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Keeping Up with NFPA 13

Instructor: Bob Caputo, CFPS

Bob Caputo, president of the American Fire Sprinkler Association (AFSA), is chair of the NFPA 24 and NFPA 291 technical committees and a member of multiple NFPA technical committees, including NFPA 13 and NFPA 25. Caputo is a contributor of the NFPA 13 and NFPA 25 Handbooks, and the NFPA Inspection Manual. A senior member of NFPA and AFSA faculties, Caputo has written and presented courses available on the protection and life-safety systems and is a regular speaker at AFSA and NFPA conventions. Caputo is an instructor at the National Fire Academy and an advisory board member at Oklahoma State University’s Industrial Fire Prevention Engineering & Safety. Caputo’s industry distinctions include: “Fire Prevention Officer of the Year” from San Diego County in 1994, “Man of the Year” from Fire Protection Contractor magazine in 1997, and the Henry S. Parmelee award from AFSA in 2017. Caputo attended the University of Albuquerque, New Mexico, and is a U.S. Navy veteran and former volunteer firefighter.

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Disclaimer

This seminar and its content is not a formal interpretation issued pursuant to NFPA regulations. Any opinion expressed is the personal opinion of the author and presenter and does not necessarily present the official position of the NFPA and its Technical Committees.
NFPA Standards Development

- Standards are updated every 3 to 5 years.
- Approximately 8,880 volunteers serve on NFPA Technical Committees.
- Technical Committees represent a balanced variety of interests.
- Approximately 260 Technical Committees are responsible for document development.
- AFSA representation
  - 55 Committees
  - 44 Documents
  - 118 Seats (Principal/Alternate)

NFPA Standard Development Process

WE NEED YOU
Administration
Chapter 1

Are you Qualified Knowledgeable and Trained?

- Legislative process needs to address qualifications
- Includes and licensure or certifications

Equivalency

- Use the best information
- Latest edition, in its entirety
- Standard revision cycle is not fast enough to keep up with latest advances
- Many jurisdictions behind by several editions

Section 1.2.2

Section A.1.5
New Definitions
Chapter 3

Floor area covered by a sprinkler
Assigned to the design area

Figure A.28.3.4.2.1

Section 3.3.8

Moved from the annex to the body
Capable of trapping heat
Maximum 300 ft²

Missing Information
- No unfilled penetrations at roof interface
- Beams permitted to be spaced more than 7-½ feet apart

Section 3.3.237
Automatic Breach Control Valve

- Designed to shut off water supply during catastrophic event
- Not permitted to be installed on sprinkler systems
- Not listed for fire protection use
- How do you determine catastrophic loss?

Dwelling Unit

- New annex language added
- Common areas for residential use are a part of the dwelling unit
- Examples:
  - Lounges
  - Group kitchens
  - Laundry spaces

Supplemental Sprinklers

- New Term, Old Concept
3.3.220.3.6 Supplemental Sprinkler:
A sprinkler that is installed below an obstruction. (AUT-SSI)

Can be QR ordinary temperature
Should be the same K-factor, orientation, and coverage type as ceiling
19.5 Design Approaches for Supplemental Sprinklers.
When required to be included in the hydraulic calculations in accordance with 28.3.4.7.4.3, the design approach for supplemental sprinklers shall be permitted to be based on the hazard located directly below the obstruction.
Sloped Ceilings and Obstructed Construction

- Initially based on different slopes
- Returned to 2022 language
- Updated requirements for concrete tees
  - 3 inch below
  - Limited to 30 inch depth

Section 10.2.7.1.2

Design Approaches for Sloped Ceilings

- Increase design area 30% unless
- False ceiling - 3 lb/sq. ft
- Slopes not exceeding 4 in 12 structure must have
  - Purlins
    - Perpendicular to slope
    - Not exceeding 18 inch depth
    - Not exceed 5 ft on center
  - Beams
    - Not exceeding 40 ft on center
  - Blocking

