

Best of August 2016

Following are a dozen questions answered by the engineering staff as part of the NFSA's Expert of the Day (EOD) member assistance program being brought forward as the "Best of August 2016." If you have a question for the NFSA EOD (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 formal interpretations in accordance with the NFPA Regulations Governing Committee Projects and should therefore not be considered, nor relied upon, as the official positions of the NFPA or its Committees. Unless otherwise noted the most recent published edition of the standard referenced was used.

Question 1 - Larger Orifice Sprinklers in Light Hazard Occupancies

A building contains a light hazard occupancy. Can 3/4-inch fire sprinklers be used when protecting the building in accordance with NFPA?

Answer: Yes. First, NFPA 13 references sprinkler size by the nominal K-factor. Based on the NPT for the sprinklers in Table 6.2.3.1, this question refers to sprinklers with a K-factor of 8.0 and larger. NFPA 13 does not prohibit sprinklers with K-factors larger than 5.6 in light hazard occupancies. NFPA 13 does regulate the use of sprinkler with small K-Factors, those less than K-5.6 (see section 8.3.4), but does not prohibit the use of larger K-factor sprinklers in light hazard occupancies. In fact, there are many sprinklers that are listed for light hazard that have larger K-factors such as K-8. Section 8.4.6.6 even has an allowance for ESFR sprinklers to be permitted to protect light or ordinary hazard spaces and ESFR sprinklers are all larger K-factor orifices. What is important is that for a sprinkler to be used in a light hazard occupancy, it must be a quick response type sprinkler (see section 8.3.3).

Question 2 - Distance from a Ceiling Fan Obstruction

A ceiling fan is being installed with a dwelling unit of a building that is being protected in accordance with NFPA 13R. It was indicated that the ceiling fan in question will be suspended on a rod. Does the 3 ft distance from the center of the ceiling fan to the residential pendent sprinkler need to be maintained?

Answer: No. The 3 ft measurement was a decision of the technical committee based on practical installation conditions and common fan models that are installed tight to the ceiling. The distance is measured from the center of the fan since often the exact fan is frequently not known when the fire sprinkler system is being installed (or planned). The main obstruction created by a ceiling fan is the motor housing unit. If the motor housing unit is suspended via a rod, then the obstruction to the development of the fire sprinkler spray pattern is reduced. The rod and escutcheon would be considered noncontinuous obstructions. NFPA 13R does not offer much guidance on this type of obstruction.

As NFPA 13R provides minimal guidance on these types of obstructions, it would be wise to keep some distance between the ceiling fan support rod and its escutcheon. However, the length of the rod will alter how much of an impact the obstruction has on the sprinkler. Where the support rod is long, more than 18 inches, only a small amount of space would be necessary assuming the rod is a minimal diameter, such as an inch or so. If the support positions the fan only a few inches below the ceiling, then more distance will be needed so that the



sprinkler spray pattern could develop. As always, it is important to discuss this issue with the authority having jurisdiction so that stakeholders agree on the appropriate distance to maintain since NFPA 13R does not specifically address this type of ceiling fan arrangement.

Question 3 - CMSA Hydraulically Remote Area

This scenario uses CMSA sprinkler protection criteria for Group A plastics on single- and multiple-row racks. The storage is up to 20 feet in a building with a maximum ceiling height of 25 feet. K-16.8 upright sprinklers have been selected to protect the arrangement. The design area includes the 15 most hydraulically remote sprinklers. Can the remote area rectangle be based on the design area of the 15 sprinklers spaced at their maximum allowable coverage area of 100 square feet?

Answer: Yes. Following the guidance in NFPA 13 for K-16.8 CMSA wet sprinklers with a minimum operating pressure of 22 psi, 15 sprinklers need to be included in the remote area. It is acceptable to determine this design area based on the maximum spacing of these sprinklers when determining what the size of the design area would be. Assuming a maximum spacing of 100 square feet per sprinkler, the design area would appropriately be 1,500 square feet. This was further clarified in the 2016 edition of NFPA 13 under section 23.4.4.3.1 as follows:

23.4.4.3.1 For CMSA sprinklers, the design area shall be the rectangular area having a dimension parallel to the branch lines at least 1.2 times the square root of the area protected by the number of sprinklers to be included in the design area. The design area protected by the number of sprinklers to be used by the 1.2 rule shall be based on the maximum allowable area per sprinkler.

