Bob Caputo, CFPS

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Navigating NFPA 13
2019 edition

Sprinklers Installation Requirements
- Chapter 9 – Sprinkler Location Requirements
- Chapter 10 – Standard Spray Uprights, Pendants, Sidewalls
- Chapter 11 – Extended Coverage Uprights, Pendants, Sidewalls
- Chapter 12 – Residential Sprinklers
- Chapter 13 – CMSA Sprinklers
- Chapter 14 – ESFR Sprinklers
- Chapter 15 – Special Sprinklers

Design and Discharge
- Chapter 19 – Design Approaches
- Storage Chapters
- Chapter 20 – General Requirements for Storage
- Chapter 21 – CMDA
- Chapter 22 – CMSA
- Chapter 23 – ESFR
- Chapter 24 – Alternative Designs
- Chapter 25 – In-rack Sprinklers
- Chapter 26 – Special Occupancies
General Requirements

General
- Topics covered
  - Commodity classification
  - Storage arrangements
  - Storage heights
  - Clearances
  - Miscellaneous/Low-Piled
    - See chapter 4

Section 20.1

High-Piled vs. Low-Piled

High-Piled Storage
- Class I through Class IV
- 12 ft or less in height
- Group A plastics
  - 5 ft or less in height
  - Use miscellaneous criteria

Low-Piled Storage

Section 4.3.1.5 & 4.3.6
- Not low-piled
- Class I through Class IV
  - Exceeding 12 ft in height
  - Group A plastics
    - Exceeding 5 ft in height
Miscellaneous Storage

- Storage height not exceeding 12 ft
- No more than:
  - No more than 10% building area
  - 4,000 sq. ft
  - Whichever is greater
- Separated by 25 ft
- Solid shelf requirements do not apply

Section 4.3.1.4

---

Table 4.3.1.7.7.1

---

Protection of Storage

- Identify the commodity
- Identify the method of storage
- Establish storage height
- Establish building height
- Select sprinkler technology
  - CMDA
  - CMSA
  - ESFR

Section 20.2
Multiple Hazard Classification

- Select water supply based on duration of higher hazard classification
- Unless:
  - Higher hazard contained to 400 sq. ft.

Classification of Commodities

- Consider
  - Product being stored
  - Primary packaging
  - Pallet
- Lab data permitted to classify commodity
- Design for the highest, all lower commodities are protected

Pallet Types

- Wood
- Metal
- Plastic
  - May increase commodity classification
Plastic Pallets

Unreinforced Plastic Pallets

- No secondary reinforcing
- Increase one commodity class
- Marked with a permanent symbol

Reinforced Plastic Pallets

- Incorporates secondary reinforcing
- Increase two commodity classes
- Class IV
- Group A
- No increase for Group A
- Assumed reinforced without permanent marking

---

Plastic Pallets – No Increase

Sprinklers 16.8-K or Larger Listed

- Maximum 25 ft
- CMDA sprinklers
- Increase density by 20%
- Unless in-racks are used

---

Slave Pallets

- Flat, combustible pallets
- Class I through IV
- Maximum 25 ft
- CMDA sprinklers
- Increase density by 20%
- Unless in-racks are used

---

Section 20.3.2.4 & 20.3.2.3

Figure A.3.3.154.1

Section 20.3.2.5
Open-Top Containers
- Entirely or partially open
- Collects water
- Outside the scope of storage chapters
  - OK for miscellaneous/low-piled storage

Commodity Classes

Class I
- Non-combustible products
  - Directly on wood pallets
  - Single-layer corrugated cartons, with or without pallets
  - Shrink-wrapped or paper-wrapped, with or without pallets
Class I Examples

Section A.20.4.1

Class II

- Noncombustible products
  - In slatted wood crates
  - Solid wood boxes
  - Multiple-layered corrugated cartons
  - Or equivalent packaging material
  - With or without pallets