Section 19.2.3.2.4

Blocking

- Previously “firestopped”
- Eliminates confusion
- Uses equivalent construction materials
- Limits channeling of heat at the ceiling level
- Small openings at roof interface can be ignored

Section 3.3.22
Design Approaches for Sloped Ceilings

- Increase design area 30% unless
  - Slopes not exceeding 4 in 12
  - Sprinklers installed in every beam channel

Shape Factors

\[ L = 1.2\sqrt{A} \]

- Discussions to increase shape factor to 1.4
- Based on steep slopes and obstructed vs. unobstructed construction
- Ultimately REJECTED
- All scenarios remain at 1.2

High Clearance

Ceiling Heights Greater Than 30 ft
Limited Use of Sprinklers

- Not allowed when:
  - Ceiling heights greater than 30 ft
  - Sidewalls in OH1 and higher
  - Sprinklers less than K-11.2 in OH2 and higher
  - EC pendants K-22.4 or less in OH2 and higher
  - Ceiling heights greater than 40 ft
  - SR standard-coverage sprinklers in OH2

- Corresponding sections in installation chapters

Discharge Adjustments

- OH1 (>30 ft):
  - Increase design area 30%

- OH2 (>30 ft but < 40 ft):
  - Minimum 0.37 gpm/sq. ft

- OH2 (>40 ft):
  - Minimum 0.45 gpm/sq. ft
  - Increase design area 30%
  - Not required for EC K-25.2 or higher

- EH1 and EH2 (>30 ft):
  - Minimum 0.45 gpm/sq. ft

Summary of Requirements

<table>
<thead>
<tr>
<th>Ceiling Height</th>
<th>Sprinkler Coverage</th>
<th>K-factor US</th>
<th>K-factor Metric</th>
<th>Spray Type</th>
<th>Minimum GPM/Sq. ft</th>
<th>Increase Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>OH1 (&gt;30 ft)</td>
<td>Standard or Extended</td>
<td>5.6 (80) SR or QR</td>
<td>80</td>
<td>Upright or Pendent</td>
<td>Per Table 19.2.3.1.1</td>
<td>30% increase</td>
</tr>
<tr>
<td>OH2 (&gt;30 ft but &lt; 40 ft)</td>
<td>Standard</td>
<td>11.2 (160) QR</td>
<td>160</td>
<td>Upright or Pendent</td>
<td>0.37 (15.1)</td>
<td>None</td>
</tr>
<tr>
<td>OH2 (&gt;40 ft)</td>
<td>Standard</td>
<td>11.2 (160) SR or QR</td>
<td>160</td>
<td>Upright or Pendent</td>
<td>0.45 (18.3)</td>
<td>None</td>
</tr>
<tr>
<td>OH2 (&gt;40 ft)</td>
<td>Extended</td>
<td>25.2 (360) SR or QR</td>
<td>360</td>
<td>Upright or Pendent</td>
<td>0.45 (18.3)</td>
<td>None</td>
</tr>
<tr>
<td>OH1 (&gt;30 ft)</td>
<td>Standard or Extended</td>
<td>5.6 (80) SR or QR</td>
<td>80</td>
<td>Upright or Pendent</td>
<td>Per Table 19.2.3.1.1</td>
<td>30% increase</td>
</tr>
<tr>
<td>OH2 (&gt;30 ft but &lt; 40 ft)</td>
<td>Standard</td>
<td>11.2 (160) QR</td>
<td>160</td>
<td>Upright or Pendent</td>
<td>0.37 (15.1)</td>
<td>None</td>
</tr>
<tr>
<td>OH2 (&gt;40 ft)</td>
<td>Standard</td>
<td>11.2 (160) SR or QR</td>
<td>160</td>
<td>Upright or Pendent</td>
<td>0.45 (18.3)</td>
<td>None</td>
</tr>
<tr>
<td>OH2 (&gt;40 ft)</td>
<td>Extended</td>
<td>25.2 (360) SR or QR</td>
<td>360</td>
<td>Upright or Pendent</td>
<td>0.45 (18.3)</td>
<td>None</td>
</tr>
<tr>
<td>EH1 &amp; EH2 (&gt;30 ft)</td>
<td>Standard</td>
<td>16.8 (240) SR</td>
<td>240</td>
<td>Upright or Pendent</td>
<td>0.45 (18.3)</td>
<td>None</td>
</tr>
<tr>
<td>EH1 &amp; EH2 (&gt;30 ft)</td>
<td>Extended</td>
<td>25.2 (360) SR</td>
<td>360</td>
<td>Upright or Pendent</td>
<td>0.45 (18.3)</td>
<td>None</td>
</tr>
</tbody>
</table>
General Requirements