Question 4 - Extending Higher Hazard Protection

There is a small tenant improvement in an existing building protected with an ESFR sprinkler system. The modified section is to be a 2-story office area located in the interior corner of the existing warehouse building. The new office area walls are not fire rated and the top of the office walls do not extend all the way to the roof deck. There is a 16 ft area above the office ceiling that is open to the warehouse space protected with the ESFR system. Since the walls of the office are not fire rated, does the ESFR system need to be extended 15 ft into the first and second floors of the office?

Answer: No, the 15 ft extension of the higher hazard system is found in NFPA 13, section 11.1.2 and section 12.3 (similar language exists in earlier editions). These sections state that the higher hazard criteria needs to be extended 15 ft into the lower hazard area only when the areas are not separated by a barrier or partition capable of delaying heat from a fire in one area from activating sprinklers in the other area. This barrier is permitted to be a 2 ft draft curtain or 2 ft change in ceiling heights where the heat from an incident in the higher hazard will be collected by the stepped ceiling.

There is no required fire resistance rating of this partition or barrier, it must simply be capable of delaying the heat from the higher hazard area from opening sprinklers in the lower hazard area. The non-rated walls and ceiling of the new office area are one example of a barrier that can delay the heat from reaching the sprinklers in the lower hazard area. The extension of the ESFR protection would not be required. The sprinkler system protecting the office spaces simply need to be sufficient for the hazard classification of the office hazard.

The area above the office ceiling is already protected by the ESFR sprinkler system so no additional barrier would be required.

Question 5 - Tub and Shower Enclosures

For a bathroom within a dwelling unit, is the bathtub or shower enclosure included in the 55 square-foot used in the exception for omitting sprinklers in NFPA 13 (2016)?

Answer: Yes, unless the enclosure meets the definition of a compartment as per section 3.3.6. It states, "A space completely enclosed by walls and a ceiling. Each wall in the compartment is permitted to have openings to an adjoining space if the openings have a minimum lintel depth of 8 in. (200 mm) from the ceiling and the total width of the openings in each wall does not exceed 8 ft (2.4 m). A single opening of 36 in. (900 mm) or less in width without a lintel is permitted when there are no other openings to adjoining spaces."

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A bathroom suite made up of multiple rooms or compartments that meet the definition of a bathroom, section 3.3.2, for the purposes of the standard. The 55 square-foot rule is applied to each "bathroom" individually. They are also permitted to be adjacent to each other.

Question 6 - Flexibility in a Sprinkler Drop

Does a drop greater than 15 ft, supplying one (1) sprinkler, need a flexible coupling if a flexible hose at the bottom of the drop is utilized connecting the drop to the (1) sprinkler?

Answer: In general, the same seismic protection requirements are not applicable when a pipe feeds a single sprinkler as when it feeds multiple sprinklers. This is a little dearer when dealing with restraint. However, it is not the intent that the same flexibility requirements be applied to a drop for a single sprinkler either. Caution should be used with drops of a significant length as they could move significantly if not restrained somehow near the free end. The standard does not clearly state this because there is not a specific length when it becomes an issue. The scenario needs to be looked at as a whole and determine if it is a problem should the pipe (and sprinkler) move. Is there a concern of impact? Is there a rigid ceiling that could damage the sprinkler? Is there differential movement between where the sprinkler is installed and the branch line pipe that feeds the drop? Unfortunately, this is a subjective decision based on the site specifics as to whether additional restraint or flexibility is needed in long drops. The authority having jurisdiction should be part of the discussion on how to appropriately address a long drop for the specific building and its expected seismic forces. A flexible hose may be one solution to address the anticipated movement of the drop.

Question 7 - Fabric Awnings or Canopies

Awnings and canopies are frequent components that can be found attached to buildings. It was indicated that many of those are comprised of a frame with fabric covering. Do the awnings (fabric covered) need to have fire sprinklers installed under them?

Answer: Yes. In general, these are extensions of the building and would need to be protected once they extend more than 4 ft from the building. Of course, there are exceptions for noncombustible construction. In the 2016 Edition of NFPA 13, language has been added to include acceptable fabric materials. The text follows for your convenience:

8.15.7.2* Sprinklers shall be permitted to be omitted where the exterior canopies, roofs, porte-cocheres, balconies, decks, and similar projections are constructed with materials that are noncombustible, limited-combustible, or fire retardant-treated wood as defined in NFPA 703, or where the projections are constructed utilizing a noncombustible frame, limited-combustibles, or fire retardant-treated wood with an inherently flame-resistant fabric overlay as demonstrated by Test Method 2 in accordance with NFPA 701.

Question 8 - Concealed Space within Projection

A building has a covered entryway. It was indicated that there is occupiable space above the covered entry. The entryway is comprised of noncombustible construction and no storage will be kept below the projection. Does the projection creating the entryway need to have fire sprinklers installed within the concealed space creating the projection in accordance with NFPA 13.