Section 20.4.2

Class II Examples

Section A.20.4.2
Class III

- Combustible products
  - Wood
  - Paper
  - Natural Fibers
  - Group C plastics
- Contained in
  - Cartons
  - Boxes
  - Cases
  - Pallets

Section 20.4.3

Cartoned Class III

Figure 20.4.3.3(a)

Exposed Class III Commodities

Figure 20.4.3.3(b)
Class III Examples

Section A.20.4.3

30

Class IV

- Group B plastics
- Free-flowing Group A plastics
- 5-15% wt. nonexpanded Group A, cartoned
- 5-15% vol. expanded Group A, cartoned
- 5-15% wt. nonexpanded Group A, exposed

Section 20.4.4

31

Cartoned Class IV

Figure 20.4.3.3(a)

32
Exposed Class IV Commodities

Figure 20.4.3.3(b)

Class IV Examples

Section A.20.4.4

Group A Plastics

- Based on list of materials in standard
- Subdivided into expanded/non expanded

Section 20.4.5.1 & 20.4.5.2
Cartoned Group A Expanded Plastics

Figure 20.4.3.3(a)

Exposed Group A Expanded Plastics

Section 20.4.5.3

Cartoned Group A Nonexpanded Plastics

Figure 20.4.3.3(a)
Exposed Group A Nonexpanded Plastics

Figure 20.4.3.3(b)

Group A and Group C Plastics

- Based on list of materials in standard
- Group B protected as Class IV
- Group C protected as Class III

Figure 20.4.8

Special Commodities

Sections 20.4.9, 20.4.10, 20.4.11, & 20.4.12
Special Commodities

Sections 20.4.9, 20.4.10, 20.4.11, & 20.4.12

Mixed Commodities

- Not based on overall mix/distribution
- Based on highest classified commodity
- Up to 10 pallets of higher classification permitted
- Up to 5 pallets of Class IV or Group A (Class I or II)
- Max 40,000 sq. ft area
- Randomly dispersed, nonadjacent

Section 20.4.13

CLASS II COMMODITY

Section 20.4.13
Ranking Commodities

1) Class I
2) Class II
3) Class III
4) Class IV
5) Cartoned nonexpanded plastic
6) Cartoned expanded plastic
7) Exposed nonexpanded plastic
8) Exposed expanded plastic

Storage Arrangements

Rack Types

- Moveable Racks
  - Protected as multiple-row rack
- Portable Racks
  - Protected as multiple-row racks

Section 20.5.1 & 20.5.2
Rack Storage

Rack Definitions

Shelving

- Solid shelves if:
  - Less than 50% open
  - Or placement of loads block required flue space
  - Greater than 20 ft² in an area
- Open rack if not

Section 20.5.3.1
Double-Row Racks

- Solid shelf if longitudinal flue not provided
- Open if
  - No solid shelves
  - Longitudinal flue
  - Storage ≤ 25 ft
  - Transverse flues every 5 ft or less

Section 20.5.3.1.2

Multiple-Row Racks

- Considered solid shelf unless:
  - Transverse flues spaced ≤ 5 ft
  - Longitudinal flues spaced ≤ 5 ft
  OR
  - Transverse flues spaced ≤ 5 ft
  - Rack depth ≤ 20 ft
  - Aisles ≥ 3.5 ft
  - Longitudinal flue not required

Section 20.5.3.1.3

Slatted Shelves

- Determine if they are open
- Special design requirements in Chapter 26

Section 20.5.3.2
Aisles

- Horizontal dimension
- Between face of loads in racks under consideration

Section 3.3.4 & 20.5.3.3

Flues

Longitudinal Flue Space

- Double-row and multiple-row racks:
  - ≤25 ft. in height: No flue required
  - Double-row racks:
  - >25 ft. in height: 6 in. nominal required

Section 20.5.3.4.1
Transverse Flue Space

- Single, Double and Multiple-row Racks:
  - Nominal 6 in. flue between loads and at rack uprights
  - Random variations in width or vertical alignment permitted

Section 20.3.4.3

Building Construction and Storage Heights

Ceiling Slope

- Not to exceed 2 in 12 unless modified by specific sections in Chapters 20-25

Section 20.9.1
Building Height and Clearance

- Measured to underside of the roof deck or ceiling
- Corrugated Metal Deck
  - 3 in. or less
  - Greater than 3 in.
- Insulation
  - Rigid, no sag
  - Sag, 6 in. or less
  - Sag, greater than 6 in.

