

Changes in the 2013 Edition of NFPA 13 Discharge Criteria

In the January 29, 2013 issue of e-TechNotes, we discussed the changes to the Installation Criteria and the Hanging and Bracing Criteria in the new (21013) edition of NFPA 13. In this issue of e-TechNotes we will discuss what is new in the Discharge Criteria portions of the 2013 edition of NFPA 13. This summary will explain the changes that are most important in the opinion of the editor. This will not be a list of every change to the standard, but is intended to help everyone understand the big issues with respect to installation, hanging and bracing. The following items were changed:

Separating Adjacent Hazards (11.1.2(3)). For light, ordinary, and extra hazard occupancies, a 2 ft or more change in elevation at the ceiling is sufficient separation so that the higher hazard discharge criteria does not need to extend 15 ft into the lower hazard area. Note that this was permitted in the 2010 edition for storage already and continues in that portion of the standard.

High Speed Low Volume (HVLS) Fans (11.1.7). Information was added to the standard to allow HVLS fans to be installed in sprinklered buildings. Significant research was conducted to minimize the effect that these fans would have on sprinkler performance. The same rules apply to the installation of HVLS fans with all sprinklers including ESFR as follows:

1. The maximum fan diameter is 24 ft.
2. The fans need to be centered between four sprinklers
3. There needs to be 36 inches of vertical clearance between the sprinkler deflectors and the fan
4. The fan shall be shut down upon waterflow alarm in accordance with NFPA 72 (90 seconds)

3,000 sq ft rule (11.2.3.1.4(3)). For many years, NFPA 13 has required a minimum design area of 3,000 sq ft when

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certain unsprinklered combustible concealed spaces were in the building. More recently, the standard clarified that only the sprinkler systems "adjacent" to the unsprinklered combustible concealed space needed to be designed for 3,000 sq ft. This allowed a system on the seventh floor of a building to be designed for less than 3,000 sq ft if the unsprinklered concealed space was between the first and second floors. But there was no clear definition of "adjacent".

In the 2013 edition, the term "adjacent" was defined as, "above, below or next to the qualifying concealed space". Also, the committee decided that a wall or ceiling with a fire resistance rating equivalent to the water supply duration eliminates the need for a 3,000 sq ft design if the entire rated assembly is between the concealed space and the adjacent sprinklers. It is important for the application of this last part of the rule that the entire rated assembly be between the concealed space and the sprinkler system. If a portion of the assembly is in the concealed space, the 3,000 sq ft rule must apply to the sprinklers on the other side.

3,000 sq ft Rule and Residential Sprinklers (11.3.1.2). In the 2010 edition of NFPA 13, the 3,000 sq ft rule applied to sprinkler systems with residential sprinklers adjacent to certain unsprinklered combustible concealed spaces. This has proven to be an onerous requirement. In the 2013 edition, the rule has been changed to eight residential sprinklers rather than 3,000 sq ft. The eight sprinkler rule applies to the same types of unsprinklered concealed spaces as the 3,000 sq ft rule and the same discussion of "adjacent" sprinkler systems applies.

Storage Occupancies and Clearance to Ceilings (12.1.3.4). A standardized method for determining the clearance from the top of the storage to the ceiling was written using the same set of rules as the sprinkler deflector distance to the ceiling measurements in Chapter 8. The rules are:

- For corrugated deck with up to 3 inch depth, measure to the bottom of the deck
- For corrugated deck greater than 3 inches deep, measure to the highest point of the deck
- Measure to the underside of insulation
- o Average the sag



o If sag is more than 6 inches, measure to highest point

High Speed Low Volume (HVLS) Fans and Storage Occupancies (12.1.4). Information was added to the standard to allow HVLS fans to be installed in sprinklered buildings. Significant research was conducted to minimize the effect that these fans would have on sprinkler performance. The same rules apply to the installation of HVLS fans with all sprinklers including ESFR as follows:

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ESFR Sprinklers and Light Hazard (12.6.7.1). While ESFR sprinklers are overkill protection for light hazard occupancies, situations have arisen where their use might be requested. The most common example is a large open spec building that is protected with ESFR sprinklers that then gets turned into a gym, fitness, and weight lifting space. There is no reason to change out the sprinklers in this case. In the past, NFPA 13 did not anticipate the use of ESFR in light hazard, so it was not expressly stated that it was okay. After repeated inquiries into the subject, the committee decided that expressly state that ESFR sprinklers could be used for light hazard.

