National Fire Protection Association

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M E M O R A N D U M

TO: NFPA Technical Committee on Sprinkler System Discharge Criteria

FROM: Elena Carroll, Administrator, Technical Projects

DATE: October 14, 2011

SUBJECT: NFPA 13 ROC **TC** Letter Ballot (A2012)

The ROC letter ballot for NFPA 13 is attached. The ballot is for formally voting on whether or not you concur with the committee's actions on the comments. Reasons must accompany all negative and abstention ballots.

Please do not vote negatively because of editorial errors. However, please bring such errors to my attention for action.

Please complete and return your ballot as soon as possible but no later than **Friday, October 28, 2011.** As noted on the ballot form, please return the ballot to Elena Carroll either via e-mail to ecarroll@nfpa.org or via fax to 617-984-7110. You may also mail your ballot to the attention of Elena Carroll at NFPA, 1 Batterymarch Park, Quincy, MA 02169.

The return of ballots is required by the Regulations Governing Committee Projects.

Attachments:

Comments
Letter Ballot

13-41 Log #364 AUT-SSD Final Action: Reject

(3.9.3.8 Solid Shelving)

Submitter: Gerald R. Schultz, The FPI Consortium, Inc.

Comment on Proposal No: 13-50

Recommendation: Accept the original proposal.

Substantiation: Sufficient substantiation has been provided by Mr. Comeaux. He references test results that were run for the records industry along with FM guidelines so the question is asked of the committee, what else is required? A review of the original information submitted that first made this major change to the standard does not identify any referenced tests that need to be refuted.

Committee Meeting Action: Reject

Committee Statement: The proposed change to the definition affects all commodities stored in this document, the submitter references only specific testing for limited applications. Additional data is necessary to validate this proposed change as it applies to all designs currently allowed in Storage. The data submitted also did not have blocked flues.

13-42 Log #136 AUT-SSD Final Action: Reject

(3.9.3.8 Solid Shelving, 16.1.6.1, and 16.1.6.2)

Submitter: Larry L. Varn, Pierce Atwood LLP

Comment on Proposal No: 13-50

Recommendation: Accept the original proposal as submitted.

Substantiation: The requirement that the maximum size of a solid shelf be no greater than 20 square feet was unsubstantiated when adopted and remains so and numerous tests show that it is unnecessarily restrictive. The Committee, in rejecting the proposal, failed to address the test data described in the submitter's substantiation, which demonstrates that with the installation of in-rack sprinklers the size of a solid shelf can be substantially larger. Further, the loss history does not support the current requirements.

Committee Meeting Action: Reject

Committee Statement: The proposed change to the definition affects all commodities stored in this document, the submitter references only specific testing for limited applications. Additional data is necessary to validate this proposed change as it applies to all designs currently allowed in Storage. The data submitted also did not have blocked flues.

13-48 Log #322 AUT-SSD Final Action: Accept in Principle
(5.6.4.4)

Submitter: Richard Pehrson, Pehrson Fire PC
Comment on Proposal No: 13-59
Recommendation: Modify Proposed new 5.6.4.4 text to read as follows:
5.6.4.4 ~~Cartoned g~~Group A plastics shall be further subdivided as either expanded or non-expanded. If ~~the~~ a cartoned commodity is more than 40% (by volume) expanded plastic, it shall be protected as a~~n~~ cartoned expanded plastic. If a cartoned commodity is more than 25% expanded plastic, but not more than 40% expanded plastic, it shall be protected as an cartoned unexpanded plastic. Uncartoned commodities containing expanded plastic shall be protected as uncartoned expanded plastic.
Substantiation: The ROP text only gives criteria for cartoned commodities with greater than 40% expanded plastic. The text includes text for lower percentages, as well as giving guidance to clarify what to do with uncartoned commodities. The committee may wish to consider guidance for mixed commodities containing both unexpanded and expanded plastics (i.e. including a graph with these requirements).
This is not original material; its reference/source is as follows:
FM 8-9 Data Sheet for Commodity Classification (2004).
Committee Meeting Action: Accept in Principle
5.6.4.4 ~~Cartoned g~~Group A plastics shall be further subdivided as either expanded or non-expanded. If ~~the~~ a cartoned commodity is more than 40% (by volume) expanded plastic, it shall be protected as a~~n~~ cartoned expanded plastic. Exposed commodities containing greater than 25% by volume expanded plastic shall be protected as exposed expanded plastic."
Committee Statement: The last sentence was modified to make the requirement consistent with the definition for class IV commodity.

13-111 Log #115 AUT-SSD Final Action: Reject
(8.4.6.1.2.1 (New))

Submitter: Peter T. Schwab, Wayne Automatic Fire Sprinklers, Inc.
Comment on Proposal No: 13-178
Recommendation: Add new text to read as follows:
8.4.6.1.2.1 Open top containers shall be permitted to be used on the bottom tier of storage.
Substantiation: The concern with open top containers is that they will collect water and prevent that water from getting to a fire below them. This should not be an issue on the bottom tier of storage.
Committee Meeting Action: Reject
Committee Statement: Open top containers are defined in Section 3.9.1.19 and A.3.9.1.19.

13-250 Log #125 AUT-SSD Final Action: Accept
(11.1.7 and A.11.1.7)

Submitter: Kenneth E. Isman, National Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-28
Recommendation: Replace the existing 11.1.7 in the 2010 edition and its annex note with the following:

11.1.7*High Volume Low Speed (HVLS) Fans. ~~(Reserved)~~

11.1.7.1 The installation of HVLS fans in buildings equipped with sprinklers, including ESFR sprinklers, shall comply with the following:

1) The maximum fan diameter shall be 24 feet.
2) The HVLS fan shall be centered approximately between four adjacent sprinklers.
3) The vertical clearance from the HVLS fan to sprinkler deflector shall be a minimum of 3 feet.
4) All HVLS fans shall be interlocked to shutdown ~~within 90 seconds of water flow from the first operating sprinkler. The~~ immediately upon receiving a waterflow signal from the alarm system ~~shall be~~ in accordance with the requirements of NFPA 72, The National Fire Alarm and Signaling Code.

~~A.11.1.7 There has been some full-scale fire testing involving the interaction of HVLS fans and fire sprinklers. To date, this testing is insufficient to determine design criteria for fire sprinkler systems in the vicinity of such fans.~~

A.11.1.7 A series of 10 full scale fire tests and limited scale testing were conducted to determine the impact of HVLS fan operation on the performance of sprinkler systems. The project, sponsored by the Property Insurance Research Group (PIRG) and other industry groups, was coordinated by the Fire Protection Research Foundation (FPRF). The complete test report, titled High Volume/Low Speed Fan and Sprinkler Operation – Ph. 2 Final Report (2011), is available from the FPRF. Both Control Mode Density Area and Early Suppression Fast Response sprinklers were tested. Successful results were obtained when the HVLS fan was shut down upon the activation of the first sprinkler followed by a 90 second delay. Other methods of fan shutdown were also tested including shut down by activation of air sampling type detection and ionization type smoke detectors. Earlier fan shut down resulted in less commodity damage.

Substantiation: The HVLS fan criteria were added to NFPA 13 in Chapter 12 in the ROP, but they need to be added to Chapter 11 as well because these fans are often installed in buildings protected in accordance with ordinary hazard and extra hazard discharge criteria. The language proposed is exactly what was approved in the ROP except for the 90 second delay in shutting down the fan, which has been proposed to be changed in Chapter 12. See our comment on Chapter 12 for substantiation of this change. Whichever way the committee goes on this language, the final version should be the same in both chapters.

This comment has the endorsement of the NFSA Engineering and Standards Committee.

Committee Meeting Action: Accept

13-251 Log #5 AUT-SSD Final Action: Accept in Principle in Part
(11.2.3.1.1)

Submitter: Roland J. Huggins, American Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-370
Recommendation: Revise text to read as follows:
11.2.3.1.1 The water supply for sprinklers shall be determined only from one of the following~~, at the discretion of the designer~~ :
(1) Density/area curves of Figure 11.2.3.1.1 in accordance with the density/area method of 11.2.3.2
(2) The room that creates the greatest demand in accordance with the room design method of 11.2.3.3
(3) Special design areas in accordance with 11.2.3.4
~~(4) Special design approaches in accordance with Section 11.3.~~
Substantiation: The choice "at the discretion of the designer" is adequately covered by 11.1.1 for all types of systems and the redundancy should have been deleted when it was added to Section 11.1 (editorial).
Adding 11.2.3.1.1(4) is unnecessary since it is already addressed in the general section 11.1. In particular 11.1.3 addresses the concern that there is no legal way to use section 11.3 with a hydraulically calculated system (which if true would also apply to chapter 12). Additionally, this change confuses the user by adding guidance in an inappropriate location. 11.2 and 11.3 are separate and independent design approaches. This is no different than putting guidance on sidewall sprinklers in section 8.6 instead of 8.7.
Committee Meeting Action: Accept in Principle in Part
Add "for Spray Sprinklers" to title of 11.2 as follows:
11.2 Occupancy Hazard Fire Control Approach for Spray Sprinklers
Delete 11.2.3.1.1(4)

Replace "basis" with "approach" in 11.1.1 as follows:
11.1.1 A building or portion thereof shall be permitted to be protected in accordance with any applicable design ~~basis~~ approach at the discretion of the designer
11.2.3.1.1 The water ~~supply~~ demand for sprinklers shall….

DO NOT DELETE "at the discretion of the designer" as suggested by submitter.
Committee Statement: 11.2 and 11.3 are considered separate sections and therefore the issue is better addressed in 11.1 in the general section for the chapter. Removing the language "at the discretion of the designer" would be considered new material. Using the term design approaches provides consistency throughout the chapter.

13-252 Log #CC20 AUT-SSD Final Action: Accept
(11.2.3.1.1)

Submitter: Technical Committee on Sprinkler System Discharge Criteria,
Comment on Proposal No: 13-371
Recommendation: Delete proposal 13-371
Return to prior text.
Substantiation: 11.2.3.1.1 is already applicable and referencing it in 11.2.3.1.2 is unnecessary. Note that ROP 13-494 addressed submitters' issue regarding calculating closest to riser.
Committee Meeting Action: Accept

13-253 Log #269 AUT-SSD Final Action: Hold
(11.2.3.1.2)

Submitter: William N. Brooks, Brooks Fire Protection
Comment on Proposal No: 13-371
Recommendation: Revise the Accepted language as follows:
The minimum water supply shall be ~~as~~-calculated using one of the methods in Section 11 .2.3.1 .1 or as defined in Chapters 13-21, including any supplementary water supply for inrack sprinkler systems. and interior and exterior hose streams. When automatic sprinkler systems. including inside hose, are supplied by tanks. tank size shall be a minimum of 110 percent of nominal design flow. Water flow shall be available for the minimum duration specified in Table 11.2.3.1.2.
Substantiation: Statement of Problem and Substantiation for Comment:
1. The language accepted under 13·371 does not address calculation methods for special storage applications where a density/area approach is used.
2. Sizing of water tanks under the 13·371 accepted language would have to wait until construction drawings are issued, the sprinkler contractor is selected, and sprinkler
system shop drawings and calculations are complete. In some cases two different contractors may be responsible for a) site piping and appurtenances, and b) sprinkler
system installation. By sizing the water tank for a minimum of 110 percent of the nominal flow it is possible to determine the appropriate tank size during the development of the
construction drawings, making early coordination possible. 110 percent of the nominal flow will allow for a reasonable system hydraulic imbalance.
Committee Meeting Action: Hold
Committee Statement: This is new material and will be reviewed at the ROP meeting in the next cycle.

13-254 Log #263 AUT-SSD Final Action: Reject
(11.2.3.1.4(3))

Submitter: Rod McPhee, Canadian Wood Council
Comment on Proposal No: 13-372
Recommendation: Further clarification of the intent, perhaps by the use of a Figure, is needed.
Substantiation: See comment. It is agreed that a design area of 3000 sq ft should not be needed for sprinklers in an area that is separated from an otherwise unsprinklered concealed space by construction having a fire resistance rating equivalent to the water supply duration. However, the wording provided is confusing and does not sufficiently provide for a clear understanding of how the provisions are to be applied.
Committee Meeting Action: Reject
Committee Statement: There is no proposed text or artwork for the TC to act upon.

13-255 Log #323 AUT-SSD **Final Action: Reject**
(11.2.3.1.4(3))

Submitter: Richard Pehrson, Pehrson Fire PC
Comment on Proposal No: 13-372
Recommendation: Modify Proposed new 11.2.3.1.4(3) text to read as follows:
The term "adjacent" shall apply to any sprinkler system protecting a space above, below or next to the qualifying concealed space except where a barrier with a fire resistance rating at least equivalent to the water supply duration completely separates the concealed space from the ~~sprinklered~~ adjacent area.
Modify Proposed new A.11.2.3.1.4(3) text by modifying the last sentence as follows:
If the fire rated assembly is the qualifying concealed space, an interior fire would greatly reduce the assigned fire rated duration, so this arrangement would not limit the extent of the 3,000 ft^2 design area and additional sprinklers would need to be calculated from the adjacent area.
Substantiation: Comment is intended to clarify when it is acceptable to limit the 3,000 ft^2 design area with combustible rated assemblies.
Committee Meeting Action: Reject
Committee Statement: The TC feels that the comment does not provide any additional clarification on the application of the 3,000ft^2 rule.

13-256 Log #324 AUT-SSD **Final Action: Accept**
(11.2.3.1.4(4)(k))

Submitter: Richard Pehrson, Pehrson Fire PC
Comment on Proposal No: 13-374
Recommendation: Reject change proposed by ROP Log #559.
Substantiation: It is a mistake to not require the 3,000 ft^2 design area with this configuration. Paper backed insulation in this assembly, even if limited combustible, will give a propagating fire that can lead to flashover of the concealed space. There is no limit on how far down the ceiling can be suspended below the insulation, thus allowing the insulation to fall once the paper is consumed or plastic netting melted and giving fire access to the wood above. Finally, by not limiting the distance the suspended ceiling may be below the bottom of the joists, the sidewalls of the entire space can be exposed wood construction, with no sprinkler protection (thus providing enough fuel to start the process of burning or melting away the insulation facing to expose the joists as the insulation falls).
Committee Meeting Action: Accept
Committee Statement: The requirement for using limited combustible construction does not allow the use of the referenced facing.

13-257 Log #276 AUT-SSD **Final Action: Reject**
(11.2.3.4.4 and 22.4.4.1.3)

Submitter: Tracey D. Bellamy, Telgian Corporation
Comment on Proposal No: 13-380
Recommendation: Add new text as follows:
11.2.3.4.4 Except as provided by 14.5(2) sprinkler protection installed under open gratings as provided by 8.6.5.3.5, 8.8.5.3.4, 8.11.5.3.3 and 8.12.5.3.3 shall be ordinary temperature, quick-response sprinklers having the same: K-factor, orientation and area spacing as the sprinklers installed at the ceiling level and using the same branchline piping installed at the ceiling level. Sprinklers installed under open grating as outlined above are not required to be added to the hydraulic design of the ceiling level sprinkler system.
22.4.4.1.3 Open Gratings. Except as provided by 14.5(2) sprinkler protection installed under open gratings as provided by 8.6.5.3.5, 8.8.5.3.4, 8.11.5.3.3 and 8.12.5.3.3 shall be ordinary temperature, quick-response sprinklers having the same: K-factor, orientation and area spacing as the sprinklers installed at the ceiling level and using the same branchline piping installed at the ceiling level. Sprinklers installed under open grating as outlined above are not required to be added to the hydraulic design of the ceiling level sprinkler system.
Substantiation: The provisions of 8.6.5.3.5, 8.8.5.3.4, 8.11.5.3.3 and 8.12.5.3.3 provide no mandatory guidance as to the appropriate design criteria for the sprinklers added under open gratings. Without mandatory design parameters the user is left without sufficient guidance to determine adequate protection for such arrangement. The proposed protection criterion was developed based on the provisions of FM 8-9, 2.2.1.4.2 with an exception for that protection provided in 14.5(2).
Committee Meeting Action: Reject
Committee Statement: A single design basis does not adequately address the different conditions that can exist beneath all locations using grating. Sprinklers beneath gratings that are obstructions should mimic the ceiling design basis and when beneath a floor can be a separate design basis.

13-258 Log #325 AUT-SSD **Final Action: Reject**
(11.3.1.2.1)

Submitter: Richard Pehrson, Pehrson Fire PC
Comment on Proposal No: 13-383
Recommendation: Modify Proposed new 11.2.3.1.4(3) text to read as follows:
The term "adjacent" shall apply to any sprinkler system protecting a space above, below or next to the qualifying concealed space except where a barrier with a fire resistance rating at least equivalent to the water supply duration completely separates the concealed space from the ~~sprinklered~~ adjacent area.
Modify Proposed new A.11.2.3.1.4(3) text by modifying the last sentence as follows:
If the fire rated assembly is the qualifying concealed space, an interior fire would greatly reduce the assigned fire rated duration, so this arrangement would not limit the extent of the design area and additional sprinklers would need to be calculated from the adjacent area.
Substantiation: Comment is intended to clarify when it is acceptable to limit the 3,000 ft^2 design area with combustible rated assemblies.
Committee Meeting Action: Reject
Committee Statement: The TC feels that the comment does not provide any additional clarification on the application of the 3,000ft^2 rule. This action correlates with 13-255 (Log #323).

13-259 Log #120 AUT-SSD Final Action: Reject
(12.1.3.4.1)

Submitter: Pascal Pfeiffer, AXA
Comment on Proposal No: 13-48
Recommendation: Revise text to read as follows:

12.1.3.4.1* The clearance to ceiling shall be measured in accordance with Section 12.1.3.4.1.1 ~~and 12.1.3.4.1.2~~ through 12.1.3.4.1.3.

12.1.3.4.1.3 For corrugated metal deck roof having an upper web width 3 times or more greater than the lower web width, the clearance to ceiling shall be measured from the top of storage to the highest point of the deck.

Substantiation: This comment is to cope with various deck geometries available around the world and in particular in Europe where upper web width is significantly larger than the lower part. In such a case, heat will accumulate in the upper part. This issue has already been raised by Mr. Javeri in his comment on affirmative vote.
Committee Meeting Action: Reject
Committee Statement: This is already addressed in Section 12.1.3.4.1 - wider flues will not change the intent of this section which deals with Ceiling Clearance.

13-260 Log #127 AUT-SSD Final Action: Accept in Principle
(12.1.3.4.3 (New))

Submitter: Kenneth E. Isman, National Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-395
Recommendation: Insert a new section 12.1.3.4.3.1 as follows:

12.1.3.4.3.1 For protection of idle wood pallets in accordance with the second row of Table 12.12.1.2(a), storage of idle wood pallets on the floor up to 8 ft high shall be permitted in a building up to 30 ft in height.

Substantiation: Section 12.1.3.4.3 specifically says that idle wood pallets protected in accordance with Table 12.12.1.2(a) have to follow the rule of being designed for a maximum clearance of 20 ft. But the second row in the Table allows storage up to 8 ft in a building that is up to 30 ft high, which would result in 22 ft clearance, violating section 12.1.3.4.3.

When we pointed this out in Proposal 13-395 and asked the committee to lower the maximum ceiling height to 28 ft, we were told that the fire testing had been performed on idle wood pallets 8 ft high in a building that was 30 ft high, so that there was fire test experience for this 22 ft clearance situation and our proposal was rejected.

We are not arguing with the test data. But if the committee wants the standard to be consistent, they have to recognize that the 22 ft clearance currently in the table is allowed, otherwise, the table is violating the excessive clearance rules.

This comment has the endorsement of the NFSA Engineering and Standards Committee.
Committee Meeting Action: Accept in Principle
Committee Statement: See committee action on Log 13-37.

13-261 Log #37 AUT-SSD Final Action: Accept in Part
(12.1.3.4.4, 12.1.3.4.5, and 12.1.3.4.6)

Submitter: Roland J. Huggins, American Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-384
Recommendation: Revise text to read as follows:

12.1.3.4.4 Where the clearance to ceiling exceeds 20ft (6.1m) for ~~Table 12.12.1.2(a) or~~ Section 16.2, protection shall be based upon the storage height that would result in a clearance to ceiling of 20ft (6.1m) or providing one level of supplemental, quick-response in-rack sprinklers located directly below the top tier of storage and at every flue space intersection

12.1.3.4.5 Where the clearance to ceiling exceeds 10ft (3.1 m) for ~~Section 16.3 or~~ Section 17.2, protection shall be based upon the storage height that would result in a clearance to ceiling of 10ft (3.1m) or providing one level of supplemental, quick-response in-rack sprinklers located directly below the top tier of storage and at every flue space intersection.

12.1.3.4.6 Where the clearance exceeds 10 ft for Section 16.3 or Section 17.3 protection shall be based upon providing one level of supplemental, quick-response in-rack sprinklers located directly below the top tier of storage and at every flue space intersection.

Substantiation: Deleting the reference in 12.1.3.4.4 to Table 12.12.1.2(a) correlates with the action taken on proposal 13-394

Changes to 12.1.3.4.5 and 12.1.3.4.6 are needed because the allowance to artificially raise the height does not impose any change to criteria on Class I-IV commodities for storage greater than 25 ft (the same issue was addressed for Group A plastic by proposal 13-384). Thus, only requiring supplemental in-rack sprinklers for this arrangement is appropriate.

Committee Meeting Action: Accept in Part
Accept proposed revision to Section 12.1.3.4.4 (preprint section)
Do not accept 12.1.3.4.5 and 12.1.3.4.6.
Committee Statement: The proposal to move the reference to Section 16.3 from 12.1.3.4.5 to 12.1.3.4.6 adds additional criteria for this section that is not intended.

13-262 Log #358 AUT-SSD Final Action: Reject
(12.1.4)

Submitter: Alan L. Hall, Loss Prevention Consultants
Comment on Proposal No: 13-28
Recommendation: Renumber new 12.1.4 to 8.5.6 High Volume Low Speed Fan (then renumber remainder of sections accordingly). Keep wording the same.
Substantiation: The committee's recommendation to place this in Chapter 12 implies that this is the requirements when an HVLS fan is installed in a Storage occupancy and does not provide sufficient information that these are the requirements when installing an HVLS fan. The majority of these are used in industrial type occupancies such as a factory not a storage warehouse. If the committee wishes to have these requirements for all HVLS fans the requirements should be placed in Chapter 8.
Committee Meeting Action: Reject
Committee Statement: HVLS fans have specific design criteria and testing for storage. Reference to these fans can be submitted to other sections of this standard but need to be referenced in the storage sections - see committee action on 13-250 (Log #125).

13-263 Log #126 AUT-SSD Final Action: Accept
(12.1.4(4))

Submitter: Kenneth E. Isman, National Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-28
Recommendation: Revise part (4) as follows:
4) All HVLS fans shall be interlocked to shutdown ~~within 90 seconds of water flow from the first operating sprinkler. The~~ immediately upon receiving a waterflow signal from the alarm system ~~shall be~~ in accordance with the requirements of NFPA 72, The National Fire Alarm and Signaling Code.
Substantiation: The 90 second shut-down time is a requirement of NFPA 72 and does not need to be repeated here. By putting the 90 second limit here it appears that 90 seconds is preferable to a 20 second or 45 second delay. Actually, the shorter delays would be better, and NFPA 72 may go that way in the future with different devices, so there is no need to hold on to the 90 second requirement in NFPA 13.
This comment has the endorsement of the NFSA Engineering and Standards Committee.
Committee Meeting Action: Accept

13-264 Log #57 AUT-SSD Final Action: Reject
(12.6.7)

Submitter: George W. Stanley, Wiginton Fire Systems
Comment on Proposal No: 13-389
Recommendation: Add new text to read as follows:
12.6.7 CMSA and ESFR sprinklers shall be permitted to protect light hazard, ordinary hazard, extra hazard, storage of Class I through Class IV commodities, plastic commodities, miscellaneous storage, and other storage as specified in Chapter 12 through 20 or by other NFPA standards.
12.6.7 (1) When utilizing ESFR or CMSA sprinklers to protect light hazard and ordinary hazard occupancies, the pressure and number of design sprinklers from the ESFR or CMSA Tables shall be based on maximum ceiling height as well as Class I commodity.
12.6.7 (2) When utilizing ESFR or CMSA sprinklers to protect extra hazard occupancies, the pressure and number of design sprinklers from the ESFR or CMSA Tables shall be based on maximum ceiling height as well as Group A plastic commodity.
Substantiation: The majority of the speculative warehouse owners are requiring an ESFR or CMSA sprinkler system because of the wide range of hazards, commodities, storage heights, and arrangements that it can protect. In some cases these speculative warehouses are used for manufacturing, printing, or other processes that would be classified as extra hazard occupancy. The way the current standard is written, the owner would have to install a new system that provides less protection for the extra hazard occupancy. Guidance is needed when these situations occur.
The minimum flows based on prescribed pressures from the individual tables for ESFR and CMSA sprinklers provide more than the minimum density to protect light, ordinary, and extra hazard occupancies. An example would be operating (12) k14.0 ESFR sprinklers at 50 psi produces 1188 gpm compared to an extra hazard group II density of .40 over 2500 sq ft, which produces 1,000 gpm over the design area. Even if, (25) ESFR sprinklers open during a fire event, they would still produce a density of about .47, which still exceeds the extra hazard group II requirement. Therefore, ESFR and CMSA sprinkler protection should be extended to protect light, ordinary and extra hazard occupancies.
Committee Meeting Action: Reject
Committee Statement: Expanding the application to extra hazard can introduce shielded fires which are outside the scope of some CMSA and ESFR sprinklers.

13-265 Log #91 AUT-SSD Final Action: Accept
(12.6.7)

Submitter: Larry Keeping, Vipond Fire Protection
Comment on Proposal No: 13-389
Recommendation: Revise 12.6.7 to read:

12.6.7 CMSA and ESFR sprinklers shall be permitted to protect ~~ordinary hazard~~ storage of Class I through Class IV commodities, plastic commodities, miscellaneous storage, and other storage as specified in Chapter 12 through Chapter 20 or by other NFPA standards.

