

TechNotes Issue #423
August 13, 2019

Best of July 2019

Following are a dozen questions answered by the engineering staff as part of the NFSA's Expert of the Day (EOD) member assistance program during the month of July 2019. This information is being brought forward as the "Best of July 2019." 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.

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Question #1 - FDC Sizing

An AHJ is stating that the Fire Department Connection (FDC) for a sprinkler system must be capable of supplying the system demand and that a 2-1/2 in. inlet must be provided for every 250 gpm of system

Upcoming Technical Tuesdays

August 20, 2019

Foam Systems ITM - NFPA 25, NFPA 11, and NFPA 16

Presented by Vince Powers, Inspection, Testing & Maintenance Specialist

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demand. Does the number of FDC inlets have to be determined by the sprinkler demand divided by 250 gpm?

Answer: No, unlike NFPA 14, Fire department connections required for sprinkler systems by NFPA 13 are not intended to supply the demand of the system it is serving. The fire department connections only serve as a supplemental supply to the system. This concept is explained in Annex section A.16.12.4 (with similar language in earlier editions). This section reads as follows:

***A.16.12.4** The purpose of a fire department connection is to supplement the pressure to an automatic fire sprinkler system. It is not the intent to size the fire department connection piping based on system demand. For multiple system risers supplied by a manifold, the fire department connection need not be larger than that for an individual system.*

Question #2 - Combustible Materials in Unprotected Ceiling Pockets

NFPA 13-2016 section 8.6.7.2(5) states that one of the conditions to leave sprinklers out of a ceiling pocket is that the ceiling pocket must have noncombustible or limited combustible finishes. A wood beam was added to an unprotected ceiling pocket in a sprinklered building and coverage would now be required per NFPA 13-2016 section 8.6.7.2(5). Is there any alternative?

Answer: Yes, NFPA 13-2016 section 8.6.7.2(5) only refers to the finishes of the ceiling pocket. The beam can be encapsulated in a noncombustible or limited-combustible material to eliminate the requirement for additional sprinkler protection.

Question #3 - Conveyor Belts

An ESFR sprinkler system is protecting a space that includes conveyor belts over 24 in. wide and 6 ft off the floor. Are sprinklers required to protect underneath this obstruction?

Answer: Yes, based upon section 8.12.5.3 of the NFPA 13-2016, sprinklers would be required under this conveyor. As the conveyor is wider than 2 ft, there is no allowance to omit sprinklers from under this continuous obstruction in the five options in section 8.12.5.3.1. Additionally, based upon section 8.5.5.3.3, the sprinklers under this obstruction is required to be the same type as at the ceiling (ESFR).

Question #4 - Institutional Sprinklers



Are institutional sprinklers allowed to be used in a residential application in accordance with NFPA 13-2016?

Answer: Yes, as long as the institutional sprinkler is listed for the required response and spray type. NFPA 13-2019 defines an institutional sprinkler as follows:

3.3.205.4.7 Institutional Sprinkler. *A sprinkler specially designed for resistance to load-bearing purposes and with components not readily converted for use as weapons.*

The definition does not include any limitation on the response characteristics (Standard or Fast-Response) or on the spray type (SSU/SSP, Residential, Extended Coverage, etc.) If the sprinkler that you are intending to use is listed for a response and spray type that is appropriate for residential applications, then the institutional sprinkler may be used. Residential occupancies are typically considered to be light hazard and as such quick response or residential sprinklers are required.

If the institutional sprinkler is listed as a residential sprinkler as well, the special design method of section 19.4.1 using residential sprinklers would be permitted to be applied. Currently, we are not aware of any sprinkler having both of these qualities, so the density/area design method of section 19.3.3.2 or the room design method would (19.3.3.3) be required to be applied.

Question #5 - Dry System Water Delivery Time

Does the installer have the obligation to do a trip test for all new dry pipe system to make sure the water delivery time will be under 60 seconds.

