

TOP 10 CHANGES TO THE 2016 EDITION OF NFPA 13 – WHAT'S NEW FOR SPRINKLERS?



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NFPA 13 – 2016 Edition

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- First Revisions – August 2013
- Second Revisions – June 2014
- Membership Vote – June 2015
- Published – October 2015
- **Public Input Due for the 2019 Edition June 2016**





10. Main Drain Sizing

Main Drain Sizing

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- No longer mandates a maximum size for main drains
- This allows the main drain as a method for performing forward flow tests for backflow preventions devices, if desired.

Main Drain Sizing

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Riser or Main Size (inches)	2013 – Drain Connection (inches)	2016 – Drain Connection (inches)
Up to 2	3/4 or larger	3/4 or larger
2 1/2, 3, 3 1/2	1 1/4 or larger	1 1/4 or larger
4 and larger	2 only	2 or larger



9. Adjacent Hazards/Design Methods

Adjacent Hazards

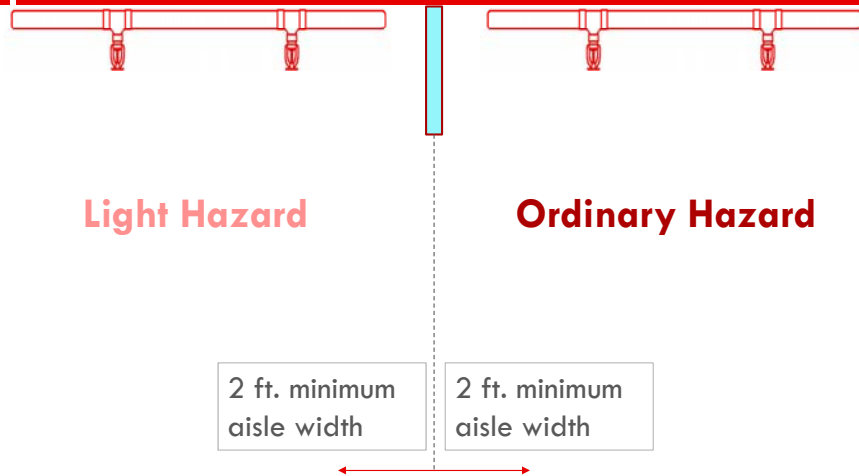
7

- **11.1.2*** Adjacent Hazards or Design Methods.
 - (1) Increase highest design area by 15 feet,
 - (2) barrier located above an aisle, horizontally a minimum of 2 ft (0.6 m) from an adjacent hazard,
 - (3) a change in ceiling height between adjacent hazards, which is at least 2 feet, and located above an aisle, horizontally a minimum of 2 ft (0.6m) from an adjacent hazard .



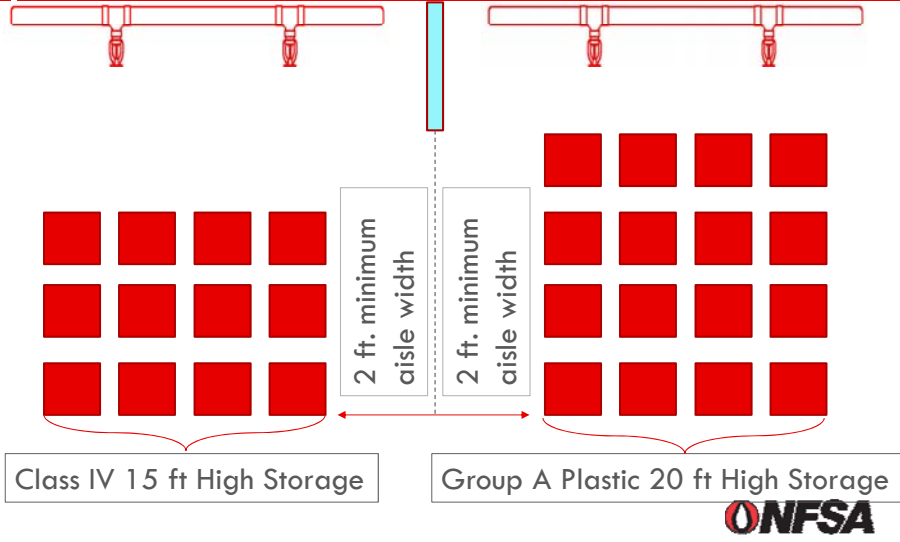
Adjacent Hazards

8



Adjacent Hazards

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8. Pipe Stands

Pipe Stands

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- Registered professional engineer is permitted to design an alternative
- Calculations must include system details and safety factors incorporated
- Considered structure equivalent