Also revise the new 12.6.7.1 to better correspond with the new text of 8.4.6.6 and 8.4.7.4 of Proposals 13-180 and 13-181, as follows:

12.6.7.1 ESFR sprinklers designed to meet any criteria in Chapter 12 through Chapter 20 shall be permitted to protect light and ordinary hazard occupancies.

12.6.7.2 Quick response CMSA sprinklers designed to meet any criteria in Chapter 12 through Chapter 20 shall be permitted to protect light and ordinary hazard occupancies.

12.6.7.3 Standard response CMSA sprinklers designed to meet any criteria in Chapter 12 through Chapter 20 shall be permitted to protect ordinary hazard occupancies.

Substantiation: As it was accepted by the "Discharge" TC, all CMSA sprinklers would be allowed to protect light hazard occupancies, but this is in conflict with the actions of the "Installation" TC, which would require quick response CMSA sprinklers over those light hazard areas. The revised text offered here would co-ordinate the requirements of Chapter 12 with those of Chapter 8 and eliminate this conflict.

Also, it is suggested to delete the term "ordinary hazard" from 12.6.7, as an editorial amendment, because the requirements in that sentence are dealing with storage commodities, rather than occupancy hazards.
Committee Meeting Action: Accept

13-266 Log #147 AUT-SSD Final Action: Accept in Principle
(12.6.7.1 and 12.6.7.2 (New))

Submitter: Kenneth E. Isman, National Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-389
Recommendation: Revise the proposed 12.6.7.1 and insert a new 12.6.7.2 as follows:

12.6.7.1 ESFR and CMSA sprinklers designed to meet any criteria in Chapter 12 through Chapter 20 shall be permitted to protect ~~light and~~ ordinary hazard occupancies.

12.6.7.2 ESFR and quick response CMSA sprinklers designed to meet any criteria in Chapter 12 through Chapter 20 shall be permitted to protect light hazard occupancies.

Substantiation: As pointed out by Mr. Keeping in his ballot, this needs to be coordinated with the installation Criteria Committee action on Proposal 13-181. The Installation Criteria Committee thinks that it is important to have quick response sprinklers in all light hazard occupancies, so the use of CMSA sprinklers should be limited in these occupancies to only those that are quick response.
Committee Meeting Action: Accept in Principle
Committee Statement: See TC action on 13-265 (Log #91).

13-267 Log #100 AUT-SSD **Final Action: Accept**
(Table 12.8.6)

Submitter: Thomas L. Multer, Reliable Automatic Sprinkler Company, Inc.
Comment on Proposal No: 13-410
Recommendation: Add row to proposed table 12.8.6 Hose Stream Allowance and Water Supply Duration. Under CMSA, Extended Coverage:

Up to 8 @ max, 144 ft^2 250gpm (950 L/min) 60 minutes

Substantiation: The 250 gpm (950 L/min) hose stream allowance and the 60 minutes duration are based upon a maximum demand area of 1200 square feet.
8 extended coverage CMSA sprinklers, with a maximum spacing of 144 ft^2, equals a demand area of 1152 square feet and meets the requirements for the lower flow and duration.
Committee Meeting Action: Accept

13-268 Log #357 AUT-SSD **Final Action: Reject**
(Table 12.8.6)

Submitter: Alan L. Hall, Loss Prevention Consultants
Comment on Proposal No: 13-410
Recommendation: Delete the 150 minutes requirement for water supply duration and replace with 120 minutes.
Substantiation: This is a substantial change occurring without technical justification. The standard has never required a 2-1/2 hour water supply. Also DNA in the table should be defined.
If the 150 minutes is removed, it needs to be coordinated with other proposals, such as 12-425 Log #281.
Committee Meeting Action: Reject
Committee Statement: This standard has had 150 minute water supply duration, the larger demand areas in the table require longer duration of water supply.

13-269 Log #264 AUT-SSD **Final Action: Accept**
(12.12.1.2 and 12.12.2)

Submitter: Rod McPhee, Canadian Wood Council
Comment on Proposal No: 13-393
Recommendation: In the proposed 12.12.2.2.1 replace the reference to non-wood pallets with plastic to read, in part, as follows:
12.2.2.2.1 ~~Non-wood~~ Plastic pallets having a demonstrated fire hazard that is...".
Substantiation: Editorial. The section applies to plastic pallets.
Committee Meeting Action: Accept

13-270 Log #122 AUT-SSD Final Action: Reject
(Table 12.12.1.2(c), 12.12.2.1, 14.4.1, 15.4.1, 16.2.3.1, 17.2.3.1, 17.3.3.1, 18.4(d), 19.1.2.3)

Submitter: Pascal Pfeiffer, AXA
Comment on Proposal No: 13-397
Recommendation: Do not remove the 40 ft (12.2 m) ceiling only option for K14 (200) ESFR as recommended by the Technical Committee.
Substantiation: As mentioned by Mr. Javeri with his negative vote during ROP, the issue is not the building height but the clearance. As mentioned by Mr. Keeping with his abstention during ROP, data needs to be further analyzed and discussed prior to eliminating a protection scenario that is currently widely used throughout the logistic industry. Additional tests performed by the Fire Protection Research Foundation at Factory Mutual facility under the HVLS program have shown that a 25 ft clearance of in rack standard class A commodity had not affected the suppression performance of the ESFR, even with the HVLS impact (see test FM4 available in 'HVLS and sprinkler operation – Ph. 2 final report' from the Research Foundation website). I think further testing is needed to substantiate any action at the Committee level, especially because any decision regarding ESFR k14 sprinklers will have a great impact on existing systems.
Committee Meeting Action: Reject
Committee Statement: Fire test data submitted to the committee supports the elimination of the 40 ft ceiling criteria.

13-271 Log #131 AUT-SSD Final Action: Accept
(12.12.1.4)

Submitter: Bruce Torrey, IGPS Company, LLC
Comment on Proposal No: 13-398
Recommendation: Delete text to read as follows;
~~Add a new section 12.12.1.4 as follows:~~
~~12.12.1.4 Non-wood pallets that have been testing and listed to be equivalent to wood pallets in accordance with 5.6.2.6 shall be permitted to be protected as wood pallets when stored as idle pallets.~~
Substantiation: The proposed new section in unnecessary since the issue of testing and listing plastic pallets for idle storage is already addressed in Chapter 12. Section 12.12.2.1 addresses the storage of plastic pallets for fire hazard and permits tested and listed plastic pallets to be protected according to the requirements of wood pallets referenced in Section 12.12.1 Wood Pallets, or when specific test data are available. Additionally, Section 12.12.2.3.1 addresses the in-rack storage of idle plastic pallets when they are tested and listed - FM 4996 specifically tests and lists racked idle plastic pallets. Section 12.12.2.3 also allows in-rack plastic pallet storage when protected according to Table 12.12.2.1.
Committee Meeting Action: Accept

13-272 Log #265 AUT-SSD Final Action: Accept in Principle
(12.12.1.4)

Submitter: Rod McPhee, Canadian Wood Council
Comment on Proposal No: 13-398
Recommendation: This change needs to be coordinated with changes agreed to in 13-393.
Substantiation: Correlation.
Committee Meeting Action: Accept in Principle
Committee Statement: See TC action on 13-271 (Log #131).

13-273 Log #212 AUT-SSD **Final Action: Reject**
(12.12.3.3)

Submitter: Moataz Remah, Cairo
Comment on Proposal No: 13-400
Recommendation: Revise text to read as follows:
Reject proposal 13-400 and revert back to the original text
12.12.3.3 Where idle pallet storage is above a door, the idle pallet storage height ~~and ceiling height~~ shall be calculated from the base of storage above the door using the applicable protection criteria referenced in Section 12.12.
Substantiation: This is to resolve the inconsistencies with section 12.1.3.1 and with the definition of the ceiling height section 3.3.3.
The issue of calculating the storage height from the base of the storage is not limited to idle pallets, this applies to all storage arrangements according to section 12.1.3.3.
If proposal 13-400 is going to be adopted, Sections 12.1.3.1 and 3.3.3 shall be revised such that:
Section 12.1.3.1 clearly differentiate between the "calculated ceiling height upon which the design criteria is determined" and the "building height"
Section 3.3.3 's definition of the ceiling height shall indicate that it is calculated from the floor to the underside of the roof deck for general occupancies; but from the base of the storage to the underside of the rood deck for high piled storage occupancies.
Committee Meeting Action: Reject
Committee Statement: This section applies only to idle pallet storage above a door - the reference to the ceiling height is appropriate.

13-274 Log #128 AUT-SSD **Final Action: Accept**
(Table 13.2.1)

Submitter: Kenneth E. Isman, National Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-403
Recommendation: Reject Proposal 13-403.
Substantiation: The submitter was not correct. The information is not redundant. This is the section that allows OH2 at the ceiling with a row of in-rack sprinklers to replace EH2 at the ceiling. This is a significant savings for a building owner with a marginal water supply and a necessary option. There is no reason to eliminate this option.
This comment has the endorsement of the NFSA Engineering and Standards Committee.
Committee Meeting Action: Accept

13-275 Log #105 AUT-SSD **Final Action: Accept**
(Figure 13.2.1, 14.2.4.1, 14.2.4.2, 16.2.1.3.2(a) through (g))

Submitter: Technical Correlating Committee on Automatic Sprinkler Systems,
Comment on Proposal No: 13-406
Recommendation: The TCC directs the SSD TC to review all of the design curves for presentation and context for consistency during the next cycle.
Substantiation: This is a direction from the Technical Correlating Committee on Automatic Sprinkler Systems in accordance with 3.4.2 and 3.4.3 of the Regulations Governing Committee Projects.
Committee Meeting Action: Accept

13-276 Log #281 AUT-SSD Final Action: Accept in Principle
(13.2.3 (New))

Submitter: Tracey D. Bellamy, Telgian Corporation
Comment on Proposal No: 13-377
Recommendation: Include a new 13.2.3 as follows:
13.2.3 Where K-11.2 (160) or larger sprinklers are used for EH1 or EH2 designs, the design area shall be permitted to be reduced by 25 percent but not below 2,000 ft² (186 m²), regardless of temperature rating.

Substantiation: The original intent of the proposal was to address those storage applications covered by Chapter 13 using EH1 and EH2 design criteria. So as to address concerns related to the broad application of this allowance to all extra hazard occupancies, it is proposed that a new 13.2.3 be added that would only be applicable to those storage applications contained in Chapter 13.
Committee Meeting Action: Accept in Principle
Accept new sentence but change as follows:
Where K-11.2 (160) or larger sprinklers are used ~~for~~ with EH1 or EH2 ~~designs~~ design curves from Figure 13.2.1, the design area shall be permitted to be reduced by 25 percent but not below 2,000 ft^2 (186 m^2), regardless of temperature rating.

13-277 Log #93 AUT-SSD Final Action: Accept in Principle
(Table 13.3.3.4.2)

Submitter: Larry Keeping, Vipond Fire Protection
Comment on Proposal No: 13-407
Recommendation: Do not adopt the new Table 13.3.3.4.2 as illustrated in Proposal 13-407. Instead substitute a copy of the revised Table 16.4.2.1 from Proposal 13-444.
Substantiation: Editorial – the new Table 16.4.2.1 shows the information for both encapsulated and nonencapsulated commodities, whereas the proposed Table 13.3.3.4.2 does not. Therefore, the information within Table 16.4.2.1 should be copied over for the new Table 13.3.3.4.2 so that the spacing for all commodities may be addressed.
Committee Meeting Action: Accept in Principle
Do not adopt the new Table 13.3.3.4.2 as illustrated in Proposal 13-407
Use Figure 16.2.4.2.1 from proposal 13-444 and change title from 25 ft to 12 ft
Revise section 13.3.4.2 as follows: Strike "nonencapsulated"
Change reference to Table 13.3.3.4.2 to Table 13.3.4.2.
Eliminate the last sentence as follows:
13.3.3.4.2 Maximum horizontal spacing of in-rack sprinklers in single- or double-row racks with nonencapsulated, Class I, II, III or IV commodities shall be in accordance with Table 13.3.3.4.2. ~~For encapsulated Class I-IV commodities and~~
~~Group A plastic commodities, maximum horizontal spacing shall be 8 ft (2.4 m).~~
Committee Statement: Editorial and revised storage height in title of table to 12 ft (3.7m) to be consistent with chapter 13.
The new table has all of the rules in it, so there is no need to repeat the rules.

13-278 Log #129 AUT-SSD **Final Action: Accept in Principle**
(Table 13.3.3.4.2)

Submitter: Kenneth E. Isman, National Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-407
Recommendation: Change the title of the table to: "Table 13.3.3.4.2 In-Rack Sprinkler Spacing for Nonencapsulated Class I, II, III, and IV Commodities Stored Up to ~~25 ft (7.6 m)~~ 12 ft (3.7 m) in Height".
Substantiation: This comment needs to be made for two reasons. First, the base paragraph 13.3.3.4.2 limits the use of the table to nonencapsulated commodities (the spacing for encapsulated commodities is 8 ft).
Second, since this table is in the chapter relating to Miscellaneous Storage, the height of storage is limited to 12 ft, so the table should be cut off there as well.
This comment has the endorsement of the NFSA Engineering and Standards Committee.
Committee Meeting Action: Accept in Principle
Committee Statement: See TC action on 13-277 (Log #93).

13-279 Log #361 AUT-SSD **Final Action: Accept in Principle**
(13.3.3.4.3)

Submitter: Gerald R. Schultz, The FPI Consortium, Inc.
Comment on Proposal No: 13-407
Recommendation: Add the following additional wording to the committee proposed wording:
13.3.3.4.3 In-rack sprinkler shall be located in the longitudinal flue at the intersection of the transverse flue...
If no longitudinal flue is provided, in-rack sprinklers shall be located in the middle of the rack while not exceeding the maximum spacing.
Substantiation: Longitudinal flues are not required in storage up to 25 feet in height so there is a problem with mandating sprinklers in the longitudinal flue. This attempts to clarify the actual requirement.
Committee Meeting Action: Accept in Principle
Revise proposed Sentence as follows:
"If no longitudinal flue is provided in single and double row racks, in-rack sprinklers shall be located within 12" (300 mm) of the center of the rack while not exceeding the maximum spacing.
Committee Statement: Correct section # is 13.3.4.3 - the committee wants to provide some tolerance from the location of in-racks sprinklers from the center.

13-280 Log #38 AUT-SSD **Final Action: Reject**
(14.2.4.6)

Submitter: Roland J. Huggins, American Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-416
Recommendation: Delete the following text:
~~14.2.4.6 For storage greater than 12 ft (3.7 m), the sprinkler design density for any given area of operation for a Class III or Class IV commodity, calculated in accordance with 14.2.4, shall not be less than 0.2 gpm/ft^2 (8 mm/min) density.~~
Substantiation: This section needs to be deleted in its entirety. As the ROP Substantiation states, it is old criteria that previously applied to storage less than 12 ft. As such, that height of storage is covered by Ch 13. By keeping it as applicable to heights greater than 12 ft, we now have a conflict with 12.2.4.5 (minimum density of 0.15 gpm/sf). A final note is that this section effectively eliminates applying 75% of the Class III curve for Figure 14.2.4.2 which seems to be an unintentional consequence.
Committee Meeting Action: Reject
Committee Statement: The TC would like to retain the 2010 edition text. See TC action on 13-281 (Log #138). This section applies to storage over 12 ft because section 14.2.3.2 sends the user back to Chapter 13 for storage under 12 ft, which references OH2 for protection, so there is no need to worry about setting OH2 as a minimum.

13-281 Log #138 AUT-SSD Final Action: Accept
(14.2.4.6)

Submitter: Kenneth E. Isman, National Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-416
Recommendation: Reject Proposal 13-416.
Substantiation: Section 14.2.4.6 was fine the way it was in the 2010 and previous editions. The reason that it applies to storage over 12 ft is that section 14.2.3.2 sends the user back to Chapter 13 for storage under 12 ft, which references OH2 for protection, so there is no need to worry about setting OH2 as a minimum.

What we do need to worry about is going through the adjustments in Chapter 14 for storage over 12 ft in height and ending up with protection criteria that is less than what is allowed for OH2. For example, consider 15 ft storage of Class III commodity protected with high temperature K-8 sprinklers. Figure 14.2.4.2 would allow a design of 0.212 over 2000, but the Figure 14.2.4.3 would let me modify the density by 70%, making the design 0.148 over 2000. Comparing this to the OH2 curve, we see that the OH2 curve would allow a density of 0.19 over 2000, so I would have to bump the density up to 0.19. I should not have to bump the density up to 0.2 because the design area is 2000 sq ft.
Committee Meeting Action: Accept

13-282 Log #39 AUT-SSD Final Action: Reject
(15.2.2.1, 17.2.1.2.1, and 17.3.1.1)

Submitter: Roland J. Huggins, American Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-449
Recommendation: Revise text to read as follows:

17.3.1.1 Protection of Group A plastics in cartons, expanded or nonexpanded, whether encapsulated or nonencapsulated shall be permitted using control mode density / area sprinklers with an ordinary temperature rating in accordance with Section 17.3.1.

17.2.1.2.1 Protection of Group A plastics in cartons, expanded or nonexpanded, whether encapsulated or nonencapsulated shall be permitted using control mode density / area sprinklers with an ordinary temperature rating in accordance with Section 17.2.1.2.

Renumber remaining sections.

15.2.2.1 Protection of Group A plastics and rubber commodities shall be permitted using control mode density / area sprinklers with an ordinary temperature rating in accordance with Section 15.2.2.

Renumber remaining sections.

Substantiation: This change affects two issues. It provides consistency for the other storage arrangements of Group A plastic with the change made at the ROP to just Section 17.3.1.1. More importantly, though, is that it identifies the temperature rating of the sprinklers.
Committee Meeting Action: Reject
Committee Statement: The temperature limit being proposed is too restrictive.

13-283 Log #139 AUT-SSD Final Action: Accept
(16.1.6.5)

Submitter: Kenneth E. Isman, National Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-432
Recommendation: Clarify that Section 16.1.6.5 will read as revised in Proposal 13-432, not Proposal 13-436. Then further revise the section as follows:

16.1.6.5 Where the criteria in 16.1.6.6 is not met, the water demand for in-rack sprinklers for the in-rack sprinklers shall be based on a minimum flow of 30 gpm discharging from the following number of sprinklers balanced to the ceiling sprinkler demand in accordance with Section 22.8:

Substantiation: Proposals 13-432 and 13-436 revised the same section in different ways. The committee needs to declare how it wants the section to actually read. This comment puts the ideas of the two proposals together.

This comment has the endorsement of the NFSA Engineering and Standards Committee.

Committee Meeting Action: Accept
Committee Statement: Proposal 13- 432 and 13-436 covered the same section 16.1.6.5, the committee intent was to accept the revision in 13-432, this comment is acceptable and incorporates the reference to Section 22.8 as 13-436 had requested.

13-284 Log #59 AUT-SSD Final Action: Reject
(16.1.6.5, 16.1.8.1, and 17.1.7.1)

Submitter: Jack A. Medovich, Fire & Life Safety America / Rep. AFSA
Comment on Proposal No: 13-436
Recommendation: Revise text to read as follows:

16.1.6.5 Design criteria for combined ceiling and in-rack sprinklers, shall be used ~~in accordance with 22.8~~ for the storage configurations in 16.16.1.6.1 and 16.1.6.2.

16.1.8.1 The number of sprinklers and the pipe sizing on a line of sprinklers in racks shall be restricted only by hydraulic calculations in accordance with 22.8 and not by any piping schedule.

17.1.7.1 The number of sprinklers and the pipe sizing on a line of sprinklers in racks shall be restricted only by hydraulic calculations in accordance with 22.8 and not by any piping schedule.

Substantiation: Return to prior text. This section was originally added to provide guidance on which curves from Figures 16.2.1.3.2(a) - (g) are applicable when solid shelves are present. It is not on the calculation process for in-rack sprinklers so a reference to 22.8 does not belong in this section. If a cross reference to 22.8 (which applies without a cross reference) is deemed necessary, then adding it to the general sections of Chapter 16 and 17 on in-rack sprinklers would be more appropriate locations.

Committee Meeting Action: Reject
Committee Statement: See committee action on 13-283 (Log #139); Chapter 17 reference was not referenced in 13-436.

13-285 Log #359 AUT-SSD Final Action: Reject
(16.1.6.5 and 16.1.6.6)

Submitter: Gerald R. Schultz, The FPI Consortium, Inc.
Comment on Proposal No: 13-432
Recommendation: Revise the following:
16.1.6.5 ~~Where the criteria of 16.1.6.6 is not met,~~ the water demand for the in-rack sprinklers shall be based on a pressure of 15 psi for storage up to and including 25 feet and a minimum flow of 30 gpm for storage over 25 feet from the following number of sprinklers balanced to the ceiling sprinkler demand: remainder the same
Delete 16.1.6.6 in its entirety.
Substantiation: The revision utilizes the standard criteria for in-rack sprinklers that has been in the standard for years. The requirement for additional flow is submitted without technical justification. The allowance to not balancing the overhead with the in-racks is against long standing industry practice again without technical justification.
Committee Meeting Action: Reject
Committee Statement: The protection provided with additional face sprinklers does not require the flow to be balanced with the ceiling system due to increased performance of the in-rack protection under solid shelves. The 30 gpm demand is appropriate for the solid shelf criteria.

13-286 Log #356 AUT-SSD Final Action: Reject
(16.1.6.5 and 16.1.6.6 (New))

Submitter: Alan L. Hall, Loss Prevention Consultants
Comment on Proposal No: 13-432
Recommendation: Revise the following:
16.1.6.5 ~~Where the criteria of 16.1.6.6 is not met,~~ The water demand for the in-rack sprinklers shall be based on a pressure of 15 psi for storage up to and including 25 feet and a minimum flow of 30 gpm for storage over 25 feet from the following number of sprinklers balanced to the ceiling sprinkler demand: remainder the same—
Delete 16.1.6.6 in its entirety.
Substantiation: The revision utilizes the standard criteria for in-rack sprinklers that has been in the standard for years. The requirement for additional flow is submitted without technical justification. The allowance to not balancing the overhead with the in- racks is against the long standing industry practice, again without technical justification.
Committee Meeting Action: Reject
Committee Statement: The protection provided with additional face sprinklers does not require the flow to be balanced with the ceiling system due to increased performance of the in-rack protection under solid shelves. The 30 gpm demand is appropriate for the solid shelf criteria.

13-287 Log #360 AUT-SSD Final Action: Reject
(16.1.6.6)

Submitter: Gerald R. Schultz, The FPI Consortium, Inc.
Comment on Proposal No: 13-437
Recommendation: Accept the submitters original proposal.
Substantiation: I agree with Mr. Baker and question how this should be an Accept in Principle. I do not see any technical justification allowing the use of the solid shelving requirements when using the ESFR or the CMSA sprinkler. The committee is trying to rectify an issue that has been in the standard since 1999 but they are not clearing this up. The proposed revision addresses ESFR sprinklers but does not address CMSA. Section 16.2.2.1 would still not allow solid shelving be protected with CMSA sprinklers. There is no technical material to justify this change.
Committee Meeting Action: Reject
Committee Statement: The solid shelf design criteria in section 16.1.6 require in-rack sprinklers under the solid shelves, this increased level of protection works with CMSA and ESFR sprinklers at the ceiling. ESFR and CMSA do not allow the elimination of the in-rack sprinklers required by section 16.1.6. The intent is not to allow solid shelf storage without in-rack sprinklers as required in 16.1.6 with ESFR and CSMA sprinklers.

13-288 Log #143 AUT-SSD Final Action: Accept in Principle
(16.2)

Submitter: Kenneth E. Isman, National Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-430
Recommendation: Revise Section 16.2 by moving the in-rack sprinkler requirements as follows:

1. Where Control Mode Density Area sprinklers are installed at the ceiling, put the in-rack sprinkler requirements in Section 16.2.1.
2. Where Control Mode Specific Application sprinklers are installed at the ceiling, put the in-rack sprinkler requirements in Section 16.2.2.
3. Where ESFR sprinklers are installed at the ceiling, put the in-rack sprinkler requirements in Section 16.2.3.
4. Delete Section 16.2.4.
5. Renumber old 16.2.5 as new 16.2.4.

The proposed revision starts by adding a new Section 16.2.1.4 and goes through 16.2.5 as shown below along with the associated changes to the annex text. The Draft of Chapter 16 after the results of the ROP was used to generate this comment.

******Insert Include 13_L143_R Here******

Substantiation: There are a number of reasons for this comment. First, the in-rack sprinkler installation rules are tied to the ceiling sprinkler selection, so separating the rules by several sections makes the standard more difficult to use.

Second, the in-rack sprinkler rules were written for use with CMDA sprinklers at the ceiling. They have been adapted for situations where CMSA or ESFR sprinklers are used, but the specific rules to apply are not clear. Section 16.2.2.2 says that when CMSA sprinklers are used at the ceiling, the in-rack rules need to be used "as applicable for the commodity". But this is does not really work. For example, 25 ft high multiple-row rack storage of Class IV commodity 25 ft in height in a 35 ft building requires 1 level of in-rack sprinklers for many of the CMSA options per Table 16.2.2.1, but the commodity would require 2 levels of in-rack sprinklers under Table 16.2.1.3.3.1 or 16.2.1.3.3.2. With 2 rows of in-rack sprinklers, the maximum horizontal spacing is 10 ft according to Table 16.2.4.2.1 and the number of sprinklers in the design area is 14 according to 16.2.4.3.1. But what is the user supposed to do? Do they install 2 rows of sprinklers 10 ft apart? Do they install a single row of sprinklers? If they install the single row, is the 10 ft spacing still valid? If they install a single row, is the design area 8 sprinklers or the 14 sprinklers for the commodity?