Storage Height

- Based on routine or periodic storage height, whichever is more demanding
- Above door storage calculated from the base of storage above the door

Clearance to Ceiling

Section 20.9.2

Section 20.9.3.1 & 20.9.3.2

Section 20.9.4.1

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Maximum Clearance for CMDA Protection

Table 20.9.4.2

Excessive Clearance - Class I through Class IV

Table 20.9.4.3

Excessive Clearance - Plastic and Rubber

Table 20.9.4.4
Roof Vents and Draft Curtains

Roof Vents
- Manual operation
- Automatic
  - Activation temperature higher than sprinklers
- ESFR Sprinklers
  - Automatic
  - Activation temperature higher than sprinklers
  - Standard Response

Section 20.9.5.1 & 20.9.5.2

Draft Curtains
- Not permitted within ESFR
- Permitted at breaks in ESFR systems
  - ESFR/ESFR
  - ESFR/Control Mode
  - Different hazards

Section 20.9.5.3
Draft Curtains

- ESFR and Standard Response Sprinkler Break:
  - Non-combustible construction
  - At least 2 ft. in depth
  - Clear aisle of at least 4 ft. below the draft curtain

Section 20.9.5.3

Clearance from Deflector to Storage

- Minimum 18 in.
- Superseded by other standards/chapters
- Less with fire testing
- Minimum 36 in.
  - Rubber tires
  - CMSA
  - ESFR

Section 20.9.6
Unsprinklered Combustible Concealed Space

- Minimum 3000 sq. ft design area for adjacent spaces
- Unless
  - Construction meets 1 of 9 exceptions
  - Fire-resistant barrier installed equal to water supply duration

Section 20.10

Adjacent Hazards

- Separated by draft curtains
- Over an aisle
- 24 in clear on both sides
- Partition capable of delaying heat
- Change in elevation of 24 in
  - More demanding must be in higher ceiling
- If not, extend more demanding design 15 ft

Section 20.13

Hose Connections

- Small (1 ½ inch) Hose Connections
  - Where required by AHJ
- Not required for I-V commodities stored ≤ 12 ft in height

Section 20.14
Hose Allowance and Water Supply Duration

Table 20.15.2.6

Multiple Adjustments
- Compounded based on the original area of operation
- Minimum 3,000 sq. ft for combustible concealed space applied after

System Types
- Wet Systems Required
- Dry or Preaction permitted
  - Subject to freezing
  - Special conditions
  - Increase 30%
  - Even for single interlock

Section 20.16
Section 20.16.2
Special Design Considerations

Idle Pallets
Rubber Tire Storage (Columns)

Sections 20.17 & 20.18

Protection of Racks with Solid Shelves

Vertical Spacing and Location

- CMDA
  - 20 sq ft to 64 sq ft
  - Every 6 ft
- CMDA
  - Over 64 sq ft
  - Every level
- CMSA/ESFR
  - Every level

Section 20.19.3
Horizontal Location and Spacing

- Class I through Class IV
  - 10 ft max
- Group A plastics
  - 5 ft max
- Partial solid shelves
  - Extend at least 4 ft
  - End at flue space

Section 20.19.4

---

Installation of CMDA, CMSA, and ESFR Sprinklers

Intermediate Design School

---

Basic Requirements

1. Installed throughout
2. Maximum protection area
3. Satisfactory performance
4. Allowable omissions
5. Laboratory testing
6. Laboratory testing

