AGENDA

NFPA Technical Committee on Sprinkler System Discharge Criteria (AUT-SSD)
NFPA 13 Second Draft Meeting (A2024)

August 3-4, 2023
9:00 a.m. – 6:00 p.m. (Eastern Time)

Kansas City Marriot Country Club, Kansas City, MO
To join the meeting, please contact ELiolin@nfpa.org

1. **Call to order.** Will Smith, Chair.
2. **Introductions.** See committee roster attached.
3. **Chair report.** Will Smith, Chair.
4. **Staff liaison report.** Tom Goss.
5. **Previous meeting minutes.** July 28-30, 2022, Indianapolis, IN. See attached.
6. **Research Foundation.** Introduction and quick overview, Amanda Kimball.
7. **NFPA 13 Second Draft.**
   a. **Presentation.** High Ceilings. Richard Gallagher**.**
   b. **Public Comments.** See attached.
8. **Other Business.**
9. **Future meetings.**
10. **Adjournment.**

Address List No Phone

07/10/2023
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AUT-SSD

Sprinkler System Discharge Criteria

Automatic Sprinkler Systems

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Sprinkler System Discharge Criteria

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Sprinkler System Discharge Criteria

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Sprinkler System Discharge Criteria

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Sprinkler System Discharge Criteria

Automatic Sprinkler Systems

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Sprinkler System Discharge Criteria

Automatic Sprinkler Systems

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MINUTES

NFPA Technical Committee on Sprinkler System Discharge Criteria (AUT-SSD)
NFPA 13 First Draft Meeting (Annual 2024)

July 28-30, 2022
8:00am – 5:00pm (EDT)

Westin Indianapolis
241 W Washington St
Indianapolis, IN 46204

1. **Call to order.** Will Smith, chair, called the meeting to order at 8:00am on July 28, 2022.
2. **Introductions.** Attendees introduced themselves and identified their affiliation. NFPA staff took attendance.
3. **Chair report.** Will Smith welcomed attendees and provided an overview of the meeting.
4. **Staff liaison report.** Chad Duffy provided an overview of the standards development process and the revision cycle schedule.
5. **Previous meeting minutes.** The minutes from July 15-17 and July 20-21, 2020; February 2022 – Web Meeting/Teleconference were approved without revision.
6. **NFPA 13 First Draft.**
   a. **Review of Public Inputs.** The Technical Committee reviewed the Public Inputs and developed First Revisions and Committee Inputs as necessary. These will be available in the First Draft Report at www.nfpa.org/13.
   b. **Task group reports.** The following task groups provided their reports and recommendations.
      i. **Task Group 1**. Kevin Kelly. The task group provided a report, and revisions were made. The task group has been discharged with thanks.
      ii. **Task Group 2**. Martin Workman. The task group provided a report, and revisions were made. The task group has been discharged with thanks.
      iii. **Task Group 3**. Don Hopkins. The task group provided a report, and revisions were made. The task group has been discharged with thanks.
      iv. **Task Group 4**. John Denhardt. The task group provided a report, and revisions were made. The task group has been discharged with thanks.
      v. **Task Group 5**. Terry Victor. The task group provided a report, and revisions were made. The task group has been discharged with thanks.

c. **Presentation(s).** The committee heard presentations from the following individuals.

i. **Sloped Ceilings.** Wes Baker. See attached presentation

ii. **Vapor Phase Corrosion Inhibitor.** Mark Hopkins. See attached presentation.

iii. **Vacuum Fire Protection.** Jonathan Roger. See attached presentation.

7. **Recessed.** The meeting was recessed at 6:30 PM on July 28, 2022.
8. **Reconvened.** The meeting was reconvened at 8:00 AM on July 29, 2022.
9. **Continuation of First Draft Technical Committee Review of Public Inputs.** The Technical Committee reviewed the Public Inputs and developed First Revisions and Committee Inputs as necessary.
10. **Recessed.** The meeting was recessed at 8:00 PM on July 29, 2022.
11. **Reconvened.** The meeting was reconvened at 8:00 AM on July 29, 2022.
12. **Continuation of First Draft Technical Committee Review of Public Inputs.** The Technical Committee reviewed the Public Inputs and developed First Revisions and Committee Inputs as necessary.
13. **Other Business.**
14. **Future meetings.** The next committee meeting will be around the same time in 2023. A meeting notification will be posted at www.nfpa.org/13next when the meeting is scheduled.
15. **Adjournment.** The meeting was adjourned at 11:15am on July 30, 2022.

Attendees

Committee Members:

✓	**William Smith**	Chair	Code Consultants, Inc.
✓	**Weston Baker**	Principal	FM Global
✓	**Charles Bauroth**	Principal	Liberty Mutual
✓	**Kerry Bell**	Principal	UL LLC
✓	**John Denhardt**	Principal	American Fire Sprinkler Association
✓	**James Fantauzzi**	Principal	American Fire Sprinkler Association
✓	**Abram Selim Fouad**	Principal	Elite Consolidated Engineers
✓	**Bo Hjorth**	Principal	AlbaCon AB
✓	**Donald Hopkins**	Principal	JENSEN HUGHES
✓	**Sultan Javeri**	Principal	SC Engineering
✓	**Michael Joanis**	Principal	National Fire Sprinkler Association
✓	**Larry Keeping**	Principal	PLC Fire Safety Solutions

✓	**Kevin Kelly**	Principal	National Fire Sprinkler Association
✓	**Elley Klausbruckner**	Principal	Klausbruckner & Associates, Inc.
✓	**William Koffel***	Principal	Koffel Associates, Inc.
✓	**Russell Leavitt**	Principal	Telgian Corporation
✓	**Stuart Lloyd**	Principal	Zurich Risk Engineering UK
✓	**Joseph Lynch***	Principal	Swiss Re America Holding Corporation
✓	**Brian Mosberian**	Principal	Phoenix Fire Department
✓	**Nicholas Pinto***	Principal	Canadian Automatic Sprinkler Association
✓	**Kenneth Schneider***	Principal	United Assn. of Journeymen & Apprentices
✓	**Peter Schwab**	Principal	Wayne Automatic Fire Sprinklers, Inc.
✓	**Michael Sides**	Principal	Global Asset Protection Services, LLC
✓	**Manuel Silva**	Principal	Johnson Controls
✓	**George Stanley**	Principal	National Fire Sprinkler Association
✓	**Steven Wolin**	Principal	Reliable Automatic Sprinkler Company
✓	**Martin Workman**	Principal	The Viking Corporation
✓	**Tracey Bellamy**	Alternate	Telgian Corporation
✓	**Chase Browning**	Alternate	Medford Fire Department
✓	**John Desrosier**	Alternate	National Fire Sprinkler Association
✓	**Thomas Frank**	Alternate	Code Consultants, Inc.
✓	**Richard Gallagher**	Alternate	Zurich Services Corporation
✓	**Kevin Hall**	Alternate	American Fire Sprinkler Association
✓	**Jeffrey Hewitt***	Alternate	National Fire Sprinkler Association
✓	**Robert Holliday**	Alternate	United Assn. of Journeymen & Apprentices
✓	**Mark Hopkins**	Alternate	TERPconsulting
✓	**Shaun Kramer**	Alternate	The Viking Corporation
✓	**Milosh Puchovsky***	Alternate	Worcester Polytechnic Institute
✓	**Steven Scandaliato**	Alternate	American Fire Sprinkler Association
✓	**Gerald Schultz***	Alternate	Rack Manufacturers Institute
✓	**Stephanie Thomas***	Alternate	FM Global
✓	**Terry Victor**	Alternate	Johnson Controls
✓	**Cary Webber**	Alternate	Reliable Automatic Sprinkler

✓	**Chad Duffy**	Staff Liaison	National Fire Protection Association
✓	**Tom Harris**	Staff Liaison	National Fire Protection Association
✓	**Tom Goss**	Staff Liaison	National Fire Protection Association

Guests:

Josh Mcdonald*	AFSA
Karl Wiegand	Victaulic/Globe Fire Sprinkler
Michael Newell*	Belvedeer Engineering
Ernesto Rodriguez	Wiginton Fire Protection
Mark Fessenden*	Johnson Controls
Adam Seghi	Code Risk Analysis
Patrick Bakaj*	NFPA Staff
Keith Heckler*	US Fire Administration

*Participated by teleconference
Total number in attendance: 54

2019 NFPA Conference & Expo

Evaluating Storage Protection under Sloped Ceilings

Large-Scale Fire Suppression Testing

Presented by:

Prateep Chatterjee

FM Global

Noah Ryder

Fire & Risk Alliance LLC

Collaborative Effort





RESEARCH FOUNDATION

RESEARCH FOR THE NFPA MISSION



Property Insurance Research Group



Sloped Ceilings

Phase I

Numerical modeling

Survey

Unobstructed, sloped ceilings

Spray simulations

Phase II

Numerical modeling

Obstructed construction

Ridges

Additional sprinklers

Phase III

Large-scale testing

Baseline suppression test

Cold flow spray tests

Sloped ceiling tests

Outline

- Background and objectives
- Phase I and II summary
  - Survey
  - Numerical modeling
- Phase III
  - Cold-flow testing
  - Large-scale fire suppression testing

Background

- Minimal options for slopes greater than 2:12 (10°) in storage applications
- NFPA 13 guidance for storage applications limited to <2:12
- FM Global Data Sheet 2-0 – <2:12
  - For >2:12
    - Install drop ceiling
    - Install in-racks for up to 4:12 (18°)
- What should guidance be?

Project Objectives

1. Conduct numerical modeling of sprinkler activations and spray transport
2. Conduct cold-flow spray tests
3. Develop a large-scale testing research plan
4. Develop guidance for sloped ceilings for storage applications

Survey

Survey Results

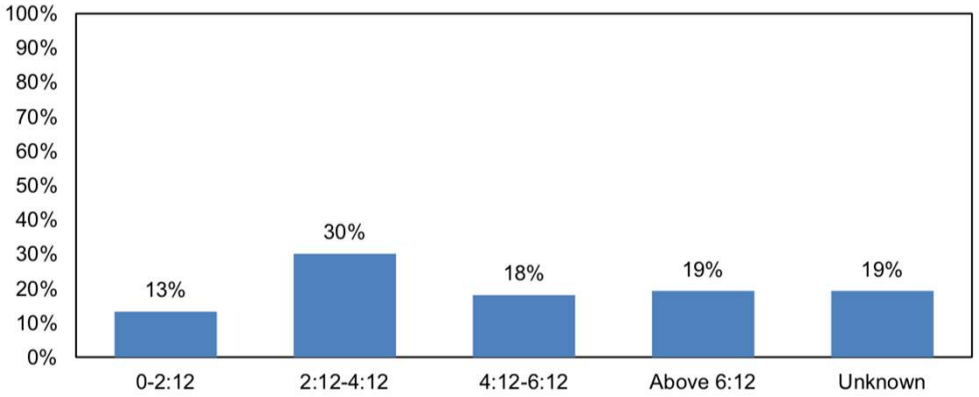


Figure 5. Ceiling slope responses.

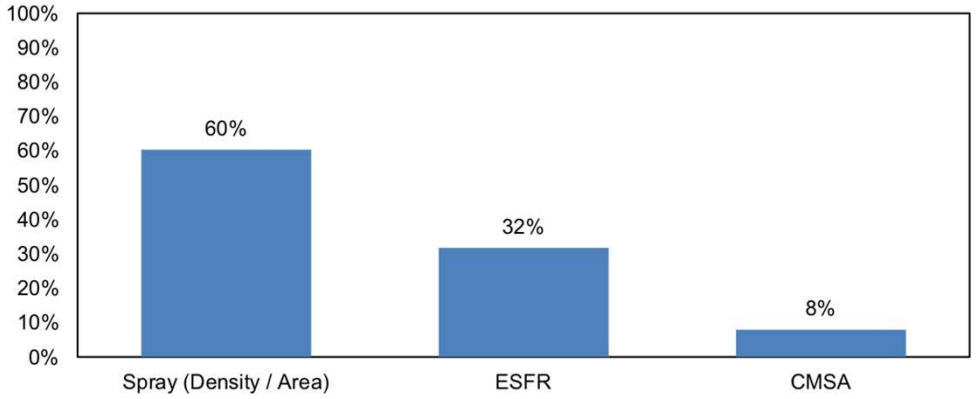


Figure 14. Sprinkler types

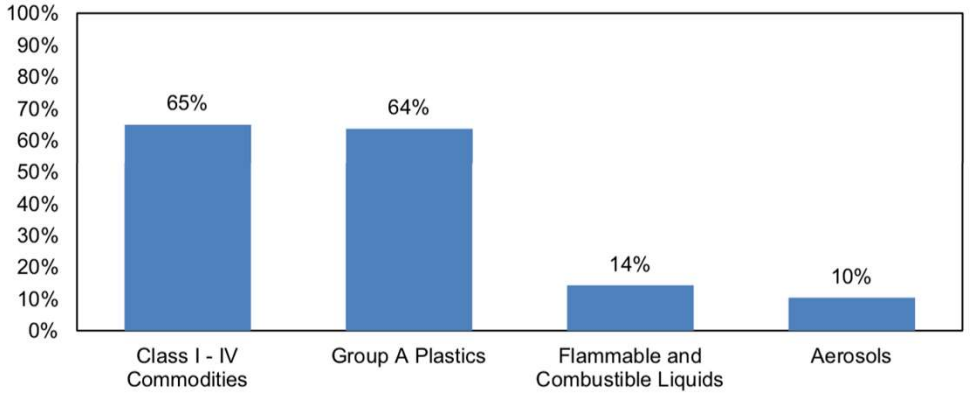


Figure 9. Summary of total commodity classification.

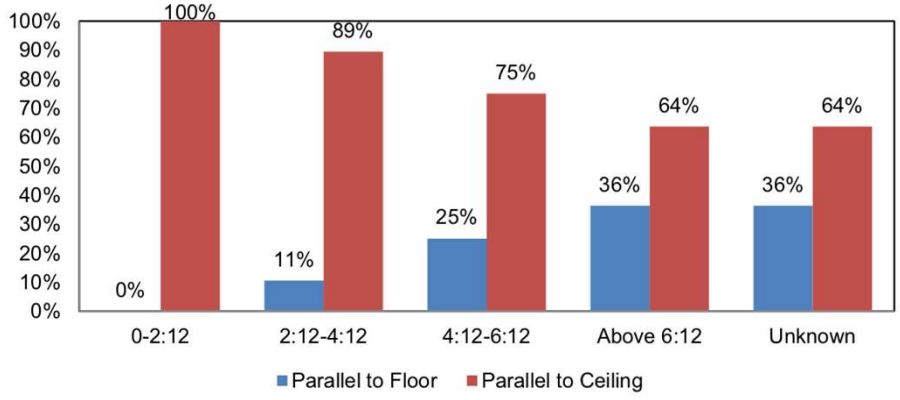
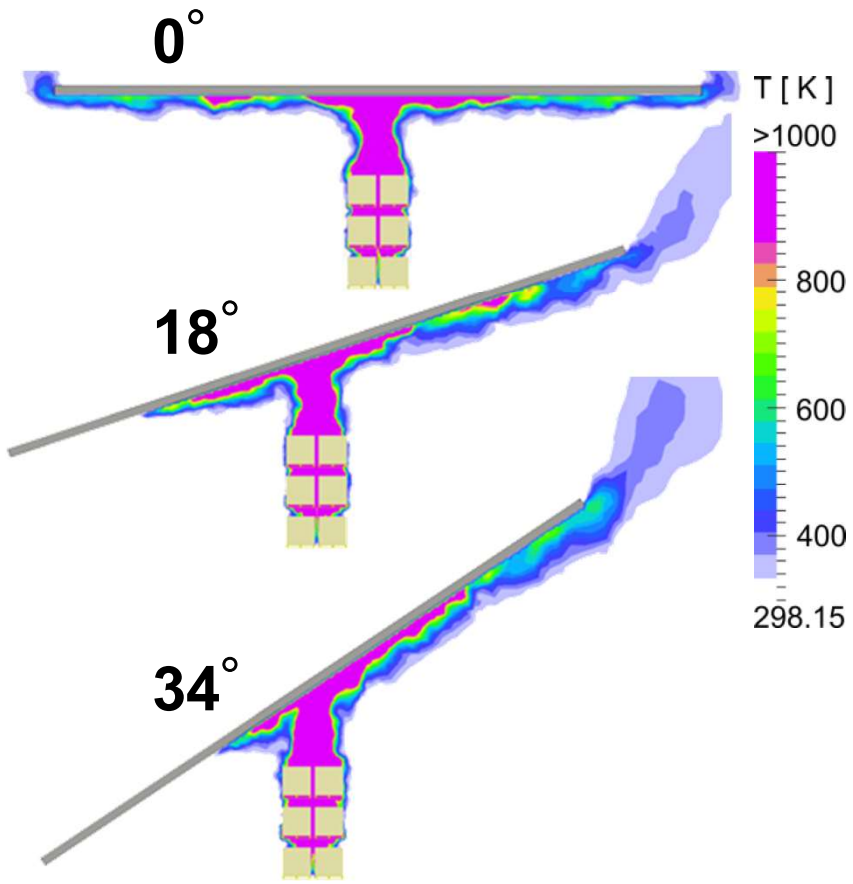


Figure 16. Sprinkler orientation by ceiling slope.

Numerical Modeling

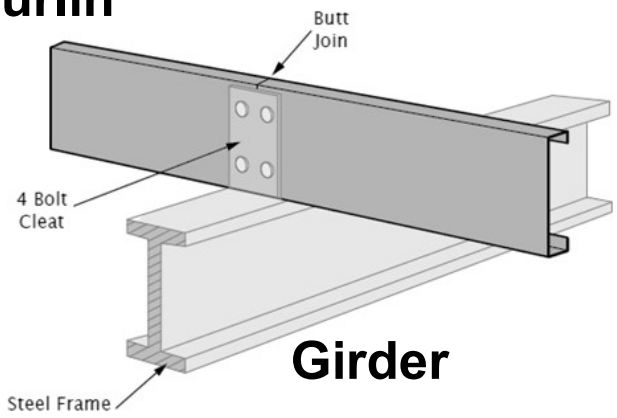
Unobstructed Ceilings

- Activation for QR/OT sprinklers
  - For four sprinklers immediately adjacent to fire source
  - Inclination ≤18° (4:12)
  - Similar activation times and patterns as horizontal ceiling

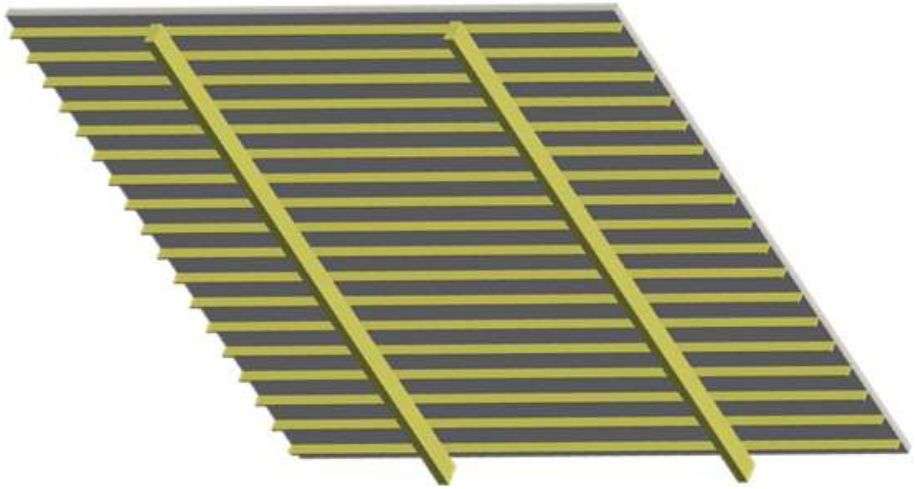


Obstructed Construction

Purlin



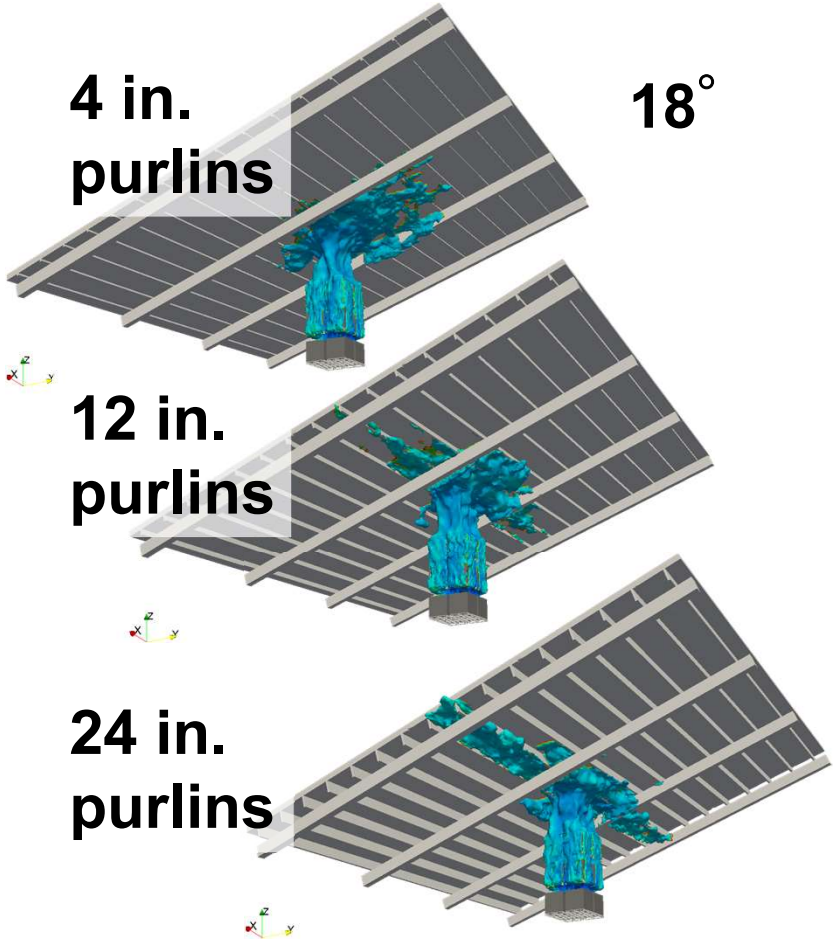
Simplified Purlin and Girder Geometries



4-24 in. deep purlins, 24 in. deep girders

Obstructed Construction

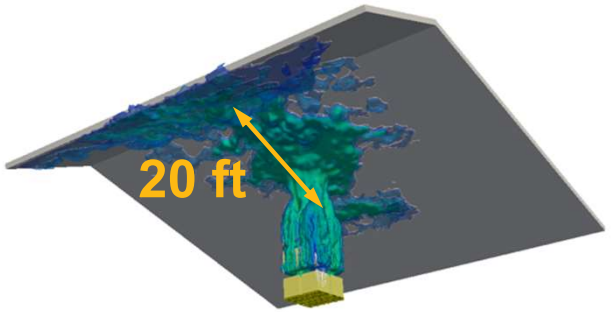
- Activation for QR/OT sprinklers, downslope delays observed for
  - 10° (2:12) and purlin depths >12 in.
  - 18° (4:12) and purlin depths ≥8 in.



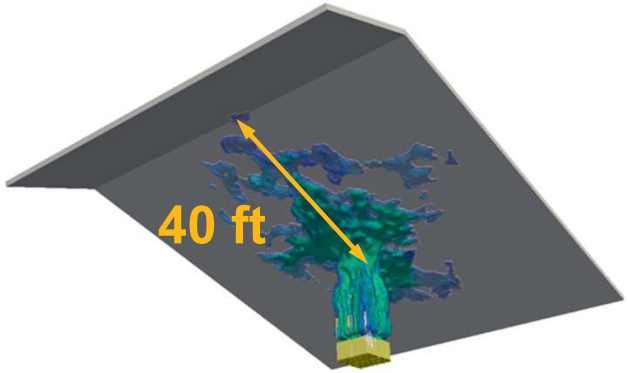
Ridge Effect

- Initial ceiling jet development not affected by the ridge distance
- 20 ft Ridge
  - Ceiling jet extended past the ridge
  - Combustion products accumulation
- 40 ft Ridge
  - Marginal effect on sprinkler activations close to ignition region

20 ft Ridge

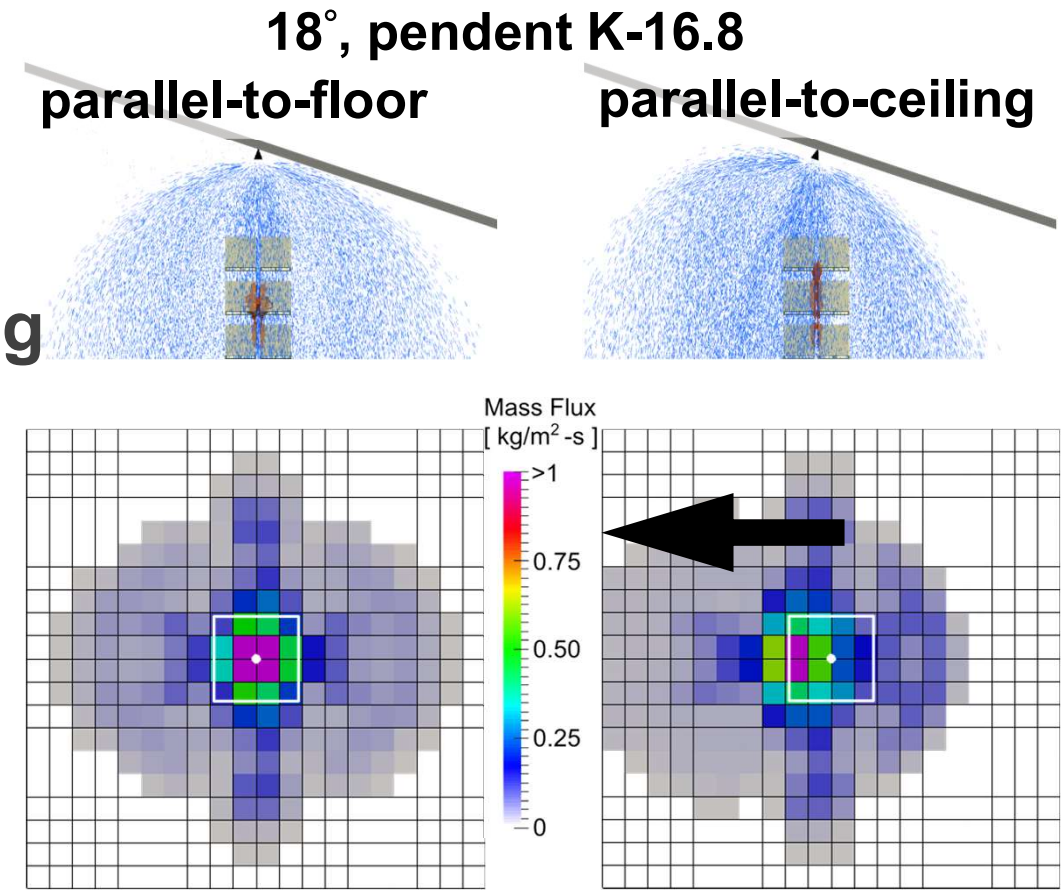


40 ft Ridge



Sprinkler Sprays

- Sprinklers modeled
  - Upright K-11.2, pendent K-14.0 and K-16.8
- Deflector parallel-to-ceiling
  - Significant reduction of water flux above fire region
- Deflector parallel-to-floor
  - Maintained constant water flux independent of slope



Cold Flow Spray Tests

Cold Flow Spray Tests

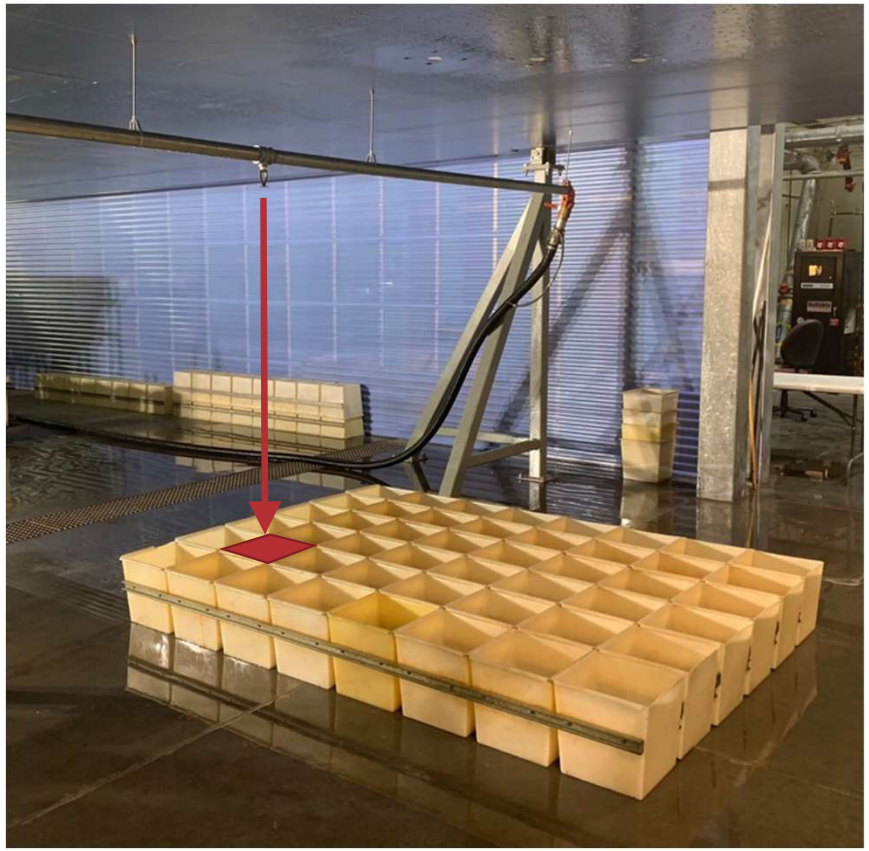
Examine impact of:

- Ceiling slope (0° and 18°)
- Deflector orientation (parallel-to-ceiling vs. floor)
- Effect of standoff distance (8 in. and 18 in.)
- Sprinkler K-Factor (14.0 and 16.8)
- Pressure (35, 50, 75 psi)
- Sprinkler manufacturer/model (A/B and C/D)

Cold Flow Test Matrix

Sprinkler Manufacturer/Model	A/B		C/D
K-factor	14.0		16.8
Pressure (psi)	35	50	75
Ceiling Slope	0:12		4:12
Nominal Standoff Distance	8 in.		18 in.
Deflector Parallel Orientation	Ceiling		Floor