Similar concerns exist where ESFR sprinklers are installed at the ceiling. It would be better for the committee to be explicit about what it wants for in-rack requirements in each individual portion of 16.2. While this creates some repetition, it is worthwhile to clarify the requirements.

Committee Meeting Action: Accept in Principle
Accept the proposed changes with the following modification:

Modify 16.2.2.7.4: change 5 feet to 8 feet.

Committee Statement: The change from 5 to 8 provides greater flexibility and provides consistency with other control mode sprinklers.

16.2.1.4 ~~16.2.4~~ In-Rack Sprinklers for Rack Storage of Class I Through Class IV Commodities Stored Up to and Including 25 ft (7.6 m) in Height Protected with Control Mode Density/Area Sprinklers at the Ceiling.

16.2.1.4.1 In-Rack Sprinkler Location for Rack Storage of Class I Through Class IV Commodities Stored Up to and Including 25 ft (7.6 m) in Height.

16.2.1.4.1.1 In single- or double-row racks without solid shelves, in-rack sprinklers shall be installed in accordance with Table 16.2.1.3.2.

16.2.1.4.1.2 In multiple-row racks no deeper than 16 ft (4.9 m) with aisles 8 ft (2.4 m) or wider, in-rack sprinklers shall be installed in accordance with Table 16.2.1.3.3.1.

16.2.1.4.1.3 In multiple-row racks deeper than 16 ft (4.9 m) or with aisles less than 8 ft (2.4 m) wide, in-rack sprinklers shall be installed in accordance with Table 16.2.1.3.3.2.

16.2.1.4.1.4 In-rack sprinklers at one level only for storage up to and including 25 ft (7.6 m) high shall be located at the first tier level at or above one-half of the storage height.

16.2.1.4.1.5 In-rack sprinklers at two levels only for storage up to and including 25 ft (7.6 m) high shall be located at the first tier level at or above one-third and two-thirds of the storage height.

16.2.1.4.2 In-Rack Sprinkler Spacing for Rack Storage of Class I Through Class IV Commodities Stored Up to and Including 25 ft (7.6 m) in Height Protected by Control Mode Density/Area Sprinklers at the Ceiling.

16.2.1.4.2.1* Maximum horizontal spacing of in-rack sprinklers in single- or double-row racks up to and including 25 ft (7.6m) in height shall be in accordance with Table 16.2.1.4.2.1. **[ROP-444]**

Table 16.2.1.4.2.1 In-Rack Sprinkler Spacing for Class I, II, III, and IV Commodities Stored in Single- or Double-Row Racks Up to 25 ft (7.6 m) in Height [ROP-444] Protected by Control Mode Density/Area Sprinklers at the Ceiling.

16.2.1.4.2.2* Maximum horizontal spacing and maximum area of coverage of in-rack sprinklers on branch lines, in multiple-row racks with storage up to and including 25 ft (7.6 m) in height, shall be in accordance with Table 16.2.1.4.2.2. **[ROP-444]**

16.2.1.4.2.2.1 The rack plan view shall be considered in determining the area covered by each sprinkler.

16.2.1.4.2.2.2 The aisles shall not be included in area calculations.

Table 16.2.1.4.2.2 In-Rack Sprinkler Spacing for Class I, II, II and IV Commodities Stored in Multi-Row Racks up to 25 ft (7.6 m) in Height [ROP-444] Protected by Control Mode Density/Area Sprinklers at the Ceiling.

16.2.1.4.2.3* In-rack sprinklers shall be located at an intersection of transverse and longitudinal flues while not exceeding the maximum spacing rules.

16.2.1.4.2.3.1 Where distances between transverse flues exceed the maximum allowable distances, sprinklers shall be installed at the intersection of the transverse and longitudinal flues and additional sprinklers shall be installed between transverse flues to meet the maximum distance rules.

16.2.1.4.2.3.2 Where no transverse flues exist, in-rack sprinklers shall not exceed the maximum spacing rules.

16.2.1.4.2.4* The elevation of in-rack sprinkler deflectors with respect to storage shall not be a consideration in single- or double-row rack storage up to and including 20 ft (6.1 m) high. *(See Section C.16.)*

16.2.1.4.2.5* In single- or double-row racks without solid shelves with storage over 20 ft (6.1 m) high, or in multiple-row racks, or in single- or double-row racks with solid shelves and storage height up to and including 25 ft (7.6 m), a minimum of 6 in. (152.4 mm) vertical clear space shall be maintained between the in-rack sprinkler deflectors and the top of a tier of storage.

16.2.1.4.2.5.1 Sprinkler discharge shall not be obstructed by horizontal rack members.

16.2.1.4.2.6 For multiple-row racks, a minimum of 6 in. (152.4 mm) shall be maintained between the in-rack sprinkler deflector and the top of a tier of storage.

16.2.1.4.2.7 Sprinklers installed in racks shall be spaced without regard to rack uprights. *(See Section C.17.)*

16.2.1.4.3 In-Rack Sprinkler Water Demand for Rack Storage of Class I Through Class IV Commodities Stored Up to and Including 25 ft (7.6 m) in Height Protected by Control Mode Density/Area Sprinklers at the Ceiling. See Section C.18.

16.2.1.4.3.1 The water demand for sprinklers installed in racks shall be based on simultaneous operation of the most hydraulically remote sprinklers as follows:

(1) Six sprinklers where only one level is installed in racks with Class I, Class II, or Class III commodities
(2) Eight sprinklers where only one level is installed in racks with Class IV commodities
(3) Ten sprinklers (five on each two top levels) where more than one level is installed in racks with Class I, Class II, or Class III commodities
(4) Fourteen sprinklers (seven on each two top levels) where more than one level is installed in racks with Class IV commodities

16.2.1.4.3.2 Where a storage rack, due to its length, requires less than the number of in-rack sprinklers specified in 16.2.1.4.3.1(1) through 16.2.1.4.3.1(4), only those in-rack sprinklers in a single rack need to be included in the calculation.

16.2.1.4.4 In-Rack Sprinkler Discharge Pressure for Rack Storage of Class I Through Class IV Commodities Stored Up to and Including 25 ft (7.6 m) in Height Protected by Control Mode Density/Area Sprinklers at the Ceiling. Sprinklers in racks shall discharge at not less than 15 psi (1 bar) for all classes of commodities. *(See Section C.19.)*

16.2.2 CMSA Sprinklers for Rack Storage of Class I Through Class IV Commodities Stored Up to and Including 25 ft (7.6m) in Height.

16.2.2.1 Protection of single-, double-, and multiple-row rack storage without solid shelves for Class I through Class IV commodities shall be in accordance with Table 16.2.2.1.

16.2.2.2 Where in-rack sprinklers are required by Table 16.2.2.1, in-rack sprinkler spacing, design pressure, and hydraulic calculation criteria shall be in accordance with the requirements of ~~16.2.4~~16.2.2.7 as applicable for the commodity.

16.2.2.3 Protection shall be provided as specified in Table 16.2.2.1 or appropriate NFPA standards in terms of minimum operating pressure and the number of sprinklers to be included in the design area.

16.2.2.4 Open Wood Joist Construction.

16.2.2.4.1 Where CMSA sprinklers are installed under open wood joist construction, their minimum operating pressure shall be 50 psi (3.4 bar) for a K-11.2 (160) sprinkler or 22 psi (1.5 bar) for a K-16.8 (240) sprinkler.

16.2.2.4.2 Where each joist channel of open wood joist construction is fully firestopped to its full depth at intervals not exceeding 20 ft (6.1 m), the lower pressures specified in Table 16.2.2.1 shall be permitted to be used. **[ROP-410]**

16.2.2.5 Preaction Systems. For the purpose of using Table 16.2.2.1, preaction systems shall be classified as dry pipe systems.

16.2.2.6 Building steel shall not require special protection where Table 16.2.2.1 is applied as appropriate for the storage configuration.

16.2.2.7 In-Rack Sprinklers for Rack Storage of Class I Through Class IV Commodities Stored Up to and Including 25 ft (7.6 m) in Height Protected with Control Mode Specific Application Sprinklers at the Ceiling.

16.2.2.7.1 Where in-rack sprinklers are required by Table 16.2.2.1, in-rack sprinklers shall be installed at the first tier level at or above one-half of the storage height.

16.2.2.7.2 The minimum of 6 in. (152.4 mm) vertical clear space shall be maintained between the sprinkler deflectors and the top of a tier of storage.

16.2.2.7.3* In-rack sprinklers shall be located at an intersection of transverse and longitudinal flues.

16.2.2.7.4 The maximum horizontal distance between in-rack sprinklers shall be 5 ft (1.5 m).

16.2.2.7.5 Where distances between transverse flues exceed the maximum allowable distances, sprinklers shall be installed at the intersection of the transverse and longitudinal flues, and additional sprinklers shall be installed between transverse flues to meet the maximum distance rules.

16.2.2.7.6 Where no transverse flues exist, in-rack sprinklers shall not exceed the maximum spacing rules.

16.2.2.7.7 In-Rack Sprinkler Water Demand. The water demand for sprinklers installed in-racks shall be based on simultaneous operation of the most hydraulically remote eight sprinklers.

16.2.2.7.8 In-Rack Sprinkler Discharge Pressure. Sprinklers in-racks shall discharge at not less than 15 psi (1 bar) for all classes of commodities. (See Section C.19.)

16.2.3* Early Suppression Fast-Response (ESFR) Sprinklers for Rack Storage of Class I Through Class IV Commodities Stored Up to and Including 25 ft (7.6 m) in Height.

16.2.3.1 Protection of single-, double-, and multiple-row rack storage of Class I through Class IV shall be in accordance with Table 16.2.3.1.

16.2.3.2 ESFR protection as defined shall not apply to rack storage involving combustible, open-top cartons or containers **[ROP-437]**

16.2.3.3 ESFR sprinkler systems shall be designed such that the minimum operating pressure is not less than that indicated in Table 16.2.3.1 for type of storage, commodity, storage height, and building height involved.

16.2.3.4 The design area shall consist of the most hydraulically demanding area of 12 sprinklers, consisting of four sprinklers on each of three branch lines. **[ROP-487]**

~~**16.2.3.5** Where required by Table 16.2.3.1, one level of K-8.0 (115) quick-response, ordinary-temperature in-rack sprinklers shall be installed at the tier level closest to but not exceeding 1/2 of the maximum storage height. In-rack sprinkler hydraulic design criteria shall be the most hydraulically remote eight sprinklers at 50 psi (3.4 bar). In-rack sprinklers shall be located at the intersection of the longitudinal and transverse flue space. Horizontal spacing shall not be permitted to exceed 5 ft (1.5 m) intervals. **[ROP-430]**~~

16.2.3.5 In-Rack Sprinkler Requirements for Rack Storage of Class I Through Class IV Commodities Stored Up to and Including 25 ft (7.6 m) in Height Where ESFR Sprinklers are Being Used at the Ceiling.

16.2.3.5.1 Where required by Table 16.2.3.1, in-rack sprinklers shall be installed at the first tier level at or above one-half of the storage height.

16.2.3.5.2 In-rack sprinklers shall be k-8.0 (115) or K-11.2(160) quick response, ordinary temperature sprinklers.

16.2.3.5.3 The minimum of 6 in. (152.4 mm) vertical clear space shall be maintained between the sprinkler deflectors and the top of a tier of storage.

16.2.3.5.4 The maximum horizontal distance between in-rack sprinklers shall be 5 ft (1.5 m).

16.2.3.5.5* In-rack sprinklers shall be located at an intersection of transverse and longitudinal flues while not exceeding the maximum spacing rules.

16.2.3.5.6 Where distances between transverse flues exceed the maximum allowable distances, sprinklers shall be installed at the intersection of the transverse and longitudinal flues, and additional sprinklers shall be installed between transverse flues to meet the maximum distance rules.

16.2.3.5.7 Where no transverse flues exist, in-rack sprinklers shall not exceed the maximum spacing rules.

16.2.3.5.8 The water demand for sprinklers installed in-racks shall be based on simultaneous operation of the most hydraulically remote eight sprinklers.

16.2.3.5.9 Each of the in-rack sprinklers described in 16.2.3.5.8 shall discharge at a minimum of 60 gpm (227 L/min).

~~**16.2.4 In-Rack Sprinklers for Rack Storage of Class I Through Class IV Commodities Stored Up to and Including 25 ft (7.6 m) in Height.**~~

~~**16.2.4.1 In-Rack Sprinkler Location for Rack Storage of Class I Through Class IV Commodities Stored Up to and Including 25 ft (7.6 m) in Height.**~~

~~**16.2.4.1.1** In single- or double-row racks without solid shelves, in-rack sprinklers shall be installed in accordance with Table 16.2.1.3.2.~~

~~**16.2.4.1.2** In multiple-row racks no deeper than 16 ft (4.9 m) with aisles 8 ft (2.4 m) or wider, in-rack sprinklers shall be installed in accordance with Table 16.2.1.3.3.1.~~

~~**16.2.4.1.3** In multiple-row racks deeper than 16 ft (4.9 m) or with aisles less than 8 ft (2.4 m) wide, in-rack sprinklers shall be installed in accordance with Table 16.2.1.3.3.2.~~

~~**16.2.4.1.4** In-rack sprinklers at one level only for storage up to and including 25 ft (7.6 m) high shall be located at the first tier level at or above one-half of the storage height.~~

~~**16.2.4.1.5** In-rack sprinklers at two levels only for storage up to and including 25 ft (7.6 m) high shall be located at the first tier level at or above one-third and two-thirds of the storage height.~~

~~**16.2.4.2 In-Rack Sprinkler Spacing for Rack Storage of Class I Through Class IV Commodities Stored Up to and Including 25 ft (7.6 m) in Height.**~~

~~**16.2.4.2.1*** Maximum horizontal spacing of in-rack sprinklers in single- or double-row racks up to and including 25 ft (7.6m) in height shall be in accordance with Table 16.2.4.2.1. **[ROP-444]**~~

~~**Table 16.2.4.2.1 In-Rack Sprinkler Spacing for Class I, II, III, and IV Commodities Stored in Single- or Double-Row Racks Up to 25 ft (7.6 m) in Height [ROP-444]**~~

16.2.4.2.2* Maximum horizontal spacing and maximum area of coverage of in-rack sprinklers on branch lines, in multiple-row racks with storage up to and including 25 ft (7.6 m) in height, shall be in accordance with Table 16.2.4.2.2. **[ROP-444]**
16.2.4.2.2.1 The rack plan view shall be considered in determining the area covered by each sprinkler.
16.2.4.2.2.2 The aisles shall not be included in area calculations.

Table 16.2.4.2.2 In-Rack Sprinkler Spacing for Class I, II, II and IV Commodities Stored in Multi-Row Racks up to 25 ft (7.6 m) in Height [ROP-444]

16.2.4.2.3* In-rack sprinklers shall be located at an intersection of transverse and longitudinal flues while not exceeding the maximum spacing rules.
16.2.4.2.3.1 Where distances between transverse flues exceed the maximum allowable distances, sprinklers shall be installed at the intersection of the transverse and longitudinal flues and additional sprinklers shall be installed between transverse flues to meet the maximum distance rules.
16.2.4.2.3.2 Where no transverse flues exist, in-rack sprinklers shall not exceed the maximum spacing rules.
16.2.4.2.4* The elevation of in-rack sprinkler deflectors with respect to storage shall not be a consideration in single- or double-row rack storage up to and including 20 ft (6.1 m) high. *(See Section C.16.)*
16.2.4.2.5* In single- or double-row racks without solid shelves with storage over 20 ft (6.1 m) high, or in multiple-row racks, or in single- or double-row racks with solid shelves and storage height up to and including 25 ft (7.6 m), a minimum of 6 in. (152.4 mm) vertical clear space shall be maintained between the in-rack sprinkler deflectors and the top of a tier of storage.
16.2.4.2.5.1 Sprinkler discharge shall not be obstructed by horizontal rack members.
16.2.4.2.6 For multiple-row racks, a minimum of 6 in. (152.4 mm) shall be maintained between the in-rack sprinkler deflector and the top of a tier of storage.
16.2.4.2.7 Sprinklers installed in racks shall be spaced without regard to rack uprights. *(See Section C.17.)*
16.2.4.3 In-Rack SprinklerWater Demand for Rack Storage of Class I Through Class IV Commodities Stored Up to and Including 25 ft (7.6 m) in Height. See Section C.18.
16.2.4.3.1 The water demand for sprinklers installed in racks shall be based on simultaneous operation of the most hydraulically remote sprinklers as follows:
(1) Six sprinklers where only one level is installed in racks with Class I, Class II, or Class III commodities
(2) Eight sprinklers where only one level is installed in racks with Class IV commodities
(3) Ten sprinklers (five on each two top levels) where more than one level is installed in racks with Class I, Class II, or Class III commodities
(4) Fourteen sprinklers (seven on each two top levels) where more than one level is installed in racks with Class IV commodities
16.2.4.3.2 Where a storage rack, due to its length, requires less than the number of in-rack sprinklers specified in 16.2.4.3.1(1) through 16.2.4.3.1(4), only those in-rack sprinklers in a single rack need to be included in the calculation.

~~**16.2.4.4 In-Rack Sprinkler Discharge Pressure for Rack Storage of Class I Through Class IV Commodities Stored Up to and Including 25 ft (7.6 m) in Height.** Sprinklers in racks shall discharge at not less than 15 psi (1 bar) for all classes of commodities. *(See Section C.19.)*~~

16.2.4 ~~16.2.5~~ Special Design for Rack Storage of Class I Through Class IV Commodities Stored Up to and Including 25 ft (7.6m) in Height.

16.2.4.1 ~~16.2.5.1~~ Slatted Shelves.

16.2.4.1.1* ~~16.2.5.1.1*~~ Slatted rack shelves shall be considered equivalent to solid rack shelves where the shelving is not considered open rack shelving or where the requirements of 16.2.5.1.2 are not met. *(See Section C.20.)*

16.2.4.1.2 ~~16.2.5.1.2~~ A wet pipe system that is designed to provide a minimum of 0.6 gpm/ft2 (24.5 mm/min) density over a minimum area of 2000 ft2 (186 m2) or K-14.0 (200) ESFR sprinklers operating at a minimum of 50 psi (3.5 bar), K-16.8 (240) sprinklers operating at a minimum of 32 psi (1.7 bar), K-22.4 (320) ESFR sprinklers operating at a minimum of 25 psi (1.7
bar), or K-25.2 (360) ESFR sprinklers operating at a minimum of 15 psi (1 bar) shall be permitted to protect single-row and double-row racks with slatted rack shelving racks where all of the following conditions are met:

(1) Sprinklers shall be K-11.2 (160), K-14.0 (200), or K-16.8 (240) orifice spray sprinklers with a temperature rating of ordinary, intermediate, or high and shall be listed for storage occupancies or shall be K-14.0 (200), K-16.8 (240), K-22.4 (320) ESFR, or K-25.2 (360) ESFR.

(2) The protected commodities shall be limited to Class I through Class IV, Group B plastics, Group C plastics, cartoned (expanded and unexpanded) Group A plastics, and exposed (unexpanded) Group A plastics.

(3) Slats in slatted rack shelving shall be a minimum nominal 2 in. (51 mm) thick by maximum nominal 6 in. (152 mm) wide with the slats held in place by spacers that maintain a minimum 2 in. (51 mm) opening between each slat.

(4) Where K-11.2 (160), K-14.0 (200), or K-16.8 (240) orifice sprinklers are used, there shall be no slatted shelf levels in the rack above 12 ft (3.7 m). Open rack shelving using wire mesh shall be permitted for shelf levels above 12 ft (3.7 m).

(5) Transverse flue spaces at least 3 in. (76 mm) wide shall be provided at least every 10 ft (3.1 m) horizontally.

(6) Longitudinal flue spaces at least 6 in. (152 mm) wide shall be provided for double-row racks. Longitudinal flue spaces shall not be required where ESFR sprinklers are used.

(7) The aisle widths shall be at least 7½ ft (2.3 m).

(8) The maximum roof height shall be 27 ft (8.2 m) or 30 ft where ESFR sprinklers are used.

(9) The maximum storage height shall be 20 ft (6.1 m).

(10) Solid plywood or similar materials shall not be placed on the slatted shelves so that they block the 2 in. (51 mm) spaces between slats, nor shall they be placed on the wire mesh shelves.

A.16.1.2 The fire protection system design should consider the maximum storage height. For new sprinkler installations, maximum storage height is the usable height at which commodities can be stored above the floor while the minimum required unobstructed space below sprinklers is maintained. Where evaluating existing situations, maximum storage height is the maximum existing storage height if space between the sprinklers and storage is equal to or greater than that required.

A.16.1.2.2 Information for the protection of Classes I, II, III, and IV commodities was extrapolated from full-scale fire tests that were performed at different times than the tests that

were used to develop the protection for plastic commodities. It is possible that, by selecting certain points from the tables (and after applying the appropriate modifications), the protection specified by 16.2.4.1 exceeds the requirements of Section 17.2. In such situations, the protection specified for plastics, although less than that required by the tables, can adequately protect Classes I, II, III, and IV commodities. This section also allows storage areas that are designed to protect plastics to store Classes I, II, III, and IV commodities without a re-evaluation of fire protection systems.

A.16.1.9 Barriers should be of sufficient strength to avoid sagging that interferes with loading and unloading operations. [ROP-439, ROP-589]

A.16.2.1.3.1 Bulkheads are not a substitute for sprinklers in racks. Their installation does not justify reduction in sprinkler densities or design operating areas as specified in the design curves.

A.16.2.1.3.2 Data indicate that the sprinkler protection criteria in Figure 16.2.1.3.2(b) through Figure 16.2.1.3.2(g) are ineffective, by themselves, for rack storage with solid shelves, if the required flue spaces are not maintained. Use of Figure 16.2.1.3.2(b) through Figure 16.2.1.3.2(g), along with the additional provisions that are required by this standard, can provide acceptable protection.

A.16.2.1.3.2.1 The aisle width and the depth of racks are determined by material-handling methods. The widths of aisles should be considered in the design of the protection system. Storage in aisles can render protection ineffective and should be discouraged. **[ROP-410]**

A.16.2.1.4.2.1 Spacing of sprinklers on branch lines in racks in the various tests demonstrates that maximum spacing as specified is proper.

A.16.2.1.4.2.2 In-rack sprinklers at one level only for storage up to and including 25 ft (7.6 m) in multiple-row racks should be storage height.

A.16.2.1.4.2.3 In-rack sprinklers have proven to be the most effective way to fight fires in rack storage. To accomplish this, however, in-rack sprinklers must be located where they will operate early in a fire as well as direct water where it will do the most good. Simply maintaining a minimum horizontal spacing between sprinklers does not achieve this goal. This is because fires in rack storage develop and grow in transverse and longitudinal flues, and in-rack sprinklers do not operate until flames actually impinge on them. To assure early operation and effective discharge, in-rack sprinklers in the longitudinal flue of open-frame racks must be located at transverse flue intersections.

A.16.2.1.4.2.4 Where possible, it is recommended that in-rack sprinkler deflectors be located at least 6 in. (152.4 mm) above pallet loads.

A.16.2.1.4.2.5 Where possible, it is recommended that in-rack sprinklers be located away from rack uprights.

A.16.2.2.7.3 See A.16.2.1.4.2.3.

A.16.2.3 ESFR sprinklers are designed to respond quickly to growing fires and deliver heavy discharge to suppress fires rather than to control them. ESFR sprinklers should not be relied on to provide suppression if they are used outside the design parameters. While these sprinklers are intended primarily for use in high-pile storage situations, this section permits their use and extension into adjacent portions of an occupancy that might have a lesser classification. Storage in single-story or multistory buildings can be permitted, provided the maximum ceiling/roof height as specified in Chapter 12 is satisfied for each storage area. Design parameters were determined from a series of full-scale fire tests that were conducted as a joint effort between Factory Mutual Research Corporation and the National Fire Protection Research Foundation. (Copies of the test reports are available from the NFPRF.)

A.16.2.3.5.5 See A.16.2.1.4.2.3.

~~**A.16.2.4.2.1** Spacing of sprinklers on branch lines in racks in the various tests demonstrates that maximum spacing as specified is proper.~~

~~**A.16.2.4.2.2** In-rack sprinklers at one level only for storage up to and including 25 ft (7.6 m) in multiple-row racks should be storage height.~~

~~**A.16.2.4.2.3** In-rack sprinklers have proven to be the most effective way to fight fires in rack storage. To accomplish this, however, in-rack sprinklers must be located where they will operate early in a fire as well as direct water where it will do the most good. Simply maintaining a minimum horizontal spacing between sprinklers does not achieve this goal. This is because fires in rack storage develop and grow in transverse and longitudinal flues, and in-rack sprinklers do not operate until flames actually impinge on them. To assure early operation and effective discharge, in-rack sprinklers in the longitudinal flue of open-frame racks must be located at transverse flue intersections.~~

~~**A.16.2.4.2.4** Where possible, it is recommended that in-rack sprinkler deflectors be located at least 6 in. (152.4 mm) above pallet loads.~~

~~**A.16.2.4.2.5** Where possible, it is recommended that in-rack sprinklers be located away from rack uprights.~~

A.16.2.4.1.1 ~~**A.16.2.5.1.1**~~ Slatting of decks or walkways or the use of open grating as a substitute for automatic sprinkler thereunder is not acceptable. In addition, where shelving of any type is employed, it is for the basic purpose of providing an intermediate support between the structural members of the rack. As a result, it becomes almost impossible to define and maintain transverse flue spaces across the rack as required.