Answer: This concept is often misinterpreted. The answer to your question is "it depends on the size of the system and possibly whether a quick-opening device is provided." NFPA 13-2019 provides the following requirements for dry pipe sprinkler systems.

The reference to 60 seconds is actually under the size of systems section for dry pipe systems in 8.2.3.2. Subsequent sections state that a system less than 500 gal is not required to meet any specific water delivery time. A system less than 750 gal and greater than 500 gal is not required to meet any specific water delivery time if provided with a quick-opening device. A system greater than 750 gal would be required to deliver water in 60 seconds unless designed using the number of outlets and water delivery time requirements of section 8.2.3.6. Refer to Table 8.2.3.6.1. These sections read

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as follows:

8.2.3.1* *The system capacity (volume) controlled by a dry pipe valve shall be determined by 8.2.3.2, 8.2.3.3, 8.2.3.4, 8.2.3.5, or 8.2.3.7.*

8.2.3.2 *System size shall be such that initial water is discharged from the system test connection in not more than 60 seconds, starting at the normal air pressure on the system and at the time of fully opened inspection test connection.*

8.2.3.3 *A system size of not more than 500 gal (1900 L) shall be permitted without a quick-opening device and shall not be required to meet any specific water delivery requirement to the inspection test connection.*

8.2.3.4 *A system size of not more than 750 gal (2850 L) shall be permitted with a quick-opening device and shall not be required to meet any specific water delivery requirement to the inspection test connection.*

8.2.3.5 *System size shall be based on dry pipe systems being calculated for water delivery in accordance with 8.2.3.6.*

It must also be noted that if the dry system is protecting dwelling units then the required water delivery time is 15 seconds as noted in section 8.2.3.1.1.

Question #6 - Drop Ceiling Partially Removed

A drop ceiling has been partially removed and the steel deck and bar joists are exposed in a small area for renovations to an existing system. Does NFPA 13-2016 section 8.15.23 apply and do the sprinklers need to be installed to a depth of 30 ft if the original design of the sprinkler system was for 0.2 gpm per sq ft over 2500 sq ft.

Answer: The answer to the first question is yes. This is exactly the kind of situation that section 8.15.23 was designed to address.

The answer to the second question depends on what the hazard of the new space will be after the renovation. If the sprinkler demand is still going to be 0.2 gpm per sq ft over 2500 sq ft, then the sprinkler protection needs to cover 30 ft into the depth of the partially concealed space. This requirement is found in section 8.15.23.3 which states in part:

...the sprinkler system shall be permitted to extend only as far into the space as 0.6 times the square root of the design area of the sprinkler system in the adjacent space. "

0.6 times the square root of 2,500 sq. ft. equals 30 ft.

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Northbrook, IL
October 22, 2019

Inspection, Testing and
Maintenance for the Building
Owner or Manager
Oak Brook, IL
October 23, 2019

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But if the sprinkler system is now considered as protecting a lesser design area, then the sprinkler protection might be able to be reduced to 24 ft into the depth of the partially concealed space as stated in section 8.15.23.3.

Question #7 - Preaction Riser Location

In a warm climate region, would a preaction riser be permitted to be placed outside of a building?

Answer: There is nothing in the standard that prohibits this location so long as it complies with NFPA 13-2016 section 7.3.1.8:

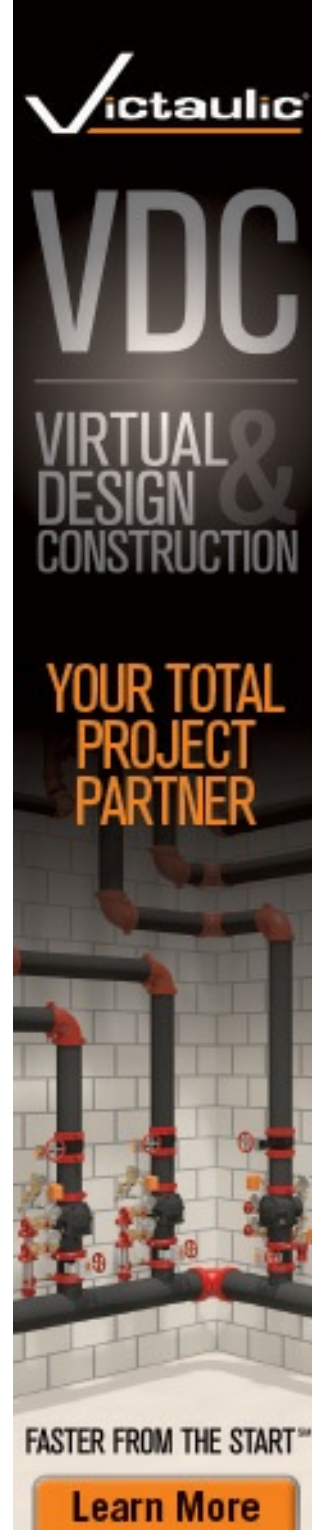
7.3.1.8 Location and Protection of System Water Control Valves.

7.3.1.8.1 *System water control valves and supply pipes shall be protected against freezing and mechanical injury*

This section does not have any language that would prohibit a preaction systems from being installed at an exterior location as long as it is protected from mechanical injury and freezing. Additional protection from the elements may be necessary as exposure may cause mechanical damage such as rust. Although, NFPA 13 does not include any specific language about protecting from rain, common sense would dictate that the preaction riser be protected from environmental conditions that may adversely impact the system. Any electrical equipment provided would need to be rated for exterior locations. Additionally, the pipe and fittings and other appurtenances be protected from possible corrosion. See section 8.16.4.2.1 and its annex section for guidance. The annex section (A.8.16.4.2.1) does state that "Being exposed to the outside atmosphere is not necessarily a corrosive environment" Although areas near the ocean may requires additionally consideration due to the saltwater. This Annex section does state:

...Where moisture conditions are severe but corrosive conditions are not of great intensity, copper tube or galvanized steel pipe, fittings, and hangers might be suitable. The exposed threads of steel pipe should be painted. It must be noted that depending on exposure temperatures, pressure spikes could be experienced. Problems with this issue have been known to occur in hot climates.

It must be noted that depending on exposure temperatures, pressure spikes could be experienced. Problems with this issue have been known to occur in hot climates.



The advertisement features the Victaulic logo at the top, followed by the text 'VDC' in large, bold letters. Below this, it reads 'VIRTUAL & DESIGN & CONSTRUCTION'. The central part of the ad shows a 3D rendering of a complex piping system with various valves and fittings, set against a background of a brick wall. At the bottom, the text 'YOUR TOTAL PROJECT PARTNER' is displayed in orange, and 'FASTER FROM THE START™' is written in white. A prominent orange button with the text 'Learn More' is located at the very bottom.

Question #8 - Phone Booths

A bank of phone booths is installed in a facility adjacent to a wall. Each booth is approximately 36 in. by 36 in. Are sprinklers required in these features in accordance with the 2016 edition of NFPA 13?

Answer: There are no specific exceptions for phone booths to omit sprinkler protection in NFPA 13. The closest section would be NFPA 13 -2016, section 8.1.1 (7) which states that furniture and similar features are not required to be provided with sprinklers; however, this section limits this omission to features that are not intended for occupancy. A phone booth will be subject to occupancy of at least one person. NFPA 13 does not have a definition of "intended for occupancy" so it is not clear if the transient nature of occupancy in a phone booth was intended to disqualify these features from this exception.

