NFSA The Voice of the Fire Sprinkler Industry TechNotes

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Best of February 2015

Following are a dozen questions answered by the engineering staff as part of the NFSA's EOD member assistance program being brought forward as the "Best of February 2015." If you have a question for the NFSA Expert of the Day (and you are an NFSA member), send your question to eod@nfsa.org and the EOD will get back to you.

It should be noted that the following are the opinions of the NFSA Engineering Department staff, generated as members of the relevant NFPA technical committees and through our general experience in writing and interpreting codes and standards. They have not been processed as a formal interpretation in accordance with the NFPA Regulations Governing Committee Projects and should therefore not be considered, nor relied upon, as the official position of the NFPA or its Committees. Unless otherwise noted the most recent published edition of the standard referenced was used.

Question 1 – Sidewall Sprinkler Location

Sidewall sprinklers are planned to be installed 6 inches below a soffit. This will make the sprinklers 12 inches below the ceiling adjacent to the soffit. Can sidewall sprinklers be installed under a soffit as long as the minimum distance from the sprinkler deflector to the bottom of the soffit and the maximum distance from sprinkler deflector to higher ceiling are maintained?

Answer: Yes, sidewall sprinklers can be installed so that they are located with the appropriate distance from the ceiling to the sprinkler deflector over the coverage area of the sprinkler. There are two conditions that must be met in order to do this. First, the space must be light hazard with smooth, horizontal or sloped, flat ceilings or ordinary hazard occupancies where sprinkler is listed for ordinary hazard. Secondly, the sidewall sprinkler has to be listed to be installed with the coordinating distance from the ceiling per Section 8.7.4.1.1.2 in NFPA 13. Based on the information given, this would mean the sidewall sprinkler would have to be listed to be installed in a zone 6 to 12 inches below ceiling.

Question 2 – Sprinklers Installed under High Ceilings

A building has a 55-foot high roof. Standard spray sprinklers are proposed to protect the building. In accordance with NFPA 13, can standard spray sprinklers be installed at an elevation of 55 ft?

Answer: Yes, sprinklers can be installed at an elevation of 55 ft. There is no building/ceiling height limitation for standard spray sprinklers in NFPA 13. They can be installed and have been effective at heights of 55 ft or greater. There have been a couple of successful test series on 60 ft high ceilings, but the opportunity for testing spaces of that height or greater are limited. On

occasion, AHJs have permitted the omission of fire sprinklers in areas with high ceilings that have little or no fuel loading where the anticipated fire in that space has been analyzed indicating that the heat produced would not be able to operate the fire sprinklers. However, this is rare. High ceiling areas can be utilized for many different things over the life of the building and sprinklers protect the structure and its contents.

NFSA has written a couple of SQ Magazine articles on this subject. Archived versions can be found at www.nfsa.org in the Members Only section.

Question 3 – High Voltage Electric Rooms
A building being protected with fire sprinklers has a high voltage electric room. Is there an exception in NFPA 13 or the building code that allows high voltage electric rooms to omit sprinkler protection?

Answer: No, in general, sprinkler protection is required in electrical equipment spaces, however there are specific situations that will allow the omission of sprinklers from the space, which is discussed below. High voltage alone does not permit the omission of sprinklers.

The International Building Code (IBC) does require sprinkler protection in electrical rooms. Section 903.3.1.1.1 of the IBC (2012 Edition) lists exempt locations for sprinkler protection and specifically states that "Sprinklers shall not be omitted from any room merely because it is damp, of fire resistance-rated construction or contains electrical equipment". It does go on to list several instances in which sprinklers can be omitted from electrical spaces. Two exceptions that may be applicable to electrical equipment rooms are items (2) and (3). Item (2) states, "Any room or space where sprinklers are considered undesirable because of the nature of the contents, when *approved* by the fire code official." For example, if water creates an adverse reaction based on a fire incident and the materials in the room, then the AHJ could approve omitting sprinklers from that specific space. Item (3) states, "Generator and transformer rooms separated from the remainder of the building by walls and floor/ceiling or roof/ceiling assemblies having a *fire-resistance rating* of not less than 2 hours." This would allow a space significantly separated from the rest of the building that houses generators and or transformers to omit fire sprinklers.

Electrical equipment rooms are also addressed in NFPA 13. Section 8.15.11 requires sprinkler protection in electrical equipment rooms. Although subsection 8.15.11.3 does allow sprinklers to be omitted from electrical equipment rooms where ALL of the following conditions are met:

(1) The room is dedicated to electrical equipment only.
(2) Only dry-type electrical equipment is used.
(3) Equipment is installed in a 2-hour fire-rated enclosure including protection for penetrations.
(4) No combustible storage is permitted to be stored in the room.