13-289 Log #94 AUT-SSD **Final Action: Accept in Principle**
(16.2.3.2)

Submitter: Larry Keeping, Vipond Fire Protection
Comment on Proposal No: 13-437
Recommendation: Do not delete Note 1 of 16.2.3.2. Instead revise 16.3.2 and add a new 16.2.3.3, styled after the new text from the Committee Action for Proposal 13-178:

16.2.3.2 ESFR sprinklers shall not be permitted to protect storage on solid shelf racks unless the solid shelves are protected in accordance with 16.1.6.

16.2.3.3 ESFR sprinklers shall not be permitted to protect storage with open top containers.

Renumber the remainder of the section accordingly.

Substantiation: The new text suggested here better defines the limitations of ESFR protection schemes. The current text saying "ESFR protection as defined …" suggests the usual idea of ESFR sprinklers being used on a ceiling protection only basis, without any corresponding in-rack sprinklers. Therefore, if only Note 1 is deleted, it could be interpreted that the corresponding in-rack sprinklers may not be needed with solid shelves.
Committee Meeting Action: Accept in Principle
Revise 16.2.3.2 as follows (add "with in rack sprinklers" to proposed language):

16.2.3.2 ESFR sprinklers shall not be permitted to protect storage on solid shelf racks unless the solid shelf racks are protected with in rack sprinklers in accordance with 16.1.6.

Add new:

16.2.3.3 ESFR sprinklers shall not be permitted to protect storage with open top containers.

Renumber accordingly

Committee Statement: Clarification that in-rack sprinklers are required per 16.1.6.

13-290 Log #355 AUT-SSD **Final Action: Reject**
(Table 16.2.4.2.1)

Submitter: Alan L. Hall, Loss Prevention Consultants
Comment on Proposal No: 13-444
Recommendation: Eliminate the Encapsulated Column and the Yes row. This effectively eliminates the 8 foot in-rack spacing for an ecapsulated commodity.
Substantiation: There has been no technical justification that a Class I encapsulated commodity requires 8 foot spacing for the in-rack sprinklers. If this is such a hazard, why in the table provided for multi-row racking can a Class I encapsulated commodity have sprinklers on 12 foot centers.
Committee Meeting Action: Reject
Committee Statement: This criteria of 8 ft spacing for encapsulated storage has been in the text of 16.2.4.2.1 and now has been added to the Table.

13-291 Log #40 AUT-SSD Final Action: Reject
(16.2.4.2.7)

Submitter: Roland J. Huggins, American Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-444
Recommendation: Delete the following text:
~~16.2.4.2.7 Sprinklers installed in racks shall be spaced without regard to rack uprights.~~
Substantiation: This is old guidance (the exact same text as in the 1995 edition of NFPA 231C) that once identified where to place the in-rack sprinklers (ie at the defined maximum interval without regard for the uprights). This text correlated with the old guidance where location was measured from the uprights (ie for storage >25, in-racks to be at least 2 ft away from uprights). With the transition to placement at the intersection of the transverse and longitudinal flues (Section 16.2.4.2.3), this old criteria presents an obscure conflict (since the intersection of the flues is often at the uprights). Without looking back at the old criteria, it is easy to think this section is addressing obstructions. This is editorial.
Committee Meeting Action: Reject
Committee Statement: This is new material which was not referenced in the ROP, this section is necessary to provide additional clarification.

13-292 Log #144 AUT-SSD Final Action: Accept
(16.3)

Submitter: Kenneth E. Isman, National Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-430
Recommendation: Revise Section 16.3 moving the in-rack sprinkler requirements as follows:
1. Where Control Mode Density Area sprinklers are installed at the ceiling, put the in-rack sprinkler requirements in Section 16.3.1.
2. Where Control Mode Specific Application sprinklers are installed at the ceiling, put the in-rack sprinkler requirements in Section 16.3.2.
3. Where ESFR sprinklers are installed at the ceiling, put the in-rack sprinkler requirements in Section 16.3.3.
4. Delete Section 16.3.4.
5. Renumber old 16.3.5 as new 16.3.4.

The proposed revision starts by adding a new Section 16.3.1.3 and goes through 16.3.5 as shown on the next pages. The Draft of Chapter 16 after the results of the ROP was used to generate this comment.

******Insert Include 13_L144_R Here******

Substantiation: There are a number of reasons for this comment. First, the in-rack sprinkler installation rules are tied to the ceiling sprinkler selection, so separating the rules by several sections makes the standard more difficult to use.

Second, the in-rack sprinkler rules were written for use with CMDA sprinklers at the ceiling. They have been adapted for situations where CMSA or ESFR sprinklers are used, but the specific rules to apply are not clear. Section 16.3.2.2 says that when CMSA sprinklers are used at the ceiling, the in-rack rules need to be used "as applicable for the commodity". But this does not really work. For example, Figure 16.3.4.1.3.1(a) through Figure 16.3.4.1.3.1(c) (which are the only in-rack sprinkler placement figures that can be used with multiple row racks) require a maximum distance from the top level of in-rack sprinklers to the top of the storage of 10 ft or 5 ft. But if only one row of in-rack sprinklers is going to be installed in accordance with Table 16.3.2.1 how is that possible? Is the one level of in-rack sprinklers to be installed real high in the racks? That does not make sense.

Significant problems also exist where ESFR sprinklers are installed at the ceiling. Section 16.3.3.5 contains some rules for the in-rack sprinklers, but then these are incomplete and contradict 16.3.4, which is supposed to apply to all in-rack sprinkler situations at this storage height.

It would be better for the committee to be explicit about what it wants for in-rack requirements in each individual portion of 16.3. While this creates some repetition, it is worthwhile to clarify the requirements.
Committee Meeting Action: Accept

13-293 Log #CC21 AUT-SSD Final Action: Accept
(17.1.5.5)

Submitter: Technical Committee on Sprinkler System Discharge Criteria,
Comment on Proposal No: 13-451
Recommendation: Revise section 17.1.5.5 to add the text as follows:
17.1.5.5 Where the criteria of 17.1.5.6 is not met, the water demand for the in-rack sprinklers shall be based on a minimum flow of 30 gpm discharging from the following number of sprinklers balanced to the ceiling sprinkler demand in accordance with Section 22.8.
Substantiation: To be consistent with the changes in Chapter 16 to make sure the correct procedures from Chapter 22 are followed.
Committee Meeting Action: Accept

16.3.1.3 ~~16.3.4~~ In-Rack Sprinklers for Rack Storage of Class I Through Class IV Commodities Stored Over 25 ft (7.6 m) in Height Protected with Control Mode Density/Area Sprinklers at the Ceiling.

16.3.1.3.1 ~~16.3.4.1~~ In-Rack Sprinkler Location for Rack Storage of Class I Through Class IV Commodities Stored Over 25 ft (7.6 m) in Height Protected with Control Mode Density/Area Sprinklers at the Ceiling.

16.3.1.3.1.1 ~~16.3.4.1.1~~* Double-Row Racks.

16.3.1.3.1.1.1 ~~16.3.4.1.1.1~~ In double-row racks without solid shelves and with a maximum of 10 ft (3.1 m) between the top of storage and the ceiling, in-rack sprinklers shall be installed in accordance with Table 16.3.1.1 and Figure 16.3.1.3.1.1.1(a) through Figure 16.3.1.3.1.1.1(j) ~~16.3.4.1.1.1(a) through Figure 16.3.4.1.1.1(j)~~. The highest level of in-rack sprinklers shall be not more than 10 ft (3.1 m) below the top of storage. Where a single-row rack is mixed with double-row racks, Table 16.3.1.1 and Figure 16.3.1.3.1.1.1(a) through Figure 16.3.1.3.1.1.1(j) ~~16.3.4.1.1.1(a) through Figure 16.3.4.1.1.1(j)~~ shall be used.

Figure 16.3.1.3.1.1.1(a) ~~Figure 16.3.4.1.1.1(a)~~ In-Rack Sprinkler Arrangement, Class I Commodities, Storage Height 25 ft to Maximum 30 ft (7.6m to Maximum 9.1m).

Figure 16.3.1.3.1.1.1(b) ~~Figure 16.3.4.1.1.1(b)~~ In-Rack Sprinkler Arrangement, Class I Commodities, Storage Height Over 25 ft (7.6m).

Figure 16.3.1.3.1.1.1(c) ~~Figure 16.3.4.1.1.1(c)~~ In-Rack Sprinkler Arrangement, Class I, Class II, or Class III Commodities, Storage Height 25 ft to Maximum 30 ft (7.6m to Maximum 9.1m).

Figure 16.3.1.3.1.1.1(d) ~~Figure 16.3.4.1.1.1(d)~~ In-Rack Sprinkler Arrangement, Class I, Class II, or Class III Commodities, Storage Height Over 25 ft (7.6m) – Option 1.

Figure 16.3.1.3.1.1.1(e) ~~Figure 16.3.4.1.1.1(e)~~ In-Rack Sprinkler Arrangement, Class I, Class II, or Class III Commodities, Storage Height Over 25 ft (7.6m) – Option 2.

Figure 16.3.1.3.1.1.1(f) ~~Figure 16.3.4.1.1.1(f)~~ In-Rack Sprinkler Arrangement, Class I, Class II, or Class III Commodities, Storage Height Over 25 ft (7.6m) – Option 3.

Figure 16.3.1.3.1.1.1(g) ~~Figure 16.3.4.1.1.1(g)~~ In-Rack Sprinkler Arrangement, Class I, Class II, or Class III Commodities, Storage Height Over 25 ft (7.6m) – Option 4.

Figure 16.3.1.3.1.1.1(h) ~~Figure 16.3.4.1.1.1(h)~~ In-Rack Sprinkler Arrangement, Class I, Class II, Class III, or Class IV Commodities, Storage Height Over 25 ft (7.6m) – Option 1.

Figure 16.3.1.3.1.1.1(i) ~~Figure 16.3.4.1.1.1(i)~~ In-Rack Sprinkler Arrangement, Class I, Class II, Class III, or Class IV Commodities, Storage Height Over 25 ft (7.6m) – Option 2.

Figure 16.3.1.3.1.1.1(j) ~~Figure 16.3.4.1.1.1(j)~~ In-Rack Sprinkler Arrangement, Class I, Class II, Class III, or Class IV Commodities, Storage Height Over 25 ft (7.6m) – Option 3.

16.3.1.3.1.1.2 ~~**16.3.4.1.1.2**~~ ~~Figure 16.3.4.1.2.1(a) through Figure 16.3.4.1.2.1(c)~~ Figure 16.3.1.3.1.1.2(a) through Figure 16.3.1.3.1.1.2(c) shall be permitted to be used for the protection of the single-row racks.

16.3.1.3.1.2* ~~**16.3.4.1.2***~~ **Single-Row Racks.**

16.3.1.3.1.2.1 ~~**16.3.4.1.2.1**~~ In single-row racks without solid shelves with storage height over 25 ft (7.6 m) and a maximum of 10 ft (3.1m) between the top of storage and the ceiling, sprinklers shall be installed in accordance with Figure 16.3.1.3.1.2.1(a) through Figure 16.3.1.3.1.2.1(e) ~~Figure 16.3.4.1.2.1(a) through Figure 16.3.4.1.2.1(e)~~.

Figure 16.3.1.3.1.2.1(a) ~~Figure 16.3.4.1.2.1(a)~~ Class I, Class II, Class III, or Class IV Commodities, In-Rack Sprinkler Arrangement, Single-Row Racks, Storage Height Over 25 ft (7.6m) – Option 1.

Figure 16.3.1.3.1.2.1(b) ~~Figure 16.3.4.1.2.1(b)~~ Class I, Class II, or Class III Commodities, In-Rack Sprinkler Arrangement, Single-Row Racks, Storage Height Over 25 ft (7.6m) – Option 1.

Figure 16.3.1.3.1.2.1(c) ~~Figure 16.3.4.1.2.1(c)~~ Class I, Class II, or Class III Commodities, In-Rack Sprinkler Arrangement, Single-Row Racks, Storage Height Over 25 ft (7.6m) – Option 2.

Figure 16.3.1.3.1.2.1(d) ~~Figure 16.3.4.1.2.1(d)~~ Class I, Class II, Class III, or Class IV Commodities, In-Rack Sprinkler Arrangement, Single-Row Racks, Storage Height Over 25 ft (7.6m) – Option 2.

Figure 16.3.1.3.1.2.1(e) ~~Figure 16.3.4.1.2.1(e)~~ Class I, Class II, Class III, or Class IV Commodities, In-Rack Sprinkler Arrangement, Single-Row Racks, Storage Height Over 25 ft (7.6m) – Option 3.

16.3.1.3.1.2.2 ~~**16.3.4.1.2.2**~~ In single-row racks, where figures show in-rack sprinklers in transverse flue spaces centered between the rack faces, it shall be permitted to position these in-rack sprinklers in the transverse flue at any point between the load faces.

16.3.1.3.1.3* ~~**16.3.4.1.3***~~ **In-Rack Sprinkler Location—Multiple-Row Racks for Rack Storage of Class I Through Class IV Commodities Stored Over 25 ft (7.6 m) in Height Protected with Control Mode Density/Area Sprinklers at the Ceiling.**

16.3.1.3.1.3.1 ~~**16.3.4.1.3.1**~~ In multiple-row racks with a maximum of 10 ft (3.1 m) between the top of storage and the ceiling, protection shall be in accordance with Table 16.3.1.2 and in-rack sprinklers shall be installed as indicated in Figure 16.3.1.3.1.3.1(a) through Figure 16.3.1.3.1.3.1(c) ~~Figure 16.3.4.1.3.1(a) through Figure 16.3.4.1.3.1(c)~~.

Figure 16.3.1.3.1.3.1(a) ~~Figure 16.3.4.1.3.1(a)~~ In-Rack Sprinkler Arrangement – Multiple-Row Racks, Class I Commodities, Storage Height Over 25 ft (7.6m).

Figure 16.3.1.3.1.3.1(b) ~~Figure 16.3.4.1.3.1(b)~~ In-Rack Sprinkler Arrangement – Multiple-Row Racks, Class I, Class II, or Class III Commodities, Storage Height Over 25 ft (7.6m).

Figure 16.3.1.3.1.3.1(c) ~~Figure 16.3.4.1.3.1(c)~~ In-Rack Sprinkler Arrangement – Multiple-Row Racks, Class I, Class II, Class III, or Class IV Commodities, Storage Height Over 25 ft (7.6m)

16.3.1.3.1.3.2 ~~16.3.4.1.3.2~~ The highest level of in-rack sprinklers shall be not more than 10 ft (3.1 m) below maximum storage height for Class I, Class II, or Class III commodities or 5 ft (1.5 m) below the top of storage for Class IV commodities.

16.3.1.3.2 ~~16.3.4.2~~ In-Rack Sprinkler Spacing for Rack Storage of Class I Through Class IV Commodities Stored Over 25 ft (7.6 m) in Height Protected with Control Mode Density/Area Sprinklers at the Ceiling.

16.3.1.3.2.1 ~~16.3.4.2.1~~ In-Rack Sprinkler Spacing. In-rack sprinklers shall be staggered horizontally and vertically where installed in accordance with Table 16.3.1.1, Figure 16.3.1.3.1.1.1(a) through Figure 16.3.1.3.1.1.1(j), and Figure 16.3.1.3.1.2.1(a) through Figure 16.3.1.3.1.2.1(e). ~~Figure 16.3.4.1.1.1(a) through Figure 16.3.4.1.1.1(j), and Figure 16.3.4.1.2.1(a) through Figure 16.3.4.1.2.1(e).~~

16.3.1.3.2.2 ~~16.3.4.2.2~~ In-rack sprinklers for storage higher than 25 ft (7.6m) in double-row racks shall be spaced horizontally and located in the horizontal space nearest the vertical intervals specified in Table 16.3.1.1 and Figure 16.3.1.3.1.1.1(a) through Figure 16.3.1.3.1.1.1(j) ~~Figure 16.3.4.1.1.1(a) through Figure 16.3.4.1.1.1(j)~~.

16.3.1.3.2.3 ~~16.3.4.2.3~~ In-Rack Sprinkler Spacing. Maximum horizontal spacing of sprinklers in multiple-row racks with storage higher than 25 ft (7.6 m) shall be in accordance with Figure 16.3.1.3.1.3.1(a) through 16.3.1.3.1.3.1(c) ~~Figure 16.3.4.1.3.1(a) through Figure 16.3.4.1.3.1(c)~~.

16.3.1.3.2.4* ~~16.3.4.2.4*~~ In-rack sprinklers shall be located at an intersection of transverse and longitudinal flues while not exceeding the maximum spacing rules.

16.3.1.3.2.4.1 ~~16.3.4.2.4.1~~ Where distances between transverse flues exceed the maximum allowable distances, sprinklers shall be installed at the intersection of the transverse and longitudinal flues, and additional sprinklers shall be installed between transverse flues to meet the maximum distance rules.

16.3.1.3.2.4.2 ~~16.3.4.2.4.2~~ Where no transverse flues exist, in-rack sprinklers shall not exceed the maximum spacing rules.

16.3.1.3.3 ~~16.3.4.3~~ In-Rack Sprinkler Water Demand for Rack Storage of Class I Through Class IV Commodities Stored Over 25 ft (7.6m) in Height Protected with Control Mode Density/Area Sprinklers at the Ceiling. The water demand for sprinklers installed in racks shall be based on simultaneous operation of the most hydraulically remote sprinklers as follows:

(1) Six sprinklers where only one level is installed in racks with Class I, Class II, or Class III commodities
(2) Eight sprinklers where only one level is installed in racks with Class IV commodities
(3) Ten sprinklers (five on each two top levels) where more than one level is installed in racks with Class I, Class II, or Class III commodities
(4) Fourteen sprinklers (seven on each two top levels) where more than one level is installed in racks with Class IV commodities

16.3.1.3.3.1 ~~16.3.4.3.1~~ In-Rack Sprinkler Discharge for Rack Storage of Class I Through Class IV Commodities Stored Over 25 ft (7.6m) in Height Protected with Control Mode Density/Area Sprinklers at the Ceiling. Sprinklers in racks shall discharge at a rate not less than 30 gpm (113.6 L/min) for all classes of commodities.

16.3.2 CMSA Sprinklers for Rack Storage of Class I Through Class IV Commodities Stored Over 25 ft (7.6 m) in Height.

16.3.2.1 Protection of single-, double-, and multiple-row rack storage without solid shelves for Class I through Class IV commodities shall be in accordance with Table 16.3.2.1.

16.3.2.2 Where in-rack sprinklers are required by Table 16.3.2.7 ~~16.3.2.1~~, in-rack sprinkler spacing, design pressure, and hydraulic calculation criteria shall be in accordance with the requirements of 16.3.4 as applicable for the commodity.

16.3.2.3 Protection shall be provided as specified in Table 16.3.2.1 or appropriate NFPA standards in terms of minimum operating pressure and the number of sprinklers to be included in the design area.

16.3.2.4 Open Wood Joist Construction.

16.3.2.4.1 Where CMSA sprinklers are installed under open wood joist construction, their minimum operating pressure shall be 50 psi (3.4 bar) for a K-11.2 (160) sprinkler or 22 psi (1.5 bar) for a K-16.8 (240) sprinkler.

16.3.2.4.2 Where each joist channel of open wood joist construction is fully firestopped to its full depth at intervals not exceeding 20 ft (6.1 m), the lower pressures specified in Table 16.3.2.1 shall be permitted to be used. **[ROP-410]**

16.3.2.5 Preaction Systems. For the purpose of using Table 16.3.2.1, preaction systems shall be classified as dry pipe systems.

16.3.2.6 Building steel shall not require special protection where Table 16.3.2.1 are applied as appropriate for the storage configuration.

16.3.2.7 In-Rack Sprinklers for Rack Storage of Class I Through Class IV Commodities Stored Over 25 ft (7.6 m) in Height Protected with Control Mode Specific Application Sprinklers at the Ceiling.

16.3.2.7.1 Where in-rack sprinklers are required by Table 16.3.2.1, in-rack sprinklers shall be installed at the first tier level at or above one-half of the storage height.

16.3.2.7.2 The minimum of 6 in. (152.4 mm) vertical clear space shall be maintained between the sprinkler deflectors and the top of a tier of storage.

16.3.2.7.3 In-rack sprinklers shall be located at an intersection of transverse and longitudinal flues.

16.3.2.7.4 The maximum horizontal distance between in-rack sprinklers shall be 5 ft (1.5 m).

16.3.2.7.5 Where distances between transverse flues exceed the maximum allowable distances, sprinklers shall be installed at the intersection of the transverse and longitudinal flues, and additional sprinklers shall be installed between transverse flues to meet the maximum distance rules.

16.3.2.7.6 Where no transverse flues exist, in-rack sprinklers shall not exceed the maximum spacing rules.

16.3.2.7.7 In-Rack Sprinkler Water Demand. The water demand for sprinklers installed in-racks shall be based on simultaneous operation of the most hydraulically remote eight sprinklers.

16.3.2.7.8 In-Rack Sprinkler Discharge Pressure. Sprinklers in-racks shall discharge at not less than 15 psi (1 bar) for all classes of commodities. (See Section C.19.)

16.3.3* Early Suppression Fast-Response (ESFR) Sprinklers for Rack Storage of Class I Through Class IV Commodities Stored Over 25 ft (7.6 m) in Height.

16.3.3.1 Protection of single-, double-, and multiple-row rack storage of Class I through Class IV shall be in accordance with Table 16.3.3.1.

16.3.3.2 ESFR protection as defined shall not apply to the following:

(1) Rack storage involving solid shelves
(2) Rack storage involving combustible, open-top cartons or containers

16.3.3.3 ESFR sprinkler systems shall be designed such that the minimum operating pressure is not less than that indicated in Table 16.3.3.1 for type of storage, commodity, storage height, and building height involved.

16.3.3.4 The design area shall consist of the most hydraulically demanding area of 12 sprinklers, consisting of four sprinklers on each of three branch lines. **[ROP-487]**

16.3.3.5 Where required by Table 16.3.3.1, one level of K-8.0 (115) or K-11.2 (160) quick-response, ordinary-temperature in-rack sprinklers shall be installed at the tier level closest to but not exceeding one-half of the maximum storage height.

16.3.3.5.1 In-rack sprinkler hydraulic design criteria shall be the most hydraulically remote eight sprinklers at 60 gpm (227 L/min).

16.3.3.5.2 In-rack sprinklers shall be located at the intersection of the longitudinal and transverse flue space.

16.3.3.5.3 Horizontal spacing shall not be permitted to exceed 5 ft (1.5 m) intervals.

16.3.3.5.4 The minimum of 6 in. (152.4 mm) vertical clear space shall be maintained between the sprinkler deflectors and the top of a tier of storage.

16.3.3.5.5 In-rack sprinklers shall be located at an intersection of transverse and longitudinal flues while not exceeding the maximum spacing rules.

16.3.3.5.6 Where distances between transverse flues exceed the maximum allowable distances, sprinklers shall be installed at the intersection of the transverse and longitudinal flues, and additional sprinklers shall be installed between transverse flues to meet the maximum distance rules.

