

Best of July 2015

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 July 2015." 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 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 – Closets in Dwelling Units

There is a dwelling unit with a closet that is currently protected by a single sprinkler at the ceiling level. Based upon the photos and sketch, there is a beam/soffit crossing the closet space. The engineer of record is requesting an additional sprinkler on the other side of this beam. Does NFPA 13 have any exceptions that will allow for this one sprinkler to provide the coverage in this situation?

Answer: Yes. As long as the closet does not exceed a volume of 400 cubic feet it is permitted to be protected with a single sprinkler. Section 8.5.5.4 which applies to all sprinklers, states, *"In all closets and compartments, including those closets housing mechanical equipment, that are not larger than 400 ft³ (11.33 m³) in size, a single sprinkler at the highest ceiling space shall be sufficient without regard to obstructions or minimum distance to the wall."*

This section was added to the standard in the 2013 Edition to recognize that in such small rooms, a single sprinkler will saturate the entire area regardless of the presence of obstructions and provide adequate protection from fire. Even with obstructions, the Committee has acknowledged that a single sprinkler is all that is necessary with rooms of small volumes.

Question 2 – Standpipe System Drains

A manual dry standpipe system has been installed in accordance with NFPA 14. There is a section of trapped pipe where an auxiliary drain is needed. Do these types of drains have to comply with the same requirements as those for a dry sprinkler system under NFPA 13?

Answer: No, Section 7.11.2.5 in NFPA 14 provides two additional options for drainage of trapped pipe. It is permissible to follow the requirements of NFPA 13 Section 8.16.2.5.3, Auxiliary Drains for Dry Pipe Systems and Preaction Systems, but it is also permissible to use an auxiliary drain sized in accordance with Table 7.11.2.3 in NFPA 14 or a hose connection approved for use as a drain.

Question 3 – Sloped Concealed Space

A project has 12-inch deep trusses between a drywall ceiling and shingled roof deck. NFPA 13 Section 8.15.1.6 requires sprinklers listed for concealed space use in this application. In some areas, the slope of the ceiling inside the concealed space exceeds 2 in 12 which exceeds the slope permitted by the listing on available concealed space sprinklers. What options are permissible under NFPA 13 for this situation?

Answer: There are basically three options to consider outlined below.

The first option is to fill the space with noncombustible insulation as per Section 8.15.1.2.7 in order to be permitted to omit sprinklers.

The second option is to install standard spray sprinklers or special listed attic sprinklers as would be done under a sloped ceiling. The concealed space listing requirement in Section 8.15.1.6 is limited to concealed spaces under a horizontal ceiling. Where the slope exceeds 2 in 12, the letter of the standard does not require a special concealed space listing.

The third option is to install concealed space sprinklers outside of their listings as permitted by Section 8.3.1.2. It specifically notes that “construction features” can create a scenario where the best protection may actually be using a sprinkler beyond its actual listings. If this option is selected, it would be prudent to discuss the installation of those sprinklers with the AHJ to ensure approval as it is not typical to use products beyond their listings.

Question 4 – Dielectric Connection

Underground fire service is being required by a building official to have a dielectric connection prior to the fire sprinkler system piping. Is there a code requirement to have a dielectric connection made at the point of connection of the fire sprinkler system and the underground fire service?

Answer: No, there is no requirement for a dielectric connection at the point between the fire service underground and the fire sprinkler system piping in NFPA 13 or NFPA 24. Section 10.6.8 of NFPA 13 prohibits the use of pipe as the grounding electrode for electrical systems. This prohibition also appears in NFPA 24. However, for safety reasons, all metallic piping systems in a building needs to be bonded together to form a ground. Therefore, while the sprinkler system

is not allowed to be the only grounding electrode for an electrical system in a building, it is expected to be grounded along with the other metallic systems in a building.

A dielectric connection would be required to couple certain metals together, such as copper with steel, to prevent galvanic corrosion. Therefore a dielectric connection would be required in a situation where copper tube is connected to steel pipe. However, this is typically done when systems have regular flow through them. A sprinkler system is generally static as flow only occurs in an incident or during testing.

Question 5 – High Zone Fire Department Connection

A building is approximately 500 ft tall. Standpipes have been installed in accordance with NFPA 14. There will be low zone and high zone fire pumps to supply the fire protection systems in the building. Is the high zone required to have a fire department connection (FDC)?

Answer: Yes. FDCs are required based on the system they are feeding. For example, NFPA 14 requires FDCs for standpipe systems in Section 7.12. This requires each zone of a Class I or Class III standpipe system to have one or more FDCs. Section 7.12.1.1 allows the high zone FDC to be omitted if the building is too tall for the fire department pumpers to supply it in accordance with Section 7.9.3. However, if this is the case an additional means of supply in the building is necessary (see Section 7.9.3). In addition, the annex in Section A.7.9.3 states, "An auxiliary means can also be in the form of pumping through the fire department connection in series with the low- or mid-zone fire pump, as approved by the AHJ."