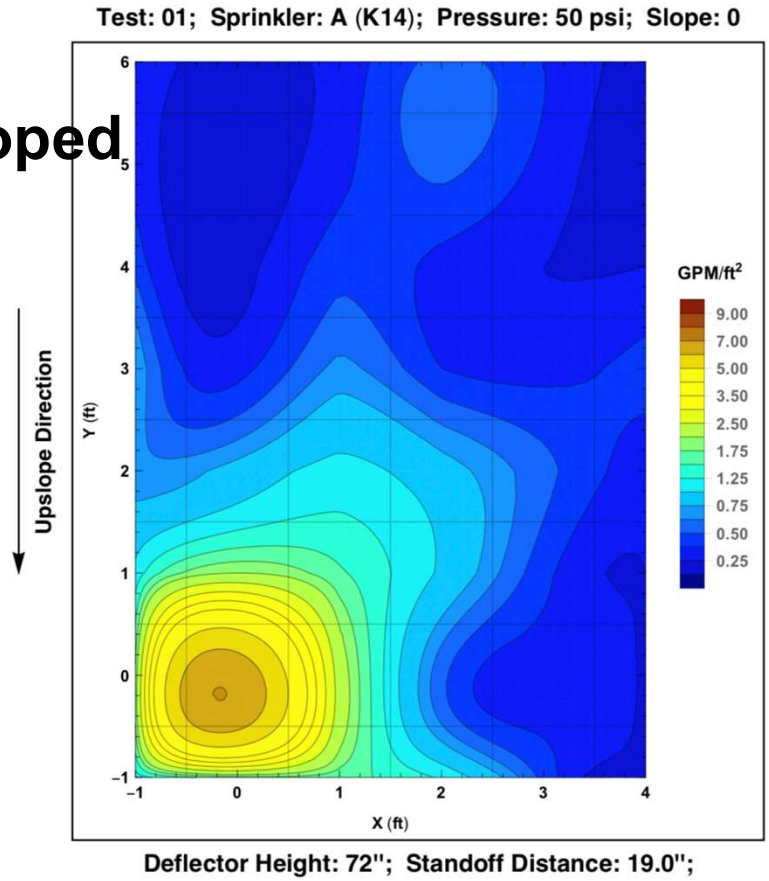
Cold Flow Test Configuration

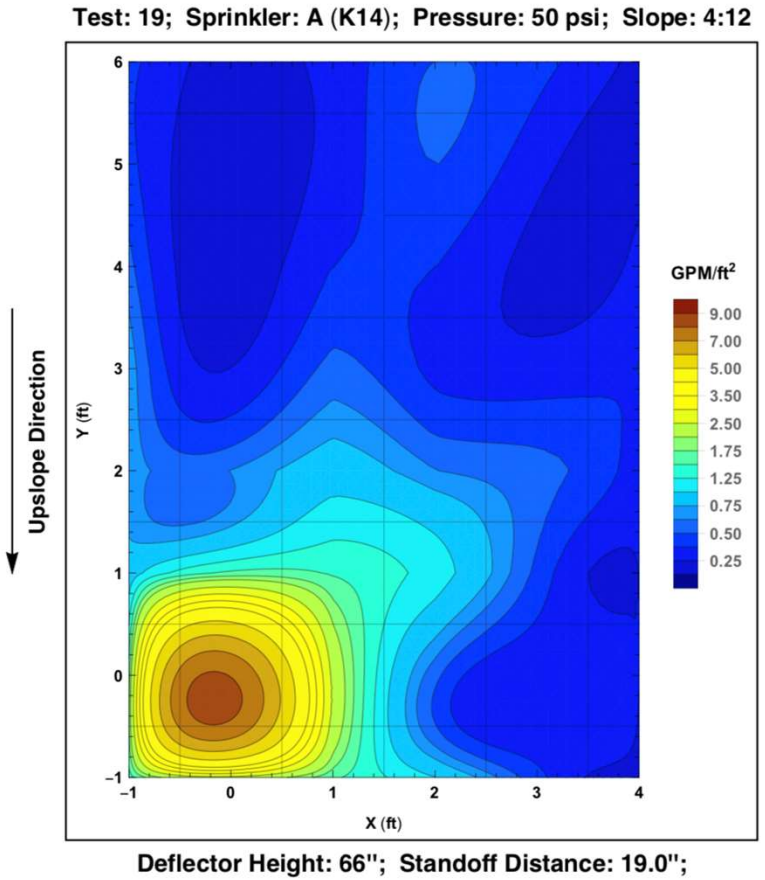




Cold Flow Test Results: Parallel-to-Floor

Non-Sloped





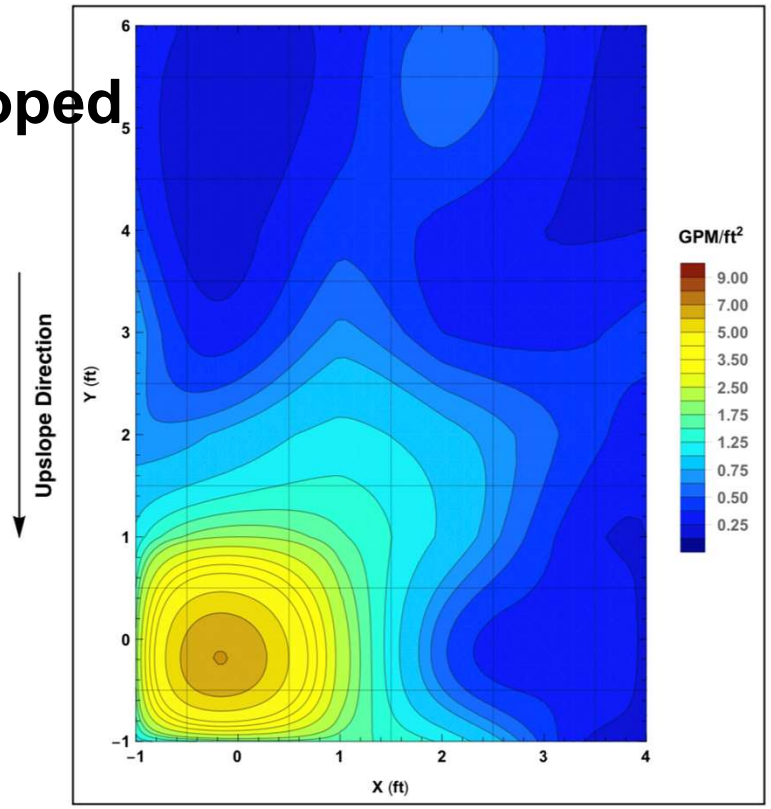
18°

Cold Flow Test Results: Parallel-to-Ceiling

Non-Sloped

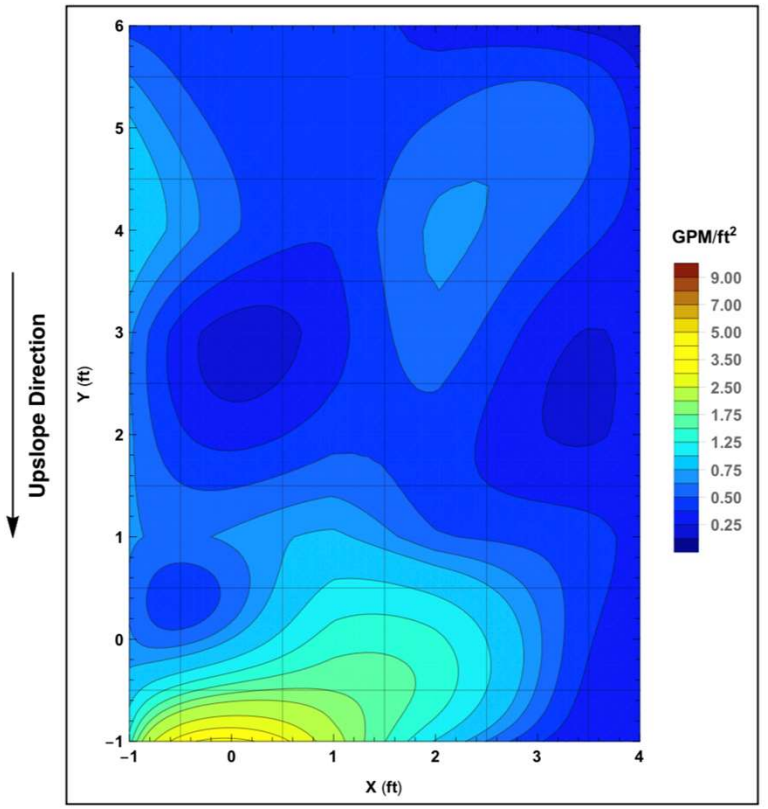
18°

Test: 01; Sprinkler: A (K14); Pressure: 50 psi; Slope: 0



Deflector Height: 72"; Standoff Distance: 19.0";
Deflector Orientation: Parallel to Ceiling

Test: 18; Sprinkler: A (K14); Pressure: 50 psi; Slope: 4:12



Deflector Height: 66"; Standoff Distance: 18.0";
Deflector Orientation: Parallel to Ceiling

Cold Flow Test Results Summary

- Parallel-to-floor orientation preferred
  - Parallel-to-ceiling orientation causes spray core to move away from intended protected area
- Trend similarity observed regardless of slope for
  - Different sprinklers
  - Pressure
  - Standoff distance

Large-Scale Testing Recommendations

- Reduced parameter space
  - Minimize number of required tests
- Practical aspects
  - Larger fire size (taller array)
- Highest inclination of 18° (4:12)

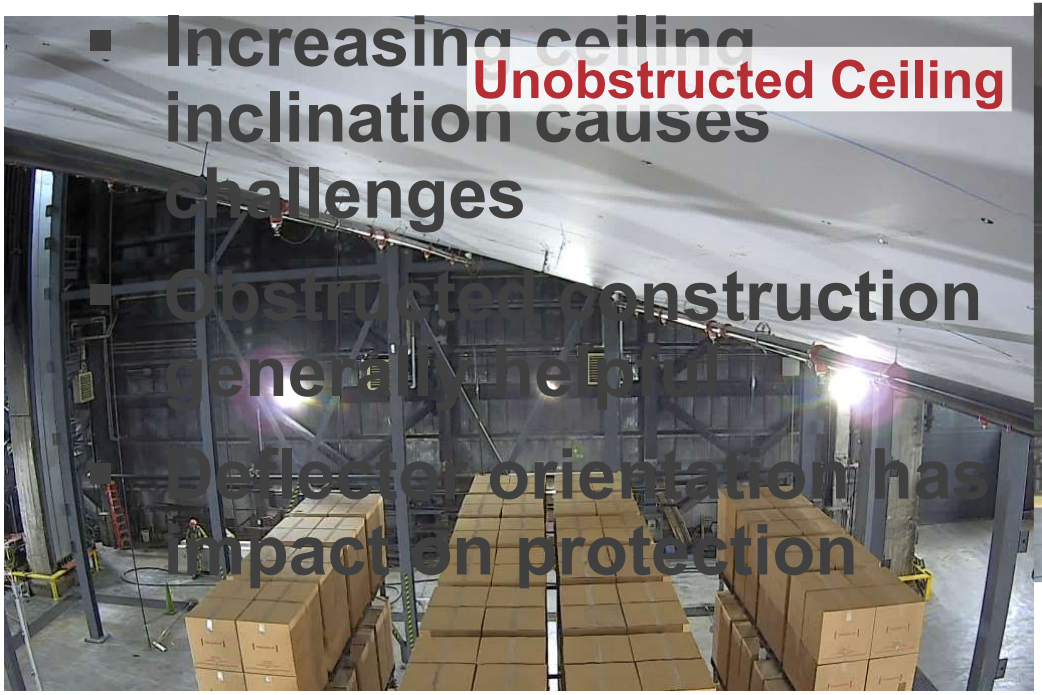
Large-Scale Test Matrix

Ceiling clearance	10 ft
Ceiling inclination	10° (2:12), 18° (4:12)
Purlin depths	6-18 in.
Purlin separation distance	5 ft
Girder depth	24 in.
Girder separation distance	25 ft

Large-Scale Fire Suppression Tests

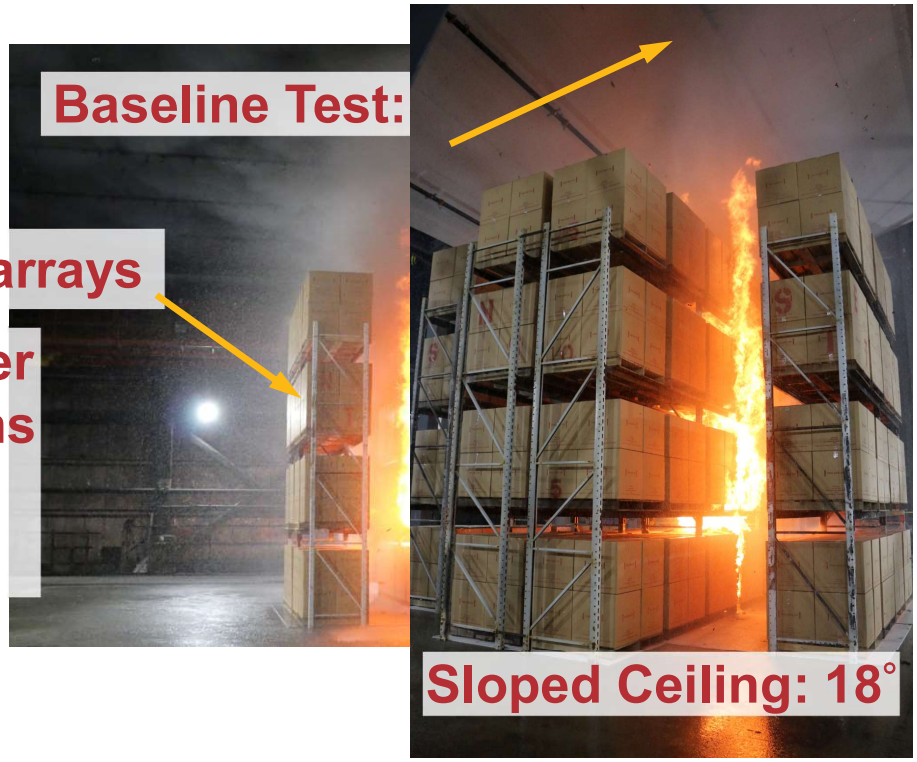
Overview

- Increasing ceiling inclination causes challenges
- Obstructed construction generally helpful
- Deflected orientation has impact on protection





Baseline Large-Scale Test



Four tier arrays

- 3 sprinkler operations
- Limited damage

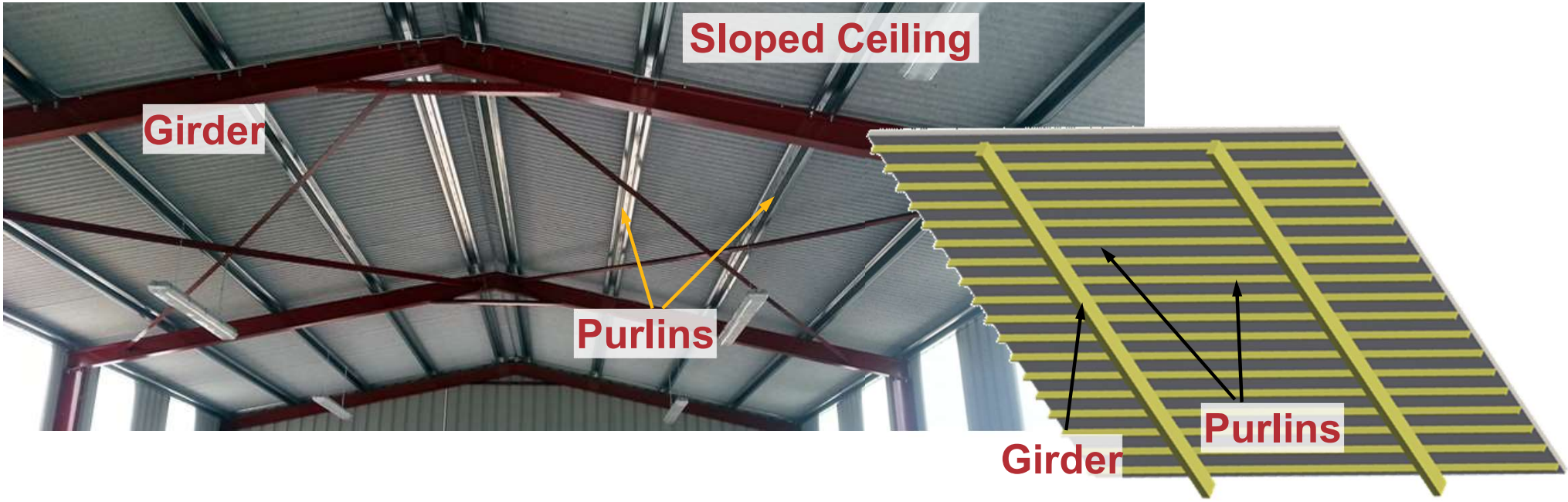
- 

oped
results
sprinkler
re spread

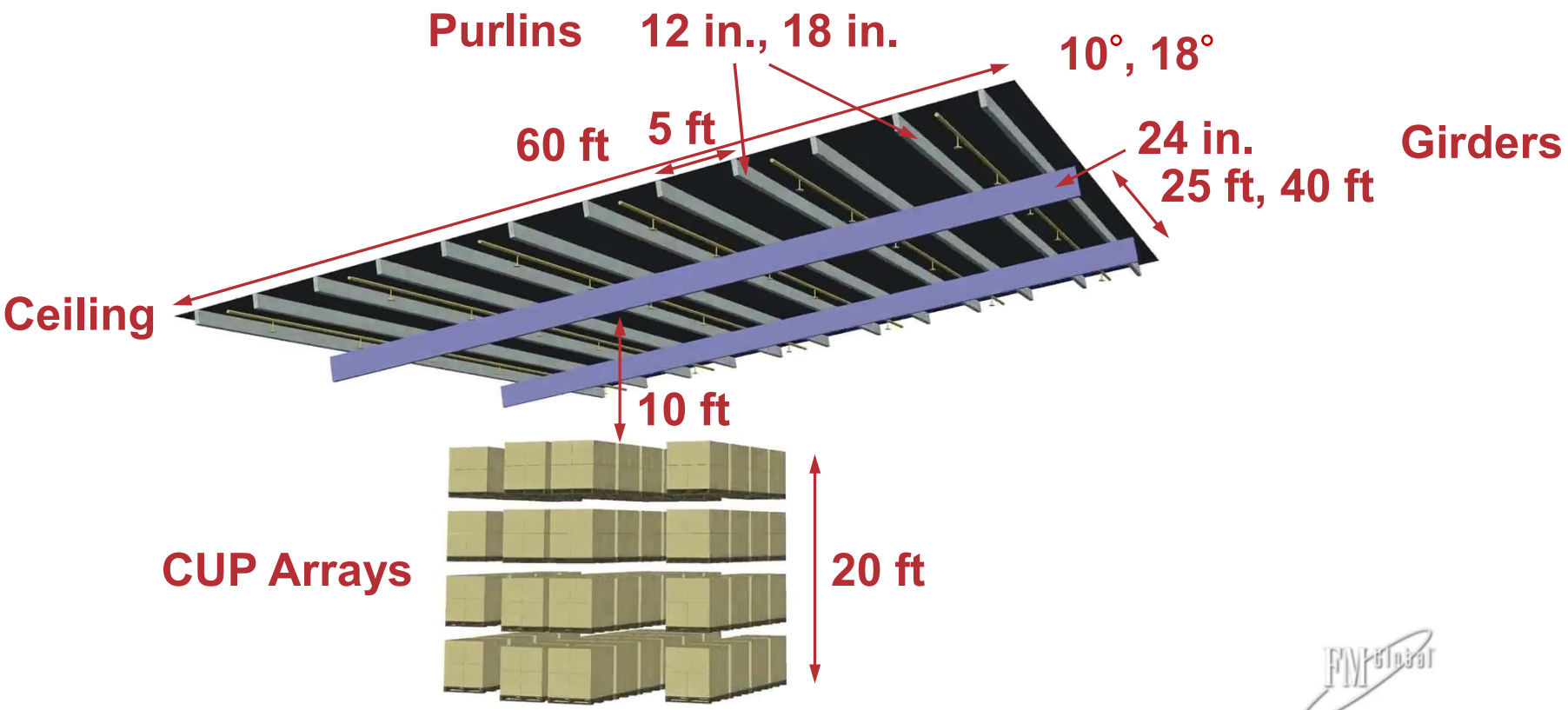
FM Global Cartoned Unexpanded Plastic (CUP) Commodity*

*NFPA Cartoned Non-expanded Group A Plastic Commodity

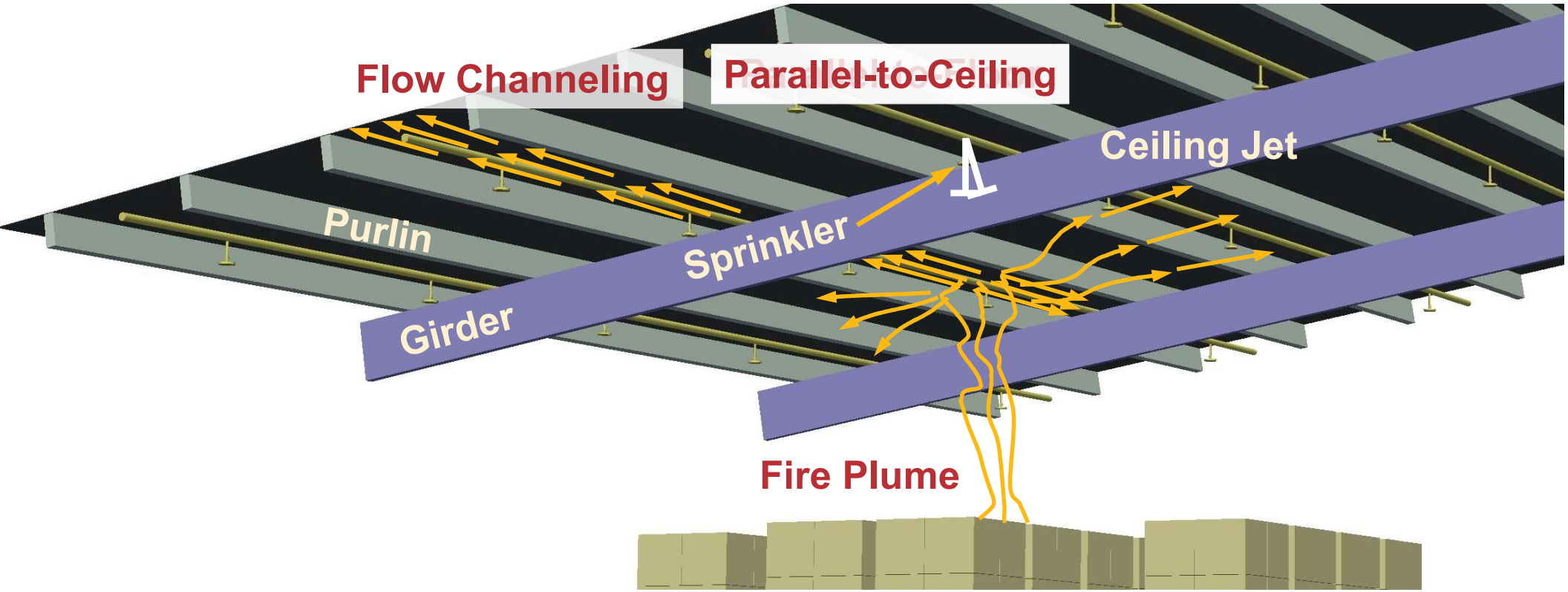
Key Concepts



Key Concepts

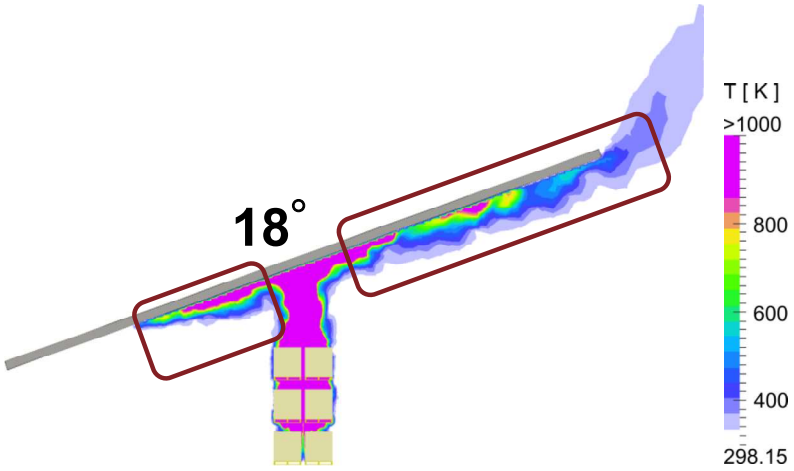


Key Concepts



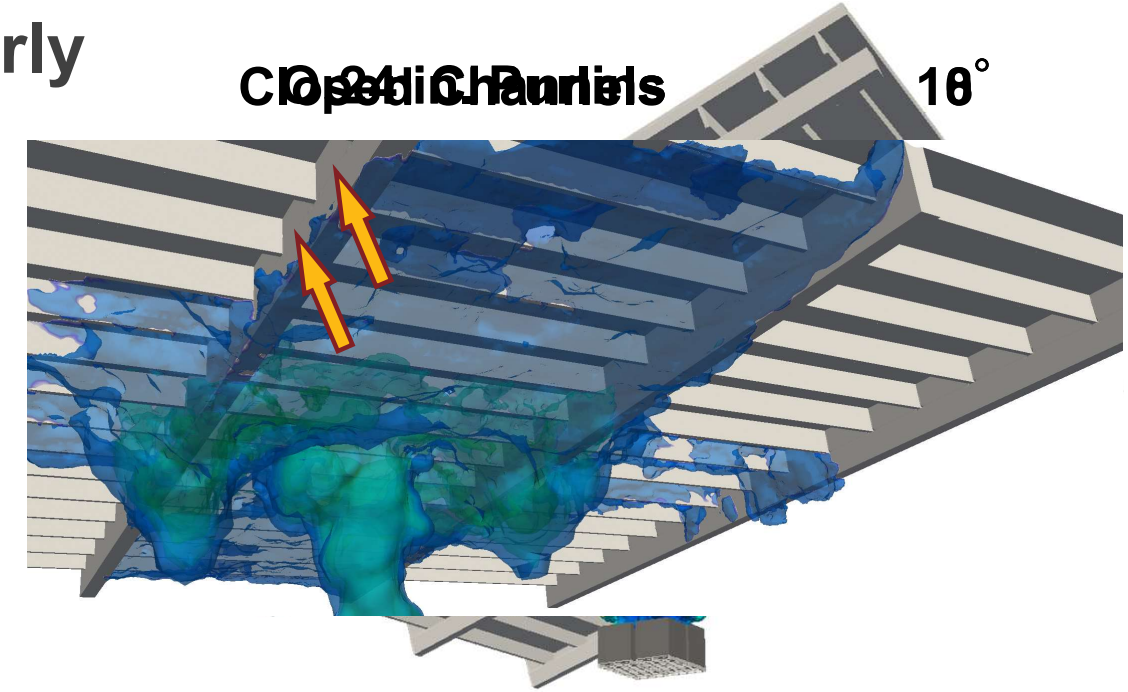
Key Concepts

- Inclination causes ceiling jet to travel in upslope direction
  - Biased sprinkler activation pattern
  - Modeling predicted limited extent of ceiling jet in downslope region
    - Particularly for inclinations ≤18° (slope of 4:12)



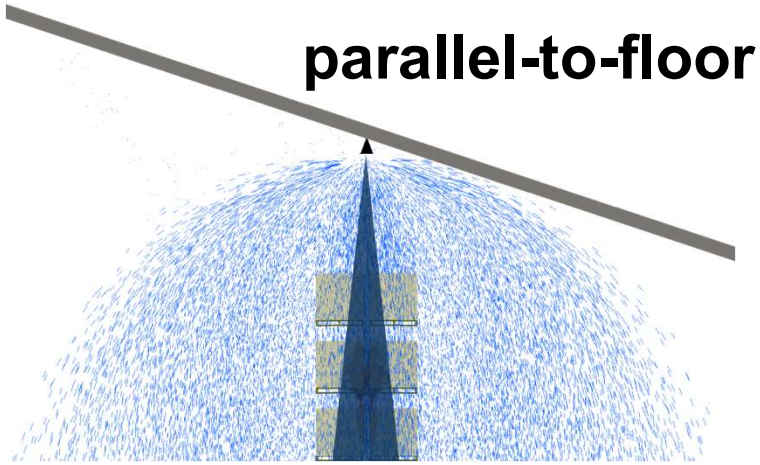
Key Concepts

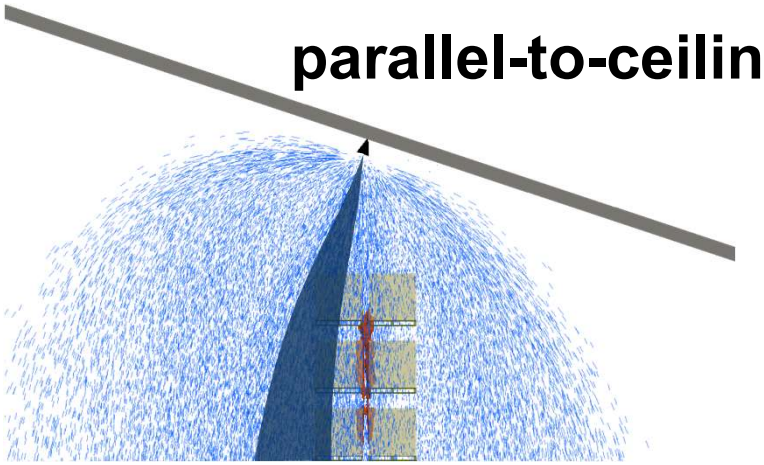
- Purlins can promote early sprinkler operations
  - Confine ceiling jet
- For deeper purlins
  - Flow channeling effect
  - Sprinkler activations along channels
  - Closing purlin channels can reduce the effect



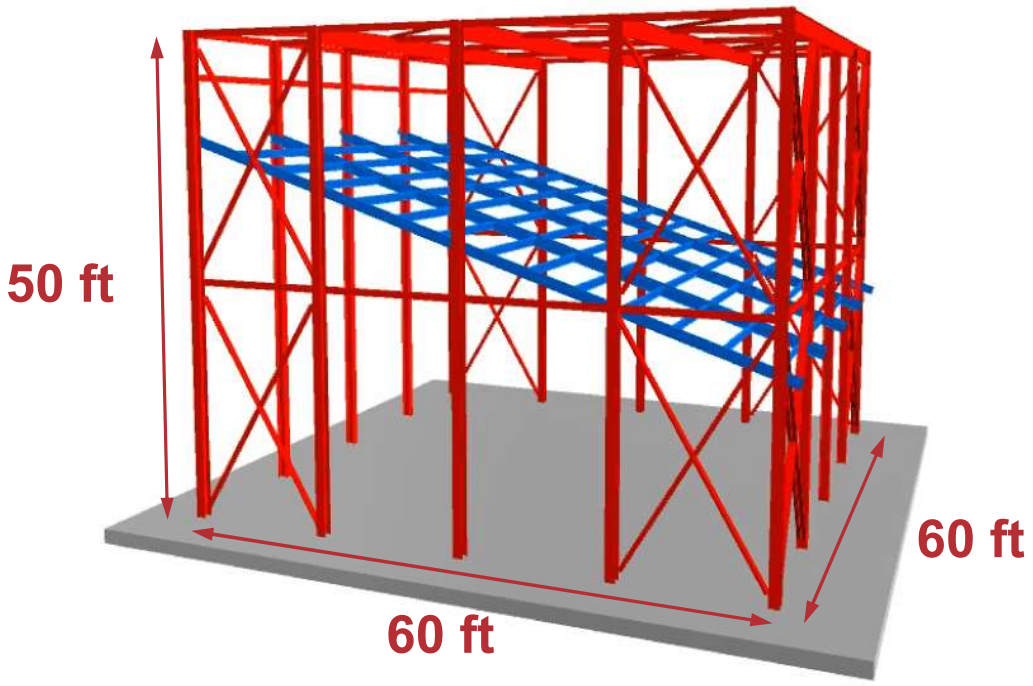
Key Concepts

- **Sprinkler deflector orientation**
  - **Critical for ceiling inclinations ≥18°**

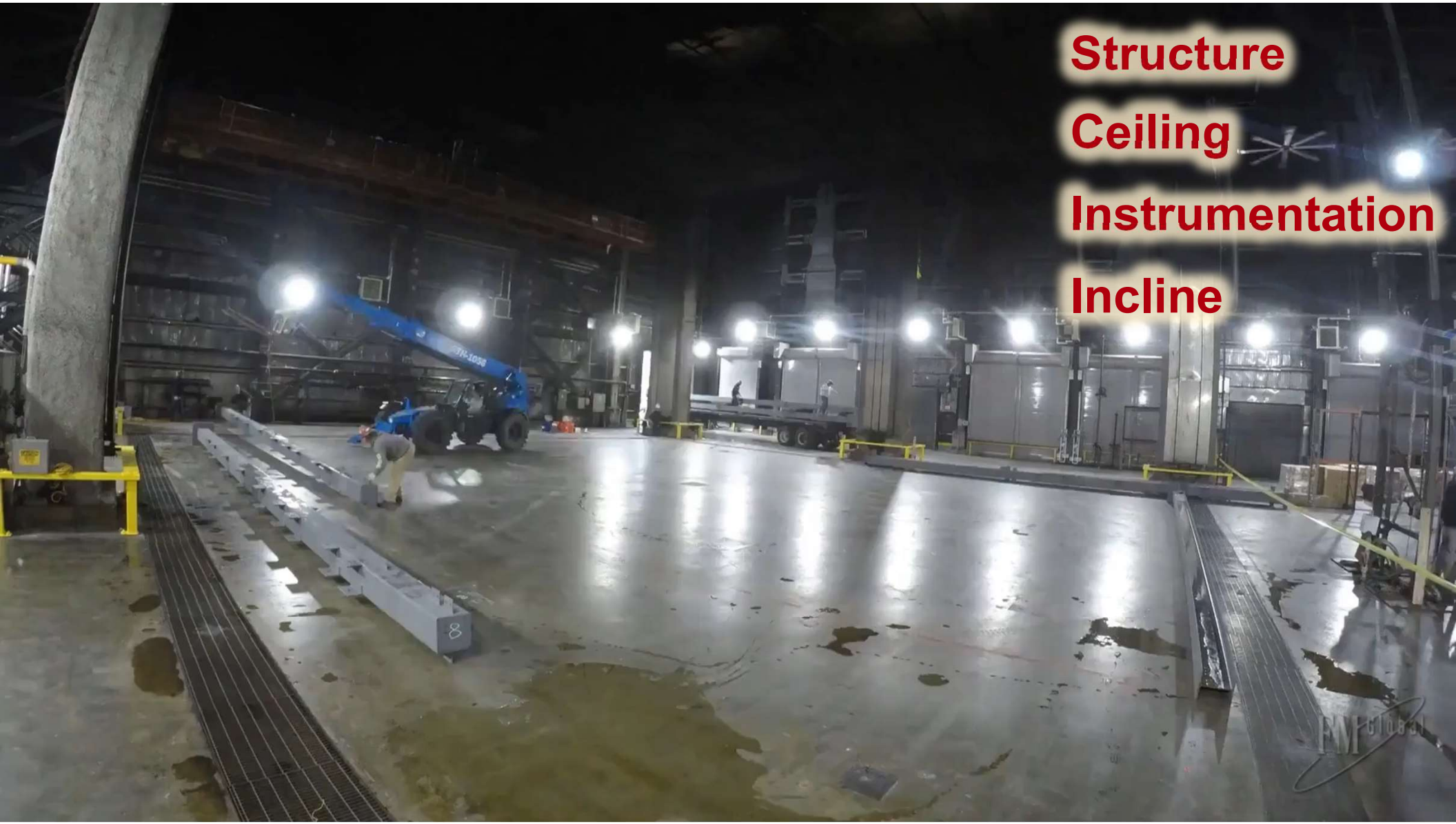




Ceiling Design



- Coordination
- Design
- Construction


Structure
Ceiling
Instrumentation
Incline

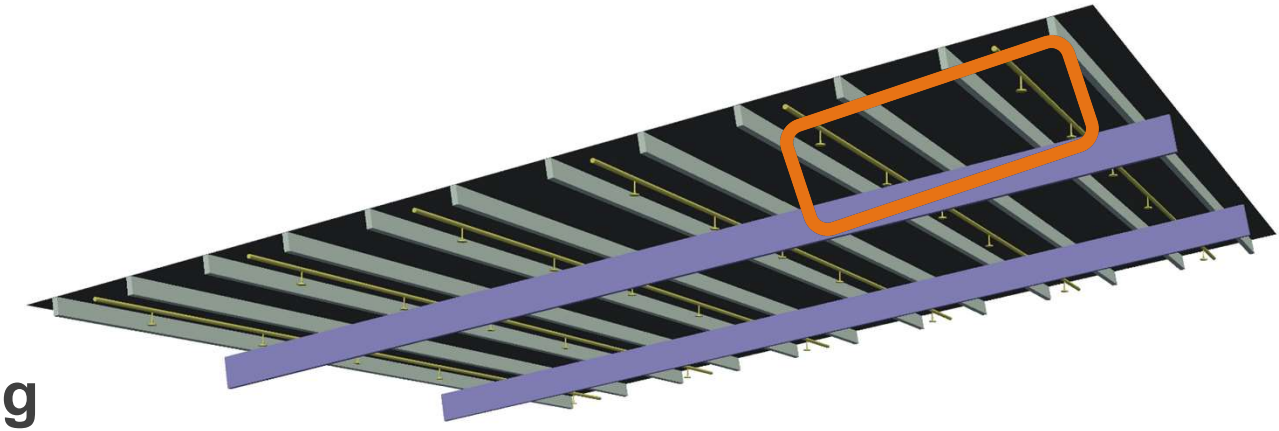
Large-Scale Tests

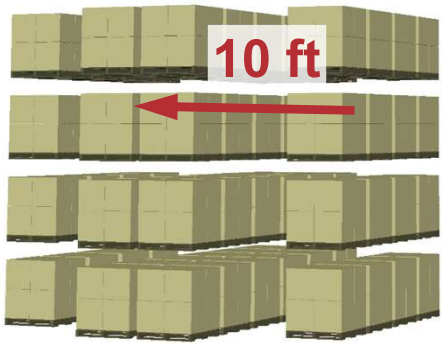
- Seven large-scale tests
  - Four tests at 10°
  - Three tests at 18°
- Obstructed construction
  - Sheet-metal purlins and girders
- One test with unobstructed ceiling