16.3.3.5.7 Where no transverse flues exist, in-rack sprinklers shall not exceed the maximum spacing rules.

~~**16.3.4 In-Rack Sprinklers for Rack Storage of Class I Through Class IV Commodities Stored Over 25 ft (7.6 m) in Height.**~~

~~**16.3.4.1 In-Rack Sprinkler Location for Rack Storage of Class I Through Class IV Commodities Stored Over 25 ft (7.6 m) in Height.**~~

~~**16.3.4.1.1* Double-Row Racks.**~~

~~**16.3.4.1.1.1** In double-row racks without solid shelves and with a maximum of 10 ft (3.1 m) between the top of storage and the ceiling, in-rack sprinklers shall be installed in accordance with Table 16.3.1.1 and Figure 16.3.4.1.1.1(a) through Figure 16.3.4.1.1.1(j). The highest level of in-rack sprinklers shall be not more than 10 ft (3.1 m) below the top of storage. Where a single-row rack is mixed with double-row racks, Table 16.3.1.1 and Figure 16.3.4.1.1.1(a) through Figure 16.3.4.1.1.1(j) shall be used.~~

~~**16.3.4.1.1.2** Figure 16.3.4.1.2.1(a) through Figure 16.3.4.1.2.1(c) shall be permitted to be used for the protection of the single-row racks.~~

~~**16.3.4.1.2* Single-Row Racks.**~~

~~**16.3.4.1.2.1** In single-row racks without solid shelves with storage height over 25 ft (7.6 m) and a maximum of 10 ft (3.1m) between the top of storage and the ceiling, sprinklers shall be installed in accordance with Figure 16.3.4.1.2.1(a) through Figure 16.3.4.1.2.1(c).~~

~~**16.3.4.1.2.2** In single-row racks, where figures show in-rack sprinklers in transverse flue spaces centered between the rack faces, it shall be permitted to position these in-rack sprinklers in the transverse flue at any point between the load faces.~~

~~**16.3.4.1.3* In-Rack Sprinkler Location – Multiple-Row Racks for Rack Storage of Class I Through Class IV Commodities Stored Over 25 ft (7.6 m) in Height.**~~

~~**16.3.4.1.3.1** In multiple-row racks with a maximum of 10 ft (3.1 m) between the top of storage and the ceiling, protection shall be in accordance with Table 16.3.1.2 and in-rack sprinklers shall be installed as indicated in Figure 16.3.4.1.3.1(a) through Figure 16.3.4.1.3.1(c).~~

~~**16.3.4.1.3.2** The highest level of in-rack sprinklers shall be not more than 10 ft (3.1 m) below maximum storage height for Class I, Class II, or Class III commodities or 5 ft (1.5 m) below the top of storage for Class IV commodities.~~

~~**16.3.4.2 In-Rack Sprinkler Spacing for Rack Storage of Class I Through Class IV Commodities Stored Over 25 ft (7.6 m) in Height.**~~

~~**16.3.4.2.1 In-Rack Sprinkler Spacing.** In-rack sprinklers shall be staggered horizontally and vertically where installed in accordance with Table 16.3.1.1, Figure 16.3.4.1.1.1(a) through Figure 16.3.4.1.1.1(j), and Figure 16.3.4.1.2.1(a) through Figure 16.3.4.1.2.1(e).~~

~~**16.3.4.2.2** In-rack sprinklers for storage higher than 25 ft (7.6m) in double-row racks shall be spaced horizontally and located in the horizontal space nearest the vertical intervals specified in Table 16.3.1.1 and Figure 16.3.4.1.1.1(a) through Figure 16.3.4.1.1.1(j).~~

~~**16.3.4.2.3 In-Rack Sprinkler Spacing.** Maximum horizontal spacing of sprinklers in multiple-row racks with storage higher than 25 ft (7.6 m) shall be in accordance with Figure 16.3.4.1.3.1(a) through Figure 16.3.4.1.3.1(c).~~

~~**16.3.4.2.4*** In-rack sprinklers shall be located at an intersection of transverse and longitudinal flues while not exceeding the maximum spacing rules.~~

~~**16.3.4.2.4.1** Where distances between transverse flues exceed the maximum allowable distances, sprinklers shall be installed at the intersection of the transverse and longitudinal flues, and additional sprinklers shall be installed between transverse flues to meet the maximum distance rules.~~

~~**16.3.4.2.4.2** Where no transverse flues exist, in-rack sprinklers shall not exceed the maximum spacing rules.~~

~~**16.3.4.3 In-Rack Sprinkler Water Demand for Rack Storage of Class I Through Class IV Commodities Stored Over 25 ft (7.6m) in Height.** The water demand for sprinklers installed in racks shall be based on simultaneous operation of the most hydraulically remote sprinklers as follows:~~

~~(1) Six sprinklers where only one level is installed in racks with Class I, Class II, or Class III commodities~~

~~(2) Eight sprinklers where only one level is installed in racks with Class IV commodities~~

~~(3) Ten sprinklers (five on each two top levels) where more than one level is installed in racks with Class I, Class II, or Class III commodities~~

~~(4) Fourteen sprinklers (seven on each two top levels) where more than one level is installed in racks with Class IV commodities~~

~~**16.3.4.3.1 In-Rack Sprinkler Discharge for Rack Storage of Class I Through Class IV Commodities Stored Over 25 ft (7.6m) in Height.** Sprinklers in racks shall discharge at a rate not less than 30 gpm (113.6 L/min) for all classes of commodities.~~

16.3.4 ~~**16.3.5**~~ **Special Design for Rack Storage of Class I Through Class IV Commodities Stored Over 25 ft (7.6 m) in Height.**

16.3.4.1 ~~**16.3.5.1**~~ Where high-expansion foam systems are used for storage over 25 ft (7.6 m) high up to and including 35 ft (10.7m) high, they shall be used in combination with ceiling

sprinklers. The maximum submergence time for the high expansion foam shall be 5 minutes for Class I, Class II, or Class III commodities and 4 minutes for Class IV commodities.
A.16.3.1.3.1.1 ~~A.16.3.4.1.1~~ Where storage tiers are not the same size on each side of the longitudinal flue, one side of the flue should be protected with sprinklers at the proper elevation above the load. The next level of sprinklers should protect the other side of the flue with the sprinklers at the proper elevation above that load as indicated in Figure A.16.3.1.3.1.1 ~~A.16.3.4.1.1~~. The vertical spacing requirements for in-rack sprinklers specified in Table 16.3.1.1 and Section 17.2 for plastics should be followed.

Figure A.16.3.1.3.1.1 ~~Figure A.16.3.4.1.1~~ Placement of In-Rack Sprinkler Where Rack Levels Have Varying Heights

A.16.3.1.3.1.2 ~~A.16.3.4.1.2~~ In single-row racks with more than 10 ft (3.1 m) between the top of storage and the ceiling, a horizontal barrier should be installed above storage with one line of sprinklers under the barrier.
A.16.3.1.3.1.3 ~~A.16.3.4.1.3~~ In multiple-row racks with more than 10 ft (3.1m) between the maximum height of storage and ceiling, a horizontal barrier should be installed above storage with a level of sprinklers, spaced as stipulated for in-rack sprinklers, installed directly beneath the barrier. In-rack sprinklers should be installed as indicated in Figure 16.3.1.3.1.3.1(a) through Figure 3.1.3.1.3.1(c) ~~Figure 16.3.4.1.3.1(a) through Figure 16.3.4.1.3.1(c)~~. Data indicate that the sprinkler protection criteria in 16.3.4.1.3 are ineffective, by themselves, for rack storage with solid shelves if the required flue spaces are not maintained. Use of Table 16.3.1.2, along with the additional provisions that are required by this standard, can provide acceptable protection.
A.16.3.1.3.2.4 ~~A.16.3.4.2.4~~ In-rack sprinklers have proven to be the most effective way to fight fires in rack storage. To accomplish this, however, in-rack sprinklers must be located where they will operate early in a fire as well as direct water where it will do the most good. Simply maintaining a minimum horizontal spacing between sprinklers does not achieve this goal. This is because fires in rack storage develop and grow in transverse and longitudinal flues, and in-rack sprinklers do not operate until flames actually impinge on them. To assure early operation and effective discharge, in-rack sprinklers in the longitudinal flue of open-frame racks must be located at transverse flue intersections.
A.16.3.3 ESFR sprinklers are designed to respond quickly to growing fires and deliver heavy discharge to suppress fires rather than to control them. ESFR sprinklers should not be relied on to provide suppression if they are used outside the design parameters. While these sprinklers are intended primarily for use in high-pile storage situations, this section permits their use and extension into adjacent portions of an occupancy that might have a lesser classification. Storage in single-story or multistory buildings can be permitted, provided the maximum ceiling/roof height as specified in Chapter 12 is satisfied for each storage area. Design parameters were determined from a series of full-scale fire tests that were conducted as a joint effort between Factory Mutual Research Corporation and the National Fire Protection Research Foundation. (Copies of the test reports are available from the NFPRF.)
~~**A.16.3.4.1.1** Where storage tiers are not the same size on each side of the longitudinal flue, one side of the flue should be protected with sprinklers at the proper elevation above the load. The next level of sprinklers should protect the other side of the flue with the sprinklers at the proper elevation above that load as indicated in Figure A.16.3.4.1.1. The vertical spacing requirements~~

~~for in-rack sprinklers specified in Table 16.3.1.1 and Section 17.2 for plastics should be followed.~~

~~**A.16.3.4.1.2** In single-row racks with more than 10 ft (3.1 m) between the top of storage and the ceiling, a horizontal barrier should be installed above storage with one line of sprinklers under the barrier.~~

~~**A.16.3.4.1.3** In multiple-row racks with more than 10 ft (3.1m) between the maximum height of storage and ceiling, a horizontal barrier should be installed above storage with a level of sprinklers, spaced as stipulated for in-rack sprinklers, installed directly beneath the barrier. In-rack sprinklers should be installed as indicated in Figure 16.3.4.1.3.1(a) through Figure 16.3.4.1.3.1(c). Data indicate that the sprinkler protection criteria in 16.3.4.1.3 are ineffective, by themselves, for rack storage with solid shelves if the required flue spaces are not maintained. Use of Table 16.3.1.2, along with the additional provisions that are required by this standard, can provide acceptable protection.~~

~~**A.16.3.4.2.4** In-rack sprinklers have proven to be the most effective way to fight fires in rack storage. To accomplish this, however, in-rack sprinklers must be located where they will operate early in a fire as well as direct water where it will do the most good. Simply maintaining a minimum horizontal spacing between sprinklers does not achieve this goal. This is because fires in rack storage develop and grow in transverse and longitudinal flues, and in-rack sprinklers do not operate until flames actually impinge on them. To assure early operation and effective discharge, in-rack sprinklers in the longitudinal flue of open-frame racks must be located at transverse flue intersections.~~

13-294 Log #279 AUT-SSD Final Action: Reject
(17.2.1.2.1 and 17.3.1.1)

Submitter: Tracey D. Bellamy, Telgian Corporation
Comment on Proposal No: 13-456
Recommendation: Reconsider the acceptance of 13-456.
Substantiation: The Committee statement for rejection is divided into three parts. The first part indicates directly that the section does not apply to Unexpanded Exposed Group A plastic, the second indicates that no test data was submitted and the third indicates that recent testing shows that Unexpanded Exposed plastic is more difficult to control than what was discussed in the 1998 code revision cycle.

The first part of the Committee statement makes a declaration that the section is simply not applicable to Unexpanded Exposed Group A plastic; however, the third statement recognizes that such a statement is not consistent with the intent of the Committee back in the 1998 code revision cycle. To try and stand on what is clearly a mistake by both the Committee and NFPA Staff during the 1998 code revision cycle that left a stray reference in the cited sections is not in keeping with the intent or spirit of the code development process.

The second part of the Committee statement cites a lack of test data being submitted as a basis for rejection. While this concept of providing test data in support of a change is well founded in the code development process, it was not needed in this case as the concept of protection for Unexpanded Exposed Group A plastic was presented and vetted through the code revision cycle back in 1998 and this was simply the correction of a mistake that has persisted unnoticed in the code since that time. Furthermore the Committee then turns to rely on new yet unsubmitted test data to proclaim what was done in 1998 did not adequately address the hazard. This doesn't make any sense. How can the Committee use a lack of a test data to reject a proponents request and then turn to do exactly the same thing but accept a proposal on the same subject matter? To further complicate matters, the Committee then turns to accept a extensive set of protection criteria for this same Unexpanded Exposed Group A plastic as proposed in 13-457 when the proponent clearly states that no fire test or risk analysis information is available to support the request.

In the third part of the Committee statement it references tests that demonstrate the increased difficulty in protection for such products; however, no specific indication or review of this data was possible without the submission of the actual test reports. Without this data is it difficult, if not impossible, to directly refute such claims; however, I do understand that some of the testing may have been completed with idle plastic pallets as well as idle plastic boxes. While these specific products might certainly have represented a greater hazard than the standard Group A plastic test commodity they are also representative of very unique hazards similar to those presented by idle wood pallets (and empty slatted wood crates that are to be treated as idle pallets in accordance with Table A.5.6) that require special protection beyond those required by the commodity classification for the base construction material of the product. Otherwise we would treat idle wood pallets the same as a Class III commodity, which we do not and justifiably so.

Finally, I have seen no presentation of data that would indicate that sprinkler systems designed in accordance with the criteria for CMDA/Group A plastics (as was presented and approved during the 1998 code revision cycle) has resulted in any unacceptable loss occurrences or system failures.

Given that the issue surrounding this proposal was prompted by an error from the 1998 code revision cycle that remained unnoticed until just prior to this cycle combined with the lack of test and loss data to support a need for restrict the use of CMDA criteria, the acceptance of this proposal should be considered.

Committee Meeting Action: Reject
Committee Statement: It is the intent of Section 17.2.1.2.1 to limit the application to cartoned commodities.

13-295 Log #268 AUT-SSD Final Action: Reject
(Figure 17.2.1.2.1(c) and (d))

Submitter: William N. Brooks, Brooks Fire Protection
Comment on Proposal No: 13-457
Recommendation: Revise existing Figures 17.2.1.2.1(c), (d), (e), and (f) as follows:
Figure 17.2.1.2.1(c), Note 3-
3. Single level of in-rack sprinklers [17/32 in. (13.5 mm) operating at 15 psi (1.03 bar) minimum or 1/2 in. (12.7 mm) operating at 30 psi (2.07 bar) minimum] installed ~~on 4 ft to 5 ft (1.25 m to 1.56 m) spacings located, as indicated,~~ in the longitudinal flue space at the intersection of every transverse flue space.

Figure 17.2.1.2.1(d), Note 4 -

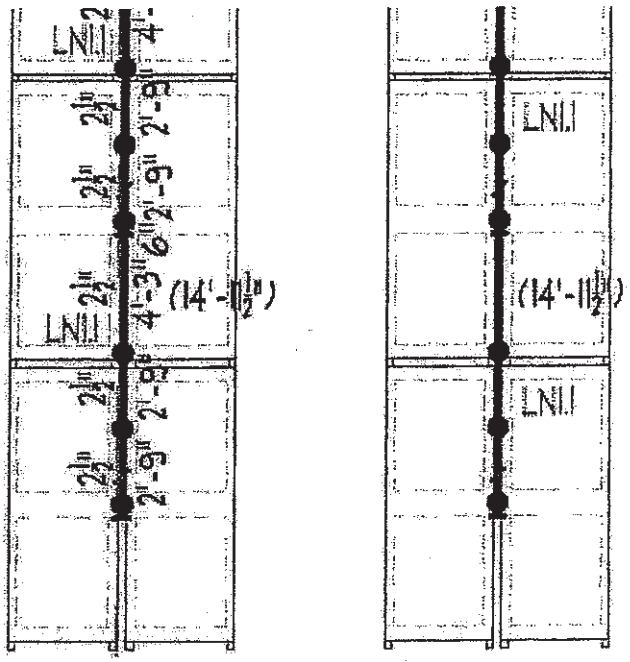
Substantiation: The acceptance of Proposal 13-457 creates an inconsistency between the existing Figures 17.2.1.2.1 and the newly adopted Figures 17.2.1.5. In most cases, overall rack length will not exceed 10 ft and the existing 4 to 5 ft spacing matches the illustrated plan views adequately. However, as Proposal 13-457 illustrates, it is not necessary to specify the 4 ft to 5 ft spacing along with the "intersection of every flue space." The illustration below shows an actual design where the overall rack length is 10 ft 3 in. and where it was necessary to create a nonsensical design in order to comply with both the 4 to 5 ft sprinkler spacing and the intersection of every flue. Although the difference was only 1.5 in., the AHJ forced the addition of the intermediate heads. Removal of the "4 ft to 5 ft" dimension would create consistency between existing Figures and the Proposal 13-457 Figures.

INSERT FIGURE HERE

Committee Meeting Action: Reject
Committee Statement: The committee realizes that for rack upright spacings greater than 10 ft will require additional sprinklers between uprights.

13-296 Log #116 AUT-SSD Final Action: Reject
(17.2.1.5)

Submitter: Pascal Pfeiffer, AXA
Comment on Proposal No: 13-457
Recommendation: Remove entire proposed Section 17.2.1.5 and move all material in the annex as a guidance for users regarding exposed plastics.
Substantiation: Although coming from ‘an internationally respected organization’ as the proposal submitter mentioned, the proposal is not backed up by test data. It is therefore not wise to lay it in the body of the document with enforceable language. The committee may end up in having to remove part or all of the material later on when test data is available or after a sprinkler failure should the investigation shows what has been written in NFPA 13 regarding exposed plastics in racks is not able to cope with such a fire. As this material is well known around the industry; we suggest to let it appear in the annex where users may chose to enforce it or not or to adapt it.
Committee Meeting Action: Reject
Committee Statement: The committee endorses the original proposal 13-457 to provide enforceable criteria for exposed unexpanded plastic storage in this section.



13_L268_Figure_ROC

13-297 Log #145 AUT-SSD Final Action: Accept
(17.2.1.5)

Submitter: Kenneth E. Isman, National Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-457
Recommendation: Revise Section 17.2.1.5 and renumber it as 17.2.1.4 (adding an annex note) so that it reads as follows:

17.2.1.4* Exposed unexpanded Group A plastics protected with Control Mode Density/Area sprinklers shall be protected in accordance with one of the following:

(a) Maximum 10 ft storage in a maximum 20 ft high building with ceiling sprinklers designed for a minimum 0.8 gpm per sq ft density over 2500 sq ft and no in-rack sprinklers required as shown in Figure 17.2.1.4(a).

(b) Maximum 10 ft storage in a maximum 20 ft high building with ceiling sprinklers designed for a minimum 0.45 gpm per sq ft density over 2000 sq ft and one level of in-rack sprinklers required at alternate transverse flues as shown in Figure 17.2.1.4(b).

(c) Maximum 10 ft storage in a maximum 20 ft high building with ceiling sprinklers designed for a minimum 0.3 gpm per sq ft density over 2000 sq ft and one level of in-rack sprinklers required in every transverse flue as shown in Figure 17.2.1.4(c).

(d) Maximum 15 ft storage in a maximum 25 ft high building with ceiling sprinklers designed for a minimum 0.45 gpm per sq ft density over 2000 sq ft and one level of in-rack sprinklers required at alternate transverse flues as shown in Figure 17.2.1.4(d).

(e) Maximum 15 ft storage in a maximum 25 ft high building with ceiling sprinklers designed for a minimum 0.3 gpm per sq ft density over 2000 sq ft and one level of in-rack sprinklers required in every transverse flue as shown in Figure 17.2.1.4(e).

(f) Maximum 20 ft storage in a maximum 25 ft high building with ceiling sprinklers designed for a minimum 0.6 gpm per sq ft density over 2000 sq ft and one level of in-rack sprinklers required at alternate transverse flues as shown in Figure 17.2.1.4(f).

(g) Maximum 20 ft storage in a maximum 25 ft high building with ceiling sprinklers designed for a minimum 0.45 gpm per sq ft density over 2000 sq ft and one level of in-rack sprinklers required in every transverse flue as shown in Figure 17.2.1.4(g).

(h) Maximum 20 ft storage in a maximum 30 ft high building with ceiling sprinklers designed for a minimum 0.8 gpm per sq ft density over 1500 sq ft and one level of in-rack sprinklers required at alternate transverse flues as shown in Figure 17.2.1.4(h).

(i) Maximum 20 ft storage in a maximum 30 ft high building with ceiling sprinklers designed for a minimum 0.6 gpm per sq ft density over 1500 sq ft and one level of in-rack sprinklers required in every transverse flue as shown in Figure 17.2.1.4(i).

(j) Maximum 20 ft storage in a maximum 30 ft high building with ceiling sprinklers designed for a minimum 0.3 gpm per sq ft density over 2000 sq ft and two levels of in-rack sprinklers required in every transverse flue as shown in Figure 17.2.1.4(j).

(k) Maximum 25 ft storage in a maximum 35 ft high building with ceiling sprinklers designed for a minimum 0.8 gpm per sq ft density over 1500 sq ft and one level of in-rack sprinklers required in every transverse flue as shown in Figure 17.2.1.4(k).

(l) Maximum 25 ft storage in a maximum 35 ft high building with ceiling sprinklers designed for a minimum 0.3 gpm per sq ft density over 2000 sq ft and two levels of in-rack sprinklers required in every transverse flue as shown in Figure 17.2.1.4(l).

<Each Figure follows on a separate page.>

A.17.2.1.4 Each of the figures in 17.2.1.4 shows a variety of different potential rack arrangements. The first single-row rack (SRR) to the left in each figure shows a rack against a wall. The second SRR shows a single-row rack with aisles on each side. The double-row rack (DRR) is in the center of the figure. The first multiple-row rack (MRR) shows the in-rack sprinkler position for racks up to 15 ft long in the dimension parallel to the transverse flue. The second MRR shows longer rack structures where the in-rack sprinkler pattern would repeat.

Renumber existing (ROP) 17.2.1.4 as new 17.2.1.5.

Add “or Figure 17.2.1.4(a) through Figure 17.2.1.4(l)” at the end of existing (ROP) 17.2.1.4.2 (new 17.2.1.5.2).

******Insert Figure 17.2.1.4(a) Here******

******Insert Figure 17.2.1.4(b) Here******

******Insert Figure 17.2.1.4(c) Here******

******Insert Figure 17.2.1.4(d) Here******

******Insert Figure 17.2.1.4(e) Here******

******Insert Figure 17.2.1.4(f) Here******

******Insert Figure 17.2.1.4(g) Here******

******Insert Figure 17.2.1.4(h) Here******

******Insert Figure 17.2.1.4(i) Here******

******Insert Figure 17.2.1.4(j) Here******

******Insert Figure 17.2.1.4(k) Here******

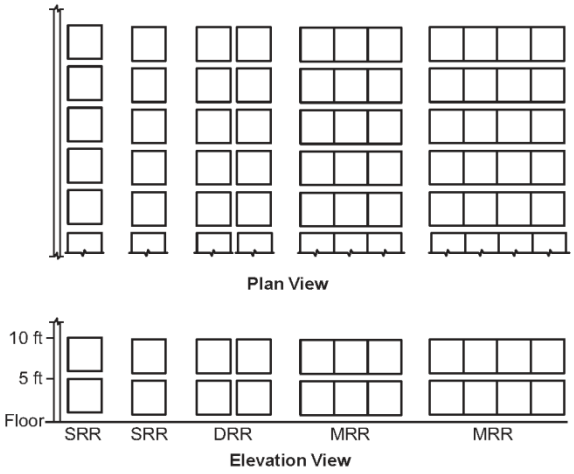
******Insert Figure 17.2.1.4(l) Here******

Substantiation: This is mostly an editorial rewrite of the section as it was approved at the ROP for clarity. In addition, situations that resulted in a clearance greater than 10 ft were eliminated because they violated section 12.1.3.4.5.
Note, do we want to have operating areas of 1500 sq ft?
Note: for 20 ft storage, should in-racks be at 15 ft storage level or 10 ft level?

Committee Meeting Action: Accept

Committee Statement: Accept as written to replace Proposal 13-457 language and Figures. Figures that were included in 13-457 and not included in this comment are not to be included in the 2013 edition.

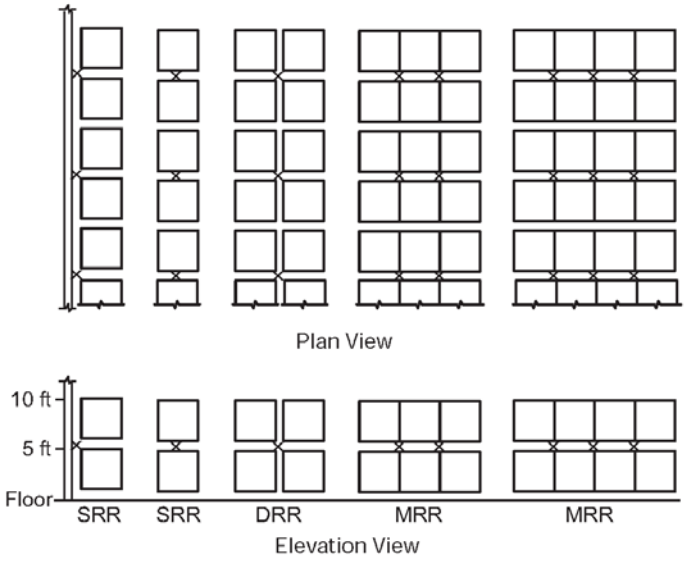
Single-, Double-, and Multiple-Row Racks
0.8 gpm per sq ft over 2500 sq ft



Note: Each square represents a storage cube measuring 4 ft to 5 ft on a side. Actual load heights can vary from approximately 18 inches up to 10 ft. Therefore, there could be as few as one load or as many as six or seven loads between in-rack sprinklers that are spaced 10 ft apart vertically

Figure 17.2.1.4(a) Exposed Unexpanded Plastics up to 10 ft in Height in up to a 20 ft High Building with No In-Rack Sprinklers

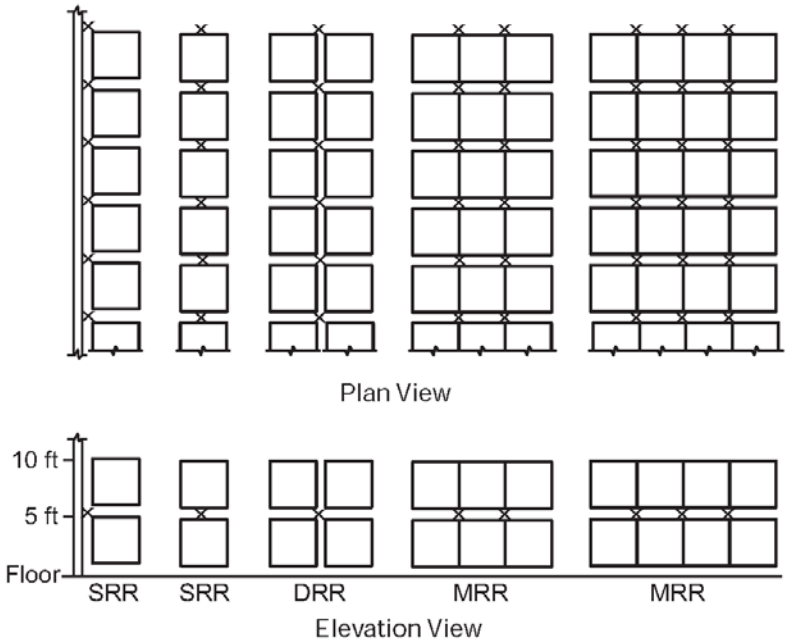
Single-, Double-, and Multiple-Row Racks
0.45 gpm per sq ft over 2000 sq ft



Note: Each square represents a storage cube measuring 4 ft to 5 ft on a side. Actual load heights can vary from approximately 18 inches up to 10 ft. Therefore, there could be as few as one load or as many as six or seven loads between in-rack sprinklers that are spaced 10 ft apart vertically

Figure 17.2.1.4(b) Exposed Unexpanded Plastics up to 10 ft in Height in up to a 20 ft High Building with One Level of In-Rack Sprinklers