In other words, there are options. In general, the rule of thumb is that each zone needs to have a FDC. Yet, high-rise buildings can present challenges, especially if they are taller than the fire department equipment can support. Then the AHJ will have to be consulted to ensure appropriate FDCs are installed for the fire department support during an incident.

Question 6 – Dry Sprinklers

The length of a dry sprinkler barrel is tied to the expected temperatures. The temperatures include both inside a space and outside a space. What temperature conditions are supposed to be used when determining the appropriate lengths?

Answer: First, it is always important to review the manufacturer's product information, yet it should also be recognized that the minimum dry barrel lengths for dry sprinklers have been standardized in the 2013 Edition of NFPA 13 (Table 8.4.9.1(a)). Of course, in order to apply any table to determine the necessary lengths, the temperatures need to be selected.

To determine the low temperature use Figure A.10.5.1 in NFPA 13, which shows the lowest one-day mean temperature for everywhere in the continental United States with data compiled by the U.S. Weather Service. This figure is specifically for above ground piping that could be exposed to freezing temperatures, and it is reasonable to use that same data for an exposed/exterior sprinkler. It may also be possible to call the weather bureau in the area where you are working to acquire local information. Either method is acceptable.

As for an interior temperature, most apartment or condominium complexes have agreements with the occupants that the temperature has to be maintained at or above 50 degrees F. This is generally the reasonable assumption for residential units, but should be confirmed with the owner (management company or homeowners association). However, the piping location within the units may also be part of the equation in determining the temperatures. For example, if the dry sprinkler is installed in a soffit and closed off from the heated room, but still within the insulation envelope, an additional 5 degrees would be generally conservative for this separation from the heated space.

In addition, it is important to remember where the measured length is physically located. Section 8.4.9.2 states, "The minimum barrel length shall be measured from the face of the fitting to which the dry sprinkler is installed to the inside surface of the insulation, wall, or ceiling leading to the cold space, whichever is closest to the fitting." This will assist in making sure the correct length sprinkler(s) is ordered.

Question 7 – Closets on Balconies

For a building protected with a NFPA 13R system, a gas water heater is in a closet where the door opens onto the balcony but not directly into the dwelling unit. There are several water line penetrations from the closet into the dwelling unit that are fire caulked. Can sprinklers be omitted from these closets in accordance with NFPA13R Section 6.6.7?

Answer: Yes, sprinkler protection may be omitted from these closets. Section 6.6.7 specifically states that sprinklers are not required in closets on exterior balconies as long as there are no doors or unprotected penetrations into the dwelling unit. Based on the description and attached sketch, this closet will not have doors or unprotected penetrations into the dwelling unit. The fire caulked pipe penetrations would not be considered unprotected penetrations and section 6.6.7 could be applied.

Question 8 – Indoor Storage of Idle Wood Pallets

Indoor storage of idle wood pallets has limited protection options. There is an existing warehouse space with a maximum ceiling/roof height of 21 ft 10 ½ inches. The new tenant anticipates storing idle wood pallets up to 6 ft within the space in a fairly sizable area. This space is protected by an existing sprinkler system with K-8 sprinklers. NFPA 13 in Table 12.12.1.2(a) limits the use of K-8 Control Mode Density Area (CMDA) sprinklers to 20 ft maximum ceiling height when protecting idle wood pallets up to 6 ft high. Can K-8 sprinklers be used in this situation if the ceiling height exceeds 20 ft?

Answer: No, Table 12.12.1.2(a) limits the use of K-8 CMDA sprinklers to 20 ft maximum. A maximum ceiling height over 21 ft will not be acceptable for applying the information in this table.

It must be noted that as the annex states in A.12.12, stacks of idle pallets are one of the greatest challenges to sprinklers. The undersides of the pallets create a dry area on which a fire

can grow and expand to adjacent pallets. This process will continue until the fire bursts through the top of the stack. At this point, it may not be possible for ceiling sprinklers to control this high challenge fire. Due to the severe fire conditions possible with idle pallet storage, the rules of section 12.12 are used to mitigate these challenges. Protection criteria outside those listed in this section would be outside the scope of NFPA 13.