Section 9.1
Allowable Omissions

- Non-combustible concealed spaces
- 16 examples with combustible construction
- May require increase in design area
- Check general storage chapter
- Other special areas

Section 9.2

Heat Sources

Storage Occupancies

- High-temperature sprinklers permitted throughout
  - Ordinary hazard
  - Extra hazard
  - Storage occupancies
- High-temperature not available in certain sprinkler types

Section 9.4.2.3
Temperature Ratings

- Ordinary/Intermediate throughout except...
  - Uncovered Steam main, heating coil, or radiator (uncovered)
  - Low pressure blowoff valve (within 7 ft)
  - Under Skylights
  - Unventilated concealed space/attic
  - Unventilated show windows w/ high powered lights
  - Commercial cooking equipment/vents
  - Heating ducts producing less than 100 °F
  - Coolers/Freezers with auto-defrost

Section 9.4.2.5

Unit Heaters

- 7 ft radius around center
- 20 ft arc 30° out from front edges

Figure 9.4.2.5

Maximum Protection Areas

\[ A_p = S \times L \]

- Where:
  - S is the distance between sprinklers on the branch line (2x distance to wall)
  - L is the distance between sprinklers perpendicular to the branch line (2x distance to wall)
  - Maximum 400 sq. ft or listing

Section 9.5.2.1 & 9.5.2.2
Maximum Distances

- As permitted
- Sprinklers
  - Centerline-Centerline
- Walls
  - ½ Max Allowable
  - Perpendicular

Section 9.5.3.1 & 9.5.3.2

Deflector Position

- Parallel to floor (2 in 12)
- Parallel to roof (sloped)
- Corrugated Metal Deck
  - 3 in. or less
  - Greater than 3 in.
- Insulation
  - Rigid, no sag
  - Sag, 6 in. or less
  - Sag, greater than 6 in.

Section 9.5.4

Obstruction Zones

- Sprinkler Discharge Pattern Development
  - Less than or equal to 18 in.
  - Beam, soffit, 3x (4x) rule
- Sprinkler Discharge Reaching Hazard
  - Greater than 18 in.
  - Greater than 4 ft wide

Section 9.5.5
Obstruction Zones

Section 9.5.5

Positioning Below Obstructions

Sprinklers can be installed here

Intermediate level rack type sprinklers

Section 9.5.5.3.1.2

Installation of CMDA Sprinklers

Chapters 9, 10, & 11
Control Mode Density Area (CMDA)

- Spray Sprinklers
- Installation requirements based on respective chapter:
  - Chapter 9 – General Requirements
  - Chapter 10 – SSU/SSP and Sidewall
  - Chapter 11 – Extended Coverage
  - Chapter 15 – Special Sprinkler

Maximum Spacing and Area of Coverage

Table 10.2.4.2.1(d)

Maximum Spacing and Area of Coverage (EC)

Table 11.2.2.1.2
Special Sprinklers

- Maximum protection area
- 196 sq. ft

Section 13.2.2

Installation of CMSA Sprinklers

Chapter 13

Control Mode

Heat Release Rate

Sprinklers Operate

Fire Department Activities

Time
CMSA Spray Pattern VK598 K25 CMSA @ 60 psi

System Types
- Permitted types
  - Wet
  - Dry
  - Preaction
- Install sprinklers in accordance with listing

Temperature Ratings
- Based on general requirements
- Wet Systems
  - Ordinary-temperature
  - Intermediate-temperature
  - High-temperature
- Dry System
  - High-temperature only
Occupancy and Hazard

- QR CMSA Sprinklers
  - Light Hazard
  - Ordinary Hazard
- SR CMSA Sprinklers
  - Ordinary Hazard