Pipe Stands (continued)

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- Must be ferrous
 - Other materials proven by fire testing
- Spaced per distances in Table 9.2.2.1



Pipe Stands (continued)

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- Sizing
 - Per Table 9.2.6.3.1
 - Short pipe stand exception
 - Maximum 4 ft (base of pipe stand to centerline of the supported pipe)
 - 2-inch pipe stand
 - Can support up to 10-inch Schedule 40
 - Must be axially loaded



Pipe Stands (continued)

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System Pipe Diameter	Pipe Stand Diameter					
	1 ½ inch	2 inch	2 ½ inch	3 inch	4 inch	6 inch
1 ½ inch	6.6 ft	9.9 ft	11.3 ft	13.8 ft	18.0 ft	26.8 ft
2 inch	4.4 ft					
2 ½ inch						
3 inch		8.1 ft	5.2 ft			
4 inch to 8 inch					14.7 ft	



Pipe Stands (continued)

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- Base
 - ▣ Secured by approved method
 - ▣ Minimum of four anchors attached to the floor
 - ▣ Allowances for short pipe stands meeting the previous exception

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Pipe Stands (continued)

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- U-bolt or equivalent connection to system piping
- Maximum cantilever attachment of 1 ft
 - ▣ Bracket sized by section modulus in Table 9.2.6.5.3
- Thrust from system operation accounted for

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Pipe Stands (continued)

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- Additional Considerations
 - ▣ Exterior application
 - ▣ Areas subject to earthquakes

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7. Openings in Concealed Spaces

Small Openings in Concealed Spaces

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- 8.15.1.2.1.2. Small openings with a combined total area of not more than 20 percent of the ceiling, construction feature, or plane used to determine the boundaries of the concealed space shall be permitted where length greater than 4 ft (1.2 m) shall not have a width greater than 8 in. (200 mm).

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6. Clearance to Obstructions

3x and 4x Spacing Rule

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- When applying the rules of 8.6.5.2.1.3 (“three times rule”) the maximum clear distance for spray sprinklers of 24 inches has been eliminated for obstructions in the vertical orientation such as columns

- Similar changes were made to the 4x rule for extended coverage sprinklers



3x and 4x rule

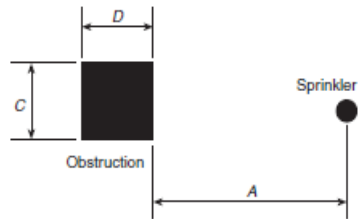
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- 8.6.5.2.1.3* Minimum Distance from Obstructions. Unless the requirements of 8.6.5.2.1.4 through 8.6.5.2.1.9 are met, sprinklers shall be positioned away from obstructions a minimum distance of three times the maximum dimension of the obstruction (e.g., structural members, pipe, columns, and fixtures) in accordance with Figure 8.6.5.2.1.3(a) and Figure 8.6.5.2.1.3(b).
- (A) The maximum clear distance required shall be 24 in.
- (B) The maximum clear distance shall not be applied to obstructions in the vertical orientation (e.g., columns).

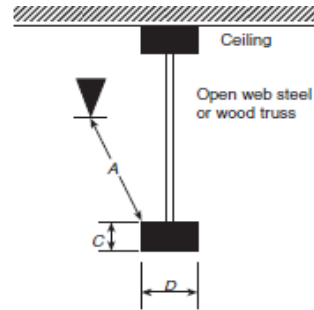


3x and 4x rule

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Plan View of Column
(Obstruction in vertical orientation)
 $A \geq 3C$ or $3D$
(Use dimension C or D , whichever is greater)



Elevation View of Truss
(Obstruction in horizontal orientation)
 $A \geq 3C$ or $3D$
 $A \geq 24$ in. (600 mm)
(Use dimension C or D , whichever is greater)



5. Air Vents

Air Venting

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- 7.1.5 Air Venting. A single air vent with a connection conforming to 8.16.6 shall be provided on each wet pipe system utilizing metallic pipe.

- This section is clear that **all wet pipe sprinkler systems** installed in accordance with the 2016 edition of NFPA 13 and using metallic pipe require the inclusion of an air vent.