Based upon the information given, it appears there are three options when using CMDA sprinklers:

- 1) The K-8 sprinklers could be replaced with K-11.2 sprinklers. As long as the hydraulic calculations work, this would allow these idle wood pallets to be protected up to a maximum ceiling height of 30 ft.
- 2) A dropped ceiling or insulation could be attached to the ceiling to make the effective maximum ceiling height 20 ft. This would allow the use of the K-8 sprinklers as long as the maximum pallet height does not exceed 6 ft.
- 3) If the storage arrangement listed in NFPA 13, section 12.12.1.2 (4) can be met, the existing K-8 CMDA sprinklers can be used using the ordinary hazard group 2 curve of figure 13.2.1. A 250 gpm minimum hose stream demand would be required and the duration would be at least 60 minutes. In order to use this option, the pallets may be stored no more than 6 ft high and each pipe of no more than four stacks must be separated from other pallet piles by at least 8 ft of clear space. A distance of at least 25 ft must be kept clear from adjacent commodities.

Question 9 – Attics Containing Fuel-Fired Equipment

The language in NFPA 13D has been modified for providing sprinklers in attics containing fuel-fired equipment. When comparing the 2007 Edition to the 2013 Edition, what is the background on the modification to the requirements?

Answer: NFPA 13D required sprinklers in attics containing fuel fired equipment in the 2007 Edition but that requirement has been eliminated in the 2013 Edition. The 2007 Edition only exempted attics that did not contain fuel-fired equipment; no special guidance was provided on what protection should be provided.

NFPA 13D (2007):

8.6.5 Sprinklers shall not be required in attics, penthouse equipment rooms, elevator machine rooms, concealed spaces dedicated exclusively to and containing only dwelling unit ventilation equipment, floor/ceiling spaces, elevator shafts, crawl spaces, and other concealed spaces that are not used or intended for living purposes and do not contain fuel-fired equipment.

The 2013 Edition specifies that sprinklers are *not* required if the space containing the fuel-fired equipment is *above* the occupied area. It also clarifies that, when fuel-fired equipment is to be

protected in a concealed space, only one sprinkler is required either above the equipment or between the equipment and the occupied space.

NFPA 13D (2013)

8.3.5 Sprinklers shall not be required in attics with or without storage, penthouse equipment rooms, elevator machine rooms, concealed spaces dedicated exclusively to and containing only dwelling unit ventilation equipment, floor/ceiling spaces, elevator shafts, crawl spaces, and other concealed spaces that are not used or intended for living purposes.

8.3.5.1 Such spaces that contain fuel-fired equipment shall also comply with 8.3.5.1.1 or 8.3.5.1.2.

8.3.5.1.1 Where the fuel-fired equipment is above all of the occupied areas of the dwelling unit, no sprinkler protection shall be required in the concealed space.

8.3.5.1.2 Where fuel-fired equipment is below or on the same level as occupied areas of the dwelling unit, at least one quick-response intermediate temperature sprinkler shall be installed above the equipment or at the wall separating the space with the fuel-fired equipment from the occupied space.

Question 10 – Gridded Deluge Systems

There is a project for a cooling tower, per NFPA 214. A deluge system is planned for the fire protection system. Is it permitted for the deluge system to be gridded?

Answer: Yes. A deluge system can be gridded. Pre-action and dry pipe systems are prohibited from being gridded due to the nature of the grid and the complications in determining water delivery times and ensuring they meet the minimum delivery time specified by the standard. This is not an issue when dealing with deluge systems since they release the water from all open orifices and have no delivery time requirements.

Question 11 – Mechanical Equipment in Concealed Space

A building with a mechanical unit located in a concealed space of dwelling units has been described. The building is being protected in accordance with NFPA 13. The concealed space would otherwise be permitted to omit fire sprinklers. There is a 2 ft by 5 ft access panel into the concealed space. Is the access panel too large to allow the sprinkler omission in the concealed space?

Answer: No. Section 8.15.1.2.2 in NFPA 13, states, "Concealed spaces of noncombustible and limited-combustible construction with limited access and not permitting occupancy or storage of combustibles shall not require sprinkler protection." Access smaller than a doorway is typically viewed as limited access. Also, this mechanical space does not appear to lend itself to storage of combustibles or occupancy. The materials described were all noncombustible or limited combustible. Therefore, it should be acceptable to omit the sprinkler from this concealed space.

Question 12 – Standpipe Flow Test

The 5-year flow tests for standpipes in Section 6.3.1.1 of NFPA 25 are in question. Specifically, is the test 500 gpm at the most remote and 250 gpm for each other consecutive riser, up to the system maximum?

Answer: Yes. The 2014 Edition of NFPA 25 changed the requirement of the 5-year standpipe flow tests to require 500 gpm at the most remote standpipe and then 250 gpm for each additional standpipe until the total system demand is simultaneously flowing. The prior editions of NFPA 25 only required the 500 gpm at the most remote standpipe to flow. This ensures that the total system demand can be met.