Large-Scale Test Setup

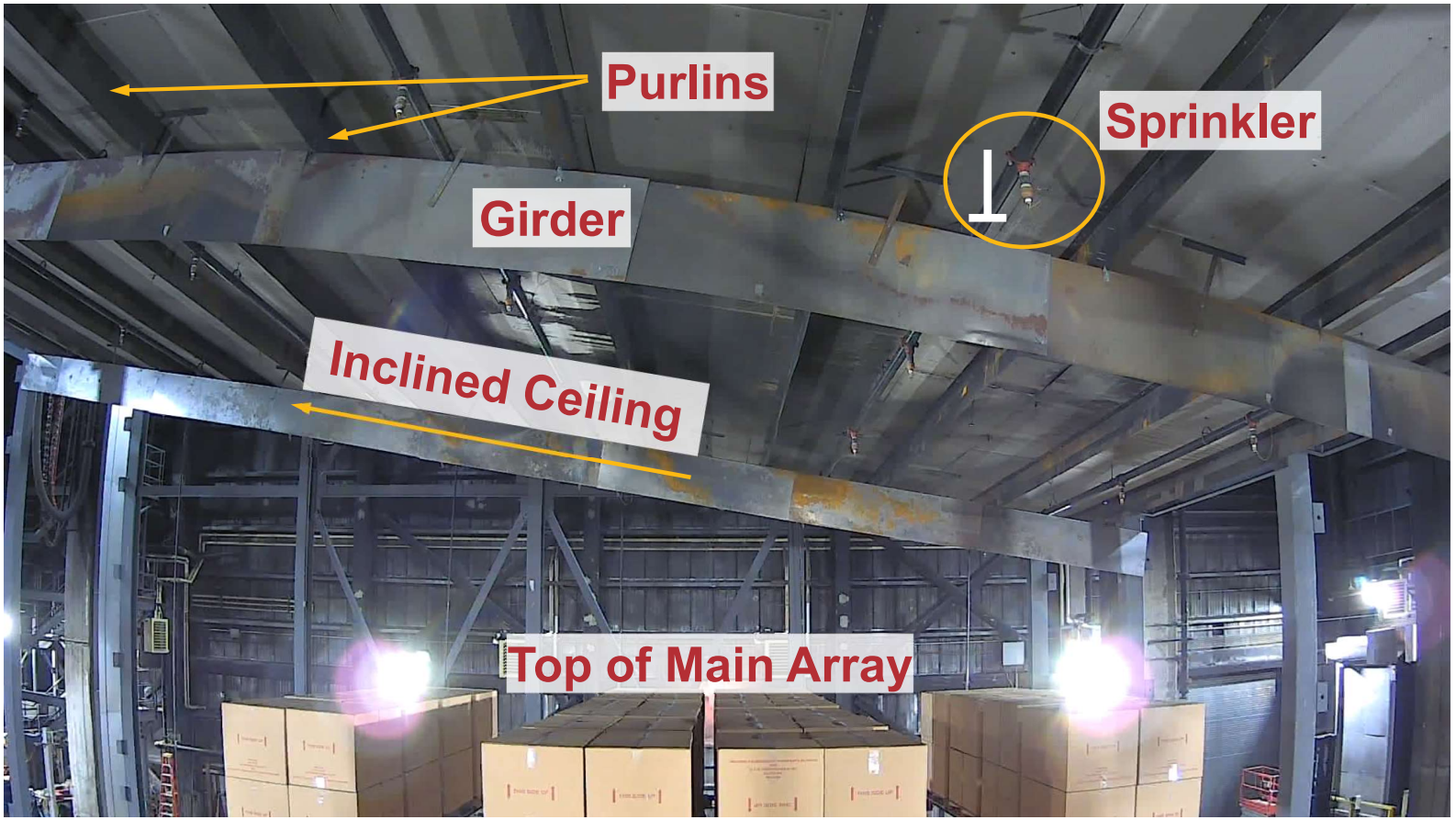
- Sprinklers
  - K-16.8, pendent QR
  - 35 psig (100 gpm)
  - 10 ft x 10 ft on ceiling
- Main array offset
  - Rack centered among four sprinklers
  - Offset ignition

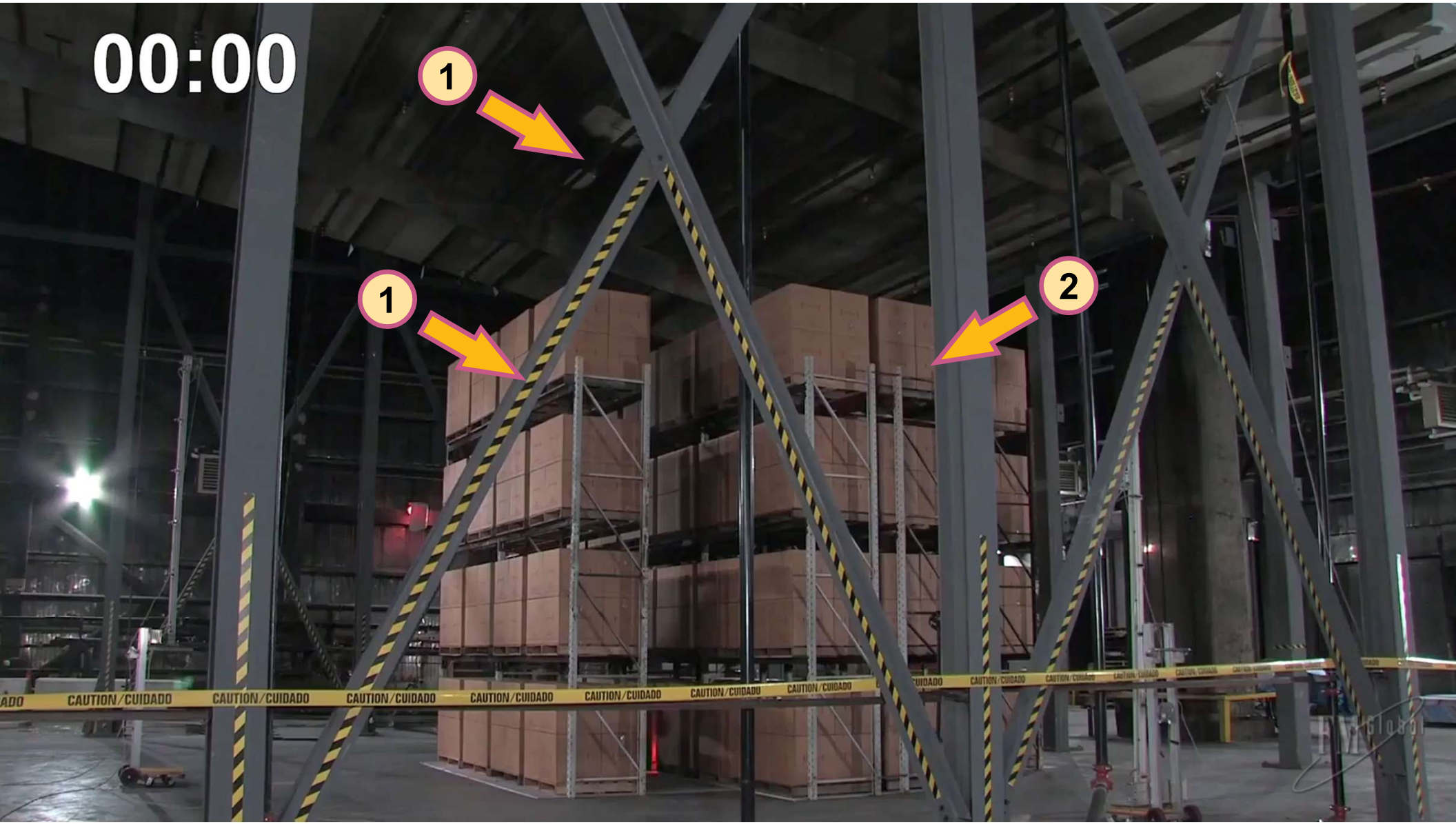




Deflector Orientation

10°, 12 in. Purlins, Parallel-to-Floor



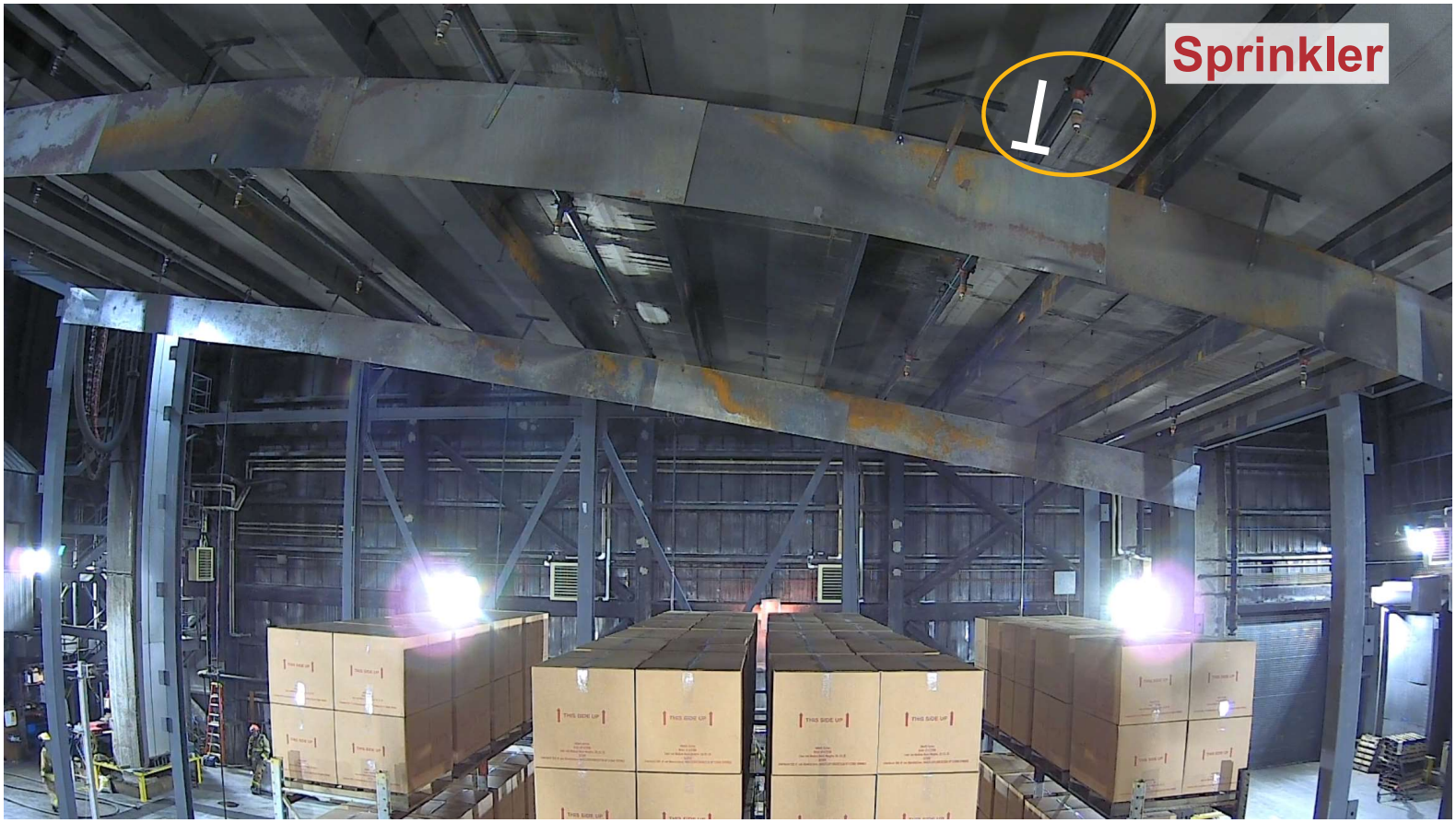

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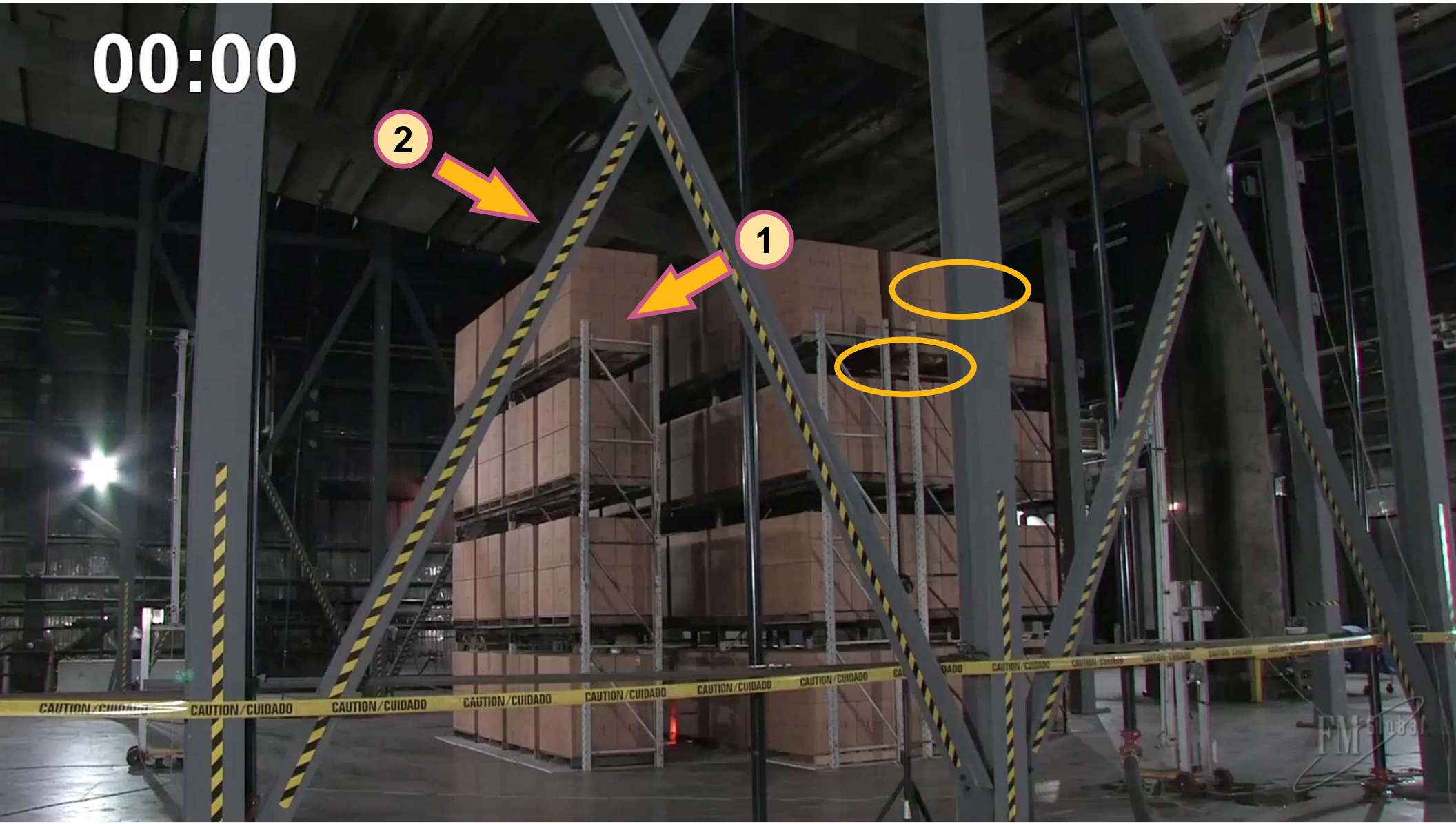
10°, 12 in. Purlins, Parallel-to-Floor



- 6 sprinkler operations
  - Within 19 s
- Fire damage around the ignition region
  - Limited damage
  - West target ignition

10°, 12 in. Purlins, Parallel-to-Ceiling



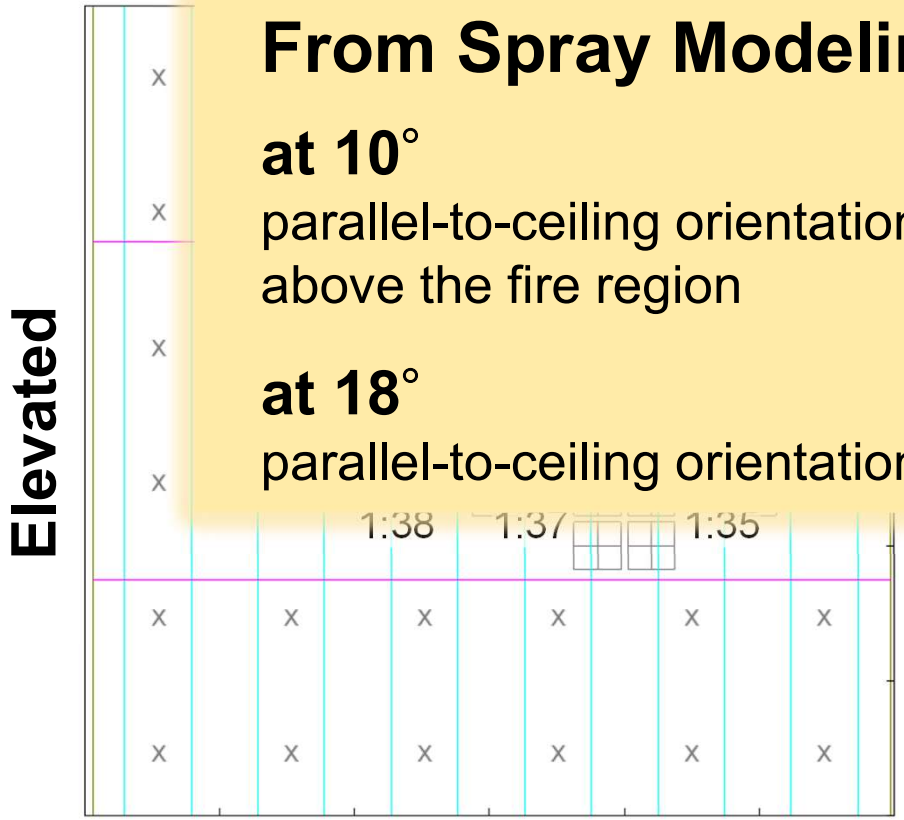

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FM Global

10°, 12 in. Purlins, Parallel-to-Ceiling



- 4 sprinkler operations
  - Two simultaneous upslope operations
  - 71 s delay, then two downslope operations
- Fire damage around the ignition region
  - Comparable to parallel-to-floor test damage area

10°, 12 in. Purlins



From Spray Modeling Results

at 10°

parallel-to-ceiling orientation provided 8% lower water flux above the fire region

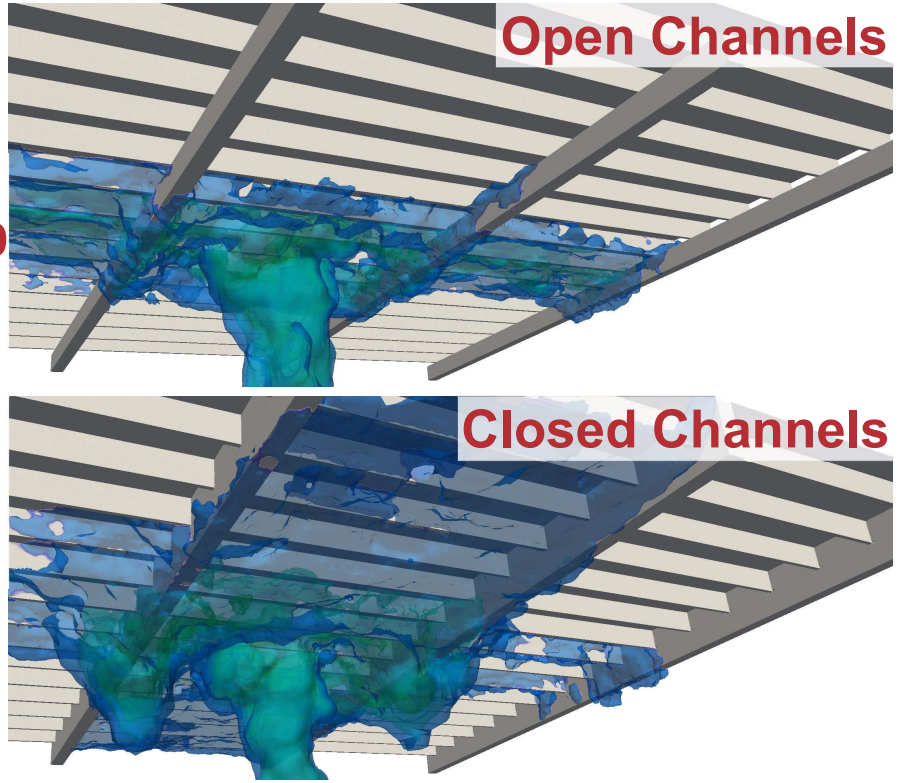
at 18°

parallel-to-ceiling orientation provided 15-25% lower water flux

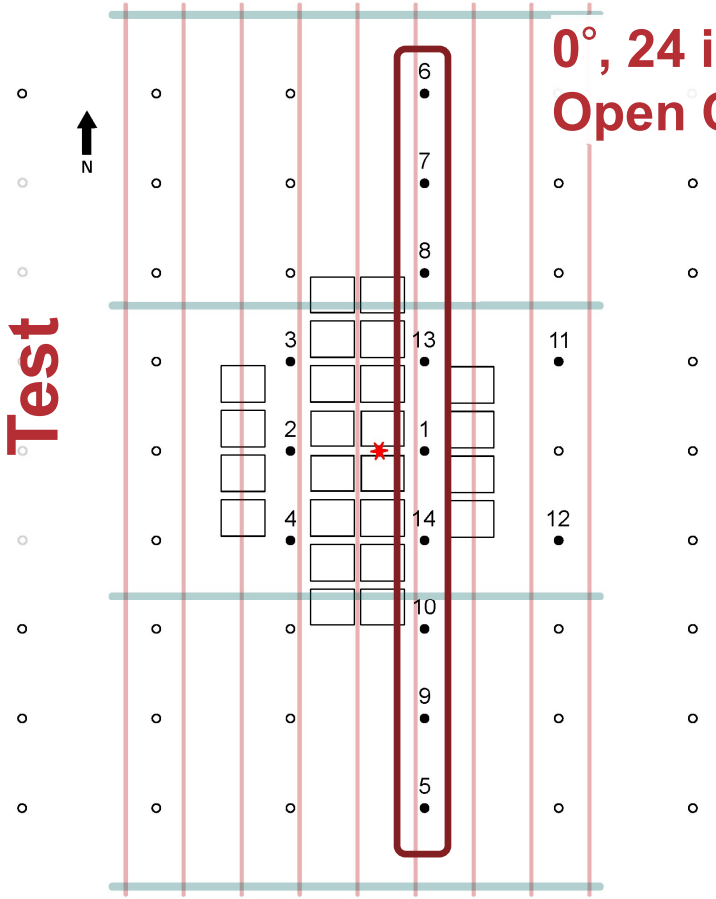
Ceiling Jet Channeling

0°, Ceiling Jet Channeling

Modeling



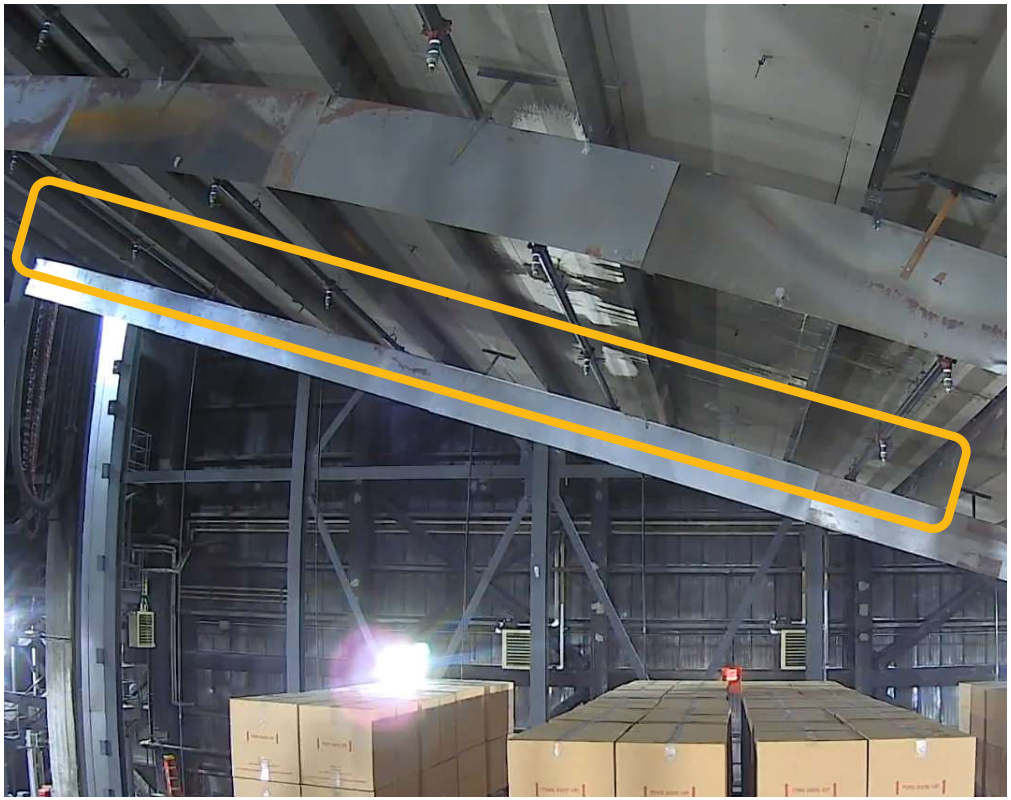
Test

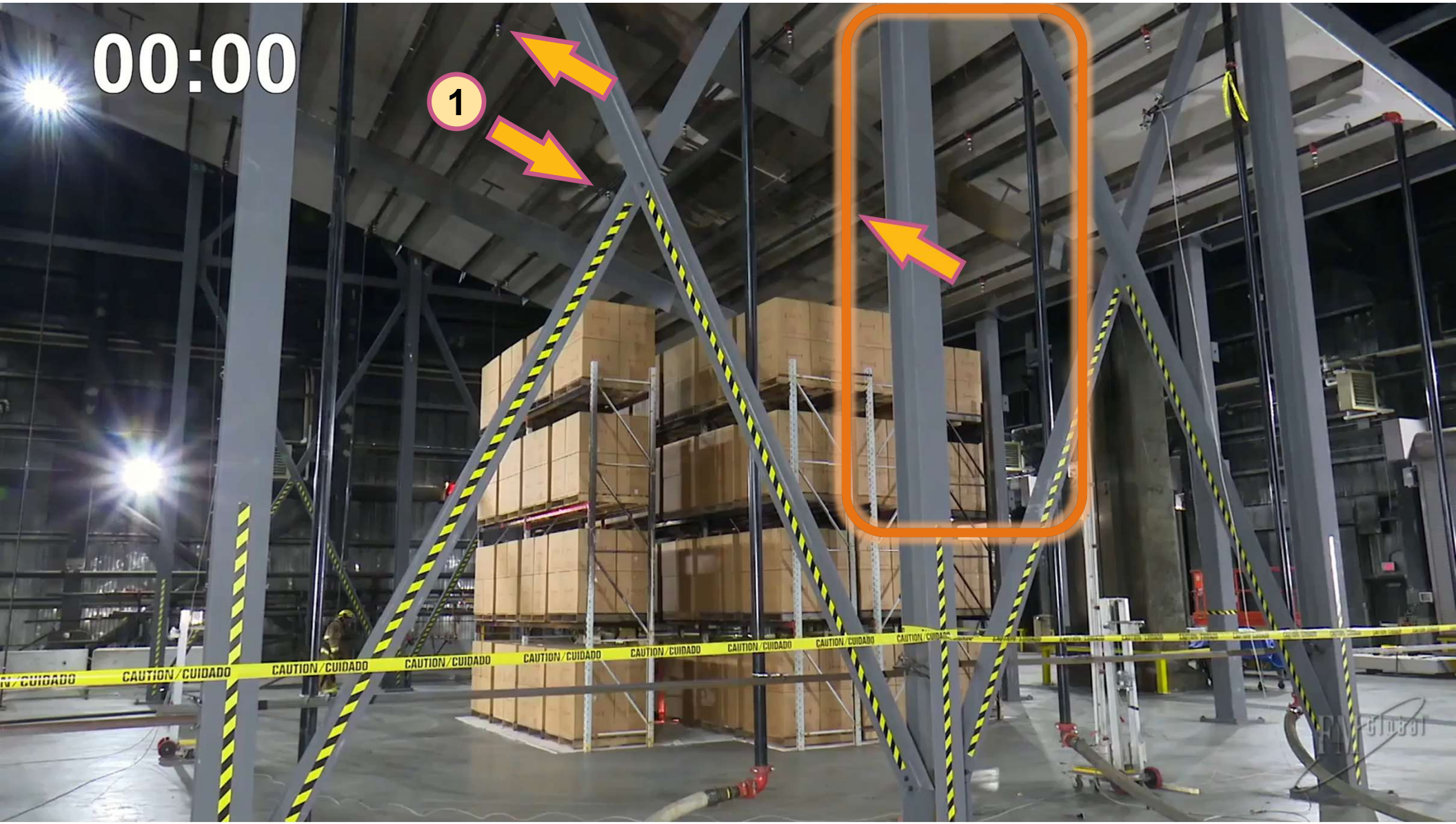


0°, 24 in. Purlins, Open Channels

18°, 12 in. Purlins, Open Channels

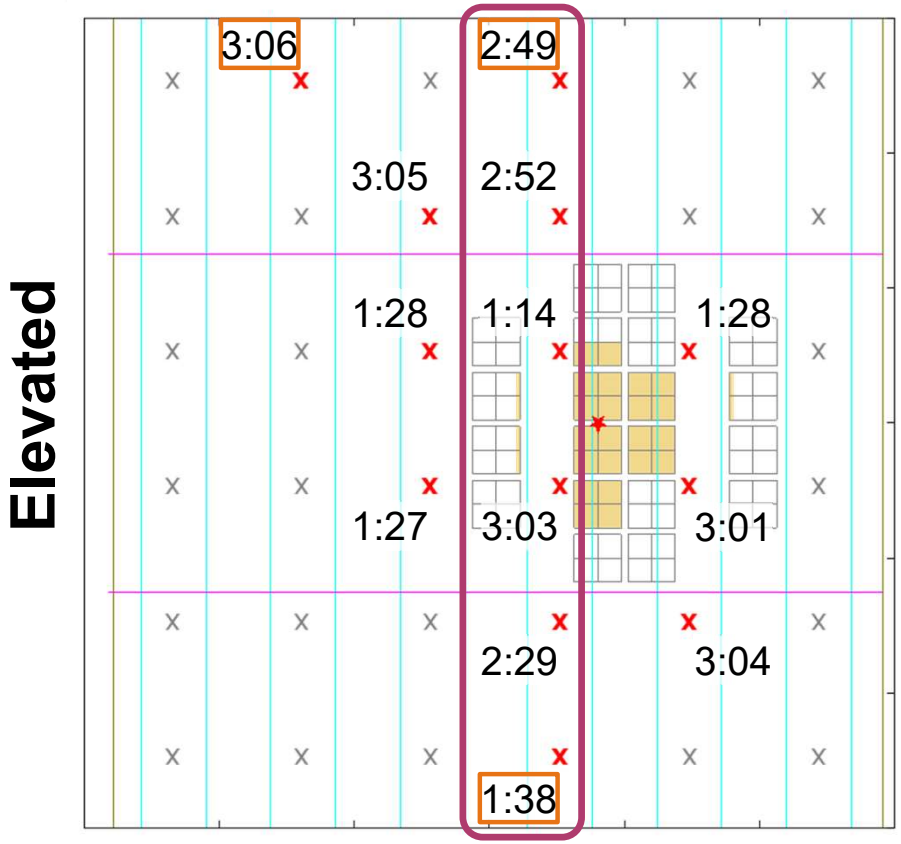
- Purlin channels open at girder locations
- Sprinkler orientation parallel-to-floor



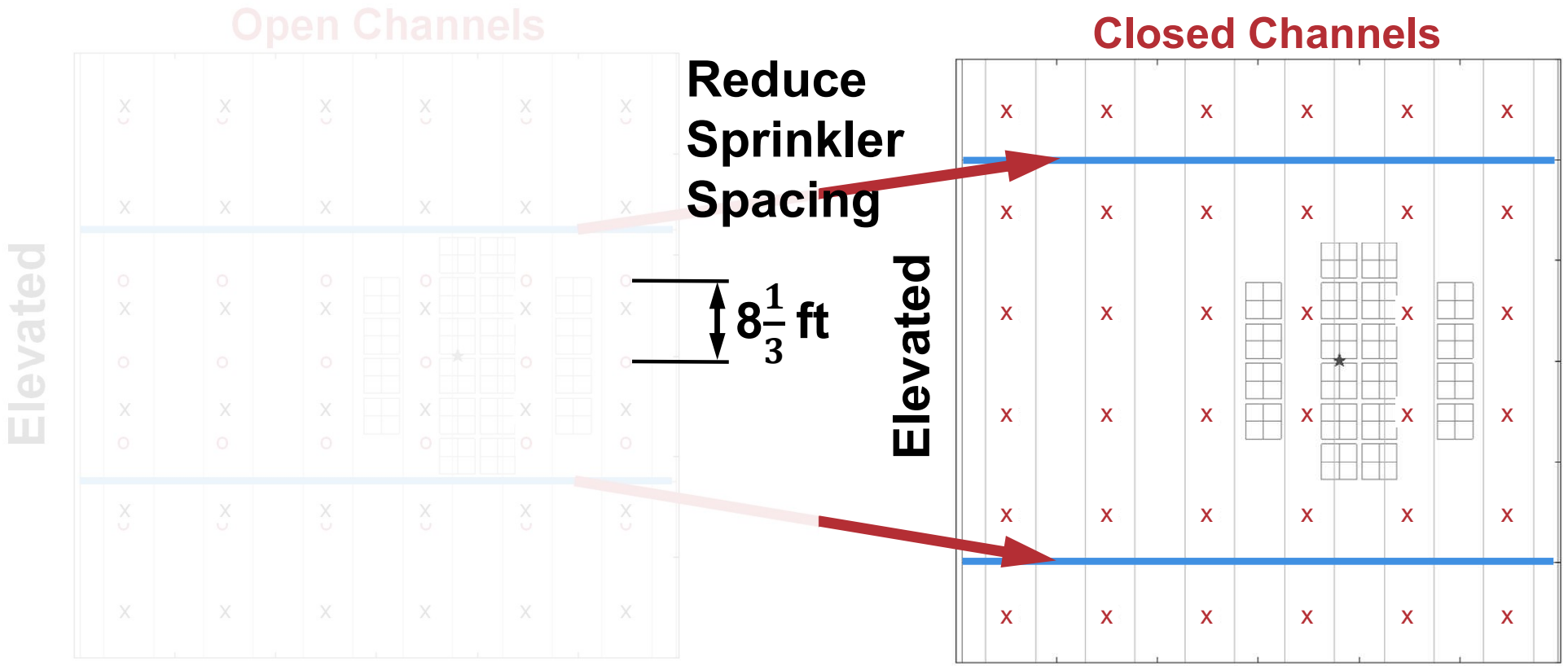

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18°, 12 in. Purlins, Open Channels