The 2018 IBC does address this issue in section 903.3.3:

[F] 903.3.3 Obstructed locations. *Automatic sprinklers shall be installed with regard to obstructions that will delay activation or obstruct the water distribution pattern and shall be in accordance with the applicable automatic sprinkler system standard that is being used. Automatic sprinklers shall be installed in or under covered kiosks, displays, booths, concession stands, or equipment that exceeds 4 feet (1219 mm) in width. Not less than a 3-foot (914 mm) clearance shall be maintained between automatic sprinklers and the top of piles of combustible fibers.*

This section seems to exempt the phone booths if they do not exceed 4 ft in width; however, the commentary for this section did not provide any additional helpful information. In light of the vagueness of the requirement of installing sprinklers in these booths, it would be prudent for the responsible design professional to take into consideration the combustibility of the booth, the potential sources of ignition and the transient nature of the occupancy of the phone booths and come to a determination with the input of the AHJ(s). If it is decided to omit sprinkler from these booths, the ceiling sprinkler coverage needs to cover to the wall as if the booths were not present.

Question #9 - Walk-in Freezer

Are air lines fed from an air compressor required to penetrate a freezer protected with a dry pipe sprinkler system?

Answer: Yes, the air lines from the compressor to the sprinkler system piping are required to penetrate the freezer. However, they are not required to come back to the warm side if you don't want them to. The minimum number of penetrations is two, not four. A better figure to look at in NFPA 13 would be Figure 8.8.2.7.1.1(a) rather than the figure that you referenced, which was Figure 8.8.2.7.1.1(b). (Note that the figure numbers are from the 2019 edition. Similar figures are in all other recent editions, just look at Figure (a) instead of Figure (b).)

It is important for the air line to penetrate the freezer prior to the connection to the sprinkler piping in order to cause the moisture in the air to drop out before it causes an ice-plug in the water piping. No matter what you do, there will always be moisture in the condensed air that is being sent into the preaction or dry-pipe system. The arrangement of piping from the compressor to the sprinkler system piping shown in NFPA 13 ensures that the moisture gets cold and drops out of the air before it gets to the sprinkler piping.

The reason that there are two air lines is that the moisture will eventually cause an ice-plug in the air line (which is much better than having one in the water line). When no more air can get through, the air pressure gauge near the compressor will be reading higher than the air pressure gauge at the top of the preaction or dry-pipe valve. When that occurs, the building owner needs to shut down the air line that is blocked and open the air line that is clear to allow the air pressure to balance out. Then the owner needs to take apart the line, clean out the ice, and put the pipe back together. The cleaned-out pipe is then left shut down until the line that is open has a blockage, and then the process is repeated.

Since the two separate air lines need to be kept with one in service and the other cleaned out and out of service, there needs to be two different control valves at each end of each pipe.

Question #10 - Residential Booster Pumps

For a residential sprinkler system installed in accordance with the 2016 edition of NFPA 13D, do residential pumps need to be tested at 150% of the demand capacity (like commercial fire pumps)?

Answer: No, residential pumps only need to be sized to meet the system demand and tested per NFPA 13D-2016 section 11.2.2. Per NFPA 13D-2016, residential pumps are not required to be listed:

5.1.2 *Except as permitted by 5.1.2.1, devices*

and materials used in sprinkler systems shall be listed.

5.1.2.1 *Tanks, expansion tanks, gauges, pumps, hangers, waterflow detection devices, and valves shall not be required to be listed.*

Pumps serving 13D systems (and not connected to the domestic system) are required to meet the provisions of section 6.2.1:

6.2.1 *Where a pump is the source of pressure for the water supply for a fire sprinkler system but is not a portion of the domestic water system, the following shall be met:*

- (1) A test connection shall be provided downstream of the pump that creates a flow of water equal to the smallest sprinkler K-factor on the system.*
- (2) Pump motors using ac power shall be rated for 240 V and be wired in accordance with the NEC (NFPA 70).*
- (3) Any disconnecting means for the pump shall be approved*
- (4) The pump shall be located not less than 1-1/2 in. off the floor.*

Testing shall also be in accordance with this standard which only requires that the pump run for the required duration time per section 6.1.2 or 6.1.3 (10 min or 7 min) with water flowing through the drain/test connection.

11.2.2* Pump Tests.