This, similar to the IBC allowance requires the space to be isolated with a 2-hour fire rated enclosure from the rest of the structure. Yet, the determination for where sprinklers are permitted to be omitted is not tied to the level of voltage in the electrical space.

Question 4 – Protecting an Attic in a Single-Family Home
A single family home is being protected. The owner would like to install fire sprinklers in the attic, even though they are not required according to NFPA 13D. Is this area considered similar to any other compartment for hydraulic calculations within the house?

Answer: As sprinkler protection of the attic is not a requirement of NFPA 13D, the standard would not have guidance on installing sprinklers in this area. Most attics, not used for living purposes, are not finished and consist of exposed wood joists. Residential sprinklers are generally not listed under exposed wood joists and this ceiling configuration. This arrangement does not meet one of the situations noted as acceptable to use the two-sprinkler design in NFPA 13D in Section 10.2 so Section 10.2.4 would apply. This section states that for situations not meeting one of the conditions where the two-sprinkler design is applicable, the AHJ should be consulted as to the number of sprinklers in the design area. The protection goals for the attic space and input from the AHJ should lead to an appropriate hydraulic demand for the home.

Question 5 – Residential Sprinkler Hydraulic Calculation
An assisted living facility is being protected with residential sprinklers per NFPA 13. You have asked for clarification on which sprinklers to include in the hydraulically remote area when applying the requirements of NFPA 13, Section 11.3.1, for residential sprinklers. Should the sprinklers being calculated be limited to those within a compartment when determining the hydraulically most demanding?

Answer: No, when the residential sprinkler rules of NFPA 13 are being used, the 4 adjacent sprinklers that provide the greatest hydraulic demand as noted in Section 11.3.1.1 must be included in the calculation. As this is a NFPA 13 system, the walls or compartments would not be considered when determining the hydraulically most demanding sprinklers. If this were an NFPA13R system, the sprinklers would be limited to those in the compartment, but under NFPA 13 this is not the case.

Based upon the physical locations of the sprinklers and their piping arrangement, the four most demanding sprinkler may or may not be located within the same compartment. However, multiple calculations may be required to prove which four sprinklers are the hydraulically most demanding situation.

Question 6 – Applying NFPA 24
Section 5.3 of NFPA13R has annex language which states: for pipes 4-inch or larger, the installation rules of NFPA 24 should be applied. Does this mean all the rules of NFPA 24 including depth of cover are applied?

Answer: It is the intent of this annex section (A.5.3) to apply the installation rules of NFPA 24 to water supply piping of NFPA 13R systems when the supply lines are 4-inch and larger in diameter. These installation rules would include items such as the depth of cover required.

It was always the intent of NFPA 13R that the supply pipe bringing water from the public main into the building to be any pipe allowed by the applicable plumbing code. However, prior to the

2010 Edition, this was stated in the annex only and not in the body of the standard. This was an issue as the annex is not enforceable. The NFSA proposed this change in order to bring the intent of the residential committee into the body of the standard.

The annex section (A.5.3) was also proposed to help clarify when NFPA 24 would be applicable and when NFPA 24 requirements do not make much sense. When this supply pipe is 4 inches or larger, it is larger than the typical supply anticipated by the plumbing codes for domestic needs and it makes sense that the installation requirements of NFPA 24 be applied.

Question 7 – Sidewall Sprinklers in Obstructed Construction
A building has obstructed construction, created from beams and girders. It is noncombustible construction. It is being proposed to install sidewall sprinklers 12 inches below the roof deck, which would make them 5 inches below the beams, which complies with Table 8.7.5.1.3 in NFPA 13. Can standard spray sidewall sprinklers be installed if they are facing perpendicular to girders (supporting the smaller beams), and in accordance with all other sidewall spacing requirements?

Answer: It is correct that sidewall sprinklers are not permitted to be used under obstructed construction. However, there are two exceptions to the rule.

The first exception is that the International Building Code specifically overrides NFPA 13 and permits sidewall sprinklers to be installed outside of a building to protect a balcony or porch. That balcony or porch is allowed to have obstructed construction and the sprinklers are allowed to be installed 1 to 6 inches below the bottom of the structural members as long as they are not more than 14 inches below the deck.

The second exception is if sidewall sprinklers are installed in each channel created by the obstructed construction. In this case, each sprinkler has a flat smooth ceiling over its coverage area. As long as the remaining rules for sidewall sprinklers are followed, the sprinklers can be located between the girders as described.