Section 13.2.4

Maximum Protection Area and Spacing

<table>
<thead>
<tr>
<th>Construction Type</th>
<th>Protection Area (ft²)</th>
<th>Maximum Spacing (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noncombustible unobstructed</td>
<td>130</td>
<td>12</td>
</tr>
<tr>
<td>Noncombustible obstructed</td>
<td>130</td>
<td>12</td>
</tr>
<tr>
<td>Combustible unobstructed</td>
<td>130</td>
<td>12</td>
</tr>
<tr>
<td>Combustible obstructed</td>
<td>100</td>
<td>10</td>
</tr>
<tr>
<td>Rack storage combustible obstructed</td>
<td>100</td>
<td>10</td>
</tr>
<tr>
<td>Rack storage unobstructed and noncombustible obstructed</td>
<td>100</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 13.2.5.2.1

Minimum Protection Area of Coverage

- Maximum: 130 sq. ft
- Minimum: 80 sq. ft

\[ A_x = S \times L \]

- Where:
  - \( S \) is the distance between sprinklers on the branch line (2x distance to wall)
  - \( L \) is the distance between sprinklers perpendicular to the branch line (2x distance to wall)

Section 13.2.5.2.2 & 13.2.5.2.3
CMSA Sprinkler Spacing

Distance From Walls
- Maximum
  - ½ allowable distance between sprinklers
- Minimum
  - 4 in.

Section 13.2.6.2 & 13.2.6.3

Minimum Distance Between Sprinklers
- Minimum 8 ft
- Baffles permitted in 2022 edition
  - Meet obstruction rules
  - Solid and rigid
  - At least 8 in. long, 6 in. high
  - Extend 2-3 in. above uprights
  - Even with pendants

Section 13.2.6.4
Section 13.2.7.1

Distance Below Ceilings

- **Unobstructed Construction**
  - Minimum: 3 in.
  - Maximum: 8 in.

- **Obstructed Construction**
  - **Option 1**
    - Minimum: 6 in.
    - Maximum: 12 in.

- **Option 2**
  - 1 to 6 in below solid member
  - Up to 22 in. maximum
  - Open wood joist
    - K-11.2 ➔ 50 psi
    - K-16.8 ➔ 22 psi

Section 13.2.7.1
Distance Below Ceilings

- Obstructed Construction
- Option 3
  - Concrete tee
    - Less than 7'-6" on center
    - More than 3'-6" on center
    - 1" below stem

Section 13.2.7.1

Obstructions to CMSA Discharge

General Requirements

- Obstructions to sprinkler discharge pattern development
  - Continuous or noncontinuous obstructions
  - Up to 36 in. below deflector
  - Apply beam rule or 3x rule
  - Solid continuous obstructions
    - Apply beam rules regardless of position

Section 13.2.8.2.1
### CMSA Beam Rule

<table>
<thead>
<tr>
<th>Obstruction Diameter (in)</th>
<th>Maximum Allowable Distance of Deflector Above Bottom of Obstruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>6</td>
<td>22</td>
</tr>
</tbody>
</table>

### CMSA 3 Times Rule
- Obstructions 8 in. or less
- Locate sprinkler 3X the greatest distance

*Figure 13.2.8.2.1.3*

### Branch Lines
- Upright sprinklers
  - Attached to pipe 4 in. or less
  - Offset 12 in. horizontally
  - Sprigged 12 in. vertically
Obstructions that Prevent Sprinkler Discharge from Reaching the Hazard

<table>
<thead>
<tr>
<th>Minimum Distance to Side of Obstruction (A)</th>
<th>Maximum Distance of Deflector Above Bottom of Obstruction (in.) (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 ft 6 in.</td>
<td>6 in.</td>
</tr>
<tr>
<td>4 ft</td>
<td>18 in.</td>
</tr>
<tr>
<td>5 ft</td>
<td>24 in.</td>
</tr>
<tr>
<td>5 ft 6 in.</td>
<td>30 in.</td>
</tr>
<tr>
<td>6 ft</td>
<td>36 in.</td>
</tr>
</tbody>
</table>

Figure 13.2.8.3.2.