CMSA Sprinklers and Light Hazard (12.6.7.1). Similar to the discussion above for ESFR sprinklers, CMSA sprinklers can also be used with light hazard occupancies. However, since faster response times are desirable in light hazard occupancies, only the quick response CMSA sprinklers are permitted to be used in light hazard spaces.

Hose Stream Demands and Water Supply Durations for Storage (12.8.6.1). All of the hose stream demands and water supply duration requirements, which were scattered around nine chapters, have been consolidated into one table and modified based on how many sprinklers are needed for fire control. In situations where more sprinklers are needed for fire control, larger hose stream demands and longer durations are needed.

Maximum Clearance for Idle Wood Pallets (Table 12.12.1.2(a)). In previous editions of NFPA 13, the maximum



20 ft clearance from the top of storage to the ceiling was applied to the protection of idle wood pallets with standard spray sprinklers in Table 12.12.1.2(a). This requirement has been lifted after a review of fire tests showed that the sprinkler protection in the table would work with greater than 20 ft clearance. This allows 6 ft of idle wood pallets in a 20 ft building, 8 ft of idle wood pallets in a 30 ft building, and 12 ft of idle wood pallets in racks in a 30 ft building.

Miscellaneous Storage of Plastic (12.2.3). Where Extra Hazard protection is required, design area can be reduced 25% with use of k-11.2 ordinary temperature sprinklers

In-Rack Sprinklers Protection Miscellaneous Storage (13.3.4). Where in-rack sprinklers are required to protect miscellaneous storage, information has been added to Chapter 13 for in-rack sprinkler locations

Palletized and Solid Piled Encapsulated Class I-IV Storage Over 15 ft up to 20 ft (14.2.5). Previous editions of NFPA 13 limited solid piled and palletized storage of encapsulated commodities to 15 ft high storage. Based on comparisons to other protection rules, protection of encapsulated storage up to 20 ft in height has been justified as follows:

- Class I – 0.46 gpm per sq ft over 2000 sq ft (based on rack storage rules)
- Class II – 0.53 gpm per sq ft over 2000 sq ft (based on rack storage rules)
- Class III and Class IV – 0.6 gpm per sq ft over 2000 sq ft (based on Group A plastics rules)

K-14 ESFR Sprinklers and Class I-IV Solid Pile and Palletized Storage (14.4.1). The k-14 ESFR sprinkler has been eliminated from the options available for 40 ft ceilings. Other ESFR options are available for this high ceiling. It is important to note that this only applies to new systems. There is no intent to require a retrofit of existing buildings that had previously installed k-14 ESFR sprinklers.

Palletized and Solid Piled Group A Plastics (15.2.8(2)(a)). Table 15.2.6(a) references the user back to EH1 and EH2 for certain storage/ceiling height combinations. Previous editions of NFPA 13 allowed k-5.6 sprinklers to be used because EH1 and EH2 allow these sprinklers to be used. The 2013 edition no longer allows the use of k-5.6 for this protection of plastic

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K-14 ESFR Sprinklers and Group A Plastics Solid Pile and Palletized Storage (15.4.1). The k-14 ESFR sprinkler has been eliminated from the options available for 40 ft ceilings. Other ESFR options are available for this high ceiling. It is important to note that this only applies to new systems. There is no intent to require a retrofit of existing buildings that had previously installed k-14 ESFR sprinklers.

Rewrite of Chapter 16 (Rack Storage of Class I-IV). The in-rack sprinkler rules were moved to be with ceiling sprinkler rules that would be used at the same time. This showed that there were some holes in the rules. These holes were filled with new rules consistent with the original intent.