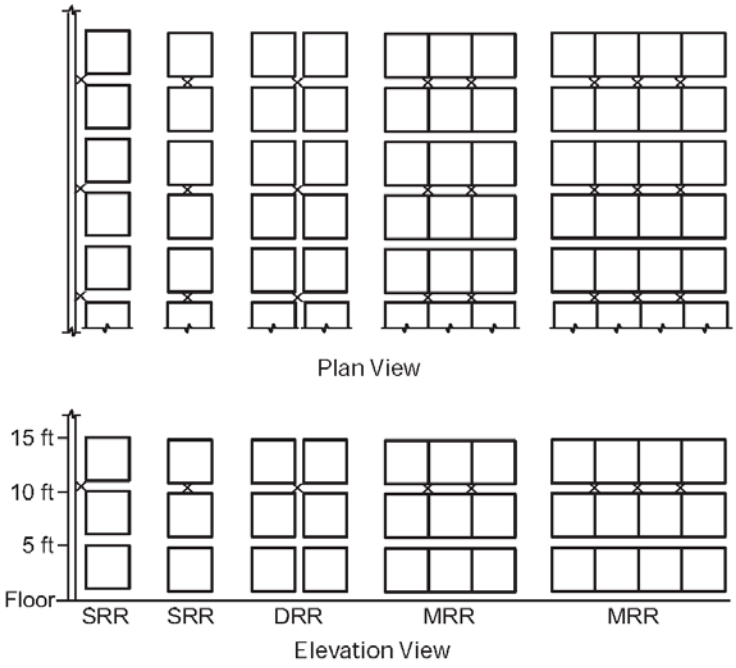
Single-, Double-, and Multiple-Row Racks
0.3 gpm per sq ft over 2000 sq ft



Note: Each square represents a storage cube measuring 4 ft to 5 ft on a side. Actual load heights can vary from approximately 18 inches up to 10 ft. Therefore, there could be as few as one load or as many as six or seven loads between in-rack sprinklers that are spaced 10 ft apart vertically

Figure 17.2.1.4(c) Exposed Unexpanded Plastics up to 10 ft in Height in up to a 20 ft High Building with One Level of Closely Spaced In-Rack Sprinklers

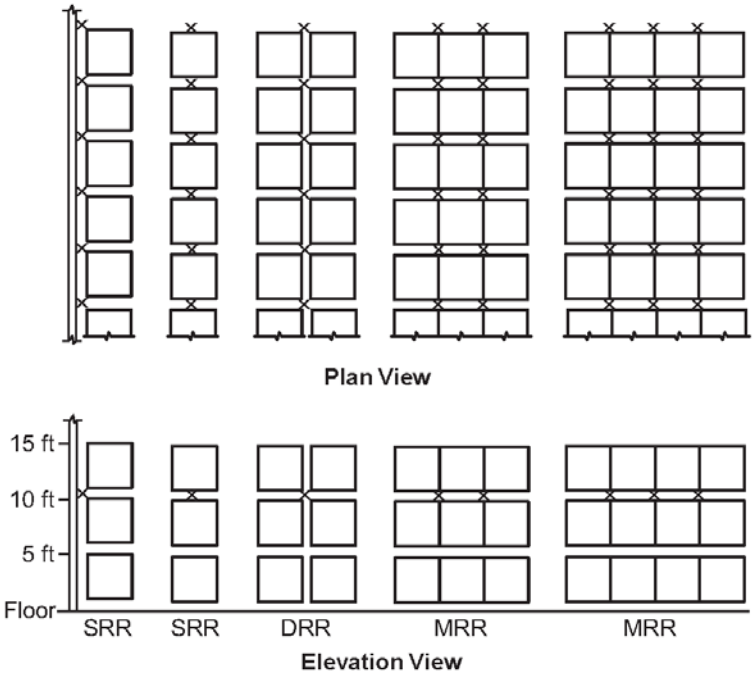
Single-, Double-, and Multiple-Row Racks
0.45 gpm per sq ft over 2000 sq ft



Note: Each square represents a storage cube measuring 4 ft to 5 ft on a side. Actual load heights can vary from approximately 18 inches up to 10 ft. Therefore, there could be as few as one load or as many as six or seven loads between in-rack sprinklers that are spaced 10 ft apart vertically

Figure 17.2.1.4(d) Exposed Unexpanded Plastics up to 15 ft in Height in up to a 25 ft High Building with One Level of In-Rack Sprinklers

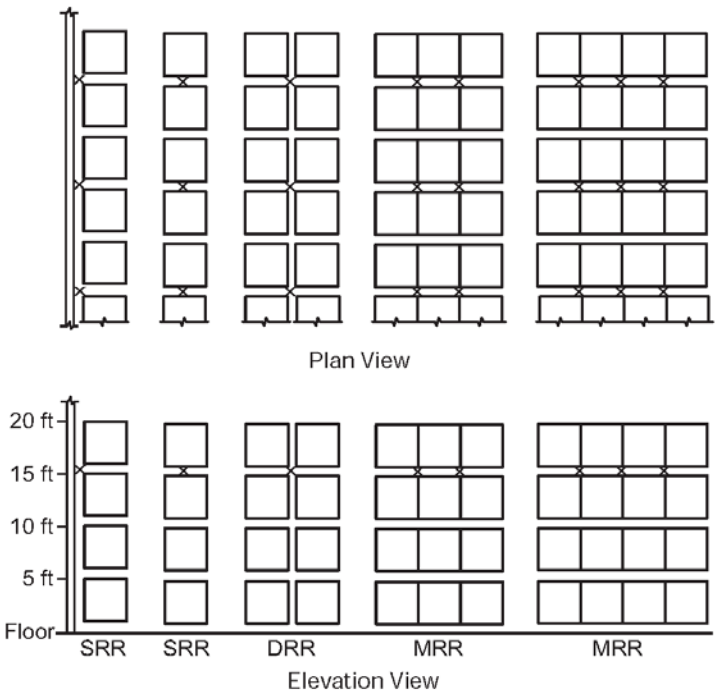
Single-, Double-, and Multiple-Row Racks
0.3 gpm per sq ft over 2000 sq ft



Note: Each square represents a storage cube measuring 4 ft to 5 ft on a side. Actual load heights can vary from approximately 18 inches up to 10 ft. Therefore, there could be as few as one load or as many as six or seven loads between in-rack sprinklers that are spaced 10 ft apart vertically

Figure 17.2.1.4(e) Exposed Unexpanded Plastics up to 15 ft in Height in up to a 25 ft High Building with One Level of Closely Spaced In-Rack Sprinklers

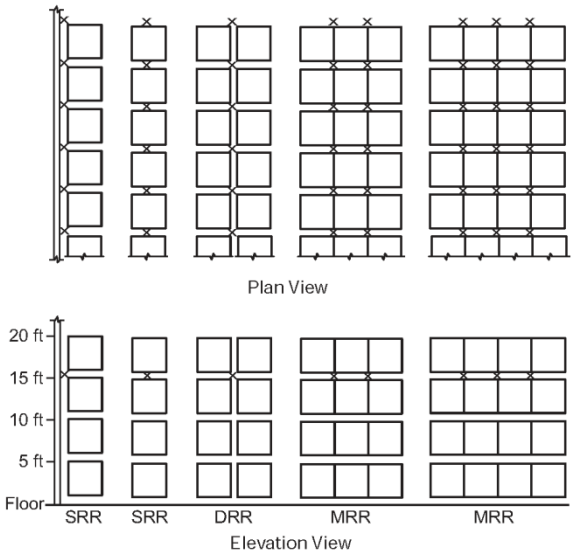
Single-, Double-, and Multiple-Row Racks
0.6 gpm per sq ft over 2000 sq ft



Note: Each square represents a storage cube measuring 4 ft to 5 ft on a side. Actual load heights can vary from approximately 18 inches up to 10 ft. Therefore, there could be as few as one load or as many as six or seven loads between in-rack sprinklers that are spaced 10 ft apart vertically

Figure 17.2.1.4(f) Exposed Unexpanded Plastics up to 20 ft in Height in up to a 25 ft High Building with One Level of In-Rack Sprinklers

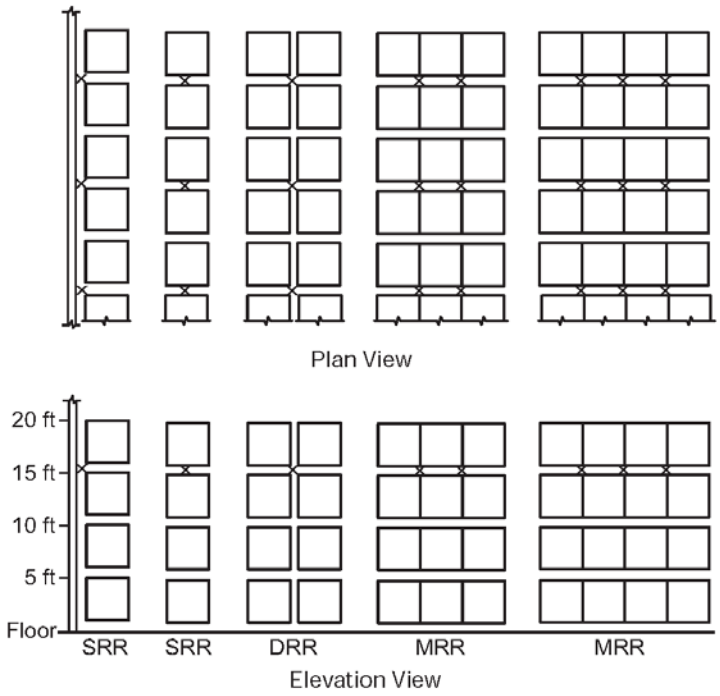
Single-, Double-, and Multiple-Row Racks
0.45 gpm per sq ft over 2000 sq ft



Note: Each square represents a storage cube measuring 4 ft to 5 ft on a side. Actual load heights can vary from approximately 18 inches up to 10 ft. Therefore, there could be as few as one load or as many as six or seven loads between in-rack sprinklers that are spaced 10 ft apart vertically

Figure 17.2.1.4(g) Exposed Unexpanded Plastics up to 20 ft in Height in up to a 25 ft High Building with One Level of Closely Spaced In-Rack Sprinklers

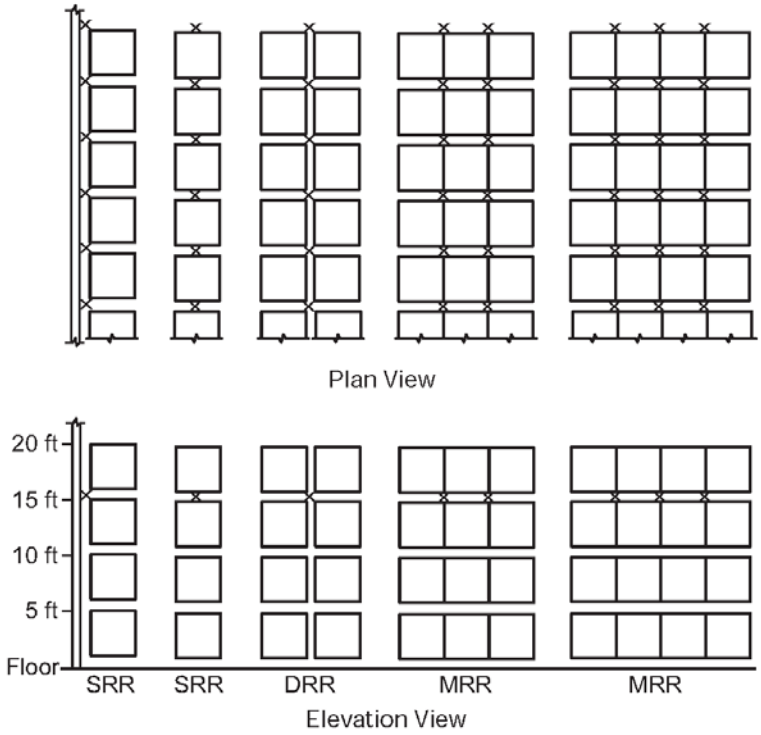
Single-, Double-, and Multiple-Row Racks
0.8 gpm per sq ft over 1500 sq ft



Note: Each square represents a storage cube measuring 4 ft to 5 ft on a side. Actual load heights can vary from approximately 18 inches up to 10 ft. Therefore, there could be as few as one load or as many as six or seven loads between in-rack sprinklers that are spaced 10 ft apart vertically

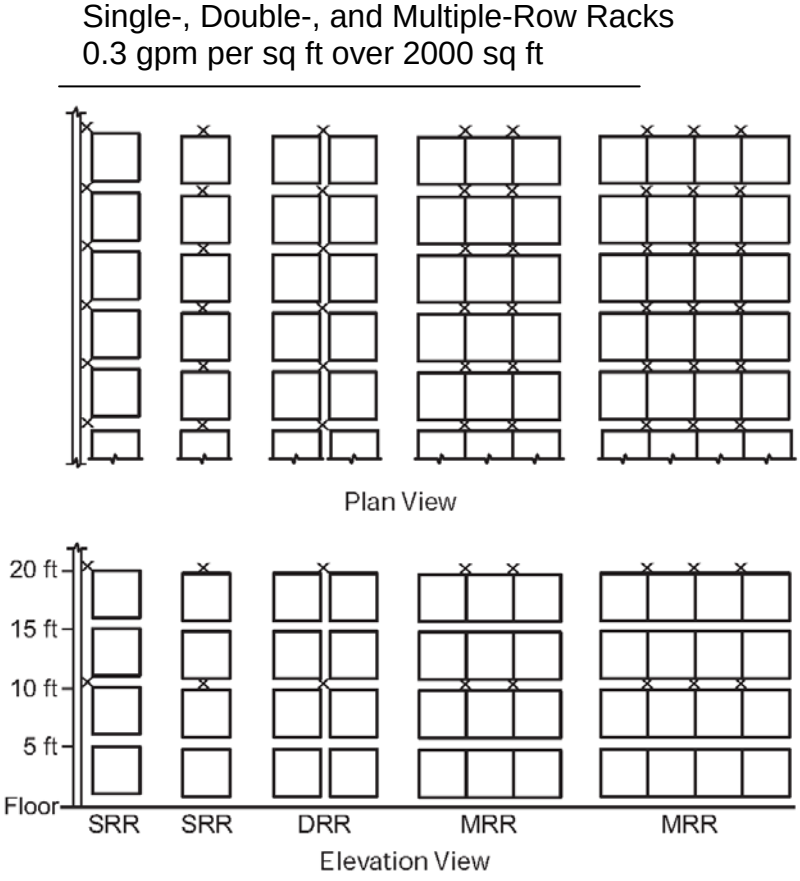
Figure 17.2.1.4(h) Exposed Unexpanded Plastics up to 20 ft in Height in up to a 30 ft High Building with One Level of In-Rack Sprinklers

Single-, Double-, and Multiple-Row Racks
0.6 gpm per sq ft over 1500 sq ft



Note: Each square represents a storage cube measuring 4 ft to 5 ft on a side. Actual load heights can vary from approximately 18 inches up to 10 ft. Therefore, there could be as few as one load or as many as six or seven loads between in-rack sprinklers that are spaced 10 ft apart vertically

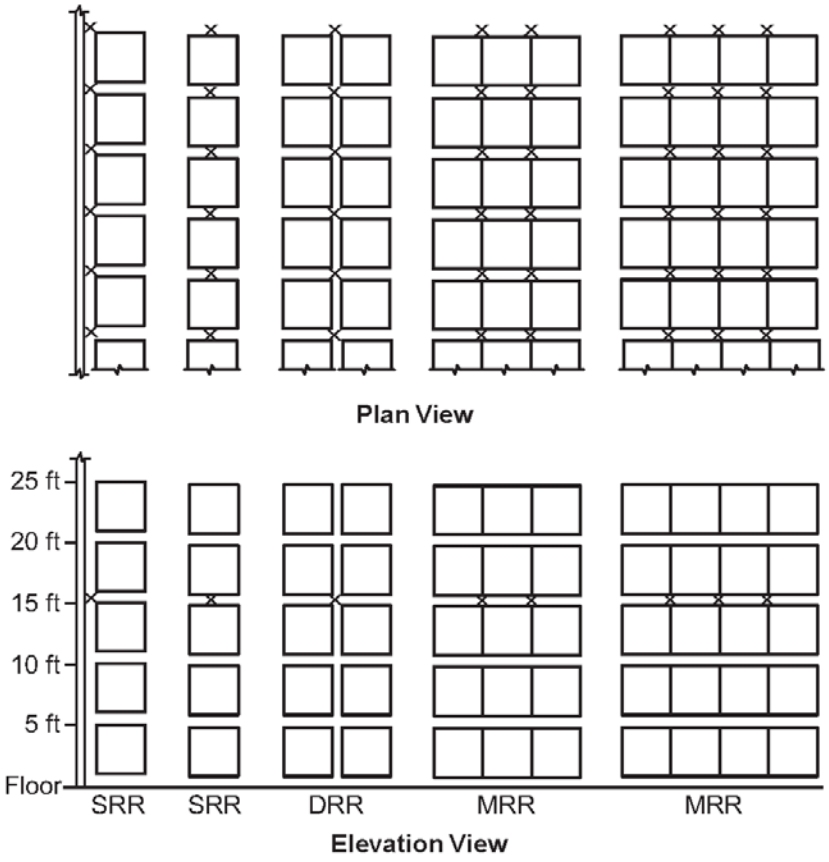
Figure 17.2.1.4(i) Exposed Unexpanded Plastics up to 20 ft in Height in up to a 30 ft High Building with One Level of Closely Spaced In-Rack Sprinklers



Note: Each square represents a storage cube measuring 4 ft to 5 ft on a side. Actual load heights can vary from approximately 18 inches up to 10 ft. Therefore, there could be as few as one load or as many as six or seven loads between in-rack sprinklers that are spaced 10 ft apart vertically

Figure 17.2.1.4(j) Exposed Unexpanded Plastics up to 20 ft in Height in up to a 30 ft High Building with Two Levels of Closely Spaced In-Rack Sprinklers

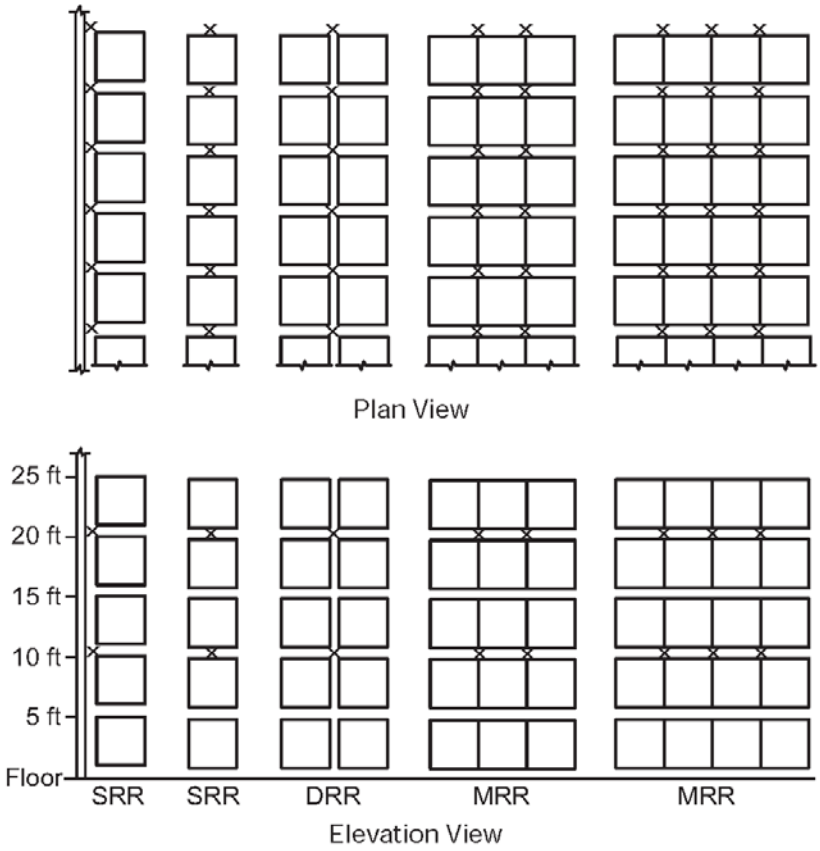
Single-, Double-, and Multiple-Row Racks
0.8 gpm per sq ft over 1500 sq ft



Note: Each square represents a storage cube measuring 4 ft to 5 ft on a side. Actual load heights can vary from approximately 18 inches up to 10 ft. Therefore, there could be as few as one load or as many as six or seven loads between in-rack sprinklers that are spaced 10 ft apart vertically

Figure 17.2.1.4(k) Exposed Unexpanded Plastics up to 25 ft in Height in up to a 35 ft High Building with One Level of Closely Spaced In-Rack Sprinklers

Single-, Double-, and Multiple-Row Racks
0.3 gpm per sq ft over 2000 sq ft



Note: Each square represents a storage cube measuring 4 ft to 5 ft on a side. Actual load heights can vary from approximately 18 inches up to 10 ft. Therefore, there could be as few as one load or as many as six or seven loads between in-rack sprinklers that are spaced 10 ft apart vertically

Figure 17.2.1.4(l) Exposed Unexpanded Plastics up to 25 ft in Height in up to a 35 ft High Building with Two Levels of Closely Spaced In-Rack Sprinklers

13-298 Log #277 AUT-SSD Final Action: Accept
(17.2.5.1.2)

Submitter: Tracey D. Bellamy, Telgian Corporation
Comment on Proposal No: 13-460
Recommendation: Reject 13-460.
Substantiation: The inclusion of multi-row racks within the allowance for the use of the provisions of 17.2.5.1.2 presents an issue with the requirements for a minimum aisle width of 7½ ft as provided in Item (7) of the section. This arrangement with such a minimum aisle width is contrary to the definition for a multi-row rack arrangement which has no minimum aisle width. The criteria established by this section is based on a series of specific full-scale tests simulating retail storage/display arrangements that did not include multi-row rack arrangements. As such the inclusion of multi-row rack arrangements is not supported by available test data and would create a conflict with the requirement for a 7½ ft aisle. Additionally, if a change is made to 17.2.5.1.2 then a companion change should also be made to 16.2.5.1.2.
This is not original material; its reference/source is as follows:
13-460
Committee Meeting Action: Accept

13-299 Log #326 AUT-SSD Final Action: Accept
(17.2.5.1.2)

Submitter: Richard Pehrson, Pehrson Fire PC
Comment on Proposal No: 13-460
Recommendation: Reject changes proposed by ROP Log #224.
Substantiation: Section 17.2.5 is recognized as a special design for the use of slatted shelves and was based on limited testing, not including multiple row racks. Although in the past multiple-row rack protection is "given" for double-row rack tests of open frame racks, this has not been shown to be the case for slatted racks. No testing has been completed to support this generalization.
Committee Meeting Action: Accept

13-300 Log #95 AUT-SSD Final Action: Accept in Principle
(17.3.3.1.1 and 17.3.3.1.2)

Submitter: Larry Keeping, Vipond Fire Protection
Comment on Proposal No: 13-453
Recommendation: Do not delete Note 1 of 17.3.3.1.1. Instead revise 17.3.3.1.1 and add a new 17.3.3.1.2, styled after the new text from the Committee Action for Proposal 13-178:
17.3.3.1.1 ESFR sprinklers shall not be permitted to protect storage on solid shelf racks unless the solid shelves are protected in accordance with 17.1.5.
17.3.3.1.2 ESFR sprinklers shall not be permitted to protect storage with open top containers.
Substantiation: The new text suggested here better defines the limitations of ESFR protection schemes. The current text saying “ESFR protection as defined …” suggests the usual idea of ESFR sprinklers being used on a ceiling protection only basis, without any corresponding in-rack sprinklers. Therefore, if only Note 1 is deleted, it could be interpreted that the corresponding in-rack sprinklers may not be needed with solid shelves.
Committee Meeting Action: Accept in Principle
Revise 17.3.3.1.1as follows(add "with in rack sprinklers" to proposed language):
17.3.3.1.1 ESFR sprinklers shall not be permitted to protect storage on solid shelf racks unless the solid shelf racks are protected with in rack sprinklers in accordance with 17.1.5.
Add new :
17.3.3.1.2 ESFR sprinklers shall not be permitted to protect storage with open top containers.
Renumber accordingly
Committee Statement: Clarification that in-rack sprinklers are required per 17.1.5.

13-301 Log #137 AUT-SSD **Final Action: Reject**
(20.8)

Submitter: Larry L. Varn, Pierce Atwood LLP
Comment on Proposal No: 13-467
Recommendation: Accept the original proposal as submitted.
Substantiation: The proposal was based on a valid large scale fire test. The TC statement that "[t]he data does not support the recommendation" is conclusory and fails to address the detail data submitted in connection with the proposal.
Committee Meeting Action: Reject
Committee Statement: The test data submitted does not represent a worst case ignition senerio. The test data referenced does not match the proposed revisions with respect to minimum pressures.

13-302 Log #102 AUT-SSD **Final Action: Accept in Principle**
(Chapter 21)

Submitter: Thomas L. Multer, Reliable Automatic Sprinkler Company, Inc.
Comment on Proposal No: 13-411
Recommendation: Add Tables 21.2 and 21.3 to new Chapter 21.

Insert Table 21.2 Here*

Insert Table 21.3 Here

Substantiation: See ROC 13-419 Committee Statement.
Note: Supporting material is available for review at NFPA Headquarters.
Committee Meeting Action: Accept in Principle
Committee Statement: The submitted tables are technically acceptable to the TC, but need to be updated to have a consistent format with the tables accepted with 13-305 (Log #291).