Did someone say, “Owner’s Certificate?”

Owner’s Certificate

Table 4.3.1.7.1 and Table 4.3.1.7.4

Miscellaneous and Low-Piled Storage

- Miscellaneous
  - Not exceeding 12 ft
  - Meets entire definition
- Low-piles
  - Class I-IV not exceeding 12 ft
  - Group A not exceeding 5 ft
- Tables split for clarity
System Area Limitations

- Currently limited to
  - 52,000 sq. ft. for LH/OH
  - 40,000 sq. ft for EH/Storage
- WHY?!
  - Pipe schedule method
- Ideas
  - Use as a nominal value
  - Allow unlimited areas?
  - Allow increase when electrically supervised?

Section 4.1.1

System Area Limitation

- System are permitted to increase to 78,000 sq. ft
  - Light Hazard Occupancies
    - Wet System
    - Electrical supervision
- Future considerations
  - Does hazard matter?
  - System type?

Section 4.1.1

Installation of Underground
Thrust Forces and Automated Testing

- Thrust forces based on test pressure
- Thrust block area
- Thrust block volume
- Automated inspection and testing devices
- AUT-PRL... Not a fan

System Types and Components

- New technologies

Corrosion Inhibitors

- Listed
- Additive to the system to limit corrosion reactions
- C Value of 120 for dry and preaction
- Corresponding ITM requirements in NFPA 25
Reorganization of Dry Pipe Requirements

- Water delivery time requirements were getting sloppy
- Clarified requirements for single and multi-orifice ITCs

Section 8.2

New System: Vacuum/Negative Pressure Systems

- Uses specially listed sprinklers
  - Vacuum pressure
- Listed system
  - Follow manufacturer's instructions
- New system requirements
  - Follow corresponding requirements for dry and preaction systems

Section 8.11

Air Supplies

- Required to be listed for fire protection
  - Dedicated for sprinkler system

Section 7.10
Sprinkler Location Requirements

To omit or not to omit…

Closets

- “Check your doors at the door”
- Should only need to meet the definition of “compartment”
- Needs to correlate with NFPA 13R/13D

Elevator Pits

Section 9.2.14.2 & 9.3.6
Elevator Pits

Section 9.2.14.2 & 9.3.6

Elevator Hoistways

Section 9.3.6.2

Skylights

All skylights are ceiling pockets
Not all ceiling pockets are skylights
If skylight exceeds 32 sq. ft, use ceiling pocket rules
- Less than 3 ft deep
- No more than 1,000 cu. ft combined volume

Section 9.3.16.2
Intermediate Temperature Sprinklers

Section 9.4.2.1

3.3.5* Alcove.
An area in a compartment or corridor that is set back from the rest of the wall it is located along.

(AUT-SSI)

Section 3.3.5

3.3.5* Alcove.