Air Venting

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- 7.1.5.1 Venting from multiple points on each system shall not be required.

- This section clarifies that it is not required to vent from multiple locations in a system



Air Venting

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- Starting in the 2013 edition of NFPA 13, the definition of a system was changed to clarify that a system is the piping that includes a water supply source, a control valve, a waterflow alarm and a drain.

- This means that each floor of a multi-story building with a FCVA is a separate system each with an air vent.



Air Venting

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- 8.16.6* Air Venting. The vent required by 7.1.5 shall be located **near a high point** in the system to allow air to be removed from that portion of the system by one of the following methods:
 - (1) Manual valve, minimum 1/2 in. size
 - (2) Automatic air vent
 - (3) Other approved means





4. Concrete Anchors

Concrete Anchors

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- Prying Factor (3.11.9)
 - A factor based on fitting geometry and brace angle from vertical that results in an increase in tension load due to the effects of prying between the upper seismic brace attachment fitting and the structure.
 - Indicated with manufacturers data

Concrete Anchors (continued)

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- Prequalified for seismic application with ACI 355.2, *Qualifications of Post-Installed Mechanical Anchors in Concrete and Commentary*
- Use Table 9.3.5.12.2(a) through Table 9.3.5.12.2(f) for loads



Concrete Anchors (continued)

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- Allowable load can be calculated
 - ▣ Software permitted as long as it accounts for prying with concrete anchors
 - ▣ Has to be seismically prequalified
 - ▣ Calculated ASD values are per ACI 318 Chapter 17 and consider prying effecting, brace angle, and overstrength factor
- Alternative designed by professional engineer per building codes





3. Commodity Classification

Classification of Commodities

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- 5.6.1.1.1 Commodity Classification and the corresponding protection requirements shall be determined based on the makeup of individual storage units (i.e, unit load, pallet load).
- 5.6.1.1.1.1 The type and amount of materials used as part of the product and its primary packaging as well as the storage pallet shall be considered in the classification of the commodity.



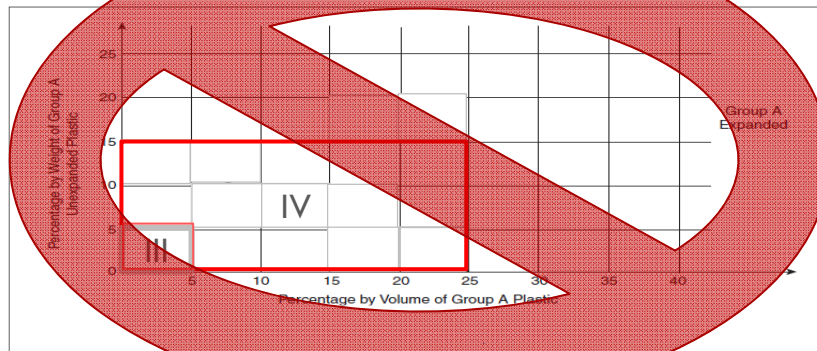
Pre-2016 Mixed Commodity

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- 5.6.3.3.2 - Class III Commodity
 - Class III commodity shall be permitted to contain a limited amount (5 % by weight or volume or less) of Group A or Group B plastics.
- 5.6.3.4.1 – Class IV Commodity
 - Class IV commodity shall be defined as a product, with or without pallets, that meets one of the following criteria:
 - (1) Constructed partially or totally of Group B plastics
 - (2) Consists of free-flowing Group A plastic materials
 - (3) Contains within itself or its packaging an appreciable amount (5 % to 15 % by weight or 5 % to 25 % by volume) of Group A plastics



5.6.3.4.1 – Class IV Commodity (Graphical Representation of old text)



2016 Class III & Class IV

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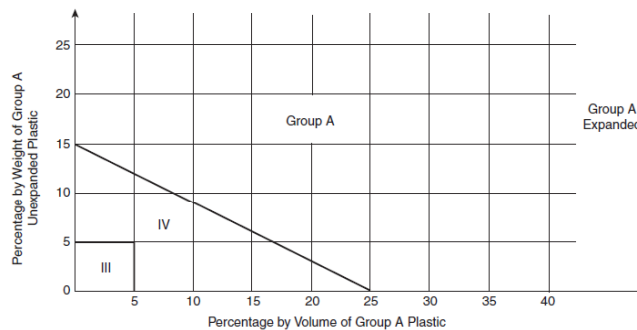
- Class III and Class IV can contain a limited amount of Group A plastics:
- Cartoned – Figure 5.6.3.3(A)
- Exposed – Figure 5.6.3.3(B)