Table 21.2 Extended Coverage, CMSA {25.2 K-factor (360) Pendent] Sprinkler Design Criteria for Palletized and Solid-Piled Storage of Class I Through Class IV and Cartoned Unexpanded Plastic Commodities

Storage Arrangement	Commodity Class	Maximum Storage Height		Maximum Ceiling/Roof Height		K Factor/ Orientation	Type of System	Maximum Spacing	Number of Design Sprinklers	Operating Pressure	Hose Stream Allowance	Water Supply Duration (Minutes)
		Ft.	m	Ft.	m							
Palletized and Solid Piled	Class l – lV and cartooned unexpanded plastics	25	7.6	30	9.1	25.2 (360) Pendent	Wet	14 ft. × 14 ft. (4.2 m × 4.2 m)	6	30 psi (2.1 bar)	250 gpm (950 L/min)	60
		30	9.1	35	10.6	25.2 (360) Pendent	Wet	12 ft. × 12 ft. (3.6 m × 3.6 m)	8	40 psi (2.8 bar)		60

Table 21.3 Extended Coverage, CMSA {25.2 K-factor (360) Pendent] Sprinkler Design Criteria for Single-, Double, and Multiple-Row Racks Without Solid Shelves of Class I Through Class IV and Cartoned Unexpanded Plastic Commodities

Storage Arrangement	Commodity Class	Maximum Storage Height		Maximum Ceiling/Roof Height		K Factor/ Orientation	Type of System	Maximum Spacing	Number of Design Sprinklers	Operating Pressure	Hose Stream Allowance	Water Supply Duration (Minutes)
		Ft.	m	Ft.	m							
Single,-, double, and multiple-row racks without solid shelves (no open top containers)	Class l – lV and cartooned unexpanded plastics	25	7.6	30	9.1	25.2 (360) Pendent	Wet	14 ft. × 14 ft. (4.2 m × 4.2 m)	6	30 psi (2.1 bar)	250 gpm (950 L/min)	60
		30	9.1	35	10.6	25.2 (360) Pendent	Wet	12 ft. × 12 ft. (3.6 m × 3.6 m)	8	40 psi (2.8 bar)		60

13-303 Log #130 AUT-SSD Final Action: Accept in Part
(21.1)

Submitter: Kenneth E. Isman, National Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-411
Recommendation: Revise the following sections and insert a new section 21.1.6.1 and a new section 21.1.9 (with annex) as follows:

Delete the "*" on section 21.1.6.

21.1.6.1 The large scale fire tests shall include reasonable worse-case conditions taking into account storage arrangements, storage commodities, maximum storage heights, maximum ceiling heights, ignition locations relative to ceiling sprinklers, sprinkler spacing, position of potential obstructions, and the distance of the sprinklers below the ceiling.

21.1.7 The manufacturer's installation and design parameter instructions for these sprinklers shall specify in a standardized manner the end use limitations . . .

21.1.8.1 Regardless of the number of sprinklers . . .

21.1.8.2 Once the number of sprinklers for a demand area has been established . . .

21.1.9* Once the fire tests have been completed, the design area has been determined, and the manufacturer's instructions have been written, the manufacturer shall submit the sprinkler and its instructions for review and inclusion in this Chapter.

A.21.1.9 For sprinklers that complete testing and development of installation instructions between cycles of NFPA 13, the Authority Having Jurisdiction has the option of reviewing the information and determining if equivalence has been established with sprinklers previously placed in this chapter.

Substantiation: The asterisk on section 21.1.6 is proposed for deletion because there is no annex section in the final proposal as it was printed in the ROP.

The new section 21.1.6.1 is important because there is no requirement for the labs to test, or even look for, a worse-case scenario. Running a fire test under optimum circumstances, and then advocating the use of a sprinkler using the results from that test would be a serious mistake, so NFPA 13 needs to prohibit that activity.

The consideration of obstructions is included in the proposed 21.1.6.1 because the original ESFR sprinkler testing was aimed at a 4 or 6 sprinkler design, but experience and obstructions showed that the 4 or 6 sprinkler design was impractical. There are too many potential problems that are not accounted for in fire tests that do not include some consideration of obstructions. For example, tests with HVLS fans showed that certain conditions can occur that cause 8 to 10 sprinklers to be open. Since HVLS fans are not used in typical laboratory sprinkler fire testing, but are allowed by NFPA 13 with no addition to the design area, there needs to be a greater safety factor on situations with very low numbers of sprinklers opening in traditional laboratory tests.

Section 21.1.7 is proposed to be revised by adding a requirement for the manufacturers to report the information in a standardized fashion. This is important because important data can get lost in many pages of text if the information is not presented in a standardized format. The UL/FM/NFSA committee is working on developing such a standardized format.

The revision to the numbering of section 21.1.8.1 is to correct an error that was printed in the ROP. The section is not intended to be 21.8.1, it needs to be 21.1.8.1.

The paragraph regarding the minimum operating area of 768 sq ft was printed in the ROP after a discussion of a minimum number of sprinklers. The information is by itself and should be given a section number, so we are recommending section number 21.1.8.2.

The E&S Committee asked staff to work on this at their April 2011 meeting.

The concept of this comment has the endorsement of the NFSA Engineering and Standards Committee.

Committee Meeting Action: Accept in Part
Accept the proposed changes with the following exceptions:

do not accept proposed 21.1.6.1
do not accept proposed 21.1.9
do not accept proposed A.21.1.9

Committee Statement: Guidance is given in the Annex for the test protocols to use and it is the option of the manufacturer to submit their test data for inclusion into this chapter.

13-304 Log #CC22 AUT-SSD **Final Action: Accept**
(21.1.6)

Submitter: Technical Committee on Sprinkler System Discharge Criteria,
Comment on Proposal No: 13-411
Recommendation: Committee Comment for the New Chapter 21
21.1.6 A series of large scale fire tests involving challenging test scenarios that address the range of variables associated with the intended application of the sprinkler shall be conducted to evaluate the ability of the sprinkler to protect storage fire risks that are representative of those described in the manufacturer's installation instruction and design parameter instructions and referenced in the listing.
Substantiation: Substantiation: Additional information is needed to describe the scope of large scale fire tests to be conducted on these sprinklers.
Committee Meeting Action: Accept

13-305 Log #291 AUT-SSD Final Action: Accept in Principle
(Table 21.2.1, Table 21.3.1, and 21.5.3.2.3)

Submitter: James E. Golinveaux, Tyco Fire Suppression & Building Products
Comment on Proposal No: 13-411
Recommendation:
Table 21.2.1: Extended Coverage

INSERT TABLE 21.2.1 HERE

Table 21.3.1: Extended Coverage

***INSERT TABLE 21.3.1 HERE

Insert text: 21.5.3.2.3 When utilizing upright CMSA. CMDA or ESFR sprinkler any continuous obstruction 4 Inches or less can be ignored.
Substantiation: The new chapter needs supplemental material to define the installation guidelines, storage heights, operating pressures I and number of required calculated sprinklers for the new sections 21.2 and 21.3. These guidelines have been tested by FM for a 25.2 K factor Upright head following all of the guidelines set forth in chapter 21. See attached summary.
According to section 8.12.5.1.3, any special obstruction allowances shall be installed according to their listing. In order to achieve a FM Listing/Approval, upright CMSA, CMDA or ESFR sprinklers must be tested for discharge criteria. During this testing FM tests upright sprinkler discharge criteria in configurations where there are continuous obstructions 4 inches wide. Therefore, according to section 8.12.5.1.3 for all FM approved upright CMSA, CMDA and ESFR sprinklers, it is currently allowed by NFPA 13 to ignore any continuous obstruction 4 inches or less, since in order to obtain an FM Listing/Approval the sprinkler must have passed the obstruction tests. Therefore this allowance should be clearly stated in NFPA 13 rather than this roundabout acceptance. . This comment is being submitted by the Tyco Codes and Standards Sprinkler Task Group
This is not original material; its reference/source is as follows:
Table was based on Table 17.2.2.1 from NFPA 13, 2010.
Committee Meeting Action: Accept in Principle
Accept the proposed tables with the following corrections:
a)Correct the hose stream value columns in the tables to be consistent with Table 21.4.1 and 13-306 (Log #101)
b)Update metric value for K-Factor to 360
c)Update metric value to 2.8 bar for 40 psi
Add the following language: 21.5.3.2.3 When utilizing upright CMSA. CMDA or ESFR sprinkler any continuous obstruction 4 Inches or less can be ignored.
Committee Statement: The hose stream values in the attached tables are incorrect and need to be updated for consistency with Table 21.4.1. Metric values are incorrect and require modifications as noted.

Storage Arrangement	Commodity Class	Maximum Storage Height		Maximum Ceiling/Roof Height		K-Factor/ Orientation	Type of system	Number of Design Sprinklers	Minimum Operating Pressure	Maximum Coverage Area	Hose Stream Allowance	Water Supply Duration (hours)
		ft	m	ft	m							
Palletized, Solid Piled, Bin Box,Shelf Storage, or Back-to-Back Shelf Storage of Class I Through Class IVand Plastic Commodities	Cartoned Unexpanded Plactics	20	6.1	30	9.1	25.2 (362,9) Upright	Wet	6	22 psi (1.5 bar)	144 sq ft	250 gpm (950 L/ min)	1
		20	6.1	30	9.1	25.2 (362,9) Upright	Wet	6	22 psi (1.5 bar)	196 sq ft	500 (1800 L/ min)	1.5
		25	7.6	30	9.1	25.2 (362,9) Upright	Wet	6	30 psi (2.1 bar)	144 sq ft	250 gpm (950 L/ min)	1
		25	7.6	30	9.1	25.2 (362,9) Upright	Wet	6	30 psi (2.1 bar)	196 sq ft	500 (1800 L/ min)	1.5
		25	7.6	35	10.6	25.2 (362,9) Upright	Wet	6	40 psi (2.6 bar)	144 sq ft	250 gpm (950 L/ min)	1
		25	7.6	35	10.6	25.2 (362,9) Upright	Wet	6	40 psi (2.6 bar)	196 sq ft	500 (1800 L/ min)	1.5
		30	9.1	35	10.6	25.2 (362,9) Upright	Wet	8	40 psi (2.6 bar)	144 sq ft	250 gpm (950 L/ min)	1
		30	9.1	35	10.6	25.2 (362,9) Upright	Wet	8	40 psi (2.6 bar)	196 sq ft	500 (1800 L/ min)	1.5

Palletized, Solid Piled, Bin Box,
Shelf Storage, or Back-to-Back Shelf Storage of Class I Through Class IV and
Plastic Commodities.

13_L291_Tb21.2.1

Storage Arrangement	Commodity Class	Maximum Storage		Maximum Ceiling/Roof		K-Factor/ Orientation	Type of system	Number of Design	Minimum Operating	Maximum Coverage Area	Hose Stream Allowance	Water Supply
		ft	m	ft	m							
Sprinkler Protection Criteria for Open-Frame Rack Storage of Class I Through Class IV and Plastic Commodities	Cartoned Unexpanded Plactics	20	6.1	30	9.1	25.2 (362,9) Upright	Wet	6	22 psi (1.5 bar)	144 sq ft	250 gpm (950 L/ min)	1
		20	6.1	30	9.1	25.2 (362,9) Upright	Wet	6	22 psi (1.5 bar)	196 sq ft	500 (1800 L/ min)	1.5
		25	7.6	30	9.1	25.2 (362,9) Upright	Wet	6	30 psi (2.1 bar)	144 sq ft	250 gpm (950 L/ min)	1
		25	7.6	30	9.1	25.2 (362,9) Upright	Wet	6	30 psi (2.1 bar)	196 sq ft	500 (1800 L/ min)	1.5
		25	7.6	35	10.6	25.2 (362,9) Upright	Wet	6	40 psi (2.6 bar)	144 sq ft	250 gpm (950 L/ min)	1
		25	7.6	35	10.6	25.2 (362,9) Upright	Wet	6	40 psi (2.6 bar)	196 sq ft	500 (1800 L/ min)	1.5
		30	9.1	35	10.6	25.2 (362,9) Upright	Wet	8	40 psi (2.6 bar)	144 sq ft	250 gpm (950 L/ min)	1
		30	9.1	35	10.6	25.2 (362,9) Upright	Wet	8	40 psi (2.6 bar)	196 sq ft	500 (1800 L/ min)	1.5

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

13_L291_Tb21.3.1

13-306 Log #101 AUT-SSD **Final Action: Accept**
(Table 21.4.1)

Submitter: Thomas L. Multer, Reliable Automatic Sprinkler Company, Inc.
Comment on Proposal No: 13-411
Recommendation: Add row to proposed table 21.4.1 Hose Stream Allowance and Water Supply duration. Under CMDA and CMSA, Extended Coverage:

Up to 8 @ max, 144 ft^2 250 gpm (950 L/min) 60 minutes

Substantiation: The 250 gpm (950 L/min) hose stream allowance and the 60 minutes duration are based upon a maximum demand area of 1200 square feet.
8 extended coverage CMSA sprinklers, with a maximum spacing of 144 ft^2, equals a demand area of 1152 square feet and meets the requirements for the lower flow and duration.
Committee Meeting Action: Accept

13-307 Log #278 AUT-SSD **Final Action: Accept in Principle**
(21.4.1.2.1 (New))

Submitter: Tracey D. Bellamy, Telgian Corporation
Comment on Proposal No: 13-469
Recommendation: Add a new 21.4.1.2.1 as follows:
21.4.1.2.1 The area of sprinkler operation shall include all sprinklers within the individual spray area as defined by NFPA 33, 3.3.2.3.
Substantiation: The provisions of NFPA 33 provide very specific design mandates regarding the construction and ventilation of spray areas that are intended to provide a degree of segregation for the hazards associated with the spray operations. This separation will also provide a degree of separation necessary to limit the likely operation of sprinklers to those within the bounds of the enclosure. This concept is supported by the inclusion of language in the final two sentences of the first paragraph of A.21.4.1.1 (NFPA 33, A.9.4) that states, “Because of the rapidity and intensity of the fires that involve spray operations, the available water should be ample to simultaneously supply all sprinkler heads likely [emphasis added] to open in one fire without depleting the available water supply for use by hose streams. Noncombustible draft curtains can be used to limit the number of sprinklers that will open.” This use of “likely” in the first sentence cited above, opens the fundamental question of how far to extend the design area for the protected spray operations; however, the sentence following that provides that the area of sprinkler operation can be limited by the installation of a draft curtain. Given that the construction of enclosed spray areas would provide a degree of enclosure at least equivalent to that of a draft curtain, it only stands to reason that the same allowance for limiting the operating area for the sprinklers should be extended to these situations as well by limiting the design to include only the sprinklers within the enclosed area. This same concept is again repeated in the first sentence of the fifth paragraph of A.21.4.2.1 (NFPA 33, A.9.4.6). The addition of the reference to the definition of spray area in NFPA 33 provides further direction necessary for determination of the required design area.
The introduction of this material as a separate section addresses the concern with changing extract material from another standard while still providing needed clarifying language as to the required operating area.
Committee Meeting Action: Accept in Principle
Add to annex and revise "shall" to "should":
A.21.4.2 The area of sprinkler operation includes all sprinklers within the individual spray area as defined by NFPA 33, 3.3.2.3.
Committee Statement: The TC wanted to clarify the extent of the area of sprinkler operation which is not spelled out in the extracted material from NFPA 33.

13-308 Log #239 AUT-SSD Final Action: Accept in Principle
(21.14.2.1 and 21.14.2.3)

Submitter: Joshua Elvove, U.S. General Services Administration
Comment on Proposal No: 13-4
Recommendation: Revise the extracted text of 21.14.2.1 and 21.1.4.2.3 as 8.1.3 and 8.1.1.2, respectively, since both have been modified by the NFPA 75 technical committee.

21.14.2.1 Sprinkler systems protecting information technology equipment areas shall be valved separately from and independent of other sprinkler systems. [75:8.1.3]

21.14.2.3 ~~Either a~~An automatic sprinkler system, ~~carbon dioxide extinguishing system, or inert agent~~ or a gaseous fire extinguishing system shall be provided for the protection of the area below a raised floor in an information technology equipment room or information technology equipment area ~~shall be provided~~ when one or more of the following exist:

(1) Where there is a critical need to protect data in the process, reduce equipment damage, and facilitate return to service

(2) The area below the raised floor contains combustible material [75:8.1.1.2]

Substantiation: NFPA 75 has revised text pertaining to where underfloor fire suppression, including the option to install sprinklers, is required. It is critical that this revised text be incorporated into NFPA 13 as there is no longer a mandatory requirement for underfloor fire suppression; underfloor fire suppression is now only required “where there is a critical need to protect data in the process, reduce equipment damage, and facilitate return to service or the area below the raised floor contains combustible material”. Hence, NFPA 13 users including AHJs need to know that in certain instances, sprinklers and other fire suppression agents may not be required (or installed) below a raised floor.
Committee Meeting Action: Accept in Principle

Accept the language with the modification made by the NFPA 75 TC at their ROC meeting. Delete "and independent of" from 21.14.2.1:

21.14.2.1 Sprinkler systems protecting information technology equipment areas shall be valved separately from ~~and independent of~~ other sprinkler systems. [75:8.1.3]

21.14.2.3 ~~Either a~~An automatic sprinkler system, ~~carbon dioxide extinguishing system, or inert agent~~ or a gaseous fire extinguishing system shall be provided for the protection of the area below a raised floor in an information technology equipment room or information technology equipment area ~~shall be provided~~ when one or more of the following exist:

(1) Where there is a critical need to protect data in the process, reduce equipment damage, and facilitate return to service

(2) The area below the raised floor contains combustible material [75:8.1.1.2]

Committee Statement: The language submitted in 13-4 was ROP text and was modified at the ROC. The TC would like to extract the ROC language.

13-309 Log #312 AUT-SSD Final Action: Accept in Principle
(22.4.2.5)

Submitter: Cecil Bilbo, Jr., Academy of Fire Sprinkler Technology, Inc.
Comment on Proposal No: 13-477
Recommendation: Replace Kp with K in the newly added formula. Use the “division sign” between Q and p. Use the square root symbol to identify the square root of ‘p’. So the formula reads as follows:

$$K_n = Q \div \sqrt{p}$$

Substantiation: The use of a ‘sub p’ is confusing since p is defined for this formula. It may be useful to provide a ‘sub n’ to represent the “new” K-factor. And the use of the square root symbol (rather than the exponent of 0.5) is a clearer method of communicating this formula given the visual restraint of having the exponent in the denominator.
Committee Meeting Action: Accept in Principle
The committee agreed with the submitter's intent, however the committee wanted the formula presented as in the attached art work.

****Insert "k-factor equation" doc Here****

Committee Statement: The "divide by" symbol can be difficult to read and the new arrangement is more universally seen.

13-310 Log #123 AUT-SSD Final Action: Reject
(22.4.3.1.1)

Submitter: Trevor Spain, Fire Pro Corporation
Comment on Proposal No: 13-478
Recommendation: Reconsider proposal 13-478.
Substantiation: A new method for calculating fitting head loss with antifreeze solutions is required for the following reasons:
1. When using the Darcy-Weisbach equation with non-water liquids, three things must be adjusted for liquid properties in order to keep the hydraulic calculation accuracy equivalent to water based systems: fitting head loss, sprinkler head k-factors, and velocity pressure. Failure to correct any of these factors will result in a less accurate hydraulic calculation than required for standard water based systems.
2. Equivalent length head loss error, for normal sprinkler system flow velocities, exceeds the typical error corrected for by 22.4.3.1.3.2.1 (internal diameters).
3. Equivalent length head loss error, for normal sprinkler system flow velocities, exceeds the typical error corrected for by 22.4.3.2.1 (c-factors).
4. See the article "Equivalent Lengths, Velocity, and Antifreeze", pg. 30-32, in the March, 2011 issue of Fire Protection Contractor magazine.
Committee Meeting Action: Reject
Committee Statement: While the proposed formula might be more technically accurate, it is more complicated and produces less conservative results than the current method in the standard. The committee's opinion is this complication is not warranted.

$$K_n = \frac{Q}{\sqrt{P}}$$

K_n = Equivalent K at a node

Q = Flow at the node

P = Pressure at the node

13-311 Log #12 AUT-SSD Final Action: Accept in Principle
(22.4.4.1.1.4)

Submitter: Roland J. Huggins, American Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-479
Recommendation: Add text to read as follows:

22.4.4.1.1.4 Where the available floor area of coverage for a specific area / density design criteria, including any extension of area as required by 11.1.2 and 12.3, is less than the required minimum design area, only sprinklers within the available design area shall be calculated except that where the total operating sprinkler is less than the minimum required discharge determined by multiplying the required design density times the required minimum design area, an additional flow shall be added at the base of the riser to increase the overall sprinkler demand to the minimum required discharge.

Substantiation: The proposal provides a reasonable approach for calculating small areas protected by a subsystem, such as dry-pipe systems on a loading dock or preaction systems in computer rooms, when they are not separated by rated construction. It is even more desirable for small areas protected by a different design approach from that in the overall building, such as an office with spray sprinklers in a warehouse that is otherwise protected with ESFR sprinklers.

The reason for rejecting the proposal was that "the design area should be proven". By adding the additional water required by a full sized remote area, one is effectively providing the same "prove" as if the adjacent sprinklers were added to the design. If the general concept is acceptable a few changes should be included as follows:

1. Add the additional water at the cross main instead of the base of the riser. This better represents the full flow from the design area.
2. Delete "of coverage: from floor area of coverage
3. Delete the reference to 12.3 since it is redundant with 11.1.2
4. Break the 95 word sentence into two sentences.

Committee Meeting Action: Accept in Principle
Committee Statement: See TC action on 13-312 (Log #280).

13-312 Log #280 AUT-SSD Final Action: Accept in Principle
(22.4.4.1.1.4 (New))

Submitter: Tracey D. Bellamy, Telgian Corporation
Comment on Proposal No: 13-479
Recommendation: Add a new 22.4.4.1.1.4

22.4.4.1.1.4 Where the available floor area for a specific area / density design criteria, including any extension of area as required by 11.1.2 and 12.3, is less than the required minimum design area, the design area is permitted to only include those sprinklers within the available design area. Where the total design discharge from these operating sprinkler is less than the minimum required discharge determined by multiplying the required design density times the required minimum design area, an additional flow shall be added at the point of connection of the branchline to the cross main furthest from the source to increase the overall demand, not including hose stream allowance, to the minimum required discharge as determined above.

Substantiation: The issue presented is not one simply involving the application of the room design method. It is one the involves situations where in order to obtain the full design area one must complete a "straddle" design calculation. A "straddle" design calculation involves having the design area situated partially within one design hazard area and partially within an adjacent design hazard area. In situations where the design area is of sufficient size to accommodate the full design area this is not an issue; however, when the space in question is too small to accommodate the full area then the issue arises with having to include more adjacent sprinklers in the design calculation that would create a demand far greater than either of the design areas considered individually where a full design area was available. It is simply not appropriate to have design requirements that result in excessive design demands simply because the design hazard area is too small. This is best illustrated using an example of such a situation.

The attached documentation presents two separate situations. The first situation includes an exterior canopy requiring a OH2 (0.20 gpm/ft²) design where the overall area of the canopy is of sufficient size to accommodate the required 1,950 ft² for the dry system along with a significantly smaller, 480 ft² canopy having the same OH2 design criteria except that the smaller canopy is closer the source of water supply. Immediately adjacent to both of these design areas on the interior of the building the sprinkler system is designed using K25.2 ESFR sprinklers. If the full design area of 1,950 ft² is required for the smaller canopy then an additional, 23 K25.2 sprinklers must be included in the hydraulic calculations to fulfill this requirement. Even though the piping for each canopy are sized the same and the smaller canopy is closer to the water supply the water demand for the smaller canopy is approximately 350% greater than that of the larger canopy. The second situation is similar except that this includes an interior room with a design of a EH2 (0.40 gpm/ft²) where the overall area of the space is sufficient to accommodate the a 2,500 ft² design area along with a smaller 260 ft² design area of the same EH2 design but that is closer to the water supply source. To obtain the 2,500 ft² design area with the smaller area an additional 36 K25.2 ESFR sprinklers must be included in the hydraulic calculations. Again even though the piping in the smaller design area is sized the same as the larger area and the space is closer to the water supply, the water demand is approximately 770% greater than that of the larger space.

The proposed methodology provides a permitted design option to avoid such a disparity while still providing a reasonable proof of the available water supply is support the full design area of the same hazard. A comparative calculation was also run using the aforementioned examples except with the smaller footprint calculated within the same location as the larger area. These calculations show that the resultant water demands using the alternative calculation provided by the new calculation methodology is less than 10% less than that of a full design area thus demonstrating the "proof" that the smaller area deign is essentially equivalent to that of a larger area design.

Committee Meeting Action: Accept in Principle
Split proposed 22.4.4.1.1.4 into 2 sections:

22.4.4.1.1.4* Where the available floor area for a specific area / density design criteria, including any extension of area as required by 11.1.2 and 12.3, is less than the required minimum design area, the design area shall be permitted to only include those sprinklers within the available design area.

22.4.4.1.1.5 Where the total design discharge from these operating sprinkler is less than the minimum required discharge determined by multiplying the required design density times the required minimum design area, an additional flow shall be added at the point of connection of the branchline to the cross main furthest from the source to increase the overall demand, not including hose stream allowance, to the minimum required discharge as determined above.

Add annex language A.24.4.4.1.1.4:

A.22.4.4.1.1.4 The following steps outline the procedure for calculation in accordance with 22.4.4.1.1.4:

1.Calculate the hydraulic design discharge including those sprinklers within the available floor area.

2.Calculate the minimum required discharge by multiplying the required design density times the required minimum

design area.

3.Subtract the discharge calculated in Step 1 from the discharge calculate in Step 2.

4.Where the discharge calculated in Step 3 is greater than 0, the hydraulic design discharge is recalculated including an additional flow equal to that calculated in Step 3. The additional flow is added at the point of connection of the branch line to the cross main furthest from the source.

5.Where the discharge calculated in Step 3 is less than or equal to 0, the hydraulic design discharge is as calculated in Step 1.

Committee Statement: The original language split into two sections as it contains multiple requirements. The annex language was added to provide a step by step procedure for the calculation.

13-313 Log #41 AUT-SSD **Final Action: Reject**
(22.4.4.2.1)

Submitter: Roland J. Huggins, American Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-482, 13-493
Recommendation: Revise text to read as follows:

Reconsider proposal 13-482 and reject 13-483.

Substantiation: Attempting to impose a portion of the area/density methodogoly onto the CMSA approach presents an excessively conservative outcome. For example, by applying 130 sf to determine the length of the remote area for a 15 sprinkler design equates to a length of 63 ft. If the sprinklers are installed 8 ft apart, this equates to 8 sprinklers on the first branch line and 7 on the second and final branch line. Since the CMSA approach is not based on a defined area but a number of sprinklers and minimum pressure, following a methodology more like the ESFR approach is more appropriate.