- 13 sprinkler operations
  - Perimeter sprinklers
- Flow channeling
- Water demand!
- Fire damage around the ignition region
  - Targets ignited but flames were rapidly suppressed

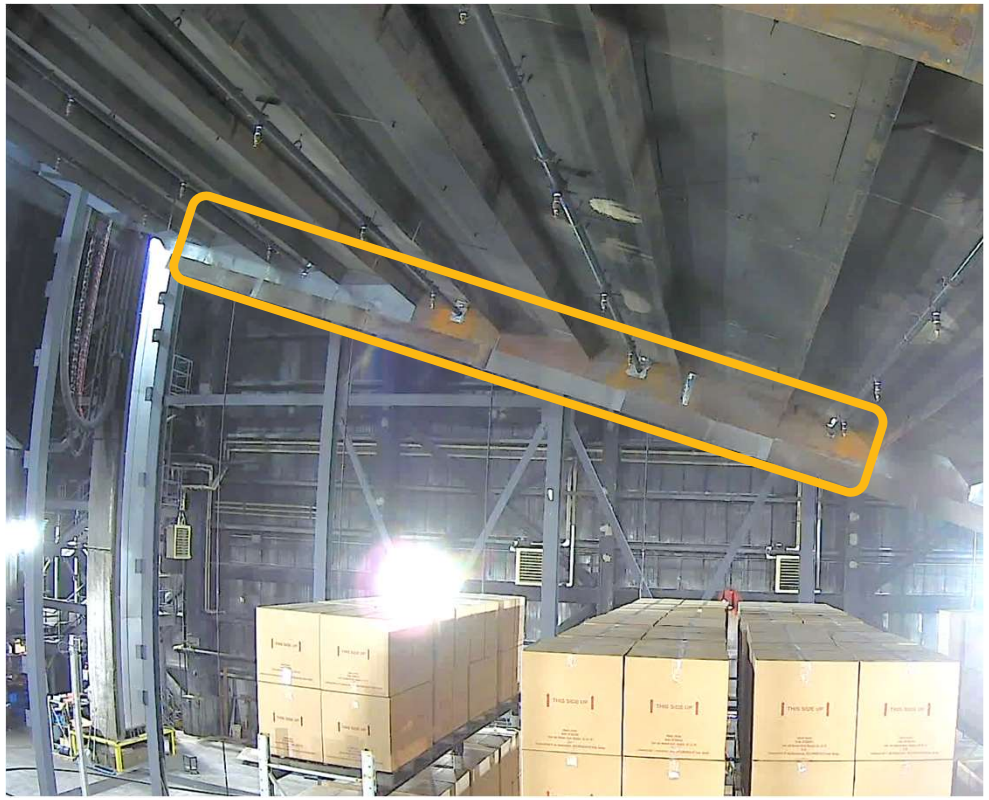


18°, 12 in. Purlins, Closed Channels



18°, 12 in. Purlins, Closed Channels

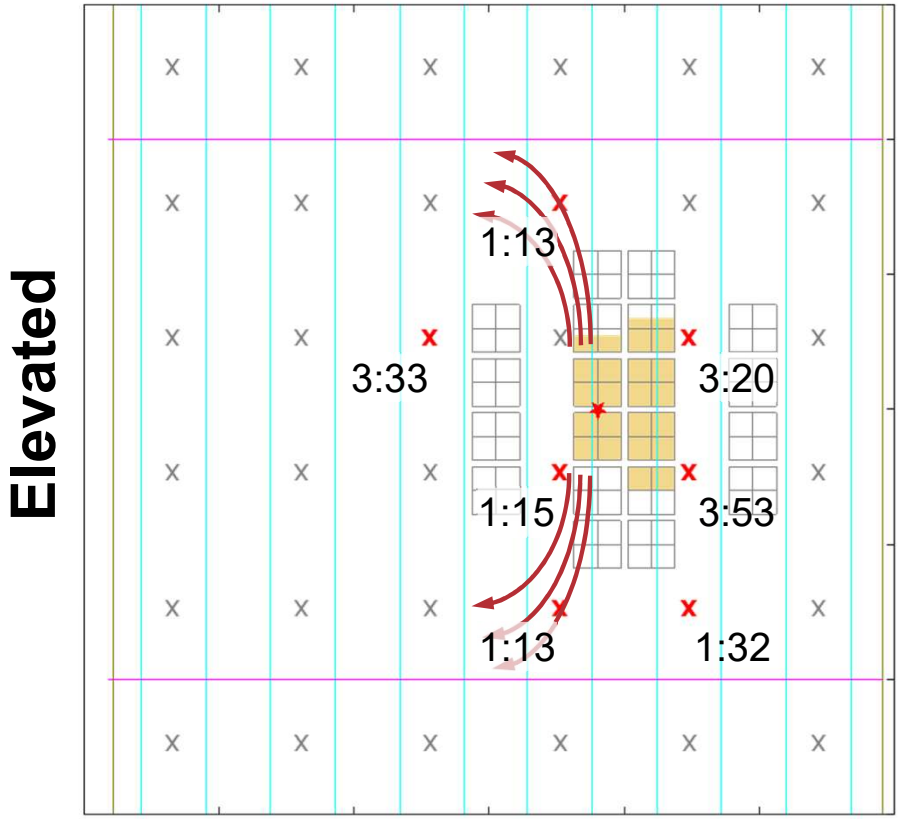
- Girder spacing 40 ft
  - Purlin channels closed at girder locations
- Sprinkler orientation parallel-to-floor




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18°, 12 in. Purlins, Closed Channels

- 7 operations
- Prevented ceiling jet channeling
- Fire damage around the ignition region
  - Limited damage



Unobstructed Ceiling

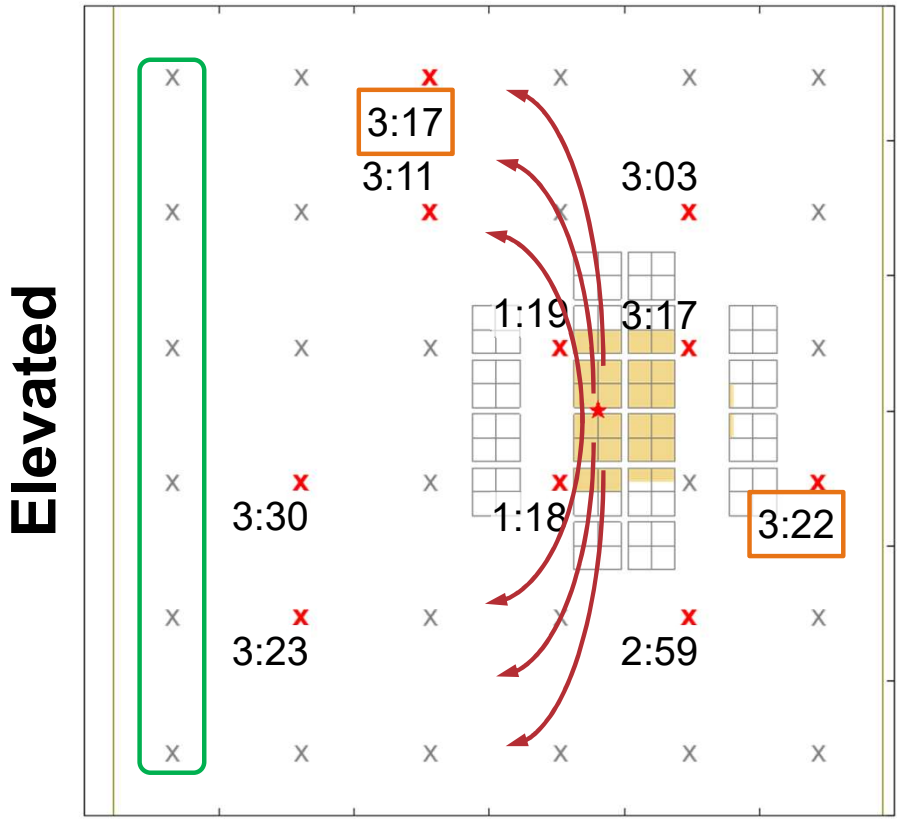
18°, Unobstructed Ceiling, Parallel-to-Floor




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18°, Unobstructed Ceiling, Parallel-to-Floor

- 10 sprinkler operations
  - Perimeter sprinklers
    - None on the elevated side
- Fire damage around the ignition region
  - Limited damage
  - West target ignited but fire was suppressed



Comparison with Baseline Test

	0°	10°	10°	10°
Purlin depth (in.)	–	12	12	18
Purlin channels	–	Open	Open	Closed
Deflector parallel to	Floor	Floor	Ceiling	Floor
First/last sprinkler (min:s)	1:22/1:25	1:22/1:41	1:16/2:32	1:23/1:34
Total sprinkler operations	3	6	4	7
Perimeter operations	No	No	No	No
Fire spread to array end	No	No	No	No

Comparison with Baseline Test

	0°	18°	18°	18°
Purlin depth (in.)	–	–	12	12
Purlin channels	–	–	Open	Closed
Deflector parallel to	Floor	Floor	Floor	Floor
First/last sprinkler (min:s)	1:22/1:25	1:18/3:30	1:14/3:06	1:08/3:48
Total sprinkler operations	3	10	13	7
Perimeter operations	No	Yes (?)	Yes	No
Fire spread to array end	No	No	No	No

Conclusions: Ceiling Inclination

- 10° (2:12 slope)
  - 1-4 additional sprinkler operations compared to baseline test
  - Non-sloped, unobstructed ceiling protection designs
- 18° (4:12 slope)
  - 4-7 additional sprinkler operations
  - More challenging protection scenario (unobstructed ceiling)
  - Increase total number of permitted sprinkler operations

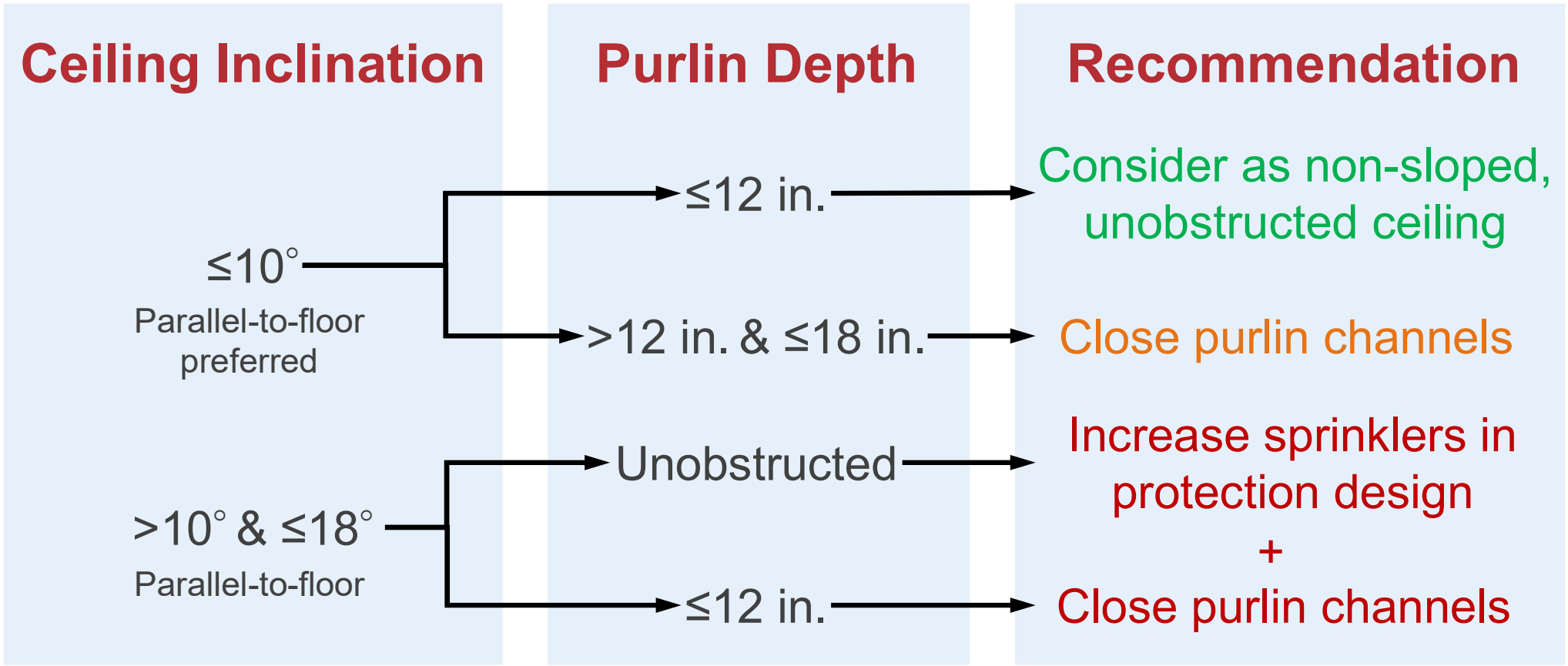
Conclusions: Obstructed Construction

- Presence of obstructed construction can be beneficial
  - Mitigating the effect of ceiling slope
  - Deeper purlins can cause ceiling jet channeling
- Closing purlin channels reduces channeling effect
  - 18 in. purlins at 10° (2:12 slope)
  - 12 in. purlins at 18° (4:12 slope)

Conclusions: Deflector Orientation

- 10° (2:12 slope)
  - Current tests showed limited effect of orientation
  - For parallel-to-ceiling orientation, core spray moved away from ignition region
- 18° (4:12 slope), parallel-to-ceiling orientation
  - Spray tests conclusively demonstrated spray-core moves toward upslope direction
  - Spray modeling showed a 25% reduction in water flux over the fire region compared to parallel-to-floor orientation

Recommendations



FM Global

Report release in Fall 2019

https://www.fmglobal.com/researchreports

https://www.nfpa.org/News-and-Research/Data-research-and-tools/Suppression/Protection-of-Storage-Under-Sloped-Ceilings

Acknowledgements

- PIRG
- Reliable Automatic Sprinkler Co., Inc.
- Amanda Kimball
- FM Global Research Campus
  - Michael Racicot
  - Ryan Foley
  - Michael Skidmore

2019 NFPA Conference & Expo

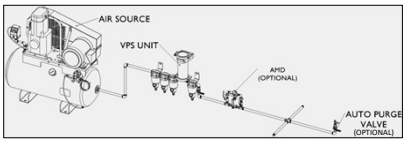
CEUs: To receive CEUs for this session, be sure to have your badge scanned

Evaluation: Complete a session evaluation on the mobile app (Search app store for 'NFPA 2019 C&E.')

Handouts: Handouts will be available via the mobile app and at nfpa.org/conference

GENERAL AIR PRODUCTS

Vapor Pipe Shield™ – How Does it Work?



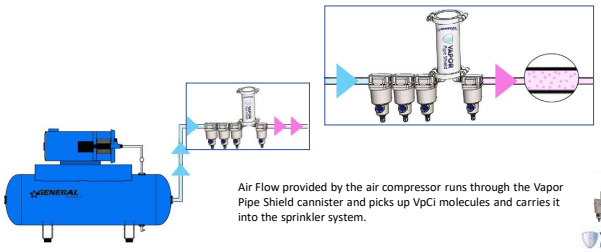
Vapor Pipe Shield is a delivery device for VPCI Corrosion Inhibitor connected to Dry & Pre-Action systems between the air compressor & the dry pipe valve or air maintenance device.

VAPOR Pipe Shield

1

GENERAL AIR PRODUCTS

Vapor Pipe Shield™ – How Does it Work?



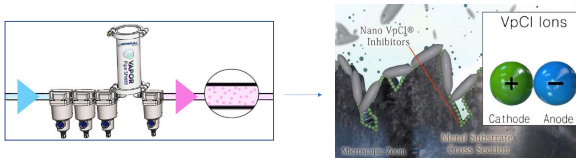
Air Flow provided by the air compressor runs through the Vapor Pipe Shield cannister and picks up VpCi molecules and carries it into the sprinkler system.

VAPOR Pipe Shield

2

GENERAL AIR PRODUCTS

Vapor Pipe Shield™ – How Does it Work?



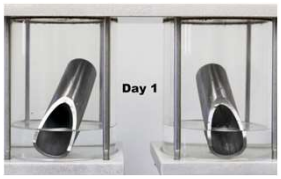
VpCI Molecules attach to the metal pipe. They form a ONE MOLECULE LAYER or shield that acts as a barrier between the metal pipe surface and the corrosive environment inside the pipe.

VAPOR Pipe Shield

3

We Asked:

How Can We Simplify Corrosion Control in Dry & Pre-Action Sprinkler Systems?



The Answer:

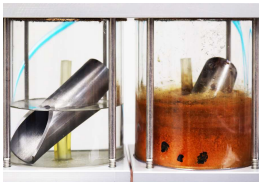
Use What Works.

4

We Asked:

How Can We Simplify Corrosion Control in Dry & Pre-Action Sprinkler Systems?

2 Years Later…



The Answer:

Use What Works.

5

Vapor Phase Corrosion Inhibitor (VpCI)







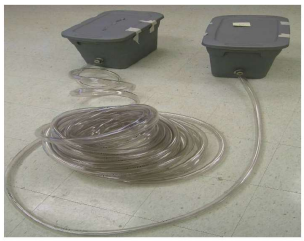
Vapor Phase Corrosion Inhibitors have been used and proven for over 40 years as the most effective means of corrosion mitigation for a wide variety of industries:

- Emitting vapor inside shipping containers containing cars, engines, and other metallic cargo
- Protecting bridge cables and other high-tension metallic construction applications where corrosion is life-threatening
- Oil pipelines and other large-scale piping networks

6

GENERAL AIR PRODUCTS

Setup of 100ft diffusion test apparatus



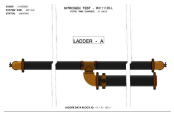
VAPOR Pipe Shield

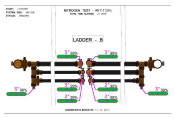
7

GENERAL AIR PRODUCTS

How Have We Tested VPCI?







TERPconsulting fire • life safety

Before contacting UL, we had to prove it to ourselves, first. General Air Products built a 1,000 Gallon Dry Pipe System Test Rig at our facility in Exton, PA.

VAPOR Pipe Shield

8

GENERAL AIR PRODUCTS

Understanding How Leak Rates Effect Your Air Supply Equipment

Sample Dry System at Commissioning (New System):

- Largest Riser: 2000 gallons
- Number of Risers: 4
- System Pressure: 40 psi
- Total System Capacity: 5000 gallons
- Total System Volume: 2487.2 cubic feet @ pressure

New System Allowable Leak Rate: 1.5 psi per day
System Volume Loss: 0.047 CFM (0.151 CFM w/ purge or N2 monitoring)











Correctly Sized Membrane Nitrogen Generator	Correctly Sized PSA Nitrogen Generator	Correctly Sized Dry Air Generator	Correctly Sized Fire Protection Air Compressor	Correctly Sized Fire Protection Air Compressor With Vapor Pipe Shield
0.6 CFM	0.88 CFM	21 CFM	24.25 CFM	20 CFM

9

PI 339 – New Definition for VPCI

3.3.236

Vapor-Phase Corrosion Inhibitor (VpCI) - a chemical compound (substance) that emits rust-inhibiting vapor to protect ferrous and non-ferrous metals against corrosion in an air-filled dry pipe or preaction sprinkler system. The inhibitor forms a thin protective layer separating the pipe from the air or water and provides protection against corrosion.

Substantiation:

This definition is needed to introduce new terminology to NFPA 13. The definition is also necessary to differentiate between corrosion inhibitors that enter the system in the vapor phase versus those entering as a liquid. NFPA 13 currently includes requirements for liquid phase corrosion inhibitors (LpCI); however, there are no requirements for VpCI. VpCI is applied through attachment of equipment to the air supply to a dry pipe or preaction sprinkler system. This new definition is part of a series of public inputs to integrate new requirements for VpCI and clarify existing requirements intended for LpCI.

10

PI 338 – New Definition for LPCI

3.3.121

Liquid-Phase Corrosion Inhibitor (LpCI) - a chemical compound added as a liquid and injected into a water filled sprinkler system to decrease the rate of corrosion. A common mechanism involves the formation of a pacification layer or coating which separates the metal from the corrosive water.

Substantiation:

It is important to differentiate VpCI from LpCI which are added to water in a sprinkler system. NFPA 13 currently includes requirements for LpCI; however, there are no requirements for VpCI. This new definition is part of a series of public inputs to integrate new requirements for VpCI and clarify existing requirements intended for LpCI.

11

PI 340 – Revision to Water Supplies – Modifications

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:

(1) Install system piping that is corrosion resistant
(2) Treat water that enters the system using a listed corrosion inhibitor
(3) Implement an approved plan for monitoring the interior conditions of the pipe at established intervals and locations
(4) Install approved corrosion monitoring stations and monitor at established intervals
(5) Fill dry-pipe or preaction systems with at least 98 percent pure nitrogen in lieu of air to mitigate against corrosion
(6) Use a listed nitrogen generator that is sized and installed in accordance with the manufacturer's instructions
(7) Use a VpCI delivery system sized and installed in accordance with the manufacturer's instructions

12

PI 340 – Revision to Water Supply and Treatment Section – Substantiation

Substantiation:

The technology has been available for many years and will soon be available as a listed product for use in dry pipe and preaction sprinkler systems. VpCIs have been used to protect metals from rust and corrosion in industrial and commercial applications for approximately 40 years. VpCIs were also used by the US to protect equipment during WWII. VPCI is effective at mitigating corrosion in dry pipe and preaction sprinkler systems.

13

PI 341 – Revision to Water Supply and Treatment Section – Modifications

~~**5.1.4 * Water Supply Treatment.**~~
5.1.4.1 Water Supplies and Environmental Conditions.
5.1.4.1.1
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:~~
~~(1) Install system piping that will not be affected by the MIC microbes~~
~~(2) Treat all water that enters the system using a listed bacterial inhibitor~~
~~(3) Implement an approved plan for monitoring the interior conditions of the pipe at established time intervals and locations~~
~~(4) Install a corrosion monitoring station and monitor at established intervals~~
5.1.4.2 ~~Corrosion.~~
~~**5.1.4.2.1**~~
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:~~
~~(1) Install system piping that is corrosion resistant~~
~~(2) Treat water that enters the system using a listed corrosion inhibitor~~
~~(3) Implement an approved plan for monitoring the interior conditions of the pipe at established intervals and locations~~
~~(4) Install approved corrosion monitoring stations and monitor at established intervals~~
~~(5) Fill dry pipe or preaction systems with at least 98 percent pure nitrogen in lieu of air to mitigate against corrosion~~
~~(6) Use a listed nitrogen generator that is sized and installed in accordance with the manufacturer's instructions~~

14

PI 341 – Revision to Water Supply and Treatment Section – New Language

5.1.4* Water Supplies and Environmental Conditions.

5.1.4.1

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

5.1.4.2

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

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.

15

PI 341 – Revision to Water Supply and Treatment Section – Substantiation

Substantiation:

This PI deletes treatments from 5.1.4 but maintains the requirements for testing. The deleted text for treatment options is intended to be relocated to 16.4.2, *Protection Against Corrosion*. Additional PIs will further consolidate the language in 5.1.4. This chapter initially provided types of water supplies. The addition of corrosion protection requirements has continued to grow and distracts from the intent of the chapter. This should be limited to testing for MIC and unusual corrosive properties.

16

PI 342 – Revision to Inhibitors – Modifications

~~**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.~~

5.1.4.3 Liquid phase corrosion inhibitors shall be permitted to be used in accordance with 8.6.1.

17

PI 342 – Revision to Inhibitors – New Language

5.1.4.3

Liquid phase corrosion inhibitors shall be permitted to be used in accordance with 8.6.1.

Substantiation:

This PI consolidates the requirements in 5.1.4 and another PI relocates the requirements to 8.6.1.

18

PI 343 – Revision to Water Supply and Treatment Section – Modifications

~~5.1.4 * Water Supply Treatment.~~
~~5.1.4.1 Water Supplies and Environmental Conditions.~~
~~5.1.4.1.1~~
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:~~
~~(1) Install system piping that will not be affected by the MIC microbes~~
~~(2) Treat all water that enters the system using a listed bacterial inhibitor~~
~~(3) Implement an approved plan for monitoring the interior conditions of the pipe at established time intervals and locations~~
~~(4) Install a corrosion monitoring station and monitor at established intervals~~

~~5.1.4.2 Corrosion.~~
~~5.1.4.2.1~~
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:~~
~~(1) Install system piping that is corrosion resistant~~
~~(2) Treat water that enters the system using a listed corrosion inhibitor~~
~~(3) Implement an approved plan for monitoring the interior conditions of the pipe at established intervals and locations~~
~~(4) Install approved corrosion monitoring stations and monitor at established intervals~~
~~(5) Fill dry-pipe or preaction systems with at least 98 percent pure nitrogen in lieu of air to mitigate against corrosion~~
~~(6) 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.~~

5.1.4.3
Liquid phase corrosion inhibitors shall be permitted to be used in accordance with 8.6.1.

19

PI 343 – Revision to Water Supply and Treatment Section – New Language

5.1.4* Water Supplies and Environmental Conditions.

5.1.4.1

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

5.1.4.2

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

5.1.4.3

Liquid phase corrosion inhibitors shall be permitted to be used in accordance with 8.6.1.

20

PI 343 – Revision to Water Supply and Treatment Section – Substantiation

Substantiation:

This PI deletes treatments from 5.1.4 but maintains the requirements for testing. The deleted text for treatment options is intended to be relocated to 16.4.2, *Protection Against Corrosion*. This PI also consolidates the reference to inhibitors which will be relocated as part of a different PI. Additional PIs will further consolidate the language in 5.1.4. This chapter initially provided types of water supplies. The addition of corrosion protection requirements has continued to grow and distracts from the intent of the chapter. This should be limited to testing for MIC and unusual corrosive properties.

21

PI 345 – Revision to Protection Against Corrosion – Modifications

16.4.2 * Protection of Piping Against Corrosion.

16.4.2.1 *
Where corrosive conditions are known to exist due to moisture or fumes from corrosive chemicals or both, special types of fittings, pipes, and hangers that resist corrosion shall be used, or a protective coating shall be applied to all unprotected exposed surfaces of the sprinkler system.

16.4.2.2
~~Where water supplies or environmental conditions are known to have unusual corrosive properties, piping shall have a corrosion resistance ratio (CRR) of 1 or more, and the system shall be treated in accordance with 5.1.4.~~

~~16.4.2.3~~
Where corrosive conditions exist or piping is exposed to the weather, corrosion-resistant types of pipe, fittings, and hangers or protective corrosion-resistant coatings shall be used.

16.4.2.34
Where steel pipe is used underground, the pipe shall be protected against corrosion.

16.4.2.4
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:
(1) Install system piping that will not be affected by the MIC microbes
(2) Treat all water that enters the system using a listed bacterial inhibitor
(3) Implement an approved plan for monitoring the interior conditions of the pipe at established time intervals and locations
(4) Install a corrosion monitoring station and monitor at established intervals

16.4.2.5
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:
(1) Install system piping that is corrosion resistant
(2) Treat water that enters the system using a listed corrosion inhibitor
(3) Implement an approved plan for monitoring the interior conditions of the pipe at established intervals and locations
(4) Install approved corrosion monitoring stations and monitor at established intervals
(5) Fill dry-pipe or preaction systems with at least 98 percent pure nitrogen in lieu of air to mitigate against corrosion
(6) Use a listed nitrogen generator that is sized and installed in accordance with the manufacturer's instructions

16.4.2.6
Where water supplies or environmental conditions are known to have unusual corrosive properties, piping shall have a corrosion resistance ratio (CRR) of 1 or more, and the system shall be treated in accordance with 5.1.4.

22

PI 345 – Revision to Protection Against Corrosion – New Language

16.4.2 * Protection of Piping Against Corrosion.

16.4.2.1 *
Where corrosive conditions are known to exist due to moisture or fumes from corrosive chemicals or both, special types of fittings, pipes, and hangers that resist corrosion shall be used, or a protective coating shall be applied to all unprotected exposed surfaces of the sprinkler system.

16.4.2.2
Where corrosive conditions exist or piping is exposed to the weather, corrosion-resistant types of pipe, fittings, and hangers or protective corrosion-resistant coatings shall be used.

16.4.2.3
Where steel pipe is used underground, the pipe shall be protected against corrosion.

16.4.2.4
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:
(1) Install system piping that will not be affected by the MIC microbes
(2) Treat all water that enters the system using a listed bacterial inhibitor
(3) Implement an approved plan for monitoring the interior conditions of the pipe at established time intervals and locations
(4) Install a corrosion monitoring station and monitor at established intervals

16.4.2.5
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:
(1) Install system piping that is corrosion resistant
(2) Treat water that enters the system using a listed corrosion inhibitor
(3) Implement an approved plan for monitoring the interior conditions of the pipe at established intervals and locations
(4) Install approved corrosion monitoring stations and monitor at established intervals
(5) Fill dry-pipe or preaction systems with at least 98 percent pure nitrogen in lieu of air to mitigate against corrosion
(6) Use a listed nitrogen generator that is sized and installed in accordance with the manufacturer's instructions

16.4.2.6
Where water supplies or environmental conditions are known to have unusual corrosive properties, piping shall have a corrosion resistance ratio (CRR) of 1 or more, and the system shall be treated in accordance with 5.1.4.

23

PI 345 – Revision to Water Supply and Treatment Section – Substantiation

Substantiation:

This change relocates requirements previously found in 5.1.4 as part of the water supplies chapter. The requirements are for protection against corrosion and should more appropriately be located in 16.4.2.

24

PI 346 – Revision to Protection Against Corrosion – Modifications

16.4.2 * Protection of Piping Against Corrosion.

~~**16.4.2.1 ***~~

Where corrosive conditions are known to exist due to moisture or fumes from corrosive chemicals or both, special types of fittings, pipes, and hangers that resist corrosion shall be used, or a protective coating shall be applied to all unprotected exposed surfaces of the sprinkler system.

~~**16.4.2.2**~~

~~Where water supplies or environmental conditions are known to have unusual corrosive properties, piping shall have a corrosion resistance ratio (CRR) of 1 or more, and the system shall be treated in accordance with 5.1.4.~~

16.4.2.1

Where corrosive conditions exist or piping is exposed to the weather, corrosion-resistant types of pipe, fittings, and hangers or protective corrosion-resistant coatings shall be used.

~~**16.4.2.34**~~

Where steel pipe is used underground, the pipe shall be protected against corrosion.

16.4.2.4

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:

(1) Install system piping that will not be affected by the MIC microbes
(2) Treat all water that enters the system using a listed bacterial inhibitor
(3) Implement an approved plan for monitoring the interior conditions of the pipe at established time intervals and locations
(4) Install a corrosion monitoring station and monitor at established intervals

16.4.2.5

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:

(1) Install system piping that is corrosion resistant
(2) Treat water that enters the system using a listed corrosion inhibitor
(3) Implement an approved plan for monitoring the interior conditions of the pipe at established intervals and locations
(4) Install approved corrosion monitoring stations and monitor at established intervals
(5) Fill dry-pipe or preaction systems with at least 98 percent pure nitrogen in lieu of air to mitigate against corrosion
(6) Use a listed nitrogen generator that is sized and installed in accordance with the manufacturer's instructions
(7) Use a VpCI delivery system sized and installed in accordance with the manufacturer's instructions

16.4.2.6

Where water supplies or environmental conditions are known to have unusual corrosive properties, piping shall have a corrosion resistance ratio (CRR) of 1 or more, and the system shall be treated in accordance with 5.1.4.

25

PI 346 – Revision to Protection Against Corrosion – New Language

16.4.2 * Protection of Piping Against Corrosion.

16.4.2.1 *
Where corrosive conditions are known to exist due to moisture or fumes from corrosive chemicals or both, special types of fittings, pipes, and hangers that resist corrosion shall be used, or a protective coating shall be applied to all unprotected exposed surfaces of the sprinkler system.

16.4.2.2
Where corrosive conditions exist or piping is exposed to the weather, corrosion-resistant types of pipe, fittings, and hangers or protective corrosion-resistant coatings shall be used.

16.4.2.3
Where steel pipe is used underground, the pipe shall be protected against corrosion.

16.4.2.4
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:

(1) Install system piping that will not be affected by the MIC microbes
(2) Treat all water that enters the system using a listed bacterial inhibitor
(3) Implement an approved plan for monitoring the interior conditions of the pipe at established time intervals and locations
(4) Install a corrosion monitoring station and monitor at established intervals

16.4.2.5
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:

(1) Install system piping that is corrosion resistant
(2) Treat water that enters the system using a listed corrosion inhibitor
(3) Implement an approved plan for monitoring the interior conditions of the pipe at established intervals and locations
(4) Install approved corrosion monitoring stations and monitor at established intervals
(5) Fill dry-pipe or preaction systems with at least 98 percent pure nitrogen in lieu of air to mitigate against corrosion
(6) Use a listed nitrogen generator that is sized and installed in accordance with the manufacturer's instructions
(7) Use a VpCI delivery system sized and installed in accordance with the manufacturer's instructions

16.4.2.6
Where water supplies or environmental conditions are known to have unusual corrosive properties, piping shall have a corrosion resistance ratio (CRR) of 1 or more, and the system shall be treated in accordance with 5.1.4.

26

PI 346 – Revision to Water Supply and Treatment Section – Substantiation

Substantiation:

This change relocates requirements previously found in 5.1.4 as part of the water supplies chapter. The requirements are for protection against corrosion and should more appropriately be located in 16.4.2. This PI also consolidates the inclusion of VpCI to the list of options for protecting against unusual corrosive conditions.

27

PI 347 – Revision to Inhibitors – Existing Language

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.

28

PI 347 – Revision to Inhibitors – New Language

8.6 Inhibitors.

8.6.1 Liquid Phase Inhibitors

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

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

8.6.2 Vapor Phase Inhibitors

8.6.2.1 Where used, listed vapor phase corrosion inhibitors shall be compatible with system components.

Substantiation:

Liquid inhibitors are injected into water-filled piping. Typically, liquid inhibitors target a specific pH level to achieve passivation and form a protect coating on the pipe interior. Vapor phase corrosion inhibitors are injected into dry pipe and preaction systems through the air supply lines. The chemical powder migrates through the piping and bonds with exposed steel/metal surfaces forming a protective boundary on the surface. VPCI protects the pipe surface in aqueous or air filled environment as well as at the air-water interface.

29

PI 348 – Revision to Additives and Coatings – New Language

7.8 Additives and Coatings.

7.8.1

Additives to the water supply intended for control of microbiological or other corrosion shall be listed for use within fire sprinkler systems.

