Yes	☐ 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	☐ Yes	☐ No
Aerosol products	☐ Yes	☐ No
Nitrile film	☐ Yes	☐ No
Pyroxylin plastic	☐ Yes	☐ No
Compressed or liquefied gas cylinders	☐ Yes	☐ No
Liquid or solid oxidizers	☐ Yes	☐ No
Organic peroxide formulations	☐ Yes	☐ No
Idle pallets	☐ Yes	☐ No

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

© 2024 National Fire Protection Association

NFPA 13 (p. 1 of 2)

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
13_AUT_SSD_FDM_A.28.1_FR1264.docx	For staff use only	

Submitter Information Verification

Committee: AUT-SSD
Submittal Date: Fri Jul 29 16:21:57 EDT 2022

Committee Statement

Committee Statement: A change was made to item (3) in section 4.2 Owner's Certificate that requires the water supply data to be provided including any necessary adjustments. The form is being changed to reflect that change.

Response Message: FR-1264-NFPA 13-2022

[Public Input No. 529-NFPA 13-2022 \[Section No. A.28.1\]](#)