Answer: No. From the description, this would be a concealed space. As it is a noncombustible concealed space, Section 8.15.1.2.1 from the 2016 Edition (similar language exists in earlier editions) would apply. It states, "Concealed spaces of noncombustible and limited combustible construction with minimal combustible loading having no access shall not require sprinkler protection."

Simply because there is an entry below a projection will not alter this requirement for allowing sprinklers in the concealed space to be omitted.

Question 9 - ESFR Upright Sprinklers

It is recognized that ESFR sprinklers are more sensitive to obstructions than other types of sprinklers. Can upright ESFR sprinklers be directly attached to branch lines that are 3-inch nominal diameter?

Answer: No, a 3-inch nominal diameter pipe would create too much of an obstruction to the upright ESFR sprinkler. Prior to the 2007 edition of NFPA 13, there were provisions for positioning upright ESFR sprinklers on sprigs such that the deflectors were a minimum of 7 inches above the branch line, which

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reduced the obstruction impact of the piping. That allowance was removed due to variations in installation requirements among different manufacturers. Depending on the specific sprinkler, that allowance may still be available through individual sprinkler listings as per section 8.12.5.2(5), which states, "Sprinklers with a special obstruction allowance shall be installed according to their listing."

Otherwise, permissible arrangements are only possible using the obstruction provisions of sections 8.12.5.2 and 8.12.5.3.1 to locate the branch lines sufficiently far below and/or to the side of upright ESFR sprinklers using sprigs and/or armovers. For example, an upright ESFR sprinkler may be placed on a sprig such that the deflector is at least 2 feet above the branch line if the branch line is 2 inches or less in diameter as per section 8.12.5.3.1(2). For larger branch lines, an armover would be necessary to comply with section 8.12.5.3.1(3), which states, "Additional sprinklers shall not be required where the obstruction is 1 ft or less in width and located a minimum of 1 ft horizontally from the sprinkler."

Question 10 - Water Delivery to Dry Residential Sprinklers

The use of quick opening devices in dry pipe sprinkler systems has been referenced. Can a quick opening device be used in order to meet the water delivery time for dry residential sprinklers in dwelling units.

Answer: No. Section 7.2.4.1 in NFPA 13, 2016 Edition, states, "A listed quick-opening device shall be permitted to help meet the requirements of 7.2.3.2, 7.2.3.5, 7.2.3.7, or 7.2.3.8." The base requirement to deliver water within 15 seconds for dry residential systems is found in Section 7.2.3.1.1 and under Section 7.2.3.6.3. This section is intentionally not included in the list where quick opening devices are permitted to assist with the water delivery times. The concerns of life safety in residential occupancies are so strong that the Committee wants the water to be there within 15 seconds.

Question 11 - Dry sprinklers in Sprinkler Cabinet

There is a building which uses several different dry sprinklers with different lengths. Is it required for each one of these different dry sprinkler lengths to be in the spare sprinkler cabinet?

Answer: No. Section 6.2.9 of NFPA 13 provides criteria for the requirements of spare sprinklers. Section 6.2.9.4 states that "where dry sprinklers of different lengths are installed, spare dry sprinklers shall not be required, provided that a means of returning the system is furnished". Otherwise the requirement stands that the sprinklers would have to be provided with a stock of spare sprinklers including each type and rating sprinkler with a minimum of 6 spare sprinklers for a facility protected with less than 300 sprinklers, 12 spare sprinklers for a facility protected with 300 to 1000 sprinklers and 24 spare sprinklers for a facility protected with over 1000 sprinklers.

Question 12 - Ductwork for Paint Spray Booths

Does ductwork for recirculating units for a paint spray booth require sprinkler protection within them?

Answer: Yes. The ductwork and filters are considered to be part of the spray area. NFPA 33-2011, section 9.1 states, "9.1*General. Spray areas, which include by definition any associated exhaust plenums and exhaust ductwork, any particulate filters, any solvent concentrator units, any recirculation air supply units, and mixing rooms, shall be protected with an approved automatic fire protection system." Annex section A.9.1 provides additional clarification regarding desired protection and intent.

The recirculation ductwork upstream of particulate filters and the filters require protection due to potential accumulation of paint residue and use of combustible filter materials. Protection of ductwork downstream of the particulate filter to the air supply ducts would be required if considered necessary based on a process hazards analysis, but would not typically be required. It is also advised to discuss the protection scheme with the design engineer and the authority having jurisdiction.

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