Sprinklers Under Open Grating

* Shields shall be installed on overhead sprinklers under open grates.

Section 13.2.8.3.3
Obstruction More Than 24 in. Below Sprinklers

Figure 13.2.8.3.4

Parallel or Directly Below a Branch Line

Figure 13.2.8.3.5

Clearance to Storage

Section 13.2.9
Installation of ESFR Sprinklers
Chapter 14

Early Suppression

CMSA and ESFR Comparison

Video Credit: The Viking Group, Inc.
System Types
- Permitted types
  - Wet pipe
  - Unless specifically listed for dry or preaction
- Install sprinklers in accordance with listing

Construction Types
- Horizontal ceilings
  - Pitch ≤ 2 in 12
- Unobstructed
- Obstructed
  - Solid members exceed 12 in.
  - Installed in each channel
  - Maintain minimum spacing in the channel

Draft Curtains
- Adjacent systems with SR sprinklers
- Separated by draft curtain
  - Minimum 2 ft depth
  - Minimum 4 ft clear aisle
  - Centered below draft curtain
Temperature Rating

- Ordinary- or intermediate-temperature unless…
- See general requirements
- High-temperature?

Section 14.2.6

Temperature Ratings

- Ordinary/Intermediate throughout except…
  - Uncovered Steam main, heating coil, or radiator (uncovered)
  - Low pressure blowoff valve (within 7 ft)
  - Under Skylights
  - Unventilated concealed space/amic
  - Unventilated show windows w/ high powered lights
  - Commercial cooking equipment/ducts
  - Heating ducts producing less than 100 ºF
  - Coolers/Freezers with auto-defrost

Section 9.4.2.5

Unit Heaters

- 7 ft radius around center
- 20 ft arc 30º out from front edges

Figure 9.4.2.5
Occupancy Hazard

- ESFR storage designs permitted to protect
  - Light hazard
  - Ordinary hazard
- In light/ordinary hazard
  - Use SSU/SSP spacing
  - Use SSU/SSP obstructions

Protection Areas per ESFR Sprinkler

Area of Coverage

\[ A_p = S \times L \]

Where:
- \( S \) is the distance between sprinklers on the branch line (2x distance to wall)
- \( L \) is the distance between sprinklers perpendicular to the branch line (2x distance to wall)
Maximum Protection Areas and Maximum Spacing of ESFR Sprinklers

<table>
<thead>
<tr>
<th>Construction Type</th>
<th>Ceiling/Roof Heights up to 30 ft</th>
<th>Ceiling/Roof Heights Over 30 ft</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Protection Area (ft²)</td>
<td>Spacing (ft)</td>
</tr>
<tr>
<td>Noncombustible unobstructed</td>
<td>100</td>
<td>12</td>
</tr>
<tr>
<td>Noncombustible obstructed</td>
<td>100</td>
<td>12</td>
</tr>
<tr>
<td>Combustible unobstructed</td>
<td>100</td>
<td>12</td>
</tr>
<tr>
<td>Combustible obstructed</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 14.2.8.2.1

Shifting Sprinklers on a Branch Line

- Permits sprinkler to exceed 100 sq. ft
- Move sprinklers on a BL
- Move up to 1 ft
- A ≤ 110 sq. ft
- Average floor area covered by adjacent sprinklers ≤ 100 sq. ft
- Maintain pattern
- 12 ft max still applies

Section 14.2.8.2.3 & 14.2.9.1(3)

Shifting Branch Lines

- Permits sprinkler to exceed 100 sq. ft
- Move a single BL
  - Can't move a sprinkler was shifted
- Move up to 1 ft
- A ≤ 110 sq. ft
- Average floor area covered by adjacent sprinklers and branch lines ≤ 100 sq. ft
- Maintain pattern
- 12 ft max still applies

Section 14.2.8.2.4 & 14.2.9.1(4)
Minimum Protection Area of Coverage

- Minimum 64 sq. ft
- Unless
  - Sprinklers installed in channels of solid structure
Distance from Walls

- Maximum
  - ½ allowable distance between sprinklers
- Minimum
  - 4 in.