7.8.2

Internal pipe coatings, excluding galvanizing, intended for control of microbiological or other corrosion shall be listed for use within fire sprinkler systems.

7.8.3

Additives to the air supply for control of corrosion shall be listed for use within fire sprinkler systems.

Substantiation:

Vapor phase corrosion inhibitors are added to the air supply for dry pipe and preaction sprinkler systems. This application does not fit within the requirements of 7.8.1 or 7.8.2 and requires the addition of a third requirement.

30

PI 350 – New Section for Use of C-120 for VPCI

8.2.6.10 VPCI for Increase C Value.

8.2.6.10.1 Where VPCI is included in the air supply to control corrosion, the C value taken from Table 28.2.4.8.1 for dry pipe and preaction systems shall be permitted to be increased to 120.

Substantiation:

VPCI is effective at mitigating corrosion in dry pipe and preaction sprinkler systems. The technology has been available for many years and is now available as a listed product for use in dry pipe and preaction sprinkler systems.

31

PI 349 – Add C-120 for VPCI to Friction Loss Section – New Language

28.2.4.8 Friction Loss.

28.2.4.8.1

Pipe friction loss shall be calculated in accordance with the Hazen–Williams formula with C values from Table 28.2.4.8.1, as follows:

(1) Pipe, fittings, and devices such as valves, meters, flow switches in pipes 2 in. (50 mm) or less in size, and strainers shall be included, and elevation changes that affect the sprinkler discharge shall be calculated.

(2) Tie-in drain piping shall not be included in the hydraulic calculations.

(3) Losses for a tee or a cross shall be calculated where flow direction change occurs based on the equivalent pipe length of the piping segment in which the fitting is included.

(4) The tee at the top of a riser nipple shall be included in the branch line, the tee at the base of a riser nipple shall be included in the riser nipple, and the tee or cross at a cross main–feed main junction shall be included in the cross main.

(5) Losses for straight-through flow in a tee or cross shall not be included.

(6) The loss of reducing elbows based on the equivalent length value of the smallest outlet shall be calculated.

(7) The equivalent length value for the standard elbow on any abrupt 90-degree turn, such as the screw-type pattern, shall be used.

(8) The equivalent length value for a fitting with a bushing shall be the same as for a similarly sized and configured reducing fitting.

(9) The equivalent length value for the long-turn elbow on any sweeping 90-degree turn, such as a flanged, welded, or mechanical joint-elbow type, shall be used. (See Table 28.2.3.1.1.)

(10) Losses shall be permitted to be excluded for tapered reducers.

(11) Losses shall be permitted to be excluded for a fitting with or without a bushing, directly connected to a sprinkler, except as required in 28.2.3.1.2 and 28.2.3.4.

(12) Losses through a pressure-reducing valve shall be included based on the normal inlet pressure condition, and pressure loss data from the manufacturer's literature shall be used.

(13) In new systems, an increased C value of 120 shall be permitted where nitrogen is provided in accordance with 8.2.6.9.

(14) In new systems, an increased C value of 120 shall be permitted where VpCI is provided in accordance with 8.2.6.10.

Substantiation:

A new line has been added for the use of a C value of 120 for VpCI due to its effectiveness in controlling corrosion.

32

PI 349 – Add C-120 for VPCI to Table 28.2.4.8.1

Existing Table

Table 28.2.4.8.1 Hazen–Williams C Values

Pipe or Tube	C Value *
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
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.

New Table

Table 28.2.4.8.1 Hazen–Williams C Values

Pipe or Tube	C Value *
Unlined cast or ductile iron	100
Black steel (dry systems including preaction)	100
Black steel (wet systems including deluge)	120
Black steel (dry system including preaction) using nitrogen^	120
Black steel (dry system including preaction) using VPCI*	**120**
Galvanized steel (dry systems including preaction)	100
Galvanized steel (wet systems including deluge)	120
Galvanized steel (dry systems including preaction) using nitrogen^	120
Galvanized steel (dry systems including preaction) using VPCI*	**120**
Plastic all (listed)	150
Cement-lined cast- or ductile iron	140
Copper tube, brass or stainless steel	150
Asbestos cement	140
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.
* VPCI used in air supply shall be installed in accordance with 8.2.6.10.

Substantiation:

A new line has been added for the use of a C value of 120 for VPCI due to its effectiveness in controlling corrosion.

33

FIREFLEX
Systems Inc.

Vacuum Technology NFPA 13 Presentation

Vacuum Fire Protection Systems – NFPA 13 Presentation





FM APPROVED

CE

Vacuum Fire Protection Systems – NFPA 13 Presentation

What is a Vacuum Fire Protection System?

- **New** method for supervising **Dry Pipe** and **Preaction** applications

- **Vacuum Fire Protection Systems is an evolution, not a revolution. Vacuum Technology for fire protection systems is based on the same basic principles as a traditional sprinkler based fire protection system.**

- **The main difference is that the Supervisory relative pressure is close to ambient pressure but negative.**
  - A low difference enables automatic sprinkler system mode while supervisory pressure is easy and fast to reach.
  - The negative pressure provides significant in-pipe Oxygen / Water depletion compared to traditional systems, thus avoiding lots of drawbacks contemplated with Wet / Dry Systems

Vacuum Fire Protection Systems – NFPA 13 Presentation

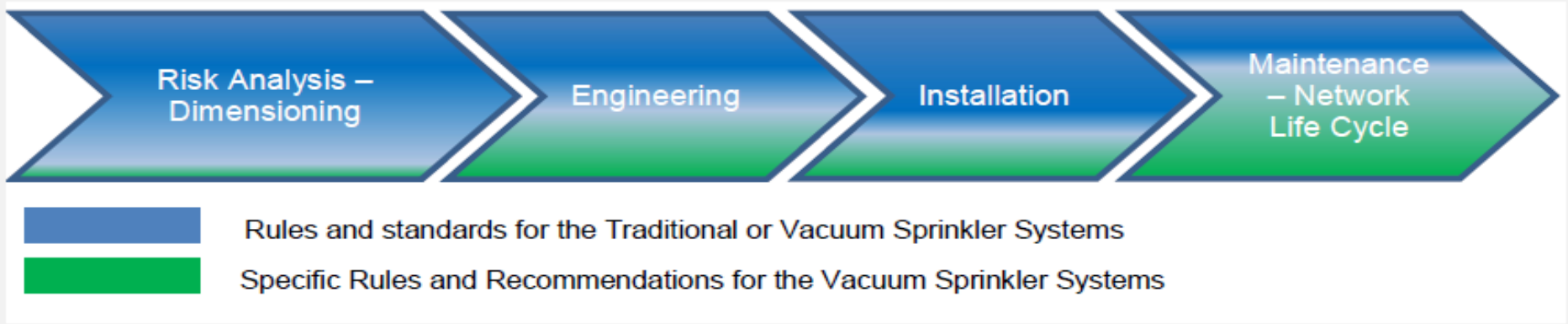
System Settings

Under normal standby conditions, entire piping network is supervised under vacuum pressure. The **Vacuum Pressure Controller** (FLX-PC) maintains vacuum pressure between **-2.6 psi** (-180 mbar) and **-2.2 psi** (-150 mbar).

System pressure set points	Relative pressure		
	bar	mbar	psi
Reference: atmospheric pressure	0	0	0
Maximum Vacuum Pressure	-0.300	-300	-4.35
Normal Lower Regulation	-0.180	-180	-2.60
Normal Upper Regulation	-0.150	-150	-2.20
Low vacuum pressure supervisory signal	-0.140	-140	-2.00
High vacuum pressure supervisory signal	-0.220	-220	-3.20
Vacuum pressure alarm signal	-0.130	-130	-1.90

Vacuum Fire Protection Systems – NFPA 13 Presentation

Vacuum Fire Protection Systems



- Water-based Sprinkler System for Fire Protection
- Same Risk Analysis
- Similar FPS Dimensioning
  - Most existing Equipment and Rules for FPS are re-used / applicable to VSS

- Vacuum Sprinkler Systems (VSS) use a different Supervisory Fluid: « Vacuum » = Depressurized Air
- Different Properties in Stand-by (Supervision) and Transition (Water Flooding in Network) phases
- Specific Advantages, either inherent or conditioned
  - Specific Equipment and Rules to enable Vacuum operations and optimize VSS benefits

Vacuum Fire Protection Systems – NFPA 13 Presentation

Advantages of having Negative Pressure in the sprinkler pipe

- Corrosion Inhibition
- Reduction of Ice plug Formation
- Quick and easy start-up
- Real time monitoring

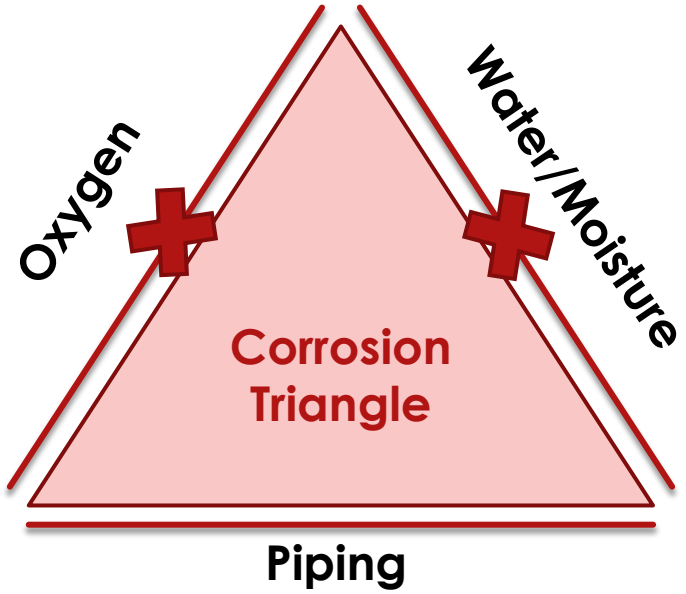
Corrosion Inhibition

- FM photography of corrosion





- Corrosion is a **major industry concern**
- **Efficiency** of fire protection system **heavily impacted**
- **System failure** in a **fire** and/or **ongoing costly repairs** (leaks).



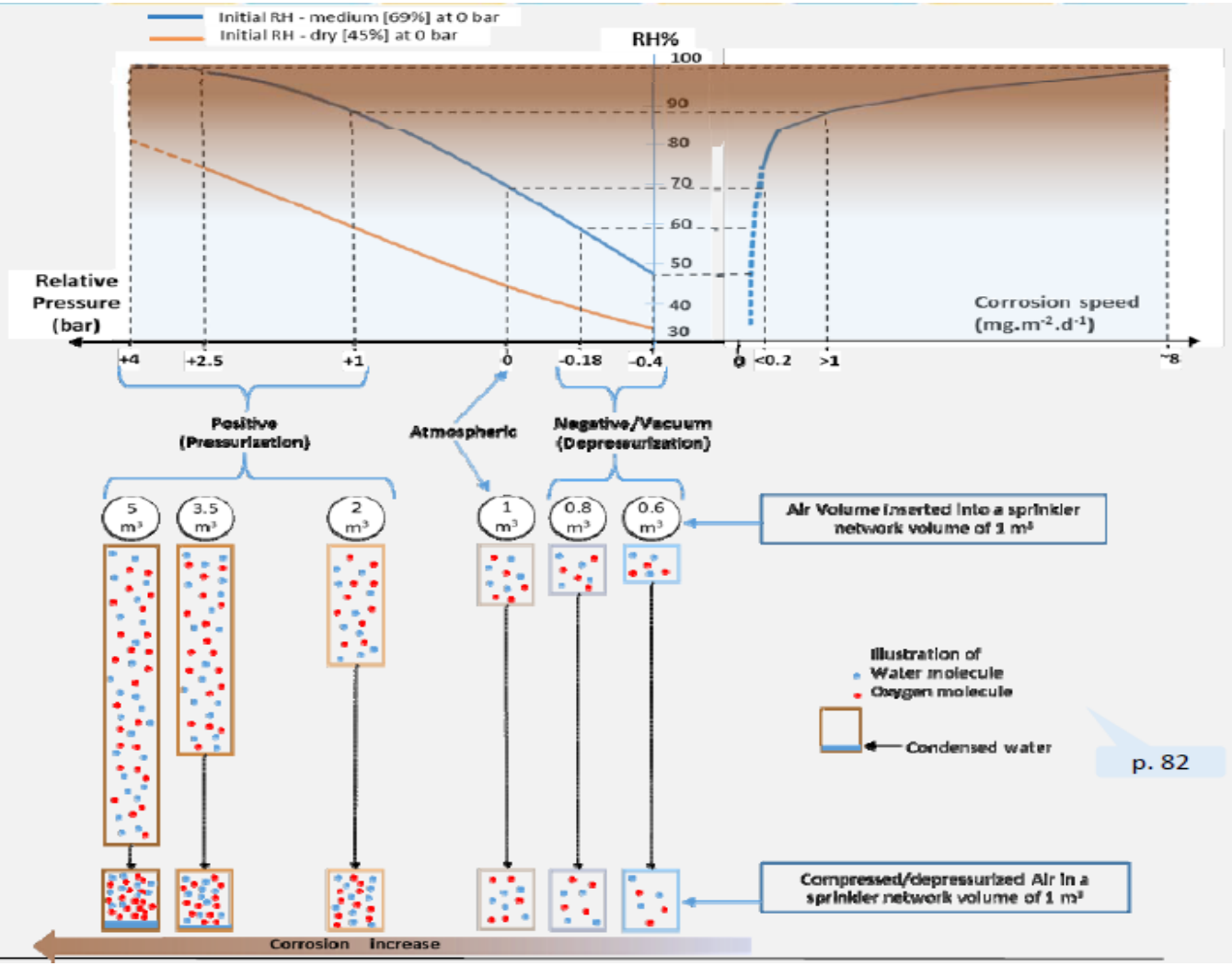
Vacuum Fire Protection Systems – removal of water/moisture & oxygen

Vacuum Fire Protection Systems – NFPA 13 Presentation

Corrosion Inhibition

❑ Relation between Pressure and Corrosion Speed

Techno	Dry	Vacuum
Pressure variation wrt. Atm	⇗	⇘
Supervisory gas pressure (bar)	+2.5	-0.18
Effect over RH	⇗	⇘
Effect over water phase balance	➔ Liquid	➔ Gas
Effect over internal pipe surface	Wetting	Drying
Effect over corrosion speed	⇗	⇘



Ice plug prevention

- Condensation leads to ice plugs in freezers
- Moisture develops as warm air cools
- Moisture is constantly injected in the piping network





Other Features

- **Quick and easy start-up**
  - Depending on the pump chosen the normal standby vacuum pressure is very quickly achieved; only 4 minutes for a 1000 USG system.
  - Respects the NFPA requirements of 30 minute fill time
- **Real time monitoring**
  - Once the normal standby vacuum pressure is achieved the sprinkler system is benefiting from all the advantages and as long as the negative pressure is maintained.
  - An supervisory pressure signal is transmitted to the release control panel when variation of the vacuum pressure is above the set point.
- **Reduction of sprinkler clogging.**
  - With negative pressure you are not compacting possible debris into a pendant sprinkler.

Vacuum Fire Protection Systems – NFPA 13 Presentation

System Configurations

- ***Dry-Pipe Vacuum***
- ***Vacuum Non-interlock Preaction***
- ***Vacuum Single-Interlock Preaction***
- ***Vacuum Double-Interlock Preaction***

Vacuum Fire Protection Systems – NFPA 13 Presentation

Application Examples

- Corrosion mitigation (high humidity environment)
- Avoid ice plugs
- Eliminate water column (ie – especially large systems are







Can be used anywhere a standard Dry or Preaction System would be installed!!

Vacuum Fire Protection Systems – NFPA 13 Presentation

Vacuum Fire Protection System History

- First Vacuum System installed in 1999 (UPM in France)
- Many systems were installed in Europe between 1999-2015
- Fireflex involved in developing a new integrated vacuum system in 2016-2017
- **FM Approvals Approved the System in 2017**
- **FM Global Property Loss Prevention Data Sheet 2-0 added the notion of vacuum in 2018**
  - Section 2.2.6 Vacuum Sprinkler Systems
  - Other references of Vacuum systems throughout the document
- Application for NFPA 13 newest addition ??

Thank you !

Any Questions?

Visit our website at **fireflex.com**

And follow us on

Public Comment No. 36-NFPA 13-2023 [Section No. 3.3.8]

3.3.8 Area of Discharge.

The floor area covered by a sprinkler that takes into account any walls or obstructions whose summation determines the remote area. *(See Figure A.28.3.4.2.1.)* (AUT-~~SSI~~ SSD)

Statement of Problem and Substantiation for Public Comment

This term should be assigned to SSD.

Related Item

• FR-1157

Submitter Information Verification

Submitter Full Name: Kevin Hall
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Street Address:
City:
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Submittal Date: Thu Mar 09 17:28:56 EST 2023
Committee: AUT-SSD

Public Comment No. 135-NFPA 13-2023 [Section No. 3.3.22]

3.3.22* Blocking.

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~~ that will stay in place before and during sprinkler operation to limit the channeling of heat ~~within the~~ between structural members. (AUT-SSD)

Statement of Problem and Substantiation for Public Comment

During the First Draft, the committee preferred the term “blocking” to “fire-stopping” and inserted this new definition. As such, the terminology needs to be consistent. This proposed text also clarifies what is intended with the use of the term “blocking”.

This material was developed by the Sloped Ceiling Task Group, which was formed by the Technical Committee on Sprinkler Systems Discharge Criteria to incorporate the results of the FPRF Project on Sprinklers Under Sloped Ceilings into NFPA 13. The Task Group consisted of Ken Isman (Chair), Wes Baker, Chase Browning, Mike Joanis, Larry Frank, Joe Noble, Abram Selim Fouad, Kevin Hall, Carry Webber, and Karl Wiegand.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 136-NFPA 13-2023 [Section No. A.3.3.22]	

Related Item

• FR 1331

Submitter Information Verification

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Submittal Date: Fri May 26 10:49:33 EDT 2023
Committee: AUT-SSD

Public Comment No. 17-NFPA 13-2023 [Section No. 3.3.146]

~~**3.3.146** – Occupancies.~~

~~**3.3.146.1** – Extra Hazard (Group 1) (EH1).~~

~~Occupancies or portions of other occupancies where the quantity and combustibility of contents are very high or dust, lint, or other materials are present, introducing the probability of rapidly developing fires with high rates of heat release but with little or no combustible or flammable liquids. (AUT-SSD)~~

~~**3.3.146.2** – Extra Hazard (Group 2) (EH2).~~

~~Occupancies or portions of other occupancies with moderate to substantial amounts of flammable or combustible liquids or occupancies where shielding of combustibles is extensive. (AUT-SSD)~~

~~**3.3.146.3** – Light Hazard.~~

~~Occupancies or portions of other occupancies where the quantity and/or combustibility of contents is low and fires with relatively low rates of heat release are expected. (AUT-SSD)~~

~~**3.3.146.4** – Ordinary Hazard (Group 1) (OH1).~~

~~Occupancies or portions of other occupancies where combustibility is low, quantity of combustibles is moderate, stockpiles of contents do not exceed 8 ft (2.4 m), and fires with moderate rates of heat release are expected. (AUT-SSD)~~

~~**3.3.146.5** – Ordinary Hazard (Group 2) (OH2).~~

~~Occupancies or portions of other occupancies where the quantity and combustibility of contents are moderate to high, stockpiles of contents with moderate rates of heat release do not exceed 12 ft (3.7 m), and stockpiles of contents with high rates of heat release do not exceed 8 ft (2.4 m). (AUT-SSD)~~

Statement of Problem and Substantiation for Public Comment

Regardless of whether or not the definitions have been long standing, the current definitions conflict with the requirements in Chapter 4 -- specifically with reference to heat release rate. In their current form, these are not definitions -- they are requirements, and the only appropriate location is in Chapter 4.

Related Item

• PI-140

Submitter Information Verification

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Submittal Date: Wed Mar 08 16:23:34 EST 2023
Committee: AUT-SSD

Public Comment No. 162-NFPA 13-2023 [New Section after 4.2]

4.3* Approved Storage Floor Plan

The owner(s) of a building or structure where a fire sprinkler system protecting storage or their authorized agent shall provide an approved storage floor plan 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

4.3.1

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

Statement of Problem and Substantiation for Public Comment

First Revision No. 1246 added a requirement to Chapter 28 to provide an approved storage plan for all storage occupancies. While this requirement is a positive addition to the standard, it belongs in Chapter 4 (General Requirements) and not in Chapter 28 (Acceptance). This requirement is an owner's responsibility and as such this comment seeks to relocate this requirement to Chapter 4. A related PC has been submitted to relocate the annex language of this section.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 163-NFPA 13-2023 [New Section after A.4.2(4)]	
Public Comment No. 168-NFPA 13-2023 [Section No. 28.2]	

Related Item

- FR-1246

Submitter Information Verification

Submitter Full Name: Roland Asp
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Street Address:
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Submittal Date: Mon May 29 17:34:01 EDT 2023
Committee: AUT-SSD

Public Comment No. 18-NFPA 13-2023 [Section No. 4.2]

4.2* ~~Owner's Certificate~~ Basis of Design .

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) * Determination and confirmation of the water supply including any necessary adjustments

(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

Statement of Problem and Substantiation for Public Comment

Users of the document get caught up on the word "Owner" in the Owner's Certificate. It would be more appropriate to call the document what it is -- a basis of design. This would align with the roles and responsibilities detailed in SFPE's PS 2020-1.

Related Item

• PI-212 • PI-252 • PI-356 • PI-391

Submitter Information Verification

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Submittal Date: Wed Mar 08 16:27:30 EST 2023
Committee: AUT-SSD

Public Comment No. 19-NFPA 13-2023 [Section No. 4.2]

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) Approved storage floor plan

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

(4) * Determination and confirmation of the water supply including any necessary adjustments

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

(6) Whether seismic protection is required and the applicable short period response parameter

(7) Any special knowledge of the general environment in which the system will be installed that might be responsible for corrosion, including airborne chemicals that could contact system components or chemical solutions that might be exposed to the sprinkler system components

Statement of Problem and Substantiation for Public Comment

The approved storage floor plan is a requirement of the fire code and the owner. This needs to be provided at the start of the project with the Owner's certificate. The current location of the approved storage floor plan in the first draft report in plans and calculations is not appropriate.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 20-NFPA 13-2023 [Section No. 28.2]	

Related Item

• FR-1246

Submitter Information Verification

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Submittal Date: Wed Mar 08 16:32:12 EST 2023
Committee: AUT-SSD

Public Comment No. 191-NFPA 13-2023 [Section No. 4.2]

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)~~*~~ Determination and confirmation of the adequacy of the water supply ~~including any necessary adjustments~~ as identified in 5.2.2

(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

Statement of Problem and Substantiation for Public Comment

There are far too many challenges tied to both the change in Facility Managers coupled with the possible change in Vendors to put this responsibility solely on the owner. This complicates the code beyond the majority of inspector's and owner's comprehension based on hundreds of locations with various facilities managers and vendors. I believe that 5.2.2 covers the necessary requirements.

Related Item

• FR-1170

Submitter Information Verification

Submitter Full Name: Joshua Brackett
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Submittal Date: Tue May 30 22:40:00 EDT 2023
Committee: AUT-SSD

Public Comment No. 49-NFPA 13-2023 [Section No. 4.2]

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) * Determination and confirmation of the water supply including any necessary adjustments

(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~~ design spectral response acceleration at short periods, S_{DS}

(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

Statement of Problem and Substantiation for Public Comment

Modifies the requirement in the owner's certificate to align with the new requirements in Chapter 18 for seismic design.

Related Item

• CN-14

Submitter Information Verification

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Street Address:
City:
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Zip:
Submittal Date: Thu Mar 09 18:08:58 EST 2023
Committee: AUT-SSD

Public Comment No. 99-NFPA 13-2023 [Section No. 4.2]

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)

(4)* ~~Determination and confirmation of the water supply including any necessary adjustments~~

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

(6) ~~Whether seismic protection is required and the applicable short period response parameter~~

(7)

(8) ~~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~~

Statement of Problem and Substantiation for Public Comment

During the development of the 2002 Edition of NFPA 13, NFSA submitted Proposal 13-20 to add a new section regarding the Owners Certificate. the proposal included three items: intended use of the building; preliminary plan of the building; special knowledge regarding MIC. NFSA substantiated the proposal by saying that "Proper application of NFPA 13 requires certain information from the building owner." During the ROP phase, the Committee only accepted the first two items, stating that it "should not be the owners responsibility to determine if MIC is a concern in the area." Obviously the Committee revised their position during the ROC phase.

The expectation that the owner can identify the need for seismic bracing, the design criteria for such bracing, and the need to adjust the water supply test information goes well beyond the original intent of the Owners Certificate and is beyond the capability of most building owners. These items are the responsibility of the individual or entity who designs the system (see A.28.1). While the current language does say "or their authorized agent" there is no requirement in NFPA 13 that systems be designed by a registered design professional retained by the owner.

What happens if the owner does not identify the need to adjust the water supply test data or for seismic bracing and the owner does not retain a registered design professional? Does the fact that the owner does not disclose that information on the Owners Certificate provide a basis that the contractor, who does the layout of the system without construction documents prepared by a registered design professional, does not have to investigate the need to adjust the water supply test data or determine the need for seismic bracing or the design criteria for such bracing? During the Committee meeting, some contractors indicated that they do not have the expertise to determine if the water supply test

data needs to be adjusted. If the technician doing the layout of the system for the contractor does not have the expertise to apply these requirements of the standard, how can we reasonably expect a building owner to give the contractor the information needed to properly layout the system?

The concept of an Owners Certificate is a valid concept but it needs to be returned to the original reason for an Owners Certificate as presented by NFSA in their original proposal. Other design considerations, such as water supply test data adjustments and seismic design criteria, need to remain with the designer of the system regardless of whether that individual is a registered design professional or a technician employed by the contractor.

In a related Comment, I have proposed the language be moved to A.28.1.

Related Item

• FR 1170

Submitter Information Verification

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Submittal Date: Fri May 12 14:38:15 EDT 2023
Committee: AUT-SSD

Public Comment No. 131-NFPA 13-2023 [Section No. 4.3]

~~**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~~

Statement of Problem and Substantiation for Public Comment

Adding specific requirements to meet the definition of Qualified Personnel is not needed. NFPA 13 and other installation standards have traditionally left it to the jurisdiction or AHJ to determine specific actions for conformance with the term "qualified". I believe the users of the standard are best served by leaving this issue to be applied as broadly as possible. I have personally seen no positive impact from the addition of these requirements in other standards. The impact has been neutral at best and negative where these the requirements are used to limit access for individuals to work in the field. In the end, the contractor or business owner is ultimately responsible for the quality of the design and installation of the system.

Related Item

• FR 1135

Submitter Information Verification

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Submittal Date: Wed May 24 16:55:34 EDT 2023
Committee: AUT-SSD

Public Comment No. 156-NFPA 13-2023 [Section No. 4.3]

~~**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~~

Statement of Problem and Substantiation for Public Comment

This comment seeks to delete this language which was submitted as FR-1173. As stated in the substantiation of related PC-154, The existing language "knowledgeable and experienced" is appropriate and as stated in the last revision cycle, state and local jurisdictions are charged with the responsibility to determine qualifications and the proposed language in 4.3 is not appropriate to be included in NFPA 13.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 155-NFPA 13-2023 [Section No. 3.3.180]	related
Public Comment No. 154-NFPA 13-2023 [Section No. 1.2.2]	related

Related Item

• FR-1173

Submitter Information Verification

Submitter Full Name: Roland Asp
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Submittal Date: Mon May 29 13:44:40 EDT 2023
Committee: AUT-SSD

Public Comment No. 97-NFPA 13-2023 [Section No. 4.3]

~~**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~~

Statement of Problem and Substantiation for Public Comment

The definition of "qualified personnel" is now provided in Chapter 3. There is now two areas in the code that defines qualified personnel and they are not consistent. Just because a person might comply with items 2 or 3, that does not necessarily make them "qualified" for a specific task.

Related Item

• FR-113, FR-1008

Submitter Information Verification

Submitter Full Name: Peter Larrimer
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Submittal Date: Fri May 12 10:44:56 EDT 2023
Committee: AUT-SSD

Public Comment No. 208-NFPA 13-2023 [New Section after 4.4.1.7.1]

4.4.1.7.2

The protection criteria for low-piled storage shall be selected from Table 4.4.1.7.2.

Table 4.4.1.7.2 Discharge Criteria for Low-Piled Storage

Commodity	Type of Storage
Class I	Solid-piled, palletized, bin box, shelf, single-, double-, or multiple-row rack, and back-to-back shelf storage
Class II	
Class II	
Class III	
Class IV	
Class IV	Palletized, bin box, shelf, and solid-piled
	Single-, double-, or multiple-row rack, and back-to-back shelf storage
	Single-, double-, or multiple-row rack
Group A Plastic (All)	Solid-piled, palletized, bin box, shelf, single-, double-, or multiple-row rack, and back-to-back shelf storage

Notes:

1. In-rack sprinklers not required for open-frame racks. Install in-rack sprinklers in accordance with Section 25

2. Install one level of in-rack sprinklers in open-frame racks in accordance with Section 25.2.2. Install in-rack s

Additional Proposed Changes

File Name	Description	Approved
Proposed_Table_4.4.1.7.2.pdf	Proposed Table 4.4.1.7.2	

Statement of Problem and Substantiation for Public Comment

Current table 4.4.1.7.1 tries to do too much attempting to capture all combinations of miscellaneous/low-piled storage, storage heights, building heights, commodities, open-frame/solid shelf, etc. Splitting miscellaneous and low-piled storage into separate tables improves use and understanding and minimizes chances for errors.

Related Public Comments for This Document

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

Related Item

• PI 220, FR 1338 • PC 207

Submitter Information Verification

Submitter Full Name: Cary Webber
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Zip:
Submittal Date: Wed May 31 09:56:47 EDT 2023
Committee: AUT-SSD

4.4.1.7.2

The protection criteria for low-piled storage protected by ceiling sprinklers only shall be selected from table 4.4.1.7.2, except as noted.

Table 4.4.1.7.2 Discharge Criteria for Low-Piled Storage

Commodity	Type of Storage	Storage Height		Maximum Ceiling Height		Design Curve Figure 19.2.3.1.1	In-Rack Sprinklers	Inside Hose		Total Combined Inside and Outside Hose		Duration (Minutes)
		ft	m	ft	m			gpm	L/min	gpm	L/min	
Class I to Class IV												
Class I	Solid-piled, palletized, bin box, shelf, single-, double-, or multiple-row rack, and back-to-back shelf storage	≤12	≤3.7	---	---	OH2	See note 1	0, 50, 100	0, 190, 380	250	950	90
Class II		≤10	≤3.0	---	---	OH2	See note 1	0, 50, 100	0, 190, 380	250	950	90
Class II		>10 to ≤12	>3.0 to ≤3.7	---	---	OH2	See note 1	0, 50, 100	0, 190, 380	250	950	90
Class III		≤12	≤3.7	---	---	OH2	See note 1	0, 50, 100	0, 190, 380	250	950	90
Class IV		≤10	≤3.0	---	---	OH2	See note 1	0, 50, 100	0, 190, 380	250	950	90
Class IV	Palletized, bin box, shelf, and solid-piled	>10 to ≤12	>3.0 to ≤3.7	32	10	OH2	See note 1	0, 50, 100	0, 190, 380	250	950	90
	Single-, double-, or multiple-row rack, and back-to-back shelf storage	>10 to ≤12	>3.0 to ≤3.7	32	10	EH1	See note 1	0, 50, 100	0, 190, 380	500	1900	120
	Single-, double-, or multiple-row rack	>10 to ≤12	>3.0 to ≤3.7	32	10	See 25.2.2	See note 2	0, 50, 100	0, 190, 380	250	950	90
Group A Plastic Storage												
Group A Plastic (All)	Solid-piled, palletized, bin box, shelf, single-, double-, or multiple-row rack, and back-to-back shelf storage	≤5	≤1.5	---	---	OH2	See note 1	0, 50, 100	0, 190, 380	250	950	90

Notes:

1. In-rack sprinklers not required for open-frame racks. Install in-rack sprinklers in accordance with Section 25.3 in solid shelf racks.
2. Install one level of in-rack sprinklers in open-frame racks in accordance with Section 25.2.2. Install in-rack sprinklers in accordance with Section 25.3 in solid shelf racks.

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

4.4.1.7.1

The protection criteria for ~~miscellaneous and low-piled storage~~ miscellaneous storage protected by ceiling sprinklers only shall be selected from Table 4.4.1.7.1.