11.2.2.1 *Prior to system acceptance, a system utilizing a pump shall be tested by opening the drain/test connection.*

11.2.2.1.1* *The pump shall sense the flow, turn on, and flow water for the required duration of 6.1.2 or 6.1.3 without interruption.*

No other testing is required.

Question #11 - Listed Strainers

Is a strainer installed on the upstream side of a backflow preventer required to be listed?

Answer: Yes, a strainer affects system performance and as such needs to be listed. All materials specifically designated for use in NFPA 13-2019 are required to be listed unless the following requirements are met:

7.1.1.2 *Unless the requirements of 7.1.1.3, 7.1.1.4, or 7.1.1.5 are met, all materials and devices essential to successful system operation shall be listed.*

7.1.1.3 Equipment as permitted in Table 7.3.1.1 and Table 7.4.1 shall not be required to be listed.
7.1.1.3.1 Nonmetallic pipe and fittings included in Table 7.3.1.1 and Table 7.4.1 shall be listed.
7.1.1.4 Materials meeting the requirements of 17.1.2, 17.1.6.2, 17.1.6.3, and 17.1.7.3 shall not be required to be listed.
7.1.1.5 Components that do not affect system performance shall not be required to be listed.*

Section 7.1.1.3 refers to common pipe and fittings that are manufactured to certain ASTM standards with the exception of non-metallic pipe and fittings. Section 7.1.1.4 refers to hanger components that do not require specific listings. The final section (7.1.1.5) relieves the requirements of listing from any component that does not affect system performance such as signs and gauges.

Due to the fact that a strainer is required on the system, there is concern of debris entering in the system or small orifice sprinklers are being utilized. Either way, debris entering the fire sprinkler system would affect the performance of the system by creating blockages. Due to this, the strainer must be listed.

Question #12 - Existing Standard Response Sprinklers in Renovated Light Hazard Space

There is a tenant improvement project for an office occupancy (light hazard). The existing sprinkler system was designed as an ordinary hazard group 2 occupancy. All the existing sprinklers are standard response. Are all the existing standard response sprinklers required to be changed to quick response sprinklers as per 8.3.3 of NFPA 13-2013?

Answer: The situation regarding the revision of an existing sprinkler system is always complicated. In general, you are allowed to maintain the sprinkler system in accordance with the rules for the edition of the standard to which it was originally designed. So, assuming that the standard response sprinklers were acceptable when the system was designed, standard response sprinklers are permitted to remain.

The fact that the occupancy classification is changing from ordinary hazard to light hazard does complicate the matter. Section 8.3.3.1(3) specifically allows standard response sprinklers to remain for additions and modifications to older light hazard systems, but since older ordinary hazard systems are not specifically mentioned in this section, it certainly makes the interpretation murky.

If you want to keep the standard response sprinklers, one option is to continue to protect the space as

ordinary hazard. There is no rule that says that office areas have to be protected as light hazard (and in fact, some insurance companies insist that they be protected at least in accordance with ordinary hazard-group 1). So, as long as you follow the rules of ordinary hazard group 1 (sprinkler spacing, density, etc.) you could continue to protect the space with standard response sprinklers.

There are a number of factors that would mandate the use of quick response sprinklers:

1. If you decide to use the rules for light hazard and the local building code determined that the renovation was so extensive that the entire system needed to be updated to the most recently adopted version of NFPA 13.
2. If you decide to use the rules for light hazard and the client or the engineer writing the contract for your work insisted that the renovated work meet the current code, not the code for when the system was first designed.
3. If you decide it would be advantageous to take advantage of the decrease in design area allowed for quick response sprinklers. This could result in a tremendous cost savings in pipe size and water supply.

You'll have to juggle all of these factors and decide which way you want to go with the system modifications.

Did You Know??

The NFSA assigns a member of the Engineering Department staff every business day to answer your technical questions. We call this the Expert of the Day (EOD) program and it is available to our members by phone, or e-mail. Call us at (845) 878-4200 and press 2, or you can e-mail us at eod@nfsa.org. Last year we answered more than 1400 requests for assistance.

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