If the general concept is acceptable, it should be changed to reflect a rectangular shape with the longer dimension along the branch line such as 6 sprinklers on 5 branch lines for 30 sprinklers. An odd number sprinkler, such as with 25 sprinklers, would be carried to a separate branch line as currently done in the area/density approach (6 sprinklers on 4 branch lines and 1 sprinkler on the 5^{th} one) instead of producing a square remote area of 5 sprinklers on 5 branch lines.

Committee Meeting Action: Reject
Committee Statement: The committee's desire is to keep the 1.2 approach. It allows for flexibility for different designs such as 6, 8 and 12 sprinklers and the new Chapter 21 in addition to the 20, 25, 30 and 36 sprinklers that are currently allowed.

13-314 Log #124 AUT-SSD **Final Action: Reject**
(22.4.4.5.1)

Submitter: Trevor Spain, Fire Pro Corporation
Comment on Proposal No: 13-484
Recommendation: Reinstate the k-factor liquid density adjustment as follows:
"...factors that are representative of aged pipe., and adjusted K-factors for fluid properties. The discharge from individual sprinklers shall be based on adjusted K-factors for fluid properties and shall be determined on the basis of the following formula:
Substantiation: 1. Manufacturing tolerance is not related to fluid density and should not be used as a reason to ignore adjusting head discharge for fluid properties. Manufacturing tolerance is not used, for example, as a reason to neglect adjusting equivalent lengths for minor differences in piping internal diameter.
2. Correcting k-factor for fluid density has a larger effect on head pressure than may be implied. For example, a k-factor multiplier of 0.95 will result in a 10% change to head pressure. This leads to a "real world" shortfall in system demand pressure of one to three psi.
3. NFPA does not currently provide the necessary fluid property data for this adjustment but if a designer is using the Darcy-Weisbach formula, the designer already has the fluid data needed (viscosity and density).
4. When using the Darcy-Weisbach equation with non-water liquids, three things must be adjusted for liquid properties in order to keep the hydraulic calculation accuracy equivalent to water based systems: *fitting head loss, sprinkler head k-factors,* and *velocity pressure*. Failure to correct any of these factors results in a less accurate hydraulic calculation than required for standard water based systems.
5. Increasing the uncertainty of hydraulic calculations is the wrong way to move NFPA 13 forward.
Committee Meeting Action: Reject
Committee Statement: While the proposed formula might be more technically accurate, it is more complicated. The committee's opinion is this complication is not warranted especially in recognition that antifreeze concentrations are now limited.

13-315 Log #141 AUT-SSD **Final Action: Accept in Principle**
(Table 22.4.4.7)

Submitter: Kenneth E. Isman, National Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-490
Recommendation: Change the c-factor for “Galvanized (all)” to 100.
Substantiation: Experience with galvanized piping is showing that it does not have the corrosion resistance to warrant a 20% better C-factor as compared to black steel pipe. With roll grove situations or welded outlets, moisture has been getting under the galvanizing layer and causes corrosion.
This comment has the endorsement of the NFSA Engineering and Standards Committee.
Committee Meeting Action: Accept in Principle
Remove "Galvanized (all) 120" from table 22.4.4.7
Add new row:
Galvanized (dry systems including preaction) 100.
Add new row:
Galvanized (wet systems including deluge)120.
Committee Statement: The TC feels that the corrosion issue is pervasive such that it impacts the hydraulic calculations, not simply the pipe integrity. Internal pipe inspections have revealed that dry galvanized systems have the same level of corrosion as black steel.

13-316 Log #270 AUT-SSD Final Action: Accept
(23.1.2)

Submitter: Russell B. Leavitt, Telgian Corporation
Comment on Proposal No: 13-494
Recommendation: Revise text to read as follows:
23.1.2 Capacity. Water supplies shall be capable of providing the required flow and pressure for the remote design area using the requirements and procedures as specified in Chapters 11 through 22 including hose stream allowance where applicable for the required duration. ~~as specified in chapter 11 through chapter 21~~.
Substantiation: I believe that specifically adding "hose stream allowance" to the accepted text will eliminate possible questions. Other changes are editorial.
Committee Meeting Action: Accept

13-317 Log #302 AUT-SSD Final Action: Reject
(23.1.5.1(5))

Submitter: Cameron Manners, Nu Flow Technologies, Inc.
Comment on Proposal No: 13-497
Recommendation: Add text to read as follows: (5) Treat interior of the pipe with an epoxy coating process that first dries the interior of th pipes, removes any corrosion and creates a profile for bonding using an abrading agent and then applies an epoxy barrier coating to the interior of the pipes.
Substantiation: All sprinkler heads will be removed during the cleaning and coating procedure. Air will be introduced to each opening or a plug put in to the opening where the sprinkler head is removed. Each opening is examined after coating to ensure that there is not restrict of the opening and any excess coating is removed. The threads where the new sprinkler heads are to be installed all examined to make sure they are clean and a proper seal can be made when new sprinkler heads are installed. After the cleaning and coating procedure is completed new head are installed in each opening.

The pipe is inspected to insure that all surface area is coated. The physics of the air movement through the pipe insures that the coating is pushed and pulled through the pipe as a hollow tube of epoxy moving through and against the surface of the interior of the pipe. This happens because the air in the center of pipe is moving faster than the air in contact with the surface of the pipe where the there is resistance from the pipe surface. This causes the coating to be pushed to the walls of the pipe and pushed and pulled down the pipe in a hollow tube. The movement of the epoxy causes the epoxy to flow over itself as it moves down the pipe completely covering the surface of the pipe.

Quality control is maintained throughout the process by monitoring each step of the process:

1. Preparing the air for drying and cleaning – check air temperatures and moisture to see that equipment is functioning properly and the temperatures in the pipe are above the dew point. This is measured by an instrument for this purpose.
2. Cleaning the pipe – check for dryness of the pipe surface at the exhaust to make sure there is no moisture in the pipe and the tuberculation is dry and brittle.
3. After abrasive blasting the pipe – check for cleanliness of the pipe and proper surface profile of at least 2 mils on the surface of the pipe.
4. Monitor air temperatures and quality throughout the drying process with temperature and moisture probes.
5. Scales are check for proper measuring of epoxy before weighing out the proper amounts of resin and curing agent to be mixed.
6. Proper amounts of epoxy are calculated and measured out according to pipe diameter and length of pipe.
7. Mix time and epoxy temperatures are monitored with proper instruments.
8. Epoxy is injected into the air stream and monitored for proper amounts of air and time the epoxy is being blown through the pipe. Pot life is 1 1/2 hours at 75 F.
9. Segments of pipe are calculated according to the size and length of the pipe to make sure there is enough time to coat the pipe within the time limit of the pot life of the epoxy.
10. After the coating reaches the exhaust end of the pipe the excess coating is blown out into the exhaust hose and then checked for coverage of the surface of the pipe. Also a wet mil thickness gauge is use to measure the thickness of the coating to insure proper coating of the pipe.
11. After coating a slow flow of air is blown through the pipe the help the epoxy to set up.
12. After the coating is cured the pipe is inspected again to check for proper coverage.

Note: Supporting material is available for review at NFPA Headquarters.

This is not original material; its reference/source is as follows:
See References.
Committee Meeting Action: Reject
Committee Statement: This technology is currently allowed when acceptable to the authority having jurisdiction under section 1.6, New Technology in a case by case basis. If this is an existing system, this needs to be addressed to NFPA 25. The committee has concerns that this type of product must be listed under the compatibility program to ensure any compatibility concerns. The committee is concerned that this is a technology that is not uniformly applicable to all systems.

13-318 Log #301 AUT-SSD Final Action: Reject
(23.1.5.2)

Submitter: Cameron Manners, Nu Flow Technologies, Inc.
Comment on Proposal No: 13-498
Recommendation: Add text to read as follows: (5) Treat interior of the pipe with an epoxy coating process that first dries the interior of th pipes, removes any corrosion and creates a profile for bonding using an abrading agent and then applies an epoxy barrier coating to the interior of the pipes.
Substantiation: A major problem of fire sprinkler systems is the internal corrosion caused by water in the pipe which clogs sprinkler heads and causes pipe failure and leakage from the piping system. The coating of the internal surface of the pipe with a proven epoxy coating would prevent the corrosion and keep the pipes in optimal operating condition for 40 to 50 years. A number of tests and research has been conducted over the past 20 years that have verified the effectiveness of epoxy coating the internal surface of pipes to prevent corrosion. Adhesion of the epoxy to the surface and the resistance of the epoxy to water make it an excellent technology for protecting fire sprinkler systems from failing. The surface of the pipe would also have a higher C factor so that more water would flow through the pipes more efficiently than new pipes. Included are studies and actual applications of epoxy coatings.
Note: Supporting material is available for review at NFPA Headquarters.
This is not original material; its reference/source is as follows:
See References.
Committee Meeting Action: Reject
Committee Statement: This technology is currently allowed when acceptable to the authority having jurisdiction under section 1.6, New Technology in a case by case basis. If this is an existing system, this needs to be addressed to NFPA 25. The committee has concerns that this type of product must be listed under the compatibility program to ensure any compatibility concerns. The committee is concerned that this is a technology that is not uniformly applicable to all systems.

13-319 Log #274 AUT-SSD Final Action: Accept in Principle
(23.2)

Submitter: Russell B. Leavitt, Telgian Corporation
Comment on Proposal No: 13-501
Recommendation: Revise text to read as follows:
23.2.1* Water supplies for sprinkler systems shall be one of the following or any approved combination: ~~or shall be permitted to be a combination of the following:~~
(c) A connection to a ~~ground level atmospheric water storage tank~~ water storage tank at grade or below grade installed in accordance with NFPA 22, *Standard for Water Tanks for Private Fire Protection* and filled from an approved source.
A.23.2.1 Acceptable water supplies for fire sprinkler systems must provide sufficient flow and pressure for the required duration per 23.1.2. Many water supply sources contain sufficient flow and volume but do not posses sufficient pressure. Some acceptable water supplies such as storage tanks located at or below grade, rivers, lakes, and reservoirs will almost always require combination with a pump to provide the needed pressure. Fire pumps are used with other supplies such as waterworks or gravity tanks to provide additional pressure needed to meet the system demand.
Substantiation: These changes provide additional clarification regarding water supplies. The change to 23.2.1 is primarily style but also brings the authority having jurisdiction into the decision process for combining supplies. The change to sub-section (c) is intended to recognize any water storage tank whether it is at grade or below grade by using language that is coordinated with NFPA 22. The new language for A.23.2.1 illustrates some of the most common types of combinations.
Committee Meeting Action: Accept in Principle
Accept the comment with the following modification:
The committee wanted to delete the word "approved" from "approved combination" as follows:
23.2.1* Water supplies for sprinkler systems shall be one of the following or any combination....
Committee Statement: Approvals are handled in the sub-sections and the reference for combinations is not required.

13-320 Log #58 AUT-SSD **Final Action: Hold**
(23.2.2.3 and A.23.2.2.2)

Submitter: Kevin Kelly, Pine Bush, NY
Comment on Proposal No: 13-501
Recommendation: Insert a new section 23.2.2.3 and move the annex note from A.23.2.2.2 to A.23.2.2.3 as follows:

23.2.2.3* Where the volume and pressure available from a water supply are determined through a waterflow test, an adjustment shall be made to the test data to account for daily and seasonal fluctuations.

A.23.2.2.3 ~~A.23.2.2.2 An adjustment to the waterflow test data to account for daily and seasonal fluctuations, possible interruption by flood or ice conditions, large simultaneous industrial use, future demand on the water supply system, or any other condition that could affect the water supply should be made as appropriate.~~ Flow tests that are run during the middle of a business day often do not account for peak water demands at other times of the day or water use during other times of year. Under ideal circumstances, NFPA 24 would have a specific value to apply to all situations, but that is not practical given the wide variations of water supplies in use and the variations of when waterflow tests are conducted. Waterflow tests conducted close to peak water usage times would need less of an adjustment than waterflow tests conducted during low water usage times. Consultation with the water authority may be necessary to determine an appropriate adjustment factor. Use of 24 hour gages at a hydrant can be helpful in determining day to day fluctuations. In addition, the user should also consider other water usage factors such as simultaneous industrial use, the potential for future demand on the system in the area of the test (depending on how well developed the area already is) and other conditions that would affect the water supply.

Substantiation: This comment is being made to NFPA 13 to correlate with a change proposed to NFPA 24 on section 5.1.3. The basic concept of requiring some adjustment to the waterflow test data needs to be in the body of the standard. It is completely irresponsible to conduct a waterflow test at a hydrant at a time of very low water demand and believe that you are going to have all of that flow and pressure available when a fire occurs a few hours later during a regular and known peak demand time.

As proposed, the rule would only apply in those situations where the waterflow test is being performed and would not apply to the development of water supply data from other sources.

The concept of evaluating the water supply for possible interruptions from flood or ice conditions has been intentionally dropped from the language because this does not have to do with the flow or pressure available. This concept should be a part of the determination as to whether the water supply is “reliable” enough to use at all, which is a completely different concept and should not be tied to evaluating data from a flow test.

Committee Meeting Action: Hold
Committee Statement: The TC needs to develop a task group in conjunction with the PRI TC to review the pros and cons of including this information in the body of the standards as opposed to the annex. There is not sufficient time at the ROC meeting to make a determination on this issue as it requires input from another TC and a thorough review of data.

13-366 Log #42 AUT-SSD **Final Action: Accept**
(A.11.1.5.3)

Submitter: Roland J. Huggins, American Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-369
Recommendation: Revise text to read as follows:

Where pumps serve sprinklers only, they…….but the demands of equipment not connected to the pump can be ignored except for evaluating their impact on the available water supply to the pump.

Substantiation: Although pumps do not have to be sized to meet the flow required by exterior, upstream hose demands, the volume and pressure produced by the pump is impacted by these demands when provided by the same water supply. The essence of this concept was deleted from 11.1.6.3.

Committee Meeting Action: Accept

13-367 Log #60 AUT-SSD **Final Action: Accept**
(A.11.2.3.1.4(3), A.11.3.1.2.1, and A.12.9.1)

Submitter: Jack A. Medovich, Fire & Life Safety America / Rep. AFSA
Comment on Proposal No: 13-391
Recommendation: Revise text to read as follows:

A.11.2.3.1.4(3) in order for the minimum 3,000 sf requirement for the size of the remote area to not be ~~extend~~ extended to the adjacent area, the qualifying concealed space must be separated by the entire fire rated assembly. Such assemblies often have ~~combustibles~~ combustible structural members separating the exterior membranes that can create a concealed combustible space that may qualify for omitting sprinkler protection. If the fire rated assembly is the qualifying concealed space, an interior fire would greatly reduce the assigned fire rated duration.

A.11.3.1.2.1 In order for the minimum eight sprinkler requirement for the size of the remote area to not be ~~extend~~ extended to the adjacent area, the qualifying concealed space must be separated by the entire fire rated assembly. Such assemblies often have ~~combustibles~~ combustible structural members separating the exterior membranes that can create a concealed combustible space that may qualify for omitting sprinkler protection. If the fire rated assembly is the qualifying concealed space, an interior fire would greatly reduce the assigned fire rated duration.

A.12.9.1 In order for the minimum 3,000 sf requirement for the size of the remote area to not be extended to the adjacent area, the qualifying concealed space must be separated by the entire fire rated assembly. Such assemblies often have combustible structural members separating the exterior membranes that can create a concealed combustible space that may qualify for omitting sprinkler protection. If the fire rated assembly is the qualifying concealed space, an interior fire would greatly reduce the assigned fire rated duration.

Substantiation: Editorial change to A.11.2.3.1.4(3) and A.11.3.1.2.1.

A.12.9.1 correlates with Chapter 11 changes on the same issue.

Committee Meeting Action: Accept
Committee Statement: Editorial change; SF to ft^2

13-368 Log #43 AUT-SSD **Final Action: Accept**
(Figure A.11.3.1.1(b))

Submitter: Roland J. Huggins, American Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-584
Recommendation: Revise text to read as follows:

Change Figure A.11.3.1.1(b) so as to indicate the 14 ft. 6 in. and 20 ft. 8 in. dimensions stop at the solid line representing the actual dimensions of the room. There should be 16 ft. and 22 ft. dimensions assigned to the dotted lines representing the assigned area of coverage for the sprinkler.

Substantiation: Correlates with the new text.
Committee Meeting Action: Accept

13-369 Log #2 AUT-SSD **Final Action: Reject**
(A.12.1.3.4.1.1)

Submitter: Sultan M. Javeri, SC Engineering
Comment on Proposal No: 13-48
Recommendation: Add new text to read as follows:

A.12.1.3.4.1.1 Attention should be given to corrugated decks with very large upper web widths irrespective of the web depth. Heat will collect quicker at the upper web for such decks. In such cases the highest point of the deck should be used as the referenced datum.

Note that if this is accepted, the same annex needs to be added for the paragraph in § 8.5.4.1.2 to be consistent.

Substantiation: The majority of new steel decks have a very wide upper web width (10 in. to 12 in. (250 to 300 mm)) which will allow heat to collect at the upper portion of the deck. The lower web width can be as small as 1 in. (25 mm) wide and only 1.5 in. (32 mm) deep with these newer decks. Clearance should be measured from where the heat will collect to the top of the storage. In addition, the distance of the sprinkler from the deck should be measured from where the heat will collect.
Committee Meeting Action: Reject
Committee Statement: This is already addressed in Section 12.1.3.4.1 - wider flues will not change the intent of this section which deals with Ceiling Clearance.

13-370 Log #92 AUT-SSD **Final Action: Accept**
(A.12.9.1)

Submitter: Larry Keeping, Vipond Fire Protection
Comment on Proposal No: 13-391
Recommendation: Add a new A.12.9.1 to read:

A.12.9.1 In order for the minimum 3,000 sf requirement for the size of the remote area to not be extend to the adjacent area, the qualifying concealed space must be separated by the entire fire rated assembly. Such assemblies often have combustibles structural members separating the exterior membranes that can create a concealed combustible space that may qualify for omitting sprinkler protection. If the fire rated assembly is the qualifying concealed space, an interior fire would greatly reduce the assigned fire rated duration.

Substantiation: This new Annex material for Chapter 12 is suggested, to match/coordinate with the Committee Action on Proposal 13-372, which deals with the same matter in Chapter 11.
Committee Meeting Action: Accept

13-371 Log #121 AUT-SSD Final Action: Reject
(A.17.1.2.1)

Submitter: Pascal Pfeiffer, AXA
Comment on Proposal No: 13-449
Recommendation: Delete text to read as follows:
~~A.17.1.2.1. All arrangements of exposed plastics cannot be protected with all types of sprinklers. Only certain combinations of ceiling sprinkler and in-rack sprinklers have been found to provide acceptable protection. No full-scale fire testing has been performed that has determined acceptable criteria for exposed expanded plastics. Factory Mutual has published criteria in its data sheets to protect exposed expanded plastics based on a risk analysis and small/intermediate scale test data. Some AHJ's accept that criteria as an alternative to the intent of NFPA 13.~~
Substantiation: Following Mr. Javeri's comment at ROP, it is not reasonable for any commercial entity to be specifically cited in an NFPA document without at least providing alternate references from competitors. Besides, the annex material specifically states that no large scale data is available and therefore the material does not add any further substantiation on what to do according NFPA 13 with exposed expanded plastics. As an insurance competitor to FM, we feel the entire section should be removed.
Committee Meeting Action: Reject
Committee Statement: The text provides necessary guidance for users for situations outside the scope of the chapter. This guidance is publicly available.

13-372 Log #140 AUT-SSD Final Action: Accept in Principle
(A.20.6)

Submitter: Kenneth E. Isman, National Fire Sprinkler Association, Inc.
Comment on Proposal No: 13-466
Recommendation: Add an annex to 20.6 as follows:
A.20.6 NFPA 13 contains protection criteria for limited configurations of compact mobile storage units with certain materials being stored in the units. For configurations beyond what can be protected explicitly by NFPA 13, and for materials beyond what can be protected explicitly by NFPA 13, a design professional must make a determination on a case-by-case basis with consideration given to the fact that no known fire testing has been performed to determine appropriate criteria.
Substantiation: The original intent of the proposal was to help the user of NFPA 13 understand that compact mobile shelving units beyond what is discussed in section 20.6 might be capable of being protected by sprinklers, but the criteria is unknown and needs to be determined by a design professional for each individual case. This information is best expressed in the annex.
Committee Meeting Action: Accept in Principle
Committee Statement: See committee action on 13-373 (Log #327).

13-373 Log #327 AUT-SSD Final Action: Accept
(A.20.6.1)

Submitter: Richard Pehrson, Pehrson Fire PC
Comment on Proposal No: 13-466
Recommendation: Add new Section A20.6.1:
NFPA 13 contains protection criteria for limited configurations of compact mobile storage units and materials stored. Storage arrangements not specifically addressed in NFPA 13 are outside the scope of the standard (i.e. protection for commodities other than paper files, magazines or books in compact mobile storage units does not simply follow high piled storage protection criteria for shelves or racks). Where compact mobile storage configurations outside the scope of NFPA 13 are to be utilized, they must be addressed on a case by case basis with consideration given to the fact that no known sprinkler protection criteria is currently available. Additional protection features, such as rated construction, barriers within the storage, consideration for safe locating away from vulnerable areas, and methods for control or exhausting of the smoke, should be considered.
Substantiation: This is language developed by a joint NFPA 13/NFPA 99 Sprinkler Task Group to provide additional guidance for protection of compact storage units outside the scope of NFPA 13.
Committee Meeting Action: Accept

13-374 Log #30 AUT-SSD Final Action: Reject
(A.23.1.3.2)

Submitter: Peter T. Schwab, Wayne Automatic Fire Sprinklers, Inc
Comment on Proposal No: 13-593
Recommendation: Revise text to read as follows:
Reject the original proposal and move the language back to the annex.
Substantiation: This standard does not give the user guidance on how to calculate domestic demand.
This is not original material; its reference/source is as follows:
NFPA 13 ROP
Committee Meeting Action: Reject
Committee Statement: The committee's intent is to include domestic demand in combined supplies under 4" in size. Domestic demand can have a major impact on the available water supply in these smaller main sizes. Domestic demand needs to be calculated based on the use of the actual use of the building and it is unique to every building. The designer needs to evaluate the domestic demand.

13-375 Log #328 AUT-SSD Final Action: Accept in Principle
(A.23.1.3.2)

Submitter: Richard Pehrson, Pehrson Fire PC
Comment on Proposal No: 13-593
Recommendation: Change 4 in. diameter to 6 inch diameter.
Substantiation: The 6 inch diameter is consistent with the long time annex note that has been in the standard for a significant time. No data was submitted to justify the reduction down to 4 inch and that this would have no impact on systems. In buildings with large domestic demands, a 4 inch combined supply has been shown repeatedly to be insufficient.
Committee Meeting Action: Accept in Principle
Do not make proposed change to A.23.1.3.2

Add New annex for 23.1.3.3
A.23.1.3.3 For typical combined domestic/fire sprinkler demands, systems with 4-inch pipe or larger typically do not need to include the domestic demand in the calculations because it is such a small fraction of the total flow that it does not make a significant difference in the results. But for situations where 4-inch pipe is used for the combined domestic/fire sprinkler systems and the domestic demand is considerable, then the domestic demand should be included in the calculations. Generally, pipe that is 6-inch or larger can carry combined domestic/fire protection demand without any consideration for domestic demand being necessary.
Committee Statement: The committee's intent is to include domestic demand in combined supplies under 4" in size. Domestic demand can have a major impact on the available water supply in these smaller main sizes. In addition, the committee's opinion is that domestic demand in combined supplies under 6" but larger than 3" in size may have an impact on the available water supply in these main sizes and should be evaluated on a case by case basis. An annex note has been added to express this concern.

13-376 Log #331 AUT-SSD Final Action: Reject
(A.23.1.3.2)

Submitter: Duane Johnson, Grove Resource Solutions
Comment on Proposal No: 13-593
Recommendation: Reject the proposal in its entirety.
Substantiation: The proposal is too vague. It does not provide enough information to the designer/engineer. More info on the domestic demand needs to be provided. Does one account for average or peak demand? Does one design to a domestic pump rating? What if a pump is not present? While I agree with the principle of the proposal, the proposal does not adequately address the issue. This requirement should remain in the appendix until details are worked out. As the submitter noted, it has been in the code for many years; why rush the change?
Committee Meeting Action: Reject
Committee Statement: The committee's intent is to include domestic demand in combined supplies under 4" in size. Domestic demand can have a major impact on the available water supply in these smaller main sizes. Domestic demand needs to be calculated based on the use of the actual use of the building and it is unique to every building. The designer needs to evaluate the domestic demand.

13-377 Log #349 AUT-SSD Final Action: Reject
(A.23.1.3.2)

Submitter: John August Denhardt, Strickland Fire Protection Inc.
Comment on Proposal No: 13-593
Recommendation: Delete the proposal in its entirety.
Substantiation: While I agree that something needs to be included on mains less than 4", several issues need to be addressed for this to move forward: 1. What is domestic demand and how does one calculate it? No guidance is given. How is an AHJ going to evaluate the domestic demand? Are we using peak demand, average, yearly water bills divided by 365 or what? This is not in the annex; it is being moved to the body of the document. 2. 23.1.3 needs to be reviewed. We might be in conflict with this section if this moves forward.
Committee Meeting Action: Reject
Committee Statement: The committee's intent is to include domestic demand in combined supplies under 4" in size. Domestic demand can have a major impact on the available water supply in these smaller main sizes. Domestic demand needs to be calculated based on the use of the actual use of the building and it is unique to every building. The designer needs to evaluate the domestic demand.