Table 4.4.1.7.1 Discharge Criteria for Miscellaneous ~~and Low-Piled~~ Storage

Commodity		Type of Storage	Storage Height ft	Storage Height m	Maximum Ceiling Height ft	Maximum Ceiling Height m	Design from 19.2.3.1.1	In-Rack Sprinklers Required	Inside Hose gpm	Inside Hose L/m
Class I to Class IV										
Class I		Solid-piled, palletized, bin box, shelf, single-, double-, or multiple-row rack, and back-to-back shelf storage	≤12	≤3.7	—	—	OH1	No	0, 50, 100	0, 19 38
Class II			≤10	≤3.0	—	—	OH1	No	0, 50, 100	0, 19 38
Class II			>10 to ≤12	>3.0 to ≤3.7	—	—	OH2	No	0, 50, 100	0, 19 38
Class III			≤12	≤3.7	—	—	OH2	No	0, 50, 100	0, 19 38
Class IV			≤10	≤3.0	—	—	OH2	No	0, 50, 100	0, 19 38
Class IV		Palletized, bin box, shelf, and solid-piled	>10 to ≤12	>3.0 to ≤3.7	32	9.8	OH2	No	0, 50, 100	0, 19 38
Class IV		Single-, double-, or multiple-row rack, and back-to-back shelf storage	>10 to ≤12	>3.0 to ≤3.7	32	9.8	EH1	No	0, 50, 100	0, 19 38
Class IV		Single-, double-, or multiple-row rack	>10 to ≤12	>3.0 to ≤3.7	32	9.8	See ~~Chapter 25~~ 25 .2.1	~~+1 level of in-rack~~ See note 1	0, 50, 100	0, 19 38
Group A Plastic Storage										
Cartoned	Nonexpanded and expanded	Solid-piled, palletized, bin box, shelf, single-, double-, or multiple-row rack, and back-to-back shelf	≤5	≤1.5	—	—	OH2	No	0, 50, 100	0, 19 38
			>5 to ≤10	>1.5 to ≤3.0	15	4.6	EH1~~No~~	See Note 2	0, 50, 100	0, 19 38
			>5 to ≤10	>1.5 to ≤3.0	20	6.1	EH2~~No~~	See Note 2	0, 50, 100	0, 19 38

Commodity		Type of Storage	Storage Height ft	Storage Height m	Maximum Ceiling Height ft	Maximum Ceiling Height m	Design from 19.2.3.1.1	In-Rack Sprinklers Required	Inside Hose gpm	Inside Hose L/m
		storage	>10 to ≤12	>3.0 to ≤3.7	17	5.2	EH2~~No~~	See Note 2	0, 50, 100	0, 19 38
		Solid-piled, palletized, bin box, shelf, and back-to-back shelf storage	>10 to ≤12	>3.0 to ≤3.7	32	9.8	EH2~~No~~	See Note 2	0, 50, 100	0, 19 38
		Single-, double-, or multiple-row rack	>10 to ≤12	>3.0 to ≤3.7	32	9.8	See ~~Chapter 25~~ 25 .	~~+ 1 level of in-rack~~	2.1	Se note
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~~No~~	See Note 2	0, 50, 100	0, 19 38
		Solid-piled, palletized, bin box, shelf, and back-to-back shelf storage	>5 to ≤8	>1.5 to ≤2.4	28	8.5	EH2~~No~~	See Note 2	0, 50, 100	0, 19 38
		Solid-piled, palletized, bin box, shelf, single-, double-, or multiple-row rack, and back-to-back shelf	>5 to ≤10	>1.5 to ≤3.0	15	4.6	EH2~~No~~	See Note 2	0, 50, 100	0, 19 38

Commodity		Type of Storage	Storage Height ft	Storage Height m	Maximum Ceiling Height ft	Maximum Ceiling Height m	Design from 19.2.3.1.1	In-Rack Sprinklers Required	Inside Hose gpm	Inside Hose L/m
		storage								
	Nonexpanded	Solid-piled, palletized, bin box, shelf, single-, double-, or multiple-row rack, and back-to-back shelf storage	>5 to ≤10	>1.5 to ≤3.0	20	6.1	EH2~~No~~	See Note 2	0, 50, 100	0, 19 38
	Expanded	Single-, double-, or multiple-row rack	>5 to ≤10	>1.5 to ≤3.0	20	6.1	See ~~Chapter 25~~ 25 .	~~+1 level of in-rack~~	2.1	Se note
	Nonexpanded and expanded	Solid-piled, palletized, bin box, shelf, and back-to-back shelf storage	>10 to ≤12	>3.0 to ≤3.7	17	5.2	EH2~~No~~	See Note 2	0, 50, 100	0, 19 38
		Single-, double-, or multiple-row rack	>10 to ≤12	>3.0 to ≤3.7	17	5.2	EH2~~No~~	See Note 2	0, 50, 100	0, 19 38
			>10 to ≤12	>3.0 to ≤3.7	32	9.8	See ~~Chapter 25~~ 25 .	~~+1 level of in-rack~~	2.1	Se note
Tire Storage										
Tires		On floor or on side	>5 to ≤12	>1.5 to ≤3.7	32	9.8	EH1~~No~~	NA	0, 50, 100	0, 19 38
		On floor, on tread, or on side	≤5	≤1.5	—	—	OH2~~No~~	NA	0, 50, 100	0, 19 38
		Single-, double-, or multiple-row racks, on tread or on side	≤5	≤1.5	—	—	OH2	No	0, 50, 100	0, 19 38

Commodity	Type of Storage	Storage Height ft	Storage Height m	Maximum Ceiling Height ft	Maximum Ceiling Height m	Design from 19.2.3.1.1	In-Rack Sprinklers Required	Inside Hose gpm	Inside Hose L/m
	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, 19 38
	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, 19 38
		>5 to ≤12	>1.5 to ≤3.7	32	9.8	See ~~Chapter 25~~ 25 .	~~+1 level of in-rack~~	2.1	Se note
Rolled Paper Storage									
Heavyweight and mediumweight	On end	≤10	≤3.0	30	9.1	OH2~~No~~	NA	0, 50, 100	0, 19 38
Tissue and lightweight	On end	≤10	≤3.0	30	9.1	EH1~~No~~	NA	0, 50, 100	0, 19 38

Notes:

1. Install one level of in-rack sprinklers in open-frame and solid shelf racks in accordance with Section 25.2.1.

2. In-rack sprinklers not required for open-frame racks. Install in-rack sprinklers in accordance with Section 25.3 in solid shelf racks.

3. Install one level of in-rack sprinklers in open-frame racks in accordance with Section 25.2.1. Install in-rack sprinklers in accordance with Section 25.3 in solid shelf racks.

Additional Proposed Changes

File Name	Description	Approved
Table_4.4.1.7.1.pdf	Table 4.4.1.7.1	

Statement of Problem and Substantiation for Public Comment

Current table 4.4.1.7.1 tries to do too much attempting to capture all combinations of miscellaneous/low-piled storage, storage heights, building heights, commodities, open-frame/solid shelf, etc. Splitting miscellaneous and low-piled storage into separate tables improves use and understanding and minimizes chances for errors.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 208-NFPA 13-2023 [New Section after 4.4.1.7.1]	

Related Item

• PI 220, FR 1338

Submitter Information Verification

Submitter Full Name: Cary Webber

Organization:	Reliable Automatic Sprinkler Company Inc
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City:	
State:	
Zip:	
Submittal Date:	Wed May 31 09:39:14 EDT 2023
Committee:	AUT-SSD

4.4.1.7.1

The protection criteria for miscellaneous storage protected by ceiling sprinklers only shall be selected from table 4.4.1.7.1, except as noted.

Table 4.4.1.7.1 Discharge Criteria for **Miscellaneous Storage**

Commodity		Type of Storage	Storage Height		Maximum Ceiling Height		Design Curve Figure 19.2.3.1.1	In-Rack Sprinklers	Inside Hose		Total Combined Inside and Outside Hose		Duration (minutes)
			ft	m	ft	m			gpm	L/min	gpm	L/min	
Class I to Class IV													
Class I		Solid-piled, palletized, bin box, shelf, single-, double-, or multiple-row rack, and back-to-back shelf storage	≤12	≤3.7	---	---	OH1	No	0, 50, 100	0, 190, 380	250	950	90
Class II			≤10	≤3.0	---	---	OH1	No	0, 50, 100	0, 190, 380	250	950	90
Class II			>10 to ≤12	>3.0 to ≤3.7	---	---	OH2	No	0, 50, 100	0, 190, 380	250	950	90
Class III			≤12	≤3.7	---	---	OH2	No	0, 50, 100	0, 190, 380	250	950	90
Class IV			≤10	≤3.0	---	---	OH2	No	0, 50, 100	0, 190, 380	250	950	90
Class IV		Palletized, bin box, shelf, and solid-piled	>10 to ≤12	>3.0 to ≤3.7	32	10	OH2	No	0, 50, 100	0, 190, 380	250	950	90
		Single-, double-, or multiple-row rack, and back-to-back shelf storage	>10 to ≤12	>3.0 to ≤3.7	32	10	EH1	No	0, 50, 100	0, 190, 380	500	1900	120
		Single-, double-, or multiple-row rack	>10 to ≤12	>3.0 to ≤3.7	32	10	See 25.2.1	See note 1	0, 50, 100	0, 190, 380	250	950	90
Group A Plastic Storage													
Cartoned	Nonexpanded and expanded	Solid-piled, palletized, bin box, shelf, single-, double-, or multiple-row rack, and back-to-back shelf storage	≤5	≤1.5	---	---	OH2	No	0, 50, 100	0, 190, 380	250	950	90
			>5 to ≤10	>1.5 to ≤3.0	15	4.6	EH1	See note 2	0, 50, 100	0, 190, 380	500	1900	120
			>5 to ≤10	>1.5 to ≤3.0	20	6.1	EH2	See note 2	0, 50, 100	0, 190, 380	500	1900	120
			>10 to ≤12	>3.0 to ≤3.7	17	5.2	EH2	See note 2	0, 50, 100	0, 190, 380	500	1900	120
		Solid-piled, palletized, bin box, shelf, and back-to-back shelf storage	>10 to ≤12	>3.0 to ≤3.7	32	10	EH2	See note 2	0, 50, 100	0, 190, 380	500	1900	120
		Single-, double-, or multiple-row rack	>10 to ≤12	>3.0 to ≤3.7	32	10	See 25.2.1	See note 3	0, 50, 100	0, 190, 380	250	950	90
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	See note 2	0, 50, 100	0, 190, 380	250	950	90
		Solid-piled, palletized, bin box, shelf, and back-to-back shelf storage	>5 to ≤8	>1.5 to ≤2.4	28	8.5	EH2	See note 2	0, 50, 100	0, 190, 380	500	1900	120
		Single-, double-, or multiple-row rack	>5 to ≤10	>1.5 to ≤3.0	15	4.6	EH2	See note 2	0, 50, 100	0, 190, 380	500	1900	120
	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	See note 2	0, 50, 100	0, 190, 380	500	1900	120
	Expanded	Single-, double-, or multiple-row rack	>5 to ≤10	>1.5 to ≤3.0	20	6.1	See 25.2.1	See note 3	0, 50, 100	0, 190, 380	250	950	90
	Nonexpanded and expanded	Solid-piled, palletized, bin box, shelf, and back-to-back shelf storage	>10 to ≤12	>3.0 to ≤3.7	17	5.2	EH2	See note 2	0, 50, 100	0, 190, 380	500	1900	120
		Single-, double-, or multiple-row rack	>10 to ≤12	>3.0 to ≤3.7	17	5.2	EH2	See note 2	0, 50, 100	0, 190, 380	500	1900	120
			>10 to ≤12	>3.0 to ≤3.7	32	10	See 25.2.1	See note 3	0, 50, 100	0, 190, 380	250	950	90

Notes:

1. Install one level of in-rack sprinklers in open-frame and solid shelf racks in accordance with Section 25.2.1.
2. In-rack sprinklers not required for open-frame racks. Install in-rack sprinklers in accordance with Section 25.3 in solid shelf racks.
3. Install one level of in-rack sprinklers in open-frame racks in accordance with Section 25.2.1. Install in-rack sprinklers in accordance with Section 25.3 in solid shelf racks.

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

4.4.1.7.3

For miscellaneous storage ~~having~~ of Class I through IV commodities up to 12 ft (3.7 m) and Group A plastics up to 5 ft (1.5 m) having solid shelf racks, ~~protection of racks in accordance with~~ the requirements of Section 25. ~~4 shall only be required where in-rack sprinklers are required by Table~~ 3 shall not apply. In-rack sprinkler protection to comply with 4.4.1.7. ~~1~~ 2 .-

Statement of Problem and Substantiation for Public Comment

More clearly aligns with previous edition, also corrects incorrect reference to Section 25.4.

Related Item

• PI 220, FR 1338

Submitter Information Verification

Submitter Full Name: Cary Webber
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Submittal Date: Tue May 30 12:21:51 EDT 2023
Committee: AUT-SSD

Public Comment No. 177-NFPA 13-2023 [Section No. 4.4.1.7.5]

4.4.1.7.5

For low-piled storage having solid shelves, in-rack sprinkler protection in accordance with Section 25.4 ~~shall~~ 3 shall be required, with corresponding ceiling protection in accordance with 25.2.2.4. ~~1.~~

Statement of Problem and Substantiation for Public Comment

Corrects incorrect reference to Section 25.4.

Related Item

• PI 220, FR 1338

Submitter Information Verification

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Submittal Date: Tue May 30 12:26:34 EDT 2023
Committee: AUT-SSD

Public Comment No. 101-NFPA 13-2023 [Section No. 4.5.1]

4.5.1

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

(1) Light hazard — 52,000 ft^2 (4830 m^2)

(2) Light hazard protected with a wet pipe system and the system water flow and supervisory alarms are transmitted to a supervising station in accordance with NFPA 72 - 78,000 ft^2 (7250 m^2)

(3) Ordinary hazard — 52,000 ft^2 (4830 m^2)

(4) * Extra hazard — Hydraulically calculated — 40,000 ft^2 (3720 m^2)

(5) High-piled Storage — High-piled storage (as defined in 3.3.104) and storage covered by other NFPA standards — 40,000 ft^2 (3720 m^2)

(6) In-rack Storage — 40,000 ft^2 (3720 m^2)

A.4.4.1 (2) Should the system be impaired, it should be noted that the increased area will result in impairment procedures in accordance with NFPA 25 being applied to the larger area which could have operational and economic impact on the building.

Statement of Problem and Substantiation for Public Comment

The Committee Input proposed an option that provides more flexibility with respect to the system protection area limitations. However, CI 1281 provides for no additional protection to increase the system protection area limits and it applies to all types of sprinkler systems. While allowing a reduced number of systems, CI 1281 provides no limit to the size of any one system. Using the example provided in CI 1281, is it assumed that the four systems are almost the same size or are three systems at 52,000 square feet and the fourth system is the only one with an increase.

The proposed language uses the same concept of rounding off but it still contains a maximum system protection area. The 78,000 square feet represents a 50% increase that can be applied to all the systems in the building. However, to utilize the increase the system waterflow alarm and supervisory alarms must be transmitted to an alarm supervising station. The transmission of the alarm and supervisory signals to a supervising station is required for most sprinkler systems by US building codes, NFPA 1, NFPA 101, and NFPA 5000.

Over the years, proposed increases in the system protection area limitations has been restricted to light hazard occupancies. Given the fact that sprinkler system reliability does vary by occupancy classification and system type, the proposed language restricts the increase to wet pipe systems protecting a light hazard occupancy. However, for systems that meet the criteria, the approach proposed in this Public Comment is less restrictive than the Committee Input. Using the same scenario as used in CI 1281, the language proposed in this Public Comment would allow the building to be protected with three systems.

Related Item

• CI 1281

Submitter Information Verification

Submitter Full Name: William Koffel
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Submittal Date: Fri May 12 15:45:36 EDT 2023
Committee: AUT-SSD

Public Comment No. 91-NFPA 13-2023 [Section No. 4.5.1]

4.5.1–

~~The maximum floor area~~

Minimum Number of Systems.

4.5.1.1*

The minimum number of systems shall be determined by dividing the total floor area by the nominal floor area determined by 4.4.1.2 using normal rounding conventions.

A.4.5.1.1

As an example, a 230,000 ft 2 light hazard occupancy would require a minimum of 4 systems which could permit the system area to be increased to 57,500 ft 2 .

$$Number\ of\ systems = \frac{Total\ Floor\ Area}{Nominal\ Floor\ Area\ per\ System}$$

$$Number\ of\ systems = \frac{230{,}000\ ft^2}{52{,}000\ ft^2}$$

$$Number\ of\ systems = 4.42$$

$$(Rounds\ to\ 4\ systems)$$

4.5.1.2

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

(1) Light hazard — 52,000 ft^2 (4830 m^2)

(2) Ordinary hazard — 52,000 ft^2 (4830 m^2)

(3) * Extra hazard — Hydraulically calculated — 40,000 ft^2 (3720 m^2)

(4) High-piled Storage — High-piled storage (as defined in 3.3.104) and storage covered by other NFPA standards — 40,000 ft^2 (3720 m^2)

(5) In-rack Storage — 40,000 ft^2 (3720 m^2)

4.5.1.3

The maximum floor area on any one floor for any hazard to be protected by sprinklers supplied by any one sprinkler system riser or combined system riser shall not exceed 65,000 ft 2 .

Statement of Problem and Substantiation for Public Comment

This proposal seeks to update the existing system size limitations in NFPA 13. The origin of the system area limitations was insurance company requirements associated with pipe schedule design that limited the number of sprinklers controlled by a single valve to 400 sprinklers. Most of the system area limitations were established by multiplying the maximum protection area for upright/pendent sprinklers

by 400.
This proposal adds a section to provide a nominal floor area per system and a requirement to determine the minimum number of systems to avoid strict application of the previous system area limitations. The 65,000 ft2 maximum system size limitation gives the design professional the necessary flexibility to layout systems with regards to steel, walls, and ceiling layouts. This is a reasonable maximum size limitation and most actual system sizes will fall well below this limitation.
Examples:
Floor Size / Nom Sys Size = Actual Number of System and Approx Sizes
60,000 ft2 / 40,000 ft2 = 1.5 or 2 systems at approx. 30,000 ft2
59,000 ft2 / 40,000 ft2 = 1.475 or 1 system at 59,000 ft2
100,000 ft2 / 40,000 ft2 = 2.5 or 3 systems at approx. 33,333 ft2
95,000 ft2 / 40,000 ft2 = 2.375 or 2 systems at approx. 47,500 ft2
65,000 ft2 / 52,000 ft2 = 1.25 or 1 system at 65,000 ft2
70,000 ft2 / 52,000 ft2 = 1.346 or 2 systems at approx. 35,000 ft2 – (65,000 ft2 max size limitation)

Related Item

• CI 1281

Submitter Information Verification

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Submittal Date: Thu May 11 09:13:36 EDT 2023
Committee: AUT-SSD

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

5.1.4.3* Inhibitors

A.5.1.4.3 VCIs entering a sprinkler system as vapor and used in powder form are not part of the water supply. Requirements for air supply are applicable to VCIs.

Statement of Problem and Substantiation for Public Comment

VCIs are one (1) of five (5) different classifications. VCI is applied through attachment of equipment to the air supply to a dry pipe or preaction sprinkler system.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 181-NFPA 13-2023 [New Section after 3.3.241]	
Public Comment No. 182-NFPA 13-2023 [New Section after A.3.3.241.2]	
Public Comment No. 185-NFPA 13-2023 [New Section after 7.8.3]	

Related Item

• PI-340 • PI-341

Submitter Information Verification

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Submittal Date: Tue May 30 14:48:48 EDT 2023
Committee: AUT-SSD

Public Comment No. 147-NFPA 13-2023 [Section No. 19.2.3.2.4]

19.2.3.2.4 Sloped Ceilings.

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

~~A~~

(1) A horizontal false ceiling capable of withstanding an uplift force of 3 lb/ft^2 (14.6 kg/m^2) is installed below the sloped ceiling and supplemented with ceiling sprinklers.

~~The~~

(2) The design area for the ceiling sprinkler system is increased by 30 percent for unobstructed construction.

- ~~The design area for the ceiling sprinkler system is increased by 30 percent for obstructed construction where the slope exceeds 4 in 12.~~

(3) For obstructed construction where the ceiling slope does not exceed 4 in 12, the sprinkler system criteria specified in Chapter 19 shall apply when all of the following conditions are met:

(a) Purlins or beams supporting the roof deck run across the roof slope.

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

(c) Purlins or beams do not exceed 5 ft (1.5m) on center.

(d) Bays created by the solid structural members are not more than 40 ft (12m) on center.

(e) Purlin or beam channels are provided with blocking above each solid structural member.

(4) For obstructed construction where the ceiling slope does not exceed 4 in 12, install sprinklers in every channel.

(5) For obstructed construction that does not meet Item (3) or Item (4) the design area for the ceiling sprinkler system is increased by 30 percent.

Additional Proposed Changes

File Name	Description	Approved
19.2.3.2.4.docx	Clean version of the proposed section	

Statement of Problem and Substantiation for Public Comment

Based on the discussion at the First Draft Meeting and a re-evaluation of the information from the FPRF testing program, the Sloped Ceiling Task Group is recommending a different approach to incorporating the results of the testing into NFPA 13. This approach will be incorporated in the following steps:

1. Return the positioning of standard spray sprinklers and extended coverage sprinklers with respect to obstructed construction to the 2022 edition rules
2. Allow the user, when protecting non-storage occupancies with a sloped ceiling, to select one of two options:
a. Locate the sprinkler in accordance with the old rules and take the 30% increase in design area
b. Locate the sprinkler in accordance with new rules in order to avoid the 30% increase. The sprinkler location rules for selecting this option will be in Chapter 19.

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

This material was developed by the Sloped Ceiling Task Group, which was formed by the Technical Committee on Sprinkler Systems Discharge Criteria to incorporate the results of the FPRF Project on Sprinklers Under Sloped Ceilings into NFPA 13. The Task Group consisted of Ken Isman (Chair), Wes Baker, Chase Browning, Mike Joanis, Larry Frank, Joe Noble, Abram Selim Fouad, Kevin Hall, Carry Webber, and Karl Wiegand.

Related Item

• FR 1175

Submitter Information Verification

Submitter Full Name: Kenneth Isman
Organization: University of Maryland
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Submittal Date: Fri May 26 14:26:04 EDT 2023
Committee: AUT-SSD

19.2.3.2.4 Sloped Ceilings.

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

(1) A horizontal false ceiling capable of withstanding an uplift force of 3 lb/ft^2 (14.6 kg/m^2) 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) For obstructed construction where the ceiling slope does not exceed 4 in 12, the sprinkler system criteria specified in Chapter 19 shall apply when all of the following conditions are met:

(a) Purlins or beams supporting the roof deck run across the roof slope.

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

(c) Purlins or beams do not exceed 5 ft (1.5m) on center.

(d) Bays created by the solid structural members are not more than 40 ft (12m) on center.

(e) Purlin or beam channels are provided with blocking above each solid structural member.

(4) For obstructed construction where the ceiling slope does not exceed 4 in 12, install sprinklers in every channel.

(5) For obstructed construction that does not meet Item (3) or Item (4) the design area for the ceiling sprinkler system is increased by 30 percent.

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

Sections 19.2.3.2.6, 19.2.3.2.7

19.2.3.2.6 ~~High-Temperature Sprinklers.~~

~~Where high-temperature sprinklers are used for~~

Extra Hazard Occupancies.

19.2.3.2.6.1

For extra hazard occupancies, the system area of ~~sprinkler~~ operation shall be permitted to be reduced by 25 percent without revising the density, but not to less than 2000 ft^2 (185 m^2) ~~.~~

~~**19.2.3.2.7** –~~

~~Where~~ where one of the following conditions occur:

(1) High-temperature sprinklers are used

(2) K-11.2 (160) or larger sprinklers are used

~~with Extra Hazard Group 1 or Extra Hazard Group 2 design curves and~~

(1)

19.2.3.

~~1.1, the design area shall be permitted to be reduced by 25 percent but not below 2000 ft^2 (185 m^2), regardless of temperature rating~~

2.6.2

The 25 percent reduction permitted by 19.2.3.2.6.1 shall only be permitted to be applied once .

Statement of Problem and Substantiation for Public Comment

The current structure for the 25% reduction is unclear that the reduction can only be taken once with either high-temperature sprinklers or large orifice sprinklers. This revisions makes the intent of the section clearer and will clarify the application of the requirements for multiple adjustments.

Related Item

• CN-36 • PI-318 • PI-319

Submitter Information Verification

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Submittal Date: Sat Mar 18 21:40:13 EDT 2023
Committee: AUT-SSD

Public Comment No. 159-NFPA 13-2023 [New Section after 19.5]

19.6 Car Stackers and Car Lift Systems

19.6. 1 For buildings having car stackers and car lift systems sprinkler protection shall be provided based upon 19.6.2, 19.6.3 or 19.6.4.

19.6.2* Where sidewall or in-rack sprinklers are installed in buildings having car stackers and car lift systems with 2 cars stacked vertically and the sprinklers are placed under each level of cars, the ceiling sprinklers shall be designed based upon the occupancy classification of parking garages.

A.19.6.2 See A.10.3.2 (9)

19.6.3 Where sidewall or in-rack sprinklers are installed in buildings having car stackers and car lift systems with more than 2 cars stacked vertically and the sprinklers are placed under each level of cars, water demand requirements shall be in accordance with Chapter 25 and shall

19.6.4 Where the car stacker or car lift system design and/or operation prohibits sprinkler coverage under the cars, the ceiling system shall be designed to compensate for the shielded floor area

A.19.6.4 *See A.4.4.4.2*

Statement of Problem and Substantiation for Public Comment

This proposed change adds additional clarity on how to address car stackers and adds additional clarity on automatic retrieval systems used in parking garages. Where sprinklers are provided below each level of cars, the cars are treated as an obstruction and the ceiling system would be based upon the overall classification of the parking garage. This comment builds upon Pi-310 which was rejected with the reasoning that "Occupancy classification is the responsibility of the design professional". This comment addresses this concern and gives guidance to the design professional.

Related Item

• PI-310

Submitter Information Verification

Submitter Full Name: Roland Asp
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City:
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Submittal Date: Mon May 29 17:00:07 EDT 2023
Committee: AUT-SSD

Public Comment No. 148-NFPA 13-2023 [Section No. 20.9.1]

20.9.1

~~Ceiling Slope~~

Sloped Ceilings .

~~Except as permitted by~~ ~~20.9.1.1~~

~~or~~ ~~20.9.1.2~~

, the sprinkler system criteria specified in Chapters 20 through 26 shall apply to buildings with ceiling slopes not exceeding 2 in 12 (16.

~~7 percent~~

7 percent) .

20.9.1.1

~~Unobstructed and Obstructed Construction with any Sprinkler Type.~~

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

~~(1)~~ ~~Protect storage with in-rack sprinklers in accordance with one of the options in~~

~~Section~~

25.7 , provided that no storage is placed above the highest level of in-rack sprinklers.

(2) Install a horizontal false ceiling capable of withstanding an uplift force of 3 lb/

~~ft~~ ~~2~~

ft² (15 kg/

~~m~~ ~~2~~

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~~

(4) For obstructed construction where the ceiling slope does not exceed 4 in 12 and the storage is protected with CMDA sprinkler approach, install sprinklers in every channel.

(5) For unobstructed construction where the ceiling slope does not exceed 4 in 12, increase the design area of the ceiling sprinklers by 50% from the criteria in Chapters 20 through 26 unless that criteria is specifically for sloped ceilings

(6) For obstructed construction where the ceiling slope does not exceed 4 in 12

~~(33.3 percent)~~

, the

~~ESFR~~

sprinkler system criteria specified in Chapters 20 through 26 shall apply when all of the following conditions are

~~satisfied~~

met :

(a) Purlins or beams supporting the roof deck run across the roof slope.

(b) Purlins or beams do not exceed 18 in

~~.~~

(450 mm) deep.

(c) Purlins or beams do not exceed 5 ft (1.

~~5 m~~

5m) on

~~centers~~

center .

~~Purlins or beams are supported by girders~~

(d) Bays created by the solid structural members are not more than 40 ft (

~~12 m~~

12m) on

~~centers~~

center .

(e) Purlin or beam channels are

~~firestopped~~

provided with blocking above each

~~girder.~~

solid structural member.

A.20.9.1.1 The intent is to have a structural member that prevents the passage of heat. The member can have holes for penetrations with reasonable clearance and penetration sealant is not expected.

Additional Proposed Changes

File Name	Description	Approved
20-9-1.docx	This is a clean version of the proposed sections	

Statement of Problem and Substantiation for Public Comment

Based on the discussion at the First Draft Meeting and a re-evaluation of the information from the FPRF testing program, the Sloped Ceiling Task Group is recommending a different approach to incorporating the results of the testing into NFPA 13. This approach will be incorporated in the following steps:

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

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

select sprinkler protection using those parameters.

This material was developed by the Sloped Ceiling Task Group, which was formed by the Technical Committee on Sprinkler Systems Discharge Criteria to incorporate the results of the FPRF Project on Sprinklers Under Sloped Ceilings into NFPA 13. The Task Group consisted of Ken Isman (Chair), Wes Baker, Chase Browning, Mike Joanis, Larry Frank, Joe Noble, Abram Selim Fouad, Kevin Hall, Carry Webber, and Karl Wiegand.

Related Item

• FR 1208

Submitter Information Verification

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Submittal Date: Fri May 26 14:33:12 EDT 2023
Committee: AUT-SSD

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

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

(1) Protect storage with in-rack sprinklers in accordance with one of the options in 25.7, provided that no storage is placed above the highest level of in-rack sprinklers.

(2) Install a horizontal false ceiling capable of withstanding an uplift force of 3 lb/ft² (15 kg/m²) below the sloped ceiling and supplemented with ceiling sprinklers below.

(3) Install sprinklers per guidance in Chapters 20 through 26, which permits a ceiling that exceeds 2 in 12.

(4) For obstructed construction where the ceiling slope does not exceed 4 in 12 and the storage is protected with CMDA sprinkler approach, install sprinklers in every channel.

(5) For unobstructed construction where the ceiling slope does not exceed 4 in 12, increase the design area of the ceiling sprinklers by 50% from the criteria in Chapters 20 through 26 unless that criteria is specifically for sloped ceilings

(6) For obstructed construction where the ceiling slope does not exceed 4 in 12, the sprinkler system criteria specified in Chapters 20 through 26 shall apply when all of the following conditions are met:

(a) Purlins or beams supporting the roof deck run across the roof slope.

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

(c) Purlins or beams do not exceed 5 ft (1.5m) on center.

(d) Bays created by the solid structural members are not more than 40 ft (12m) on center.

(e) Purlin or beam channels are provided with blocking above each solid structural member.

Delete 20.9.1.2

A.20.9.1.1 The intent is to have a structural member that prevents the passage of heat. The member can have holes for penetrations with reasonable clearance and penetration sealant is not expected.

Public Comment No. 74-NFPA 13-2023 [Section No. 23.2.2]

23.2.2

~~All design areas shall~~

The determination of the design area shall be based on one of the following:

(1) *The design area shall consist of the most hydraulically demanding 12 sprinklers, with four sprinklers on each of three branch lines*

~~, unless otherwise specified.~~

(1) .

(2) *Where portions of this standard require a design greater than 12 sprinklers, the design area shall consist of four sprinklers on each of the branch lines.*

(3) *Where specifically listed, the number of sprinklers forming the basis of design shall be permitted to be in accordance with the listing.*

Statement of Problem and Substantiation for Public Comment

A.7.1.1 lists two test standards that are appropriate for ESFR sprinklers, UL 199 & FM 2008. FM 8-9 permits design basis less than 12 sprinklers in some cases. This change allows the use of ESFR sprinklers in accordance with their listing. The 12 sprinkler design basis in NFPA 13 was originally introduced by FM for 14 K-factor ESFR's. The performance of larger K-factor ESFR's is significantly improved over those initial ESFR's.

Related Item

• PI 297

Submitter Information Verification

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Submittal Date: Tue Apr 11 09:32:37 EDT 2023
Committee: AUT-SSD

Public Comment No. 217-NFPA 13-2023 [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

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

Commodity[a]	Maximum Ceiling/Roof Height		Maximum Storage Height		ESFR Sprinklers — Pendent Orientation Minimum Operating Pressure psi (bar)				ESFR Sprinklers — Upright Orientation Minimum Operating Pressure psi (bar)	
					Nominal K-Factors				Nominal K-Factors	
	ft	m	ft	m	14 (200)	16.8 (240)	22.4 (320)	25.2 (360)	14 (200)	16.8 (240)
Exposed expanded Group A plastics	25	7.6	20	6.1	—	—	—	30 (2.0)[c] or 60 (4.1)[d]	—	—
	30	9.1	25	7.6	—	—	—	30 (2.0)[c] or 60 (4.1)[d]	—	—
	—	—	—	—	—	—	—	—	—	—
	35	10.7	30	9.1	—	—	—	60 (4.1)[c,d]	—	—
	40	12.2	35	10.7	—	—	—	60 (4.1)[c,d]	—	—
	45	13.7	40	12.2	—	—	—	—	—	—

[a]See 20.3.2 for information regarding protection of lower hazard commodities with higher hazard criteria.

[b]These options are based on the testing criteria of the higher hazard and have not been specifically tested.

[c]These options apply when all requirements in Section 23.4 are applied including vertical barriers.

[d]This option applies to palletized and solid pile storage in a closed array.

Revise Table to include criteria over 45 building heights.

Additional Proposed Changes

File Name	Description	Approved
Table_23.3.1.pdf		

Statement of Problem and Substantiation for Public Comment

FM 8-9 (Interim Revision January 2022) Table 17b includes updated criteria for 33.6, 28.0, 25.2, and 22.4 k-factor sprinklers which includes extended ceiling heights.

Related Item

• PI 492

Submitter Information Verification

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Submittal Date: Wed May 31 15:18:58 EDT 2023
Committee: AUT-SSD

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

Commodity[a]	Maximum Ceiling/Roof Height		Maximum Storage Height		ESFR Sprinklers — Pendent Orientation Minimum Operating Pressure psi (bar) Nominal K-Factors						ESFR Sprinklers — Upright Orientation Minimum Operating Pressure psi (bar) Nominal K-Factors	
	ft	m	ft	m	14 (200)	16.8 (240)	22.4 (320)	25.2 (360)	28.0 (400)	33.6 (480)	14 (200)	16.8 (240)
Class I through Class IV and cartoned nonexpanded Group A plastics	25	7.6	20	6.1	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	25	7.6	50 (3.4)	35 (2.4)	25 (1.7)	15 (1.0)	---	---	50 (3.4)	35 (2.4)
	35	10.7	30	9.1	75 (5.2)[b]	52 (3.6)[b]	35 (2.4)	20 (1.4)	---	---	75 (5.2)	52 (3.6)
	40	12.2	35	10.7	—	52 (3.6)	40 (2.8)[b]	25 (1.7)	---	---	—	—
	45	13.7	40	12.2	—	—	40 (2.8)	40 (2.8)	---	---	—	—
	50	15.2	45	13.7	---	---	63[e,f,g] (4.3)	50[e,f,g] (3.5)	40[e,f,g] (2.8)	55[e,f,g] (3.8)	—	—
	55	16.8	50	15.2	---	---	---	---	80[e,f,g] (5.5)	55[e,f,g] (3.8)	—	—
Cartoned expanded Group A plastics	25	7.6	20	6.1	50 (3.4)[b]	35 (2.4)[b]	35 (2.4)[b]	35 (2.4)[b]			50 (3.4)[b]	35 (2.4)[b]
	30	9.1	25	7.6	50 (3.4)[b]	35 (2.4)[b]	35 (2.4)	35 (2.4)			50 (3.4)	35 (2.4)
	35	10.7	30	9.1	—	—	75 (5.2)[b]	60 (4.1)[b]	—	—	—	—
	40	12.2	35	10.7	—	—	75 (5.2)[b]	60 (4.1)[b]	—	—	—	—
	45	13.7	40	12.2	—	—	—	—	—	—	—	—
Exposed nonexpanded, Group A plastics	25	7.6	20	6.1	50 (3.4)[b]	35 (2.4)[b]	35 (2.4)[b]	35 (2.4)[b]	—	—	—	—
	30	9.1	25	7.6	50 (3.4)	35 (2.4)	35 (2.4)	35 (2.4)	—	—	—	—
	35	10.7	30	9.1	—	—	75 (5.2)	60 (4.1)[b]	—	—	—	—
	40	12.2	35	10.7	—	—	75 (5.2)	60 (4.1)	—	—	—	—
	45	13.7	40	12.2	In-rack sprinklers required. See Chapter 25.	In-rack sprinklers required. See Chapter 25.	—	—	—	—	—	—
Exposed expanded Group A plastics	25	7.6	20	6.1	—	—	—	30 (2.0)[c] or 60 (4.1)[d]	—	—	—	—
	30	9.1	25	7.6	—	—	—	30 (2.0)[b,c] or 60 (4.1)[d]	—	—	—	—
	~~32~~	~~9.8~~			—	—	—	—	—	—	—	—
	35	10.7	30	9.1	—	—	—	60 (4.1)[c,d]	—	—	—	—
	40	12.2	35	10.7	—	—	—	60 (4.1)[b,c,d]	—	—	—	—
	45	13.7	40	12.2	—	—	—	—	—	—	—	—

[a] See 20.3.2 for information regarding protection of lower hazard commodities with higher hazard criteria.