Double-Row Racks with Blocked Shelves (16.1.6.3). Where blocked area exceeds 20 sq ft on double-row racks, they are not to be treated as solid shelves if transverse flues are located at 5 ft intervals and racks do not exceed 25 ft in height. The justification for this change is that it is roughly equivalent to multiple-row racks. The change is intended to help users deal with large objects on racks.

Open Top Containers with Class I-IV Commodities on Racks (16.1.7). The standard was clarified to state that the protection criteria in Chapter 16 is not intended for the storage of Class I-IV commodities in open top contains. At the same time the committee made this clarification, they also made a change to the definition of "Open Top Container" (section 3.9.1.19) with a long annex note (A.3.9.1.19) that contains some suggestions on dealing with open top containers such as putting lids on the open top containers or putting the open top containers only on the bottom level of the racks so that the collection of water isn't a problem.

Solid Shelves and ESFR Sprinklers with Class I-IV Commodities (16.2.3.2). In the 2010, and previous editions, ESFR sprinklers have been prohibited for use in protecting Class I-IV commodities on solid shelves. In the 2013 edition, ESFR sprinklers will be permitted to protect Class I-IV commodities on racks with solid shelves if in-rack sprinklers are installed under the solid shelves.

K-14 ESFR Sprinklers and Rack Storage of Class I-IV Commodities (16.2.3.1 and 16.3.3.1). The k-14 ESFR sprinkler has been eliminated from the options available for 40 ft ceilings with no in-rack sprinklers. Other ESFR options are available for this high ceiling. It is important to note that this only applies to new systems. There is no intent to require a retrofit of existing buildings that had previously installed k-



14 ESFR sprinklers. Protection of ceilings up to 45 ft high with k-14 ESFR sprinklers is still permitted with a single row of in-rack sprinklers.

Rewrite of Chapter 17 (Rack Storage of Group A Plastics). The in-rack sprinkler rules were moved to be with ceiling sprinkler rules that would be used at the same time. This showed that there were some holes in the rules. These holes were filled with new rules consistent with the original intent.

Plastic Decision Tree (Figure 17.1.2.1). A new decision tree was accepted by the committee to clarify that not every portion of Chapter 17 applies to exposed plastics (see proposal 13-499 in the ROP). Only those portions of Chapter 17 that specifically say they are for exposed plastics can be used to protect exposed plastics. Unfortunately, even though the change was accepted by the committee, it did not appear in the first printing of the standard. The NFSA is working with the NFPA staff to get the correct figure into the next printing.

Double-Row Racks with Blocked Shelves (17.1.5.3). Where blocked area exceeds 20 sq ft on double-row racks, they are not to be treated as solid shelves if transverse flues are located at 5 ft intervals and racks do not exceed 25 ft in height. The justification for this change is that it is roughly equivalent to multiple-row racks. The change is intended to help users deal with large objects on racks.

Open Top Containers with Group A Plastics on Racks (17.1.6). The standard was clarified to state that the protection criteria in Chapter 16 is not intended for the storage of Class I-IV commodities in open top contains. At the same time the committee made this clarification, they also made a change to the definition of "Open Top Container" (section 3.9.1.19) with a long annex note (A.3.9.1.19) that contains some suggestions on dealing with open top containers such as putting lids on the open top containers or putting the open top containers only on the bottom level of the racks so that the collection of water isn't a problem.

Exposed Expanded Plastics on Racks (17.2.1.4). A set of rules were put into the standard for protection of exposed expanded plastics on racks for storage up to 25 ft in height in buildings up to 35 ft high. The protection includes rules for single row racks, double row racks, and multiple row racks.

K-14 ESFR Sprinklers and Rack Storage of Group A Plastics (17.2.3.1 and 17.3.3.1). The k-14 ESFR sprinkler has been eliminated from the options available for 40 ft ceilings with no in-rack sprinklers. Other ESFR options are

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available for this high ceiling. It is important to note that this only applies to new systems. There is no intent to require a retrofit of existing buildings that had previously installed k-14 ESFR sprinklers. Protection of ceilings up to 45 ft high with k-14 ESFR sprinklers is still permitted with a single row of in-rack sprinklers.