Section 14.2.9.2 & 14.2.9.3

Minimum Distance Between Sprinklers

- Minimum 8 ft
- Unless installed above solid structural members
- Baffles permitted in 2022 edition
  - Meet obstruction rules
  - Solid and rigid
  - At least 8 in. long, 6 in. high
  - Extend 2-3 in. above uprights
  - Even with pendants

Section 14.2.9.4

ESFR Deflector Position
Distance Below Ceilings

- **Pendents**
  - Maximum 14 in.
  - Minimum 6 in.

Section 14.2.10.1.1

---

Distance Below Ceilings

- **Pendents**
  - Maximum 18 in.
  - Minimum 6 in.

Section 14.2.10.1.2

---

Distance Below Ceilings

- **Uprights**
  - K-14.0 and K-16.8
  - Maximum 12 in.
  - Minimum 3 in.

Section 14.2.10.1.3
Obstructed Construction

- Branch lines permitted to be perpendicular to beams
- Sprinklers must be in bays
- Above bottom of structural member
- Not under beams

Obstructions to ESFR Sprinkler Discharge

ESFR Beam Rule

<table>
<thead>
<tr>
<th>Minimum Distance from Sprinklers to Center of Obstruction (A)</th>
<th>Maximum Allowable Distance of Deflector Above Bottom of Obstruction (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ft 6 in.</td>
<td>0</td>
</tr>
<tr>
<td>1 ft 5 in.</td>
<td>0</td>
</tr>
<tr>
<td>1 ft 4 in.</td>
<td>0</td>
</tr>
<tr>
<td>1 ft 3 in.</td>
<td>3</td>
</tr>
<tr>
<td>1 ft 0 in.</td>
<td>10</td>
</tr>
<tr>
<td>7 ft 0 in.</td>
<td>12</td>
</tr>
<tr>
<td>6 ft 0 in.</td>
<td>15</td>
</tr>
<tr>
<td>5 ft 0 in.</td>
<td>18</td>
</tr>
<tr>
<td>4 ft 0 in.</td>
<td>22</td>
</tr>
<tr>
<td>3 ft 0 in.</td>
<td>26</td>
</tr>
<tr>
<td>2 ft 0 in.</td>
<td>31</td>
</tr>
</tbody>
</table>

Section 14.2.10.1.4

Section 14.2.11.1.1
Isolated Obstructions Below Elevation of Sprinklers

Isolated Obstruction Options

1. Install sprinklers below the obstruction

   - Sprinklers can be installed here
   - Section 14.2.11.2

2. No additional sprinklers if
   - Width ≤ 1-1/2 in.
   - Obstruction is at least 12 in. below the sprinkler

   OR

   - Obstruction is 1 ft away horizontally

   Section 14.2.11.2

2022 edition

2. No additional sprinklers if
   - Width ≤ 2 in.
   - Obstruction is at least 24 in. below the sprinkler

   OR

   - Obstruction is 1 ft away horizontally

Section 14.2.11.2
Isolated Obstruction Options

2022 edition

3. No additional sprinklers if
   - Width ≤ 6 in.
   - Obstruction is at least 6 in. horizontally from sprinkler

2019 edition

Section 14.2.11.2

---

Isolated Obstruction Options

2022 edition

4. No additional sprinklers if
   - Width ≤ 24 in.
   - Obstruction is at least 12 in. horizontally from sprinkler

2019 edition

Section 14.2.11.2

---

Isolated Obstruction Options

2022 edition

5. No additional sprinklers if
   - Location complies with beam rule

2019 edition

Section 14.2.11.2
Isolated Obstruction Options

2022 edition
6. No additional sprinklers if
   • Installed in accordance with listing