Question 8 – Floor Control Valves
A 4-story building is being protected in accordance with NFPA 13. Can the 3rd and 4th floors be supplied by one floor control valve on the 3rd story?

Answer: Yes, a floor control valve, check valve, main drain, and flow switch will be required for each floor of a building (exceeding two stories) unless the total area of all floors combined does not exceed the system protection area limitations of Section 8.2.1 (52,000 sq ft for light and ordinary hazard; 40,000 sq ft for extra hazard and storage). The top story of a building will not be required to have a separate floor control assembly if it is fed from the floor below, which is a common layout that can be arranged to protect pipe from freezing when feeding sprinklers from the floor below.

A new definition (3.3.22) of a sprinkler system was added in the 2013 edition which is related to the floor control valve assembly requirements. This new definition implies that every combination of a water control valve, flow alarm, and drain constitutes a unique sprinkler

system. This answers the common question regarding a floor control assembly and whether it makes for separate systems on each floor or not. A multiple story building with separate floor control assemblies that include control valves, alarms, and drains will be considered a bunch of separate sprinkler systems instead of one system.

Question 9 – Roof Outlets for a Standpipe System
There is a dry standpipe system that will protect a parking garage. There will be 5 standpipes as part of this system. In addition, it is proposed for each of the five standpipes to have a header with 3 valves on the roof level. Is there a requirement for a header with 3 valves on each standpipe for this dry system?

Answer: No. The requirement for an outlet is found in NFPA 14, in section 7.3.2. It is the intent that a single standpipe riser is arranged to serve the roof. This can be achieved either by use of a roof outlet or by an outlet in a stairwell that has access to the roof. Additionally, if the roof is too steep for a fire fighter to safely operate a hose on the roof, no roof outlet is necessary. Also, in the 2013 Edition, the committee added section 7.3.2.2.1 saying that the distance requirements do not apply to the roof unless the roof is used or intended to be used as a part of the occupancy of the building. This should also be seen as a clarification of previous edition intent. In terms of a parking garage, there are many where the top level is for parking purposes and there is no “roof” over this level. If the level is occupiable, then the standpipes would each continue to the level. The 3 outlets on the roof should be to facilitate testing of the standpipe system. However, this would still not require each standpipe to extend to the roof level with a manifold.

Question 10 – Multiple-Row Racks
Two double-row racks are located approximately 1 foot apart. Is this arrangement covered by the criteria in NFPA 13?

Answer: Yes. This arrangement would have to use criteria for multiple-row racks. Section 3.9.3.7.3 in NFPA 13, states, "Multiple-Row Racks. Racks greater than 12 ft in depth or single- or double-row racks separated by aisles less than 3.5 ft wide having an overall width greater than 12 ft." In other words, even those they are double-row racks, when they are spaced close together they will act similar to multiple-row racks should there be a fire event. Therefore, they would be protected by the criteria for multiple-row racks.

Question 11 – Testing for Fire Department Connections
NFPA 25 has been referenced. A wet pipe sprinkler system with a fire department connection (FDC) is being used to protect a building. Does the FDC have to be hydrostatically tested with the system?

Answer: Yes, Section 6.3.2.1 of NFPA 25 requires the standpipe system to be hydrostatically tested and the last phrase is "...including the fire department connection piping." This mean the fire department connection piping should also be hydrostatically tested at the noted pressures.

Question 12 –
There is a 6-story mansion that is to be designed per NFPA 13D as it is a single-family home. Is there a size limit, either square-foot or floor level, for single-family dwelling units to be covered under NFPA 13D.

Answer: While there is no specific height limit in NFPA 13D, the use of NFPA 13D is limited to buildings that meet the definition of one or two-family dwelling units under the building code. Most building codes limit one- and two-family dwellings to three story buildings.

It was noted that this mansion is six stories in height. If the building code actually allows it to be classified as single family home when it is six stories in height, then NFPA 13D would be permitted. But most building codes would not allow a six story building to be classified as a single family dwelling unless the AHJ decided to waive some provision of the code to permit a different standard to be used.

If the building is truly just being built for a single family, NFPA 13D can be used, regardless the square footage. However, the goal of NFPA 13D is life safety, with minimal property protection. For a home of this size, it is common for the owner to desire property protection as well as life safety from the sprinkler system. The requirements would then exceed those of NFPA 13D in order to also provide better property protection. One option would be to follow NFPA 13 to protect the premises.