Solid Shelves and ESFR Sprinklers with Group A Plastics (17.3.3.1.1). In the 2010, and previous editions, ESFR sprinklers have been prohibited for use in protecting Group A plastics on solid shelves. In the 2013 edition, ESFR sprinklers will be permitted to protect Group A plastics on racks with solid shelves if in-rack sprinklers are installed under the solid shelves.

Alternative Designs for Chapters 12 – 20 (New Chapter 21). New chapter was added to the standard for design criteria based on fire tests. The new chapter is intended to provide the user with alternatives to the other rules in Chapters 12 through 20 (storage occupancies). The user is not required to use Chapter 21, but can use the design criteria if they chose. The types of fire tests that the manufacturers will have to perform are spelled out in the chapter. The discharge criteria will be based on the number of sprinklers that open during the test(s) plus a safety margin. The sprinklers in Chapter 21 are standard spray and extended coverage CMSA (spray-type) sprinklers. The design areas go down as small as six sprinklers.

Computer Rooms (22.14.2.2). Information Technology (Computer) rooms are required to be valved separately from the rest of the sprinkler systems in the building. This rule is extracted from NFPA 75.

Museums, Libraries and Places of Worship (22.30). The Committee on Cultural Resources put their own requirements into NFPA 909 for fire sprinkler systems protecting museums, libraries, and places of worship. These rules are extracted into section 22.30 of NFPA 13 as follows:

- Branch lines need to be pitched at least ½ inch per 10 ft and mains need to be pitched at least ¼ inch per 10 ft. These rules apply regardless of the type of system (wet, dry, preaction).
- Where steel pipe is used in dry or preaction systems, the assumption has to be made that the water will have corrosive properties. The designer needs to use a corrosion resistant pipe, treat all the water that goes into the system, or implement a plan for monitoring the interior condition of the

pipe.

Waterflow Tests (23.2.1.1). The AHJ is permitted to approve waterflow tests that are more than 12 months old.

Phantom Flow (23.4.4.1.1.5). For mixed use occupancies where one of the uses is smaller than the design area, calculate the small area. Then to fill out the rest of the design area, add a "phantom flow" at the most remote branch line connection rather than picking up sprinklers in the larger area of the other hazard class. The phantom flow is equal to the minimum discharge density times the minimum design area minus the calculated flow for the small area.

Antifreeze and K-Factor Adjustment (23.4.4.5). The requirement to adjust the k-factor of sprinklers for large antifreeze systems using a complicated formula based on the density of the antifreeze was eliminated from the standard.

Hydraulics for ESFR Sprinklers and Obstructions (23.4.4.6.4). In previous editions of NFPA 13 going back to the early 1990's when ESFR sprinklers were installed at the ceiling and additional sprinklers were installed under obstructions, two additional sprinklers from under the obstruction needed to be added to the hydraulic calculations, making for a 14 sprinkler design. Under the 2013 edition, this requirement is now gone.

C-Factor for Galvanized Pipe (Table 4.4.7.1). Use C=100 for all steel pipe in dry-pipe systems, regardless of whether the pipe is galvanized.

Simultaneous Domestic Demand (24.1.3.3). Where the main is a single pipe less than 4-inches in diameter, the domestic demand needs to be added to the sprinkler system demand at the point of connection unless provisions have been made to shut off the domestic demand during a fire. For larger mains, an annex note warns the user that 4-inch pipe on a system that has a significant domestic demand may need to also consider the domestic demand. For 6-inch mains, it is rarely necessary to consider the simultaneous domestic demand.

Biocides or Corrosion Inhibitors (24.1.5.3). Biocides and corrosion inhibitors will need to be listed as being compatible with system components (and with each other if used together).

Recycled or Reclaimed Water (24.2.1(7)). A warning about using reclaimed or recycled water was added to the standard.

Collected rainwater is okay for sprinkler systems (like using ponds or rivers), but recycled and reclaimed water could be a problem. If the engineer wants to use it, they need to know what's in the water. Water reclaimed or recycled from an industrial process could be combustible, could have something in it that reacts with sprinkler components or gums up the works.

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