2019 edition

---

Isolated Obstruction Options

2022 edition
7. No additional sprinklers if
   • Protecting LH/OH
   • SSU/SSP obstruction rules met

2019 edition

---

Isolated Obstruction Options

2022 edition
8. Extend ESFR obstruction rules 6 ft into adjacent LH/OH occupancy protected with ESFR sprinklers

2019 edition

---
Continuous Obstructions Below Sprinklers

Continuous Obstruction Options

1. Install sprinklers
   a. Comply with the beam rule
   b. Install sprinklers below

   ![Diagram showing sprinkler installation below obstruction]

   Sprinklers can be installed here

   Section 14.2.11.3.1

2. No additional sprinklers if
   - Width ≤ 1-1/2 in.
   - Obstruction is at least 12 in. below the sprinkler

   2022 edition

   2019 edition

   ![Diagram showing sprinkler installation below obstruction]

   Obstruction is at least 24 in. below the sprinkler
   Obstruction is at least 1 ft away horizontally

   Section 14.2.11.3.1
Continuous Obstruction Options

2022 edition
3. Install sprinklers
   - Width ≤ 6 in.
   - Obstruction is at least 6 in. horizontally from sprinkler

2019 edition
3. Install sprinklers
   - Width ≤ 12 in.
   - Obstruction is at least 12 in. horizontally from sprinkler

Section 14.2.11.3.1

Continuous Obstruction Options

2022 edition
4. Install sprinklers
   - Width ≤ 12 in.
   - Obstruction is at least 12 in. horizontally from sprinkler

2019 edition
4. Install sprinklers
   - Width ≤ 24 in.
   - Obstruction is at least 24 in. horizontally from sprinkler

Section 14.2.11.3.1

Continuous Obstruction Options

2022 edition
5. Beam rule not applicable if
   - Row of sprinklers installed below the obstruction

2019 edition

Section 14.2.11.3.1
Continuous Obstruction Options

2022 edition
6. No additional sprinklers if
   • Protecting LH/OH
   • SSU/SSP obstruction rules met

2019 edition

Bottom Chords of Bar Joists or Open Trusses

2022 edition
• Bottom chord ≤ 4 in.
• Sprinkler over chord
• No additional protection
• Bottom chord ≤ 6 in.
• Locate sprinkler at least 6 in. away horizontally from edge
• Bottom chord ≤ 12 in.
• Locate sprinkler at least 12 in. away horizontally from edge

2019 edition
• Bottom chord ≤ 4 in.
• Sprinkler over chord
• No additional protection
• Bottom chord ≤ 12 in.
• Locate sprinkler at least 12 in. away horizontally from edge

Branch Lines

• Upright sprinklers
  • Attached to pipe 4 in. or less
  • Offset 12 in. horizontally
  • Sprigged 12 in. vertically

Section 14.2.11.3.1

Section 14.2.11.3.2

Section 14.2.11.3.3
Multiple Obstructions

- Obstructions must be separated by 3x rule
- Otherwise considered a grouped obstruction

Section 14.2.11.3.4

Open Grating

- Intermediate level/rack storage type
  - OR
  - Shielded from discharge of overhead sprinklers

Photo Credit: RASCO (Model N25)

Section 14.2.11.3.5

Overhead Doors and Special Obstruction

- Standard spray QR sprinklers permitted
- Special obstruction allowance
  - Install according to the listing

Section 14.2.11.3.6 & 14.2.11.3.7
Conveyors

- Standard spray QR sprinklers permitted
- No high-piled storage below
- ESFR required where high-piled storage is present

Section 14.2.11.4

Conveyors

- Additional sprinklers not required if
  - 70% open
  - Up to 4 ft wide and no high-piled storage
  - Openings between rollers exceeds width of roller
  - Roller conveyors with no high-piled storage

Section 14.2.11.4

Clearance to Storage

≥36 in.
Any Questions?

For additional questions regarding the content in today’s presentation, please contact:

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