[b] These options are based on the testing criteria of the higher hazard and have not been specifically tested.

[b,c] These options apply when all requirements in Section ~~27.4~~ 23.4 are applied including vertical barriers.

[c,d] This option applies to palletized and solid pile storage in a closed array.

e The maximum vertical distance from ceiling to sprinkler thermal element shall not exceed 13 in. (325 mm) unless specifically listed.

f The minimum aisle width shall not be less than 8 ft (2.4 m) unless specifically listed.

g The number of sprinklers forming the basis of design shall be permitted to be in accordance with the listing. Where listing limitations or installation instructions differ from the requirements of this standard the listing limitations and installation instructions shall apply.

Public Comment No. 117-NFPA 13-2023 [Sections 24.2, 24.3]

Sections 24.2, 24.3

24.2* Sprinkler Design Criteria for Palletized and Solid-Piled, Storage of Class I Through Class IV and Plastic Commodities.

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

~~. (2 8 bar)12 ft × 12 ft. 3.7 m × 3.7 m)~~

~~144 ft . (13 m 2)~~

Storage Arrangement	Commodity Class	Maximum Storage Height*		Maximum Ceiling/Roof Height		K-Factor/ Orientation	Type of System	Number of Design Sprinklers
		ft	m	ft	m			
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
		20	6.1	30	9.1	25.2 (360) Upright/ pendent	Wet	6
		25	7.6	30	9.1	25.2 (360) Upright/ pendent	Wet	6
		25	7.6	30	9.1	25.2 (360) Upright/ pendent	Wet	6
		25	7.6	35	10.7	25.2 (360) Upright/ pendent	Wet	8

Storage Arrangement	Commodity Class	Maximum Storage Height*		Maximum Ceiling/Roof Height		K-Factor/ Orientation	Type of System	Number of Design Sprinklers
		ft	m	ft	m			
		25	7.6	35	10.7	25.2 (360) Upright/pendent	Wet	8
		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 40 psi (2.8 bar)	14 ft × 14 ft (4.3 m × 4.3 m) 196 ft^2 (18 m^2)	

*A The following minimum clearance of 5 ft (1.5 m) shall be provided from the sprinkler deflector to the top of storage: 3 ft (900 mm) for Pendent sprinklers and 5 ft (1 .5 m) for Upright sprinklers.

24.3* Sprinkler Protection Criteria for Open-Frame Rack Storage of Class I Through Class IV and Plastic Commodities.

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

~~pendent . (2 8 bar)12 ft × 12 ft. 3.7 m × 3.7 m)~~

~~144 ft - (13 m 2)~~

Storage Arrangement	Commodity Class	Maximum Storage Height*		Maximum Ceiling/Roof Height		K-Factor/ Orientation	Type of System	Numb of Desi Sprinkl
		ft	m	ft	m			
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
		20	6.1	30	9.1	25.2 (360) Upright/ pendent	Wet	6
		25	7.6	30	9.1	25.2 (360) Upright/ pendent	Wet	6
		25	7.6	30	9.1	25.2 (360) Upright/ pendent	Wet	6
		25	7.6	35	10.7	25.2 (360) Upright/ pendent	Wet	8

Storage Arrangement	Commodity Class	Maximum Storage Height*		Maximum Ceiling/Roof Height		K-Factor/ Orientation	Type of System	Numb of Desi Sprinkl
		ft	m	ft	m			
		25	7.6	35	10.7	25.2 (360) Upright/pendent	Wet	8
		30 Pendent	9.1 Wet	35 8	10.7 40 psi	25.2 (360) Upright/		
(2 30	9 .1	35	10.7	25.2 (360) Upright	Wet	8 40 psi (2.8 bar)	14 ft × 14 ft (4.3 m × 4.3 m) 196 ft^2 (18 m^2)	

*A *The following minimum clearance of 5 ft (1.5 m) shall be provided from the sprinkler deflector to the top of storage: 3 ft (900 mm) for Pendent sprinklers and 5 ft (1 .5 m) for Upright sprinklers.

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.

Table 24.3.2 CMSA K-25.2 (K-360) 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	Num of De Sprin
		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		

24.3.3

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)

Storage Arrangement	Commodity Class	Maximum Storage Height		Maximum Ceiling/Roof Height		K-Factor	Type of System	Number of Design Sprinklers	Minimum Operating Pressure	
		ft	m	ft	m				psi	bar
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.

24.3.3.1

For protection criteria using a minimum operating pressure of 15 psi (1 bar), a maximum water delivery time of 25 seconds shall be used.

24.3.3.2

For protection criteria using a minimum operating pressure of 50 psi (3.4 bar), a maximum water delivery time of 20 seconds shall be used.

Statement of Problem and Substantiation for Public Comment

FR1220 and FR1222 changed requirements in Sections 24.2 and 24.3 that have been part of NFPA 13 for more than 10 years. Such changes were made without supporting test data. This Public Comment is intended to be supported by new and additional test data.

Related Item

• FR1220 • FR1222

Submitter Information Verification

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Committee: AUT-SSD

Public Comment No. 104-NFPA 13-2023 [Section No. 25.2.1.4.1]

25.2.1.4.1

Where in-rack sprinklers are installed in accordance with this chapter to protect miscellaneous rack storage of Class I through Class IV commodities, Group A plastic commodities, and rubber tires up to and including 12 ft (3.7 m) in height under a maximum 32 ft (9.8 m) high ceiling, the ceiling-level sprinkler design criteria shall be a 0.20 gpm/ft^2 (~~0.~~ 8.2 mm/min) density over a 1500 ft^2 (140 m^2) area of ceiling-level sprinkler operation.

Statement of Problem and Substantiation for Public Comment

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

Related Item

• FR

Submitter Information Verification

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Public Comment No. 103-NFPA 13-2023 [Section No. 25.2.2.4.1]

25.2.2.4.1

Where in-rack sprinklers are installed in accordance with this section to protect low-piled rack storage of Class I through Class IV and Group A plastic commodities, that does not meet the definition of miscellaneous storage, the ceiling-level design shall be a 0.20 gpm/ft^2 (~~0.~~ 8.2 mm/min) density over a 1500 ft^2 (140 m^2) area of ceiling-level sprinkler operation.

Statement of Problem and Substantiation for Public Comment

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

Related Item

• FR

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Committee: AUT-SSD

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

(A)

For single-, double-, and multiple-row rack storage of exposed nonencapsulated Class I through Class IV commodities stored over 12 ft (3.7 m) and up to and including 25 ft (7.6 m) in height, the ceiling-level sprinkler design in terms of density [gpm/ft^2 (mm/min)] over a 2000 ft^2 (186 m^2) area of ceiling-level sprinkler operation, with the provision of in-rack sprinklers, shall be in accordance with the following:

(1) For exposed nonencapsulated Class I commodities, see Table 25.4.2.1.2.1(A)(a)

(2) For exposed nonencapsulated Class II commodities, see Table 25.4.2.1.2.1(A)(b)

(3) For exposed nonencapsulated Class III commodities, see Table 25.4.2.1.2.1(A)(c)

(4) For exposed nonencapsulated Class IV commodities, see Table 25.4.2.1.2.1(A)(d)

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

Maximum Storage Height ft (m)	Maximum Ceiling Height ft (m)	Storage Arrangement	Aisle Width ft (m)	No. of In-Rack Sprinkler Levels Installed	Ceiling Sprinkler System Design [gpm/ft^2/2000 ft^2 (mm/min/186 m^2)]	
					High-Temperature-Rated Sprinklers	Ordinary- or Intermediate-Temperature-Rated Sprinklers
15 (4.6)	35 (10.7)	Single- and double-row racks	8 (2.4)	1	0.15 (6.1)	0.15 (6.1)
				More than 1 but not every tier level	0.15 (6.1)	0.15 (6.1)
				Every tier level	0.15 (6.1)	0.15 (6.1)
			4 (1.2)	1	0.15 (6.1)	0.15 (6.2 1)
				More than 1 but not every tier level	0.15 (6.1)	0.15 (6.1)
				Every tier level	0.15 (6.1)	0.15 (6.1)
		Multiple-row racks	Any	1	0.15 (6.1)	0.15 (6.2 1)
				More than 1 but not every tier level	0.15 (6.1)	0.15 (6.1)
				Every tier level	0.15 (6.1)	0.15 (6.1)
18 (5.5)	38 (11.6)	Single- and double-row racks	8 (2.4)	1	0.16 (6.5)	0.18 (7.4)
				More than 1 but not every tier level	0.15 (6.1)	0.15 (6.1)

Maximum Storage Height ft (m)	Maximum Ceiling Height ft (m)	Storage Arrangement	Aisle Width ft (m)	No. of In-Rack Sprinkler Levels Installed	Ceiling Sprinkler System Design [gpm/ft^2/2000 ft^2 (mm/min/186 m^2)]	
					High-Temperature-Rated Sprinklers	Ordinary- or Intermediate-Temperature-Rated Sprinklers
				Every tier level	0.15 (6.1)	0.15 (6.1)
			4 (1.2)	1	0.20 (8.2)	0.22 (8.8)
				More than 1 but not every tier level	0.16 (6.5)	0.17 (7.0)
				Every tier level	0.15 (6.1)	0.15 (6.1)
		Multiple-row racks	Any	1	0.20 (8.2)	0.22 (8.8)
				More than 1 but not every tier level	0.16 (6.5)	0.18 (7.3)
				Every tier level	0.15 (6.1)	0.15 (6.1)
25 (7.6)	45 (13.7)	Single- and double-row racks	8 (2.4)	1	0.19 (7.7)	0.22 (8.8)
				More than 1 but not every tier level	0.15 (6.1)	0.17 (7.0)
				Every tier level	0.15 (6.1)	0.15 (6.1)
			4 (1.2)	1	0.23 (9.4)	0.26 (10.6)
				More than 1 but not every tier level	0.18 (7.3)	0.20 (8.2)
				Every tier level	0.15 (6.1)	0.15 (6.1)
		Multiple-row racks	Any	1	0.23 (9.4)	0.26 (10.6)
				More than 1 but not every tier level	0.18 (7.3)	0.20 (8.2)
				Every tier level	0.15 (6.1)	0.15 (6.1)

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

Maximum Storage Height ft (m)	Maximum Ceiling Height ft (m)	Storage Arrangement	Aisle Width ft (m)	No. of In-Rack Sprinkler Levels Installed	Ceiling Sprinkler System Design [gpm/ft^2/2000 ft^2 (mm/min/186 m^2)]	
					High-Temperature-Rated Sprinklers	Ordinary- or Intermediate-Temperature-Rated Sprinklers
15 (4.6)	35 (10.7)	Single- and double-row racks	8 (2.4)	1	0.15 (6.1)	0.15 (6.1)
				More than 1 but not every tier level	0.15 (6.1)	0.15 (6.1)
				Every tier level	0.15 (6.1)	0.15 (6.1)
			4 (1.2)	1	0.15 (6.1)	0.18 (7.3)
				More than 1 but not every tier level	0.15 (6.1)	0.15 (6.1)
				Every tier level	0.15 (6.1)	0.15 (6.1)
		Multiple-row racks	Any	1	0.15 (6.1)	0.18 (7.3)
				More than 1 but not every tier level	0.15 (6.1)	0.15 (6.1)
				Every tier level	0.15 (6.1)	0.15 (6.1)
18 (5.5)	38 (11.6)	Single- and double-row racks	8 (2.4)	1	0.18 (7.3)	0.20 (8.2)
				More than 1 but not every tier level	0.15 (6.1)	0.16 (6.5)
				Every tier level	0.15 (6.1)	0.15 (6.1)
			4 (1.2)	1	0.21 (8.6)	0.26 (10.6)
				More than 1 but not every tier level	0.17 (7.0)	0.20 (8.2)
				Every tier level	0.15 (6.1)	0.15 (6.1)
		Multiple-row racks	Any	1	0.21 (8.6)	0.26 (10.6)
				More than 1 but not every tier level	0.17 (7.0)	0.20 (8.2)

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

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

Maximum Storage Height ft (m)	Maximum Ceiling Height ft (m)	Storage Arrangement	Aisle Width ft (m)	No. of In-Rack Sprinkler Levels Installed	Ceiling Sprinkler System Design [gpm/ft^2/2000 ft^2 (mm/min/186 m^2)]	
					High-Temperature-Rated Sprinklers	Ordinary- or Intermediate-Temperature-Rated Sprinklers
15 (4.6)	35 (10.7)	Single- and	8 (2.4)	1	0.15 (6.1)	0.17 (7.0)

Maximum Storage Height ft (m)	Maximum Ceiling Height ft (m)	Storage Arrangement	Aisle Width ft (m)	No. of In-Rack Sprinkler Levels Installed	Ceiling Sprinkler System Design [gpm/ft^2/2000 ft^2 (mm/min/186 m^2)]	
					High-Temperature-Rated Sprinklers	Ordinary- or Intermediate-Temperature-Rated Sprinklers
		double-row racks		More than 1 but not every tier level	0.15 (6.1)	0.15 (6.1)
				Every tier level	0.15 (6.1)	0.15 (6.1)
			4 (1.2)	1	0.17 (7.0)	0.20 (8.2)
				More than 1 but not every tier level	0.15 (6.1)	0.16 (6.5)
				Every tier level	0.15 (6.1)	0.15 (6.1)
		Multiple-row racks	Any	1	0.17 (7.0)	0.20 (8.2)
				More than 1 but not every tier level	0.15 (6.1)	0.16 (6.5)
				Every tier level	0.15 (6.1)	0.15 (6.1)
18 (5.5)	38 (11.6)	Single- and double-row racks	8 (2.4)	1	0.21 (8.6)	0.23 (9.3)
				More than 1 but not every tier level	0.17 (7.0)	0.19 (7.7)
				Every tier level	0.15 (6.1)	0.15 (6.1)
			4 (1.2)	1	0.24 (9.8)	0.28 (11.4)
				More than 1 but not every tier level	0.19 (7.7)	0.22 (9.0)
				Every tier level	0.15 (6.1)	0.17 (7.0)
		Multiple-row racks	Any	1	0.24 (9.8)	0.28 (11.4)
				More than 1 but not every tier level	0.19 (7.7)	0.22 (9.0)

Maximum Storage Height ft (m)	Maximum Ceiling Height ft (m)	Storage Arrangement	Aisle Width ft (m)	No. of In-Rack Sprinkler Levels Installed	Ceiling Sprinkler System Design [gpm/ft^2/2000 ft^2 (mm/min/186 m^2)]	
					High-Temperature-Rated Sprinklers	Ordinary- or Intermediate-Temperature-Rated Sprinklers
				Every tier level	0.15 (6.1)	0.17 (7.0)
25 (7.6)	45 (13.7)	Single- and double-row racks	8 (2.4)	1	0.25 (10.2)	0.28 (11.4)
				More than 1 but not every tier level	0.20 (8.2)	0.22 (9.0)
				Every tier level	0.15 (6.1)	0.17 (7.0)
			4 (1.2)	1	0.29 (11.8)	0.33 (13.4)
				More than 1 but not every tier level	0.23 (9.3)	0.26 (10.6)
				Every tier level	0.17 (7.0)	0.20 (8.2)
		Multiple-row racks	Any	1	0.29 (11.8)	0.33 (13.4)
				More than 1 but not every tier level	0.23 (9.3)	0.26 (10.6)
				Every tier level	0.17 (7.0)	0.20 (8.2)

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

Maximum Storage Height ft (m)	Maximum Ceiling Height ft (m)	Storage Arrangement	Aisle Width ft (m)	No. of In-Rack Sprinkler Levels Installed	Ceiling Sprinkler System Design [gpm/ft^2/2000 ft^2 (mm/min/186 m^2)]	
					High-Temperature-Rated Sprinklers	Ordinary- or Intermediate-Temperature-Rated Sprinklers
15 (4.6)	35 (10.7)	Single- and	8 (2.4)	1	0.19 (7.7)	0.22 (9.0)

Maximum Storage Height ft (m)	Maximum Ceiling Height ft (m)	Storage Arrangement	Aisle Width ft (m)	No. of In-Rack Sprinkler Levels Installed	Ceiling Sprinkler System Design [gpm/ft^2/2000 ft^2 (mm/min/186 m^2)]	
					High-Temperature-Rated Sprinklers	Ordinary- or Intermediate-Temperature-Rated Sprinklers
		double-row racks		More than 1 but not every tier level	0.15 (6.1)	0.18 (7.3)
				Every tier level	0.15 (6.1)	0.15 (6.1)
			4 (1.2)	1	0.23 (9.3)	0.27 (11.0)
				More than 1 but not every tier level	0.18 (7.3)	0.21 (8.6)
				Every tier level	0.15 (6.1)	0.16 (6.5)
		Multiple-row racks	Any	1	0.23 (9.3)	0.27 (11.0)
				More than 1 but not every tier level	0.18 (7.3)	0.21 (8.6)
				Every tier level	0.15 (6.1)	0.16 (6.5)
18 (5.5)	38 (11.6)	Single- and double-row racks	8 (2.4)	1	0.27 (11.0)	0.31 (12.6)
				More than 1 but not every tier level	0.22 (9.0)	0.25 (10.2)
				Every tier level	0.16 (6.5)	0.19 (7.7)
			4 (1.2)	1	0.33 (13.4)	0.38 (15.5)
				More than 1 but not every tier level	0.26 (10.6)	0.30 (12.2)
				Every tier level	0.20 (8.2)	0.23 (9.3)
		Multiple-row racks	Any	1	0.33 (13.4)	0.38 (15.5)
				More than 1 but not every tier level	0.26 (10.6)	0.30 (12.2)

Maximum Storage Height ft (m)	Maximum Ceiling Height ft (m)	Storage Arrangement	Aisle Width ft (m)	No. of In-Rack Sprinkler Levels Installed	Ceiling Sprinkler System Design [gpm/ft^2/2000 ft^2 (mm/min/186 m^2)]	
					High-Temperature-Rated Sprinklers	Ordinary- or Intermediate-Temperature-Rated Sprinklers
				Every tier level	0.20 (8.2)	0.23 (9.3)
25 (7.6)	45 (13.7)	Single- and double-row racks	8 (2.4)	1	0.32 (13.0)	0.37 (15.1)
				More than 1 but not every tier level	0.26 (10.6)	0.30 (12.2)
				Every tier level	0.19 (7.7)	0.22 (8.9)
			4 (1.2)	1	0.39 (15.9)	0.45 (18.3)
				More than 1 but not every tier level	0.31 (12.6)	0.36 (14.7)
				Every tier level	0.23 (9.3)	0.27 (10.9)
		Multiple-row racks	Any	2	0.39 (15.9)	0.45 (18.3)
				More than 2 but not every tier level	0.31 (12.6)	0.36 (14.7)
				Every tier level	0.23 (9.3)	0.27 (10.9)

Statement of Problem and Substantiation for Public Comment

Only metric conversion is not consistent with above number in the same table

Related Item

• FR

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Committee: AUT-SSD

Public Comment No. 211-NFPA 13-2023 [Section No. 25.5.1]

25.5.1 Protection of Racks with Solid Shelves.

25.5.1.1 ~~– General.~~

~~**25.5.1.1.1** –~~

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

~~**25.5.1.1.2** –~~

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

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

~~**25.5.1.2.1** –~~

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

~~**25.5.1.2.2** –~~

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

~~**25.5.1.2.3** * –~~

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

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

~~**25.5.1.3.1** –~~

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

~~**25.5.1.3.2** –~~

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

In-rack sprinklers for racks having solid shelves shall be in accordance with Section 25.3.

Statement of Problem and Substantiation for Public Comment

Section 25.3 addresses protection for solid shelves for all CMDA, CMSA, and ESFR ceiling protection, deleted information is redundant.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 210-NFPA 13-2023 [Section No. 25.6.1]	

Related Item

- PI 523, FR 1311

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Committee: AUT-SSD

Public Comment No. 210-NFPA 13-2023 [Section No. 25.6.1]

25.6.1 Protection of Racks with Solid Shelves.

25.6.1.1 ~~– General.~~

~~**25.6.1.1.1** –~~

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

~~**25.6.1.1.2** –~~

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

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

~~**25.6.1.2.1** –~~

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

~~**25.6.1.2.2** –~~

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

~~**25.6.1.2.3** * –~~

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

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

~~**25.6.1.3.1** –~~

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

~~**25.6.1.3.2** –~~

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

In-rack sprinklers for racks having solid shelves shall be in accordance with Section 25.3.

Statement of Problem and Substantiation for Public Comment

Section 25.3 addresses protection for solid shelves for all CMDA, CMSA, and ESFR ceiling protection; this information is redundant.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 211-NFPA 13-2023 [Section No. 25.5.1]	

Related Item

- PI 523, FR 1311

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Public Comment No. 220-NFPA 13-2023 [New Section after 26.9.1.2]

26.X Protection of automatic storage and retrieval systems.

26.X.1 A system designed to meet FM Global Property Loss Data Sheet 8-34.

26.X.2 A wet pipe sprinkler system with K-25.2 (360) K-factor electrically operated sprinklers operating at a minimum pressure of 50 psi (3.4 bar) and calculating 12 sprinklers, four on each of three branchlines, shall be permitted to protect cartoned unexpanded group A plastics in a cubed bin storage system where stored material are retrieved with robotic retrieval vehicles, and the following conditions are met:

(1) Maximum roof height shall be 45 ft (13.7 m) in the protected area.

(2) Maximum storage height shall be 30 ft (9.1 m).

(3) The cubed bin storage system shall be contained within a three-dimensional grid structure arranged in cells, each of which has multiple storage units surrounding a central void or space on different sides, contained within an aluminum structure with steel cladding/paneling on the outer perimeter.

(4) The void space shall enable the unit to be pulled into the void by mechanical means, and allow access to the bins on all sides of the void.

(5) The storage units shall be stacked within the three-dimensional grid structure and aligned voids of stacked cells shall create vertical shafts spanning between upper and lower tracks of the grid structure on which robotic retrieval vehicles can horizontally travel to and from any given shaft.

(6) The robotic retrieval vehicles shall directly access any storage unit via the vertical shafts.

(7) Commodity shall be stored in open top bins of unexpanded exposed plastic having drainage perforations on the bottom a minimum of 24% open.

(8) Water supply duration shall be 60 minutes.

Statement of Problem and Substantiation for Public Comment

Adds protection guidance on Automatic Storage Retrieval Systems.

Related Item

• PI 390

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Public Comment No. 75-NFPA 13-2023 [New Section after 26.9.1.2]

26.10 Special Design for Automobile Storage.

26.10.1 Automated-Type Parking Structures.

26.10.1.1 Automated-Type Parking Structures over two stacks high shall be protected with automatic sprinklers under each level of cars.

26.10.1.2

Protection shall be as follows:

(1) Ceiling design density shall be based on 0.40 gpm/ft2 (16.3 mm/min) density over a 2500 ft2 (230 m2) area for wet pipe sprinkler systems.

(2) Automatic sprinklers under each level of cars shall be ordinary or intermediate temperature, fast response, standard coverage or extended coverage, horizontal sidewall sprinklers, listed for use in ordinary hazard occupancies.

(3) Standard coverage horizontal sidewall sprinklers shall be designed to maintain a minimum discharge pressure of 20 psi (1.4 bar) for the most hydraulically demanding six sprinklers on each level.

(4) Extended coverage horizontal sidewall sprinklers shall be designed to maintain a minimum discharge pressure corresponding to the protection area of coverage prescribed by the listing for the protection of ordinary hazard group 2 occupancies for the most hydraulically demanding six sprinklers on each level.

(5) Under car sprinkler demand shall not be required to be added to the ceiling sprinkler demand.

(6) Minimum flue spaces of 12 in. (150 mm) shall be provided between cars.

(7) Sprinklers located adjacent to each level of cars not more than 6 in. (150 mm) from the outside edge of the car.

(8) Sidewall sprinklers shall be permitted to be install back-to-back throwing in opposite directions.

(9) Aisle widths shall be a minimum of 8 ft (2.4 m).

(10) Water supply duration shall be 120 minutes.

Statement of Problem and Substantiation for Public Comment

NFPA 88A currently requires sprinkler systems installed in automated parking structures to be installed in accordance with NFPA 13, but NFPA 13 does not have design criteria. Until specific design criteria is available from the NFPRF, this add protection criteria involving sprinklers at every level as a basis of design.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 66-NFPA 13-2023 [Section No. A.4.4.3.2]	
Public Comment No. 67-NFPA 13-2023 [Section No. A.4.4.4.2]	
Public Comment No. 68-NFPA 13-2023 [Section No. A.20.4.5.1]	

Related Item

- PI 310

Submitter Information Verification

Submitter Full Name: Mark Fessenden
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State:
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Submittal Date: Tue Apr 11 11:14:38 EDT 2023
Committee: AUT-SSD

Public Comment No. 168-NFPA 13-2023 [Section No. 28.2]

~~**28.2** * – Approved Storage Floor Plan.~~

~~**28.2.1** –~~

~~An approved storage floor plan shall be provided showing all areas of the building designed for storage in accordance with the following sections of this standard:~~

(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.~~

Statement of Problem and Substantiation for Public Comment

This comment is intended to be in conjunction with PC-162. PC-162 seeks to move the language for the Approved Storage Plan from Chapter 28 to Chapter 4. While this requirement is a positive addition to the standard, it belongs in Chapter 4 (General Requirements) and not in Chapter 28 (Acceptance). This requirement is an owner's responsibility and as such comment 162 seeks to relocate this requirement to Chapter 4. This public comment is to delete this language from Chapter 28.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 162-NFPA 13-2023 [New Section after 4.2]	
Public Comment No. 163-NFPA 13-2023 [New Section after A.4.2(4)]	

Related Item

• FR-1246

Submitter Information Verification

Submitter Full Name: Roland Asp
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Affiliation: NFSA E&S Committee
Street Address:
City:
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Submittal Date: Mon May 29 21:35:03 EDT 2023
Committee: AUT-SSD

Public Comment No. 20-NFPA 13-2023 [Section No. 28.2]

~~**28.2** * – Approved Storage Floor Plan.~~

~~**28.2.1** –~~

~~An approved storage floor plan shall be provided showing all areas of the building designed for storage in accordance with the following sections of this standard:~~

(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.~~

Statement of Problem and Substantiation for Public Comment

The approved storage floor plan is a requirement of the fire code and the owner. This needs to be provided at the start of the project with the Owner's certificate. The current location of the approved storage floor plan in the first draft report in plans and calculations is not appropriate.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 19-NFPA 13-2023 [Section No. 4.2]	Adds item to the Owner's Certificate

Related Item

• FR-1246

Submitter Information Verification

Submitter Full Name: Kevin Hall
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Submittal Date: Wed Mar 08 16:35:36 EST 2023
Committee: AUT-SSD

Public Comment No. 88-NFPA 13-2023 [Section No. 28.3.4.2.1]

28.3.4.2.1*

Where the design is based on the density/area method, the design area shall be a rectangular area having a dimension parallel to the branch lines

~~in accordance with one of the following:For unobstructed construction with ceiling or roof slopes greater than 2 in 12, the dimension parallel to the branch line shall be~~

at least 1.

4

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.

- ~~For obstructed construction with ceiling or roof slopes greater than 4 in 12, the dimension parallel to the branch line shall be at least 1.4 times the square root of the area of sprinkler operation *(A)* used, which shall permit the inclusion of sprinklers on both sides of the cross main.~~
- ~~For all other situations, the dimension parallel to the branch line shall be at least 1.2 times the square root of the area of sprinkler operation *(A)* used, which shall permit inclusion of sprinklers on both sides of the cross main.~~

Statement of Problem and Substantiation for Public Comment

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

This material was developed by the Sloped Ceiling Task Group, which was formed by the Technical Committee on Sprinkler Systems Discharge Criteria to incorporate the results of the FPRF Project on Sprinklers Under Sloped Ceilings into NFPA 13. The Task Group consisted of Ken Isman (Chair), Wes Baker, Chase Browning, Mike Joanis, Larry Frank, Joe Noble, Abram Selim Fouad, Kevin Hall, Carry Webber, and Karl Wiegand.

Related Item

• FR 1251

Submitter Information Verification

Submitter Full Name: Kenneth Isman
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Submittal Date: Wed May 10 23:03:11 EDT 2023
Committee: AUT-SSD

Public Comment No. 89-NFPA 13-2023 [Section No. 28.3.4.4.1]

28.3.4.4.

~~1~~

1

Where the design area was increased

~~beyond 12~~

to 18 sprinklers due to the slope of the ceiling or roof, the design area shall be

~~calculated in accordance with 28.3.4.2 with the design area *(A)* being the number of sprinklers multiplied by the actual floor area covered by those sprinklers~~

5 sprinklers on the most demanding three branch lines and the 3 most demanding sprinklers on the next most demanding branch line .

Statement of Problem and Substantiation for Public Comment

Rather than providing confusing instructions about coverage areas and trying to figure out what the area is covered by the sprinklers, users of ESFR sprinklers are more used to being told the number of sprinklers to calculate on each branch line. The 5, 5, 5, and 3 sprinklers on the four branch lines makes the most sense.

This material was developed by the Sloped Ceiling Task Group, which was formed by the Technical Committee on Sprinkler Systems Discharge Criteria to incorporate the results of the FPRF Project on Sprinklers Under Sloped Ceilings into NFPA 13. The Task Group consisted of Ken Isman (Chair), Wes Baker, Chase Browning, Mike Joanis, Larry Frank, Joe Noble, Abram Selim Fouad, Kevin Hall, Carry Webber, and Karl Wiegand.

Related Item

• FR 1256

Submitter Information Verification

Submitter Full Name: Kenneth Isman
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Submittal Date: Wed May 10 23:10:43 EDT 2023
Committee: AUT-SSD

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

(A)– *

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

Statement of Problem and Substantiation for Public Comment

An asterisk has been added to indicate that proposed Annex language is being submitted for this section.

Related Item

• FR-1268

Submitter Information Verification

Submitter Full Name: Weston Baker
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City:
State:
Zip:
Submittal Date: Wed May 31 08:00:32 EDT 2023
Committee: AUT-SSD

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

28.3.4.8.1

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

(1) Pipe, fittings, 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 number of bends referenced in the listing for the hose length.

(13) Losses through a pressure-reducing valve shall be included based on the normal inlet pressure condition, and pressure loss data from the manufacturer's literature shall be used.

(14) In new systems, an increased *C* value of 120 shall be permitted where nitrogen is provided in accordance with 8.2.10.

Table 28.3.4.8.1 Hazen–Williams *C* Values

Pipe or Tube	*C* Value*
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
Concrete	140

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

†Nitrogen supply shall be installed in accordance with 8.2.10.

Statement of Problem and Substantiation for Public Comment

Flexible sprinkler hose fittings have a significant pressure loss that needs to be included in the system's hydraulic calculation.

Related Item

• Committee Input 1261

Submitter Information Verification

Submitter Full Name: Kerry Bell
Organization: UL LLC
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City:
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Zip:
Submittal Date: Fri May 19 13:52:57 EDT 2023
Committee: AUT-SSD

Public Comment No. 125-NFPA 13-2023 [Section No. 28.3.4.8.1]

28.3.4.8.1

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

(1) Pipe, fittings, and devices such as valves, meters, flow switches in pipes 2 in. (50 mm) or less in size, and strainers shall be included, and elevation changes that affect the sprinkler discharge shall be calculated.

(2) Tie-in drain piping shall not be included in the hydraulic calculations.

(3) Losses for a tee or a cross shall be calculated where flow direction change occurs based on the equivalent pipe length of the piping segment in which the fitting is included.

(4) The tee at the top of a riser nipple shall be included in the branch line, the tee at the base of a riser nipple shall be included in the riser nipple, and the tee or cross at a cross main–feed main junction shall be included in the cross main.

(5) Losses for straight-through flow in a tee or cross shall not be included.

(6) The loss of reducing elbows based on the equivalent length value of the smallest outlet shall be calculated.

(7) The equivalent length value for the standard elbow on any abrupt 90-degree turn, such as the screw-type pattern, shall be used.

(8) The equivalent length value for a fitting with a bushing shall be the same as for a similarly sized and configured reducing fitting.

(9) The equivalent length value for the long-turn elbow on any sweeping 90-degree turn, such as a flanged, welded, or mechanical joint-elbow type, shall be used. *(See Table 28.3.3.1.1.)*

(10) Losses shall be permitted to be excluded for tapered reducers.

(11) Losses shall be permitted to be excluded for a fitting with or without a bushing, directly connected to a sprinkler, except as required in 28.3.3.1.2 and 28.3.3.4.

(12) Losses through a pressure-reducing valve shall be included based on the normal inlet pressure condition, and pressure loss data from the manufacturer's literature shall be used.

(13) In new systems, an increased *C* value of 120 shall be permitted where nitrogen is provided in accordance with 8.2.10.

(14) In new systems, an increased *C* value of 120 shall be permitted where negative pressure is provided in accordance with 8.11 .

Table 28.3.4.8.1 Hazen–Williams *C* Values

Pipe or Tube	*C* Value*
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
Concrete	140

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

†Nitrogen supply shall be installed in accordance with 8.2.10.

††Negative pressure shall be installed in accordance with 8.11

Statement of Problem and Substantiation for Public Comment

Data has been provided that a C Value of 120 is appropriate for dry and preaction systems using negative pressure.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 122-NFPA 13-2023 [New Section after 8.11]	
Public Comment No. 127-NFPA 13-2023 [Section No. 8.11]	

Related Item

• FR-1037

Submitter Information Verification

Submitter Full Name: Jonathan Roger
Organization: Fireflex Systems
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City:
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Zip:
Submittal Date: Fri May 19 14:21:46 EDT 2023
Committee: AUT-SSD

Public Comment No. 169-NFPA 13-2023 [Section No. 28.3.4.8.1]

28.3.4.8.1

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

(1) Pipe, fittings, and devices such as valves, meters, ~~flow switches in pipes 2 in. (50 mm) or less in size, and~~ and strainers shall be included, and elevation changes that affect the sprinkler discharge shall be calculated.

(2) Tie-in drain piping shall not be included in the hydraulic calculations.

(3) Losses for a tee or a cross shall be calculated where flow direction change occurs based on the equivalent pipe length of the piping segment in which the fitting is included.

(4) The tee at the top of a riser nipple shall be included in the branch line, the tee at the base of a riser nipple shall be included in the riser nipple, and the tee or cross at a cross main–feed main junction shall be included in the cross main.

(5) Losses for straight-through flow in a tee or cross shall not be included.

(6) The loss of reducing elbows based on the equivalent length value of the smallest outlet shall be calculated.