2016 Edition – Figure 5.6.3.3.3(a)

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Commodities Containing a Mixture of Expanded and Unexpanded Group A Plastics – Cartoned



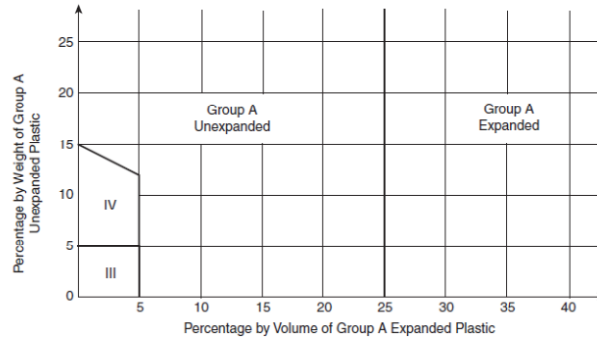
III - Class III Commodity. Refer to 5.6.2 if a plastic pallet is used.
IV - Class IV Commodity. Refer to 5.6.2 if a plastic pallet is used.



2016 Edition – Figure 5.6.3.3.3(b)

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Commodities Containing a Mixture of Expanded and Unexpanded Group A Plastics – Exposed



III - Class III Commodity. Refer to 5.6.2 if a plastic pallet is used.

IV - Class IV Commodity. Refer to 5.6.2 if a plastic pallet is used.

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5.6.4.1 – Plastics Reclassified

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- Added to Group A Plastics:
 - (5) Cellulosics (cellulose acetate, cellulose acetate butyrate, ethyl cellulose)
 - (Formerly Group B)
 - (8) Natural rubber (not expanded)
 - (Formerly Group B)
 - (10) Nylon (nylon 6, nylon 6/6)
 - (Formerly Group B)
 - (20) PVF (polyvinyl fluoride)
 - (Formerly Group C)

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2. Cloud Ceilings

Cloud Ceilings

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Cloud Ceiling

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Definition (3.3.5.1).

- “Any ceiling system installed in the same plane with horizontal openings to the structure above on all sides. This does not include sloped ceilings as defined in 3.3.5.4.”



Cloud Ceiling

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- **Cloud Ceilings (8.15.24)**
- New section provides guidance on when sprinklers may be omitted from above a cloud ceiling.
- Based upon the results of a Fire Protection Research Foundation project
- The basic premise is that under a certain set of circumstances, sprinklers located below the clouds only will provide adequate fire protection.



Cloud Ceiling

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- Sprinklers shall be permitted to be omitted above cloud ceilings where both of the following apply:
 - The openings around the cloud and the maximum sprinkler protection area meet the requirements of 8.15.1.2.1.2 and Table 8.15.24.1
 - The requirements of 8.15.24.2 are met.

- (Note: 8.15.1.2.1.2 was intended to be 8.15.1.2.1.3)



Cloud Ceiling

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- 8.15.1.2.1.3
- The space above cloud ceilings meeting the requirements in 8.15.24.1 and having openings with a combined total area of not more than 20 percent of the ceiling, construction feature, or plane used to determine the boundaries of the concealed space shall be permitted.



Cloud Ceiling

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- **Table 8.15.24.1** Maximum Sprinkler Protection Area Based on Ceiling Cloud Width and Opening Width

Ceiling Cloud — Minimum Width Dimension (ft)	Maximum Area (ft ²) — Opening Width ≤0.5 in./ ft of Ceiling Height	Maximum Area (ft ²) — Opening Width ≤0.75 in./ ft of Ceiling Height	Maximum Area (ft ²) — Opening Width ≤1 in./ ft of Ceiling Height
2 to <2.5	175	70	NP
2.5 to 4	225	120	70
> 4	225	150	150



Annex to 8.15.24.1(1)

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- The maximum allowed gap distance for omission of sprinklers above cloud ceilings formula.

$$A / B = X$$

A = inches of gap between clouds or between a cloud and a wall

B = ceiling height

X = maximum inches of gap

Example:

A = 8 in. maximum gap dimension

B = 14 ft ceiling height

X = 8/14 = 0.57 inch of gap/ft of ceiling height



Cloud Ceiling Installation Rules

8.15.24.2

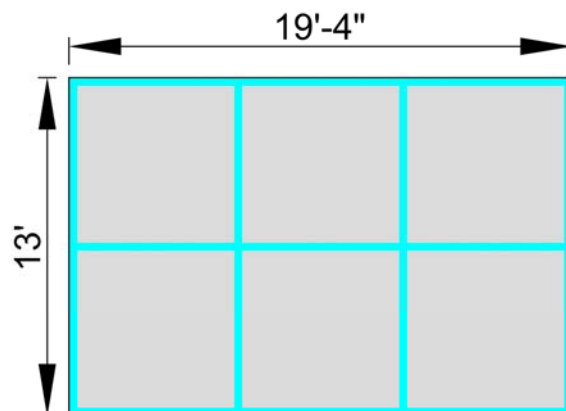
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- All sprinklers shall be quick response standard spray or extended coverage pendent or upright sprinklers.
- Where extended coverage sprinklers are used, the maximum distance between sprinklers shall not exceed 16 ft
- Maximum cloud ceiling height shall not exceed 20 ft.

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Cloud Ceiling Example

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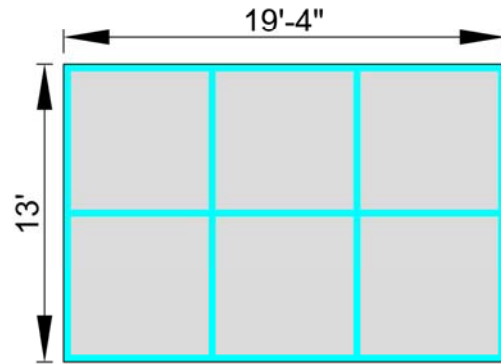


Cloud Array (6ft x 6ft) 14 ft elev.
4-inch gap between clouds & wall

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Cloud Ceiling Example

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Step 1:
Does Cloud Meet
definition?

Yes

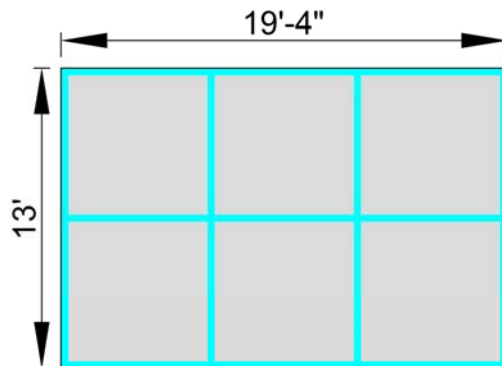
Step 2:
Is Cloud 20 ft or
less?

Yes

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Cloud Ceiling Example

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Step 3: What is
Max. spacing
allowed?

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Annex to 8.15.24.1(1)

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□ $A / B = X$

A = inches of gap between clouds or between a cloud and a wall

B = ceiling height

X = maximum inches of gap

□ Example:

$$4/14 = 0.3 \text{ inch of gap/ft of ceiling height}$$



Table 8.15.24.1

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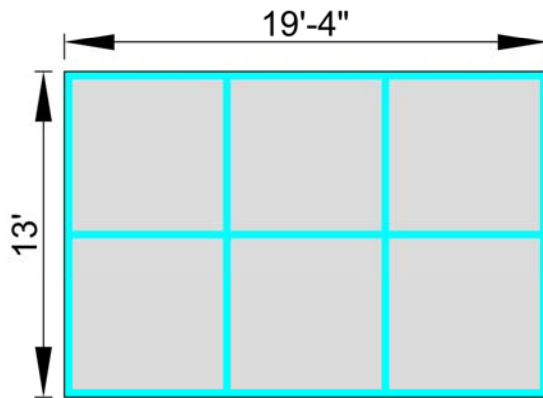
□ Maximum Sprinkler Protection Area Based on Ceiling Cloud Width and Opening Width

Ceiling Cloud — Minimum Width Dimension (ft)	Maximum Area (ft ²) — Opening Width ≤0.5 in./ ft of Ceiling Height	Maximum Area (ft ²) — Opening Width ≤0.75 in./ ft of Ceiling Height	Maximum Area (ft ²) — Opening Width ≤1 in./ ft of Ceiling Height
2–<2.5	175	70	NP
2.5–4	225	120	70
>4	225	150	150