For light hazard occupancies

* 18 in. clearance does not need to be maintained

Limitations

- 10 ft ceiling height
- 50 sq. ft area
- 1 in. clearance is maintained

Section 10.2.7.3.1.3
Obstruction Rules

- CMSA = ESFR
- Can be installed in sloped ceilings
  - Up to 4 in 12 pitch
  - New positioning rules
    - Based on slope
    - Based on construction type
      - Obstructed (solid)
      - Unobstructed

Storage Sprinklers

Sloped Ceilings and Obstructed Construction

- Slopes not exceeding 1 in 12
  1. 6 to 12 in. below deck (each channel)
  2. Max depth < 18 in.
  3. Max depth > 18 in. & < 24 in.
     1. Up to 6 in. below
     2. 400 cu. ft max (blocking)
  4. Wood or Composite wood joists
     1. 400 cu. ft max
     2. 6 in. below, but < 22 in. from deck

Sloped Ceilings and Obstructed Construction

- Slopes not exceeding 2 in 12
  1. 1 to 12 in. below deck (each channel)
  2. Max depth < 12 in.
  3. Max depth > 12 in. & < 24 in.
     1. Up to 6 in. below
     2. 400 cu. ft max (blocking)
  4. Wood or Composite wood joists
     1. 400 cu. ft max (blocking)
     2. 6 in. below, but < 22 in. from deck
1. Slopes not exceeding 4 in 12
   1. 1 to 12 in. below deck (each channel)
   2. Max depth < 12 in.
      • Up to 6 in. below member
      • 300 cu. ft max (blocking)

2. Slopes exceeding 4 in 12
   1. 6 to 12 in. below deck (each channel)
   2. Max depth <12 in.
      • Up to 6 in. below structural member
      • 300 cu. ft max (blocking)

3. If greater than 50% open
   • 1 in. to 12 in. below deck
   • Same as unobstructed

Section 13.2.6.1.2.3

Section 10.2.6.1.2.4

Section 13.2.6.1.2.4
Installation of Piping, Valves, and Appurtenances

Trust but verify

Documentation Cabinet

- Installed at an approved location
- Large enough to contain all documentation (see chapter 29)
- Electronic formats permitted

Documentation Cabinet

Section 16.11.1.3

Documentation Cabinet

Section 16.11.1.3
Pressure Gauges

Section 16.13.3

2X WORKING PRESSURE
1.5X WORKING PRESSURE

Seismic Protection
Shaking up the requirements

Revised Tables

Table 18.5.5.2(a)
Seismic Coefficient

\[ F_{pw} = C_p W_p \]

**No more \( C_p \) tables**

\[ C_p = 0.754 S_{DS} \]

\[ F_{pw} = 0.754 S_{DS} W_p \]

https://www.seismicmaps.org/

---

Plans and Calculations

Not another sign!

---

Storage Floor Plan

Section 28.2
**Flexible Sprinkler Hoses**

- Required to be calculated
- Friction loss based on number of bends referenced in manufacturer's data
- Previously permitted maximum only
- Other values permitted in UL 2443 update

Section 28.3.4.8.1

---

**More C Values**

- C Value of 120 now permitted for:
  - Vacuum systems
  - Vapor corrosion inhibitor
- NEW systems only
- Black or galvanized steel pipe
- ITM in accordance with NFPA 25

Section and Table 28.3.4.8.1

---

**System Acceptance**

Consequences from moving the CMT certificate to the annex
Remote Acceptance

- Witnessing of test can be done remotely
  - By the AHJ
  - In accordance with NFPA 915
- Performance of tests remotely not permitted

30-Minute Fill Test

- Verification of 30-minute fill in the field

Venting

- Manual air vents need to be operated when filling the system
Existing Systems

Consolidating the Existing System Requirements

Current Language in 2022 Edition

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Density/Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light</td>
<td>0.1/1500 or 0.07/3000*</td>
</tr>
<tr>
<td>Ordinary Group 1</td>
<td>0.15/1500 or 0.12/3000*</td>
</tr>
<tr>
<td>Ordinary Group 2</td>
<td>0.2/1500 or 0.17/3000*</td>
</tr>
<tr>
<td>Extra Group 1</td>
<td>0.3/2500 or 0.28/3000*</td>
</tr>
<tr>
<td>Extra Group 2</td>
<td>0.4/2500 or 0.38/3000*</td>
</tr>
</tbody>
</table>