(7) The equivalent length value for the standard elbow on any abrupt 90-degree turn, such as the screw-type pattern, shall be used.

(8) The equivalent length value for a fitting with a bushing shall be the same as for a similarly sized and configured reducing fitting.

(9) The equivalent length value for the long-turn elbow on any sweeping 90-degree turn, such as a flanged, welded, or mechanical joint-elbow type, shall be used. *(See Table 28.3.3.1.1.)*

(10) Losses shall be permitted to be excluded for tapered reducers.

(11) Losses shall be permitted to be excluded for a fitting with or without a bushing, directly connected to a sprinkler, except as required in 28.3.3.1.2 and 28.3.3.4.

(12) Losses through a pressure-reducing valve shall be included based on the normal inlet pressure condition, and pressure loss data from the manufacturer's literature shall be used.

(13) In new systems, an increased *C* value of 120 shall be permitted where nitrogen is provided in accordance with 8.2.10.

Table 28.3.4.8.1 Hazen–Williams *C* Values

Pipe or Tube	*C* Value*
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
Concrete	140

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

†Nitrogen supply shall be installed in accordance with 8.2.10.

Statement of Problem and Substantiation for Public Comment

Table 28.3.3.1.1 includes equivalent pipe length values for flow switches that are 2 inches or less and for flow switches that are greater than 2 inches, however section 8.3.4.8.1(1) only requires that these values be applied to flow switches 2 in. or less in size. This disparity causes confusion. Additionally the equivalent length values for flow switches do not correspond with the published values from the devices manufacturers and it is unknown where the values from Table 28.3.3.1.1 came from. This comment seeks to delete the language "flow switches in pipes 2 in. or less in size"

Related Item

• PI-231 • PI-349 • CI-1261

Submitter Information Verification

Submitter Full Name: Roland Asp
Organization: National Fire Sprinkler Association
Affiliation: NFSA Engineering and Standards Committee
Street Address:
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Submittal Date: Mon May 29 21:46:07 EDT 2023
Committee: AUT-SSD

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

28.3.4.8.1

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

(1) Pipe, fittings, 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 number of bends referenced in the listing for the hose length.

(13) Losses through a pressure-reducing valve shall be included based on the normal inlet pressure condition, and pressure loss data from the manufacturer's literature shall be used.

(14) In new systems, an increased *C* value of 120 shall be permitted where nitrogen is provided in accordance with 8.2.10.

Table 28.3.4.8.1 Hazen–Williams *C* Values

Pipe or Tube	*C* Value*
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
Concrete	140

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

†Nitrogen supply shall be installed in accordance with 8.2.10.

Statement of Problem and Substantiation for Public Comment

This proposal will require that pressure losses of flexible sprinkler hose be included in the system's hydraulic calculation based upon the number of bends referenced in the listing for a particular hose length. By allowing this value to be based upon the number of bends referenced by the listing and not the maximum bends possible, this gives more options to the designer and is keeping with the scope and purpose of NFPA 13 which is the "minimum requirements" to achieve "reasonable" fire protection.

Related Item

• Pi-231 • CI-1261

Submitter Information Verification

Submitter Full Name: Roland Asp
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Affiliation: NFSA Engineering and Standards Committee
Street Address:
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Submittal Date: Mon May 29 22:16:22 EDT 2023
Committee: AUT-SSD

Public Comment No. 189-NFPA 13-2023 [Section No. 28.3.4.8.1]

28.3.4.8.1

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

(1) Pipe, fittings, and devices such as valves, meters, flow switches in pipes 2 in. (50 mm) or less in size, and strainers shall be included, and elevation changes that affect the sprinkler discharge shall be calculated.

(2) Tie-in drain piping shall not be included in the hydraulic calculations.

(3) Losses for a tee or a cross shall be calculated where flow direction change occurs based on the equivalent pipe length of the piping segment in which the fitting is included.

(4) The tee at the top of a riser nipple shall be included in the branch line, the tee at the base of a riser nipple shall be included in the riser nipple, and the tee or cross at a cross main–feed main junction shall be included in the cross main.

(5) Losses for straight-through flow in a tee or cross shall not be included.

(6) The loss of reducing elbows based on the equivalent length value of the smallest outlet shall be calculated.

(7) The equivalent length value for the standard elbow on any abrupt 90-degree turn, such as the screw-type pattern, shall be used.

(8) The equivalent length value for a fitting with a bushing shall be the same as for a similarly sized and configured reducing fitting.

(9) The equivalent length value for the long-turn elbow on any sweeping 90-degree turn, such as a flanged, welded, or mechanical joint-elbow type, shall be used. *(See Table 28.3.3.1.1.)*

(10) Losses shall be permitted to be excluded for tapered reducers.

(11) Losses shall be permitted to be excluded for a fitting with or without a bushing, directly connected to a sprinkler, except as required in 28.3.3.1.2 and 28.3.3.4.

(12) Losses through a pressure-reducing valve shall be included based on the normal inlet pressure condition, and pressure loss data from the manufacturer's literature shall be used.

(13) In new systems, an increased *C* value of 120 shall be permitted where nitrogen is provided in accordance with 8.2.10.

(14) In new systems, an increased C value of 120 shall be permitted where vapor phase corrosion inhibitor is provided in accordance with 8.2.11.

Table 28.3.4.8.1 Hazen–Williams *C* Values

Pipe or Tube	*C* Value*
Unlined cast or ductile iron	100
Black steel (dry systems including preaction)	100
Black steel (wet systems including deluge)	120
Black steel (dry system including preaction) using nitrogen†	120
Black steel (dry system including preaction) using vapor phase corrosion inhibitor**	120
Galvanized steel (dry systems including preaction)	100
Galvanized steel (wet systems including deluge)	120
Galvanized steel (dry systems including preaction) using nitrogen†	120
Galvanized steel (dry systems including preaction) using vapor phase corrosion inhibitor**	120
Plastic all (listed)	150
Cement-lined cast- or ductile iron	140
Copper tube, brass or stainless steel	150

Pipe or Tube	*C* Value*
Asbestos cement	140
Concrete	140

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

†Nitrogen supply shall be installed in accordance with 8.2.10.

** Vapor phase corrosion inhibitor used in air supply piping shall be installed in accordance with 8.2.11.

Statement of Problem and Substantiation for Public Comment

A new line has been added for the use of a C value of 120 for vapor phase corrosion inhibitor due to its effectiveness in controlling corrosion.
Note: this comment also modifies Table 28.2.4.8.1 to include a c-120 for VCI. Testing has demonstrated that vapor phase corrosion inhibitor technology provides excellent corrosion protection. Reports show that nano particle vapor phase corrosion inhibitors provide excellent corrosion inhibiting ability (VIA) and have properties allowing for excellent migration into systems.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 187-NFPA 13-2023 [New Section after 8.2]	
Public Comment No. 188-NFPA 13-2023 [Section No. 16.4.2.5]	

Related Item

- • PI-349

Submitter Information Verification

Submitter Full Name: Mark Hopkins
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Submittal Date: Tue May 30 15:24:41 EDT 2023
Committee: AUT-SSD

Public Comment No. 136-NFPA 13-2023 [Section No. A.3.3.22]

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*~~

"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)~~

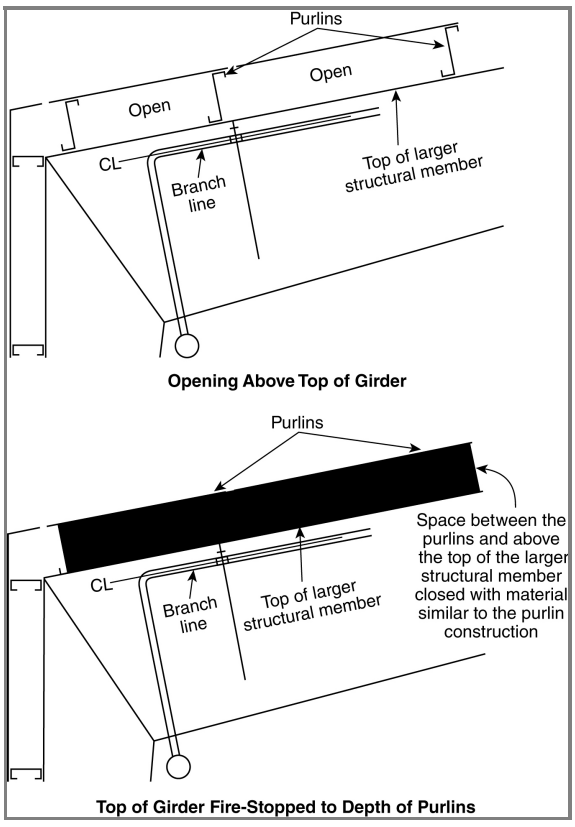
. Blocking is not intended to fill small gaps such as those found in corrugated roofing or other small openings in structural members. (AUT-SSD)

Also note the need to change the following:

1) The caption for the top half of Figure A.3.3.22 needs to be changed from "Opening" to "Openings" so that it reads: "Openings Above Top of Girder"

2) The caption for the bottom half of the Figure needs to be changed to replace "Firestopped" with "Provided with Blocking" so that it reads: "Top of Girder Provided with Blocking to Depth of Purlins".

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



Additional Proposed Changes

File Name	Description	Approved
Figure_A-3-3-22.docx	This is how the corrected figure should look	

Statement of Problem and Substantiation for Public Comment

During the First Draft, the committee preferred the term “blocking” to “fire-stopping” and inserted this new definition. As such, the terminology needs to be consistent. This proposed text also clarifies what is intended with the use of the term “blocking”.

This material was developed by the Sloped Ceiling Task Group, which was formed by the Technical Committee on Sprinkler Systems Discharge Criteria to incorporate the results of the FPRF Project on Sprinklers Under Sloped Ceilings into NFPA 13. The Task Group consisted of Ken Isman (Chair), Wes Baker, Chase Browning, Mike Joanis, Larry Frank, Joe Noble, Abram Selim Fouad, Kevin Hall, Carry Webber, and Karl Wiegand.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 135-NFPA 13-2023 [Section No. 3.3.22]	

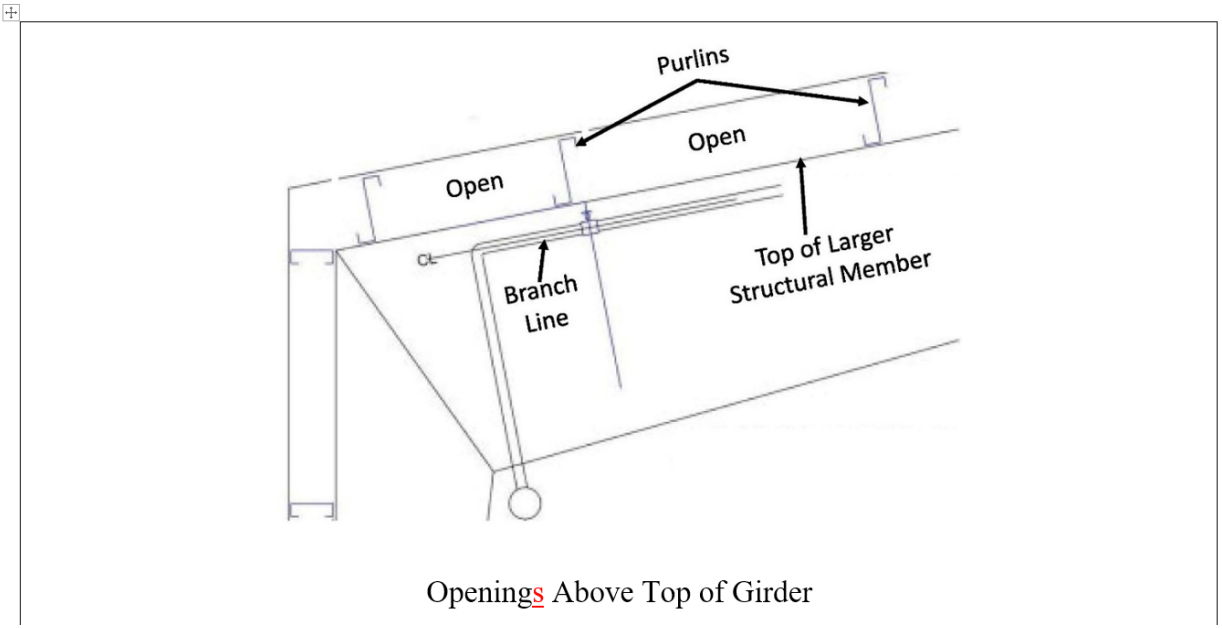
Related Item

• FR 1331

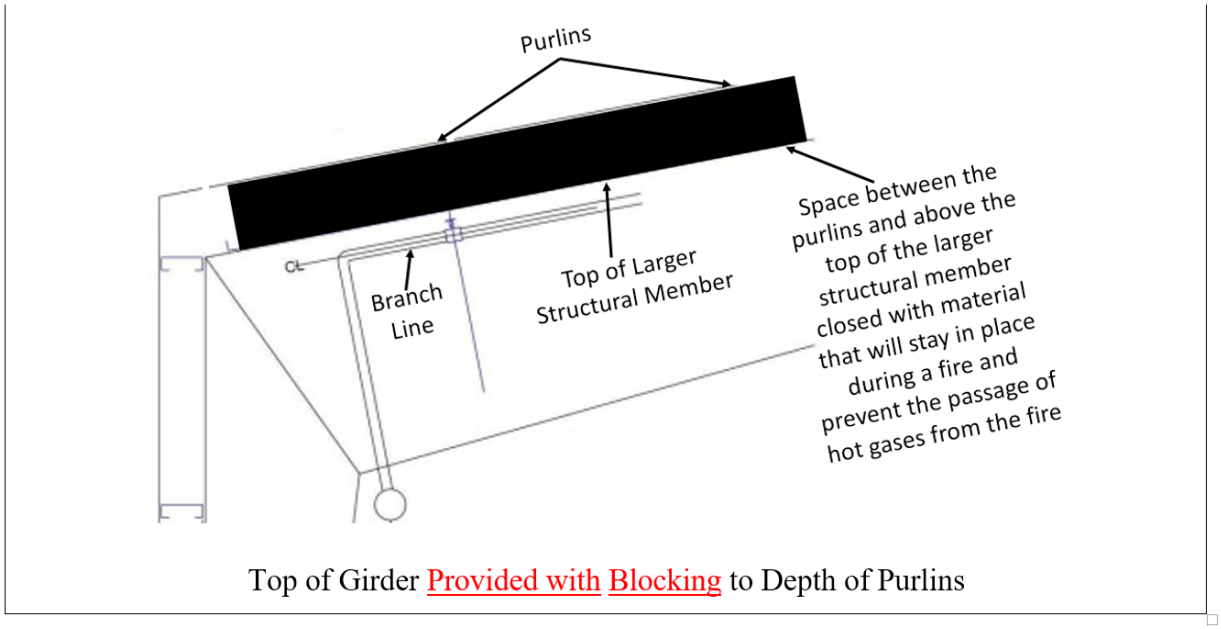
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Committee: AUT-SSD

Figure A.3.3.22



Openings Above Top of Girder



Top of Girder Provided with Blocking to Depth of Purlins

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

Public Comment No. 163-NFPA 13-2023 [New Section after A.4.2(4)]

A.4.3

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

Type your content here ...

Statement of Problem and Substantiation for Public Comment

This comment is related to PC-162 which seeks to relocate the storage plan provisions from Chapter 28 to Chapter 4. This specific comment seeks to relocate the annex note A.28.2 to A.4.3

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 162-NFPA 13-2023 [New Section after 4.2]	
Public Comment No. 168-NFPA 13-2023 [Section No. 28.2]	

Related Item

• FR-1246

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Committee: AUT-SSD

Public Comment No. 66-NFPA 13-2023 [Section No. A.4.4.3.2]

A.4.4.3.2

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

(1) Agricultural facilities

(2) Automobile parking garages

(3) Barns and stables

(4) Cereal mills

(5) Chemical plants — ordinary

(6) Confectionery products

(7) Distilleries

(8) Dry cleaners

(9) Exterior loading docks (Note that exterior loading docks only used for loading and unloading of ordinary combustibles should be classified as OH2. For the handling of flammable and combustible liquidsor hazardous materials, or where utilized for storage, exterior and interior loading docks should be protected based upon the actual occupancy and the materials handled on the dock, as if the materials were actually stored in that configuration.)

(10) Feed mills

(11) Horse stables

(12) Leather goods manufacturing

(13) Libraries — large stack room areas

(14) Machine shops

(15) Metal working

(16) Mercantile

(17) Paper and pulp mills

(18) Paper process plants

(19) Piers and wharves

(20) Plastics fabrication, including blow molding, extruding, and machining; excluding operations using combustible hydraulic fluids

(21) Post offices

(22) Printing and publishing

(23) Racetrack stable/kennel areas, including those stable/kennel areas, barns, and associated buildings at state, county, and local fairgrounds

(24) Repair garages

(25) Resin application area

(26) Stages

(27) Textile manufacturing

(28) Tire manufacturing

(29) Tobacco products manufacturing

(30) Wood machining

(31) Wood product assembly

(32) Car stackers and car lift systems where sidewall sprinkler protection is provided under each level of cars.

Statement of Problem and Substantiation for Public Comment

NFPA A.10.3.2(9) currently provides guidance on the use of sidewall sprinkler protection for car stackers. This correlates the criteria in chapter 10 to the occupancy example in chapter 4.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 67-NFPA 13-2023 [Section No. A.4.4.4.2]	
Public Comment No. 68-NFPA 13-2023 [Section No. A.20.4.5.1]	
Public Comment No. 75-NFPA 13-2023 [New Section after 26.9.1.2]	

Related Item

• PI310

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Committee: AUT-SSD

Public Comment No. 67-NFPA 13-2023 [Section No. A.4.4.4.2]

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 two cars stacked vertically and ceiling only protection

(10) Diesel fire pump houses and rooms containing pump drivers and fuel tanks

Statement of Problem and Substantiation for Public Comment

Provides clarification that the extra hazard classification for car stackers correlates to systems with ceiling only protection,

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 66-NFPA 13-2023 [Section No. A.4.4.3.2]	
Public Comment No. 68-NFPA 13-2023 [Section No. A.20.4.5.1]	
Public Comment No. 75-NFPA 13-2023 [New Section after 26.9.1.2]	

Related Item

• PI 310

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Public Comment No. 90-NFPA 13-2023 [Section No. A.20.4.1]

A.20.4.1

See Table A.20.4.1.

Table A.20.4.1 Examples of Class I Commodities

Product Heading	Product	
Batteries	Dry cells (excludes lithium, lithium-ion, and other similar exotic metals or combustible electrolyte); without blister packing (if blister packed refer to commodity classification definitions)	
	-	Vehicle; small (e.g., automobile); wet (excludes lithium-ion and other cells containing combustible electrolyte) cells
Empty Containers	Noncombustible	
Flammable/Combustible Liquids	Liquids; up to 20 percent alcohol (e.g., alcoholic beverages, flavoring extracts); metal, glass or ceramic containers	
	-	Liquids; up to 20 percent alcohol (e.g., alcoholic beverages, flavoring extracts); up to 5 gal (20 L) plastic bottles or jars
Food Products — Frozen	Frozen foods; nonwaxed or nonplastic packaging	
Food Products — Non-Frozen	Foods (coffee, fish products, fruit, meat products, nuts, poultry, etc.); metal cans	
	-	Fruits and vegetables (noncombustible semi-liquids); crushed; plastic containers up to 5 gal (20 L)
	-	Fruits and vegetables; fresh; wood spacers, non-plastic trays or containers
	-	Meat; fresh; no plastic packaging; exposed
	-	Milk; paper containers, or plastic bottles or jars up to 5 gal (20 L) plastic bottles or jars
	-	Salt; bagged
Furniture and Bedding	Furniture; metal (e.g., file cabinets or desks with plastic trim); cartoned	
Housing Materials/Appliances	Appliances; major (e.g., stoves, refrigerators); no appreciable plastic interior or exterior trim; ~~cartoned~~ Exposed	
	-	Gypsum board

Product Heading	Product	
	-	Paint; water-based (latex); friction-top metal containers; cartoned
Miscellaneous	Motors; electric	
	-	Transformer; dry or empty (i.e., void of oil)
Noncombustible Liquids	Liquids or semi liquids; PET containers greater than 5 gal (20 L) having a nominal wall thickness greater than 0.25 in. (6 mm)	
	-	Liquids or semi-liquids (e.g., crushed fruits and vegetables); plastic containers up to 5 gal (20 L) capacity
	-	Liquids; cardboard drink boxes, plastic-coated, wax-coated, and/or aluminum-lined; exposed or on corrugated carton trays with plastic sheeting
	-	Liquids; glass bottles or jars; cartoned
Plastic/Rubber	Plastics; stored in fully closed and solid (no openings), metal containers	
Powders/Pills	Powders; noncombustible free-flowing powdered or granular materials (cement, calcium chloride, clay, iron oxide, sodium chloride, sodium silicate, etc.); bagged	
	-	Powders; noncombustible; glass bottles or jars; cartoned
Wire/Cable/Spools	Wire; bare; metal spools, exposed	

Additional Proposed Changes

File Name	Description	Approved
Screenshot_2023-05-11_082406.png	Table A.20(b)	

Statement of Problem and Substantiation for Public Comment

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

Related Item

• First draft report •

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Committee:	AUT-SSD

Δ **Table A.20.4(b)** ***Continued***

Product Heading	Product	NFPA 13
	Milk; paper containers, or plastic bottles or jars up to 5 gal (20 L) plastic bottles or jars	Class I
	Salt; bagged	Class I
	Salt; cartoned	Class II
	Snack foods (e.g., potato chips); plasticized aluminum bags; cartoned	Group A Nonexpanded
	Syrup; wooden container	Class II
Furniture and Bedding	Furniture and bedding; with foam cushioning	Group A Expanded
	Furniture; metal (e.g., file cabinets or desks with plastic trim); cartoned	Class I
	Furniture; wood (e.g., doors, windows, cabinets, etc.); no plastic coverings or foam cushioning	Class III
	Furniture; wood; plastic coverings nonexpanded plastic trim	Class IV
	Box spring; standard (minimal plastic materials)	Class III
	Box spring; wrapped in plastic cover	Class IV
	Mattress; foam (in finished form)	Group A Expanded
Housing Materials/ Appliances	Appliances; major (e.g., stoves, refrigerators); no appreciable plastic interior or exterior trim; cartoned	Class II
	Appliances; major (e.g., stoves, refrigerators); no appreciable plastic interior or exterior trim; exposed	Class I

Public Comment No. 68-NFPA 13-2023 [Section No. A.20.4.5.1]

A.20.4.5.1

See Table A.20.4.5.1.

Table A.20.4.5.1 Examples of Group A Plastic Commodities

Product Heading	Product	Expanded/Nonexpanded	
Batteries	Vehicle; any size (e.g., automobile or truck); empty plastic casing	Nonexpanded	
	-	Vehicle; large (e.g., truck or larger); dry or wet (excludes lithium-ion and other cells containing combustible electrolyte) cells	Nonexpanded
Empty Containers	Rigid plastic (not including PET), up to 32 oz (1 L)	Nonexpanded	
	-	Rigid plastic (not including PET), greater than 32 oz (1 L)	Expanded
Film Rolls, Including Photographic	Film (polypropylene, polyester, polyethylene); rolled on any reel type	Nonexpanded	
Flammable/Combustible Liquids	Lighters; butane; blister-packed; cartoned	Nonexpanded	
	Liquids; up to 20 percent alcohol (e.g. alcoholic beverages, flavoring extracts); greater than 5 gal (20 L) plastic containers with wall thickness greater than ¼ in. (6 mm)	Nonexpanded	
Food Products — Non-Frozen	Margarine; over 50 and up to 80 percent oil	Nonexpanded	
	Milk; any container; stored in solid plastic crates	Nonexpanded	
	-	Snack foods (e.g., potato chips); plasticized aluminum bags; cartoned	Nonexpanded
Furniture and Bedding	Furniture and bedding; with foam cushioning	Expanded	
	-	Mattress; foam (in finished form)	Expanded
Housing Materials/Appliances	Carpet tiles; cartoned	Nonexpanded	
	Floor coverings; vinyl; rolled	Nonexpanded	

Product Heading	Product	Expanded/Nonexpanded	
Miscellaneous	Charcoal; mineral spirit impregnated; bagged	Expanded	
	-	Toys; stuffed; foam or synthetic	Expanded
Noncombustible Liquids	Liquids or semi-liquids; plastic (except PET) containers greater than 5 gal (20 L) capacity having a nominal wall thickness greater than ¼ in. (6 mm)	Nonexpanded	
	-	Liquids; cardboard drink boxes, plastic-coated, wax-coated, and/or aluminum-lined; stored in plastic containers	Nonexpanded
	-	Liquids; plastic bottles or jars; stored in open or solid plastic crates	Nonexpanded
Paper Products	Cartons; wax-coated, single-walled corrugated	Nonexpanded	
	-	Cellulosic paper products; wax-coated (paper plates, cups, etc.); loosely packed; cartoned	Nonexpanded
	-	Matches; wooden; cartoned	Nonexpanded
	-	Tissue products; plastic-wrapped; exposed	Nonexpanded
Plastic/Rubber	ABS (Acrylonitrile-butadiene-styrene copolymer)	Nonexpanded	
	-	Acetal (polyformaldehyde)	Nonexpanded
	-	Acrylic (polymethyl methacrylate)	Nonexpanded
	-	Automobile bumpers and dashboards	Expanded
	-	Butyl rubber	Nonexpanded
	-	Cellulose Acetate Butyrate	Nonexpanded
	-	Containers; nonexpanded plastic gridded or solid; collapsed or nested with no air spaces	Nonexpanded
	-	EPDM (ethylene-propylene rubber)	Nonexpanded
	-	Ethyl Cellulose	Nonexpanded
	-	FRP (fiberglass-reinforced polyester)	Nonexpanded
	-	Nitrile Rubber (acrylonitrile-butadiene rubber)	Nonexpanded

Product Heading	Product	Expanded/Nonexpanded	
	-	Nylon (nylon 6, nylon 6/6)	Nonexpanded
	-	PET (Polyethylene Terephthalate - thermoplastic polyester)	Nonexpanded
	-	Polybutadiene	Nonexpanded
	Polycarbonate	Nonexpanded	
	-	Polyester elastomer	Nonexpanded
	-	Polyethylene	Nonexpanded
	Polypropylene	Nonexpanded	
	-	Polystyrene; foam products (e.g., plates, cups, etc.)	Expanded
	-	Polystyrene; rigid products	Nonexpanded
	-	Polyurethane	Expanded
	-	PVC (polyvinyl chloride) products, greater than 20 percent plasticizer	Nonexpanded
	-	PVF (polyvinyl fluoride)	Nonexpanded
	-	Rubber; natural in blocks; cartoned	Nonexpanded
	-	Rubber; natural; expanded	Expanded
	-	Rubber; natural; nonexpanded	Nonexpanded
	-	Rubber; synthetic (santoprene)	Nonexpanded
	-	SAN (styrene acrylonitrile)	Nonexpanded
	-	SBR (styrene-butadiene rubber)	Nonexpanded
Plastic Containers	Bottles or jars (except PET) greater than 1 gal (4 L) containing noncombustible solids	Nonexpanded	
	-	Bottles or jars (except PET) up to 1 gal (4 L) containing noncombustible solids (Group A, cartoned (treat as cartoned even if exposed)	Nonexpanded
Powders/Pills	Powders; noncombustible; plastic (other than PET) bottles or jars; exposed	Nonexpanded	
	-	Powders; noncombustible; plastic bottles or jars greater than 1 gal (4 L) capacity	Nonexpanded
Textile Materials/Products	Diapers; plastic or nonwoven fabric; plastic-wrapped; exposed	Nonexpanded	
	-	Fabric; vinyl-coated (e.g., tablecloth); cartoned	Nonexpanded

Product Heading	Product	Expanded/Nonexpanded
	- Fabric; synthetic (except rayon and nylon; greater than 50/50 blend	Nonexpanded
	- Fibers; synthetic (except rayon and nylon); baled	Nonexpanded
	- Thread or yarn; rayon or nylon; plastic spools	Nonexpanded
	- Thread or yarn; synthetic (except rayon and nylon); greater than 50/50 blend; plastic spools	Nonexpanded
	- Thread or yarn; synthetic (except rayon and nylon); up to 50/50 blend; plastic spools	Nonexpanded
Wax Products	Candles	Expanded
	- Paraffin or petroleum wax; blocks	Expanded
Wire/Cable/Spools	Spools; plastic; empty	Nonexpanded
	- Wire; bare; plastic spools; exposed	Nonexpanded
Automobiles	Internal Combustion Engine or Electric Vehicle	Nonexpanded

Statement of Problem and Substantiation for Public Comment

NFPA 88A currently defers to NFPA 13 for guidance on the protection of rack storage of internal combustion engine and electric vehicles. NFPA 13 does not address this commodity. Current guidance is limited to vehicles two stacks high. The Fire Protection Research Foundation Report "Modern Vehicle Hazards in Parking Garages & Vehicle Carriers" included historic data on heat release rates (Table 7) for select vehicles and figures 11 and 12 includes a comparison between ICE and EV vehicles. Providing guidance on commodity classification will provide design professionals with a starting point upon which they can base a design.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 66-NFPA 13-2023 [Section No. A.4.4.3.2]	
Public Comment No. 67-NFPA 13-2023 [Section No. A.4.4.4.2]	
Public Comment No. 75-NFPA 13-2023 [New Section after 26.9.1.2]	

Related Item

• PI 310

Submitter Information Verification

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Submittal Date: Tue Apr 04 14:25:41 EDT 2023

Committee: AUT-SSD

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

A.26.2

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

Statement of Problem and Substantiation for Public Comment

This is annex text that was in the 2016 edition but omitted from the 2019 and 2022 editions.

Related Item

• FR1218

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

A.28.1

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

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

Drawings that accompany the certificate should include the following:

(1) Name of owner and occupant

(2) Location, including street address

(3) Point of compass

(4) Construction and occupancy of each building

(5) Building height in feet

(6) Waterflow test information and, if a waterflow test of the city main is available, indicate the following:

(7) Date and time of the test

(8) Name of party that conducted the test

(9) Location of the hydrants where the flow was taken and where static and residual pressure readings were recorded *(see A.5.2.2)*

(10) Size and configuration of mains supplying the hydrants

(11) Size and number of open hydrant butts that flood

(12) Results of the test

(13) Required adjustments to the waterflow test information

(14) Building features such as combustible concealed spaces, floor openings, areas subject to freezing, and areas from which it is intended to omit sprinkler protection

(15) Proposed location and approximate size, if a water supply employing pumps or tanks is contemplated

(16) Name and address of party submitting the preliminary plans

(17) Tentative location of major piping, including mains underground, risers, overhead mains, and fire department connections

(18) The need for seismic protection and the applicable short period response parameter.

Figure A.28.1(a) Typical Preliminary Plan.

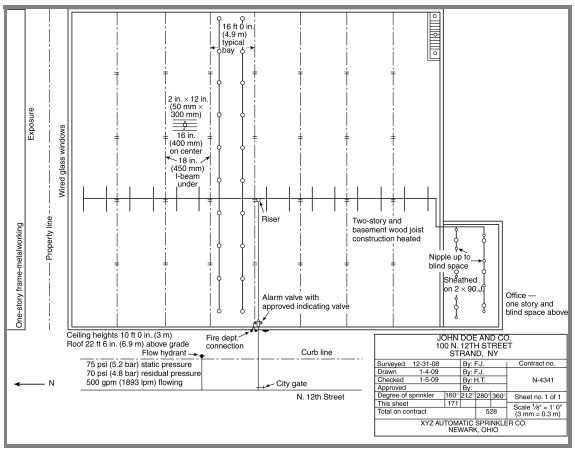


Figure A.28.1(b) Owner's Information Certificate.

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

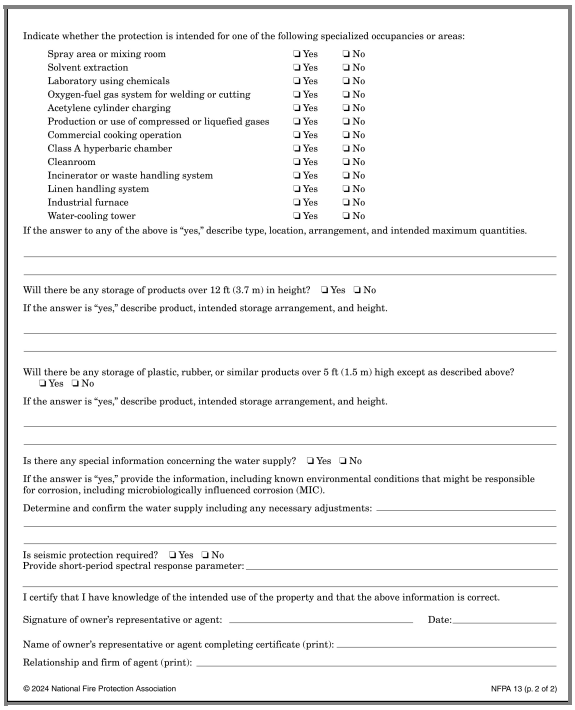
If the answer to any of the above is "yes," the appropriate NFPA standard should be referenced for sprinkler density/area criteria.

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

Flammable or combustible liquids	❑ Yes	❑ No
Aerosol products	❑ Yes	❑ No
Nitrate 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.

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

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

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

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

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

Will there be any storage of plastic, rubber, or similar products over 5 ft (1.5 m) high except as described above? ❑ Yes ❑ No

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

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

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

Determine and confirm the water supply including any necessary adjustments:

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

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

Signature of owner's representative or agent: Date:

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

Relationship and firm of agent (print):

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Statement of Problem and Substantiation for Public Comment

FR 1170 added the need to determine any necessary adjustments to the waterflow test data to the Owners Certificate. In a previous cycle, the language for seismic protection and the applicable short period response parameter was added to the Owners Certificate. It is unreasonable to expect that a building owner will be able to provide this information. Some Committee members argued that the Owners Certificate information is provided by the owner or their designated representative. If the information is to be provided by the owner's designated representative, it should be on the preliminary plans (as outlined in A.28.1).

Admittedly this comment changes the information from being a mandatory requirements as compared to being included on preliminary plans which are discussed in Annex A. However, it would be considered new information to add provisions that the preliminary plans become a mandatory requirement. In the absence of preliminary plans, one would expect the information to be contained on the working plans.

Related Item

• FR 1170

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

A.28.3.4.7.4.3(A)

If there is a single line of sprinklers installed under the obstruction, then 4 sprinklers on the same branch line should be included in the hydraulic calculations. If, however, there is more than one line of sprinklers installed under the obstruction, then the hydraulic calculations should account for 2 sprinklers on 2 lines.

Statement of Problem and Substantiation for Public Comment

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

Related Item

• FR-1268

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