Cloud Ceiling Example

55



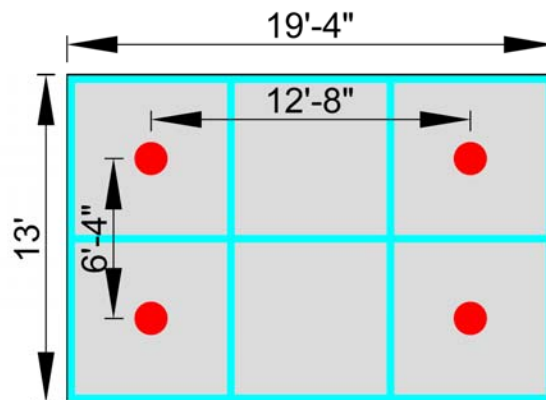
Step 3: What is Max. spacing allowed?

225 sq. ft.

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Cloud Ceiling Example

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QR Sprinklers spaced at <225 sq. ft.

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1. Exposed Expanded Group A Plastic

Exposed Expanded Plastics on Racks

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<http://www.nfpa.org/research/fire-protection-research-foundation/projects-reports-and-proceedings/suppression/applications/protecti-on-of-exposed-expanded-group-a-plastics>



Exposed Expanded Plastic up to 25 ft

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- 17.2.3.5* Protection of Exposed Expanded Group A Plastics.
- The maximum storage height shall be 25 ft.
- The maximum ceiling height shall be 40 ft.
- Sprinklers shall be intermediate temperature-rated ESFR pendent sprinklers with a nominal K-factor of K-25.2



Exposed Expanded Plastic up to 25 ft

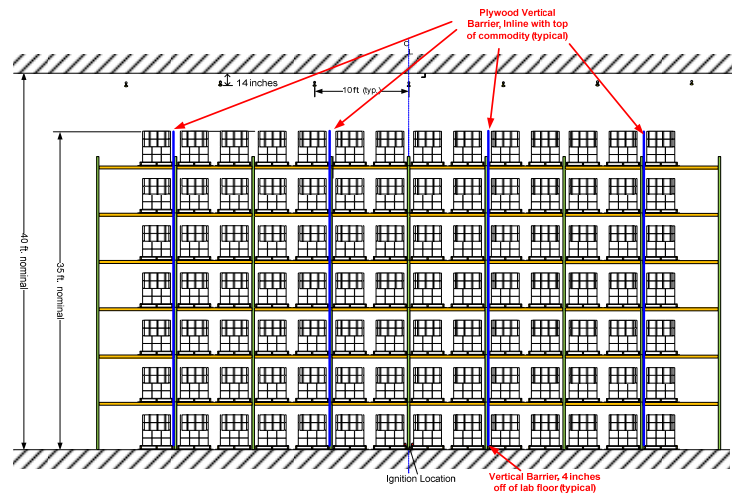
60

- 12 sprinklers design area
- The minimum operating pressure shall be either 30 psi or 60 psi
 - A) 30 psi for storage heights up to 25 ft with a maximum ceiling height of 30 ft
 - B) 60 psi (4.1 bar) for storage heights up to 25 ft. (7.6 m) with a maximum ceiling height of 40 ft (12.2 m).
- The minimum aisle width shall be 8 ft (2.4 m).



Vertical Barriers for Exposed Expanded Plastics

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Picture courtesy of FPRF Report

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17.2.3.5.8 Vertical Barriers for Exposed Expanded

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- ❑ Solid vertical face of rack to face of rack, spaced at a maximum 16.5 ft (5.0 m) interval.
- ❑ Extend a maximum of 4 in. (102 mm) above the floor to the maximum storage height.
- ❑ Area of storage between vertical barriers and aisles not exceed 124 ft² (11.52 m²)
- ❑ Extend across the longitudinal flue.
- ❑ Commodity shall be permitted to extend a nominal 4 in. (102 mm) beyond the vertical barrier at the aisle.

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Exposed Expanded Plastic over 25 ft

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- Section 17.3.3.5
- Similar requirements as storage over 25 feet.
- Differences include:
 - Maximum storage height of 35 ft (10.6 m).
 - Maximum ceiling height of 40 ft (12.2 m).
 - Minimum operating pressure of 60 psi (4.1 bar).



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THANK YOU!



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