Table/Figure 19.2.3.1.1

Density Curves for Existing Systems

Chapter 19, 21, and 25
Existing System Curves

- Deleted from the 2025 edition
- First Draft
- Old curves can be used for the evaluation of existing systems
  - Based on edition used at original install
- Edition of NFPA 13 used required to be on the General Information Sign
- Proposed for 2025

Structure of Chapter 30

- General
- Components
- Sprinklers
- Evaluation of Existing Systems
- Modification of Existing Systems
- System Design
- Testing

General Requirements

- All other requirements of NFPA 13 apply unless modified by Chapter 30
- Verify calculations when BFP or flexible sprinklers are added
  - Full hydraulic calculations are not required
  - Verify additional friction loss is not detrimental
Verifying Backflow Preventer

- Determine system demand
- Look for hydraulic placard
- Determine friction loss through BFP
- No placard?
  - Verify against as-builts
  - Main drain test
  - New flow test
  - Evaluate the system

Section 30.1.4

Verifying Flexible Sprinkler Hoses

- Determine equivalent length of existing drop
- Determine equivalent length of new flexible sprinkler hose
- Calculate friction loss with the difference

Section 30.1.5

Equivalent length of return bend:
- 10 ft pipe + 3 EL @ 2 ft = 16 ft
- Determine additional friction loss:
  \[ p = 4.52 \frac{\nu^{1.85}}{D} L(T) \]
  \[ p = \frac{4.52(22.5)^{1.85}}{(120)^{1.85}} \cdot \frac{(30 - 16)}{1.049} \]
  \[ p = 2.26 \text{ psi} \]

Section 30.1.5
Components

- Reconditioned valves and devices permitted
- Inactive systems
  - Remove Devices
  - Sprinklers
  - Hose Valves
  - Alarm Devices
  - Disable control valves
  - Uniquely identified

Evaluating Existing Systems

What Triggers an Evaluation?

- Changes in
  - Occupancy
  - Hazard
  - Water Supply
  - Storage Commodity
  - Storage Arrangement
  - Building Modification
  - Other conditions affecting installation/design criteria
What Design Criteria Do I Use?

- Treat as a new system
- Use criteria in Chs. 19-26 based on current hazard
- Use criteria from edition of NFPA originally installed
  - Keeps the curves alive
  - Allows use of old design concepts
  - Might not be best based on current knowledge

---

Modifications to Existing Systems

---

Extra Hazard Pipe Schedule

<table>
<thead>
<tr>
<th>Steel</th>
<th>Pipe Size (in.)</th>
<th>Number of Sprinklers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1-1/4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1-1/2</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>2-1/2</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>3-1/2</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>90</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Copper</th>
<th>Pipe Size (in.)</th>
<th>Number of Sprinklers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1-1/4</td>
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</tr>
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<td>1-1/2</td>
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<td></td>
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<td>2</td>
<td>8</td>
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<td>5</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>170</td>
<td></td>
</tr>
</tbody>
</table>
Revamping Pipe Schedule and Hydraulic Design

Testing
Hydrostatic Test and Deluge Systems

Hydrostatic Testing

- Isolate and test in accordance with 29.2.1
- 20 sprinklers or less
  - Test at system working pressure
- Cannot be isolated
  - Test at system working pressure
  - Any number of sprinklers

Section 30.7.1

Figure 30.5.5 and Figure 30.5.6
Deluge Systems

- Flow testing in lieu of hydro
- Verify
  - Water discharge patterns
  - Adequate coverage
  - Design pressure at nozzle
  - Design pressure at deluge valve

Any Questions?

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

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