

## TechNotes Issue # 421 June 11, 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 May 2019. This information is being brought forward as the "Best of May 2019." If you have a question for the NFSA EOD (and you are an NFSA member), send your question to [eod@nfsa.org](mailto: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 - Interstitial Sprinklers](#)
- [Question #2 - NFPA 25 Sprinkler Testing](#)
- [Question #3 - Preaction Valves in Stairwells](#)
- [Question #4 - Hose Connections at Horizontal Exits](#)
- [Question #5 - Fire Pump Test Header](#)
- [Question #6 - Hydrants and Calculations](#)
- [Question #7 - Sprinklers in Non-required Concealed Spaces](#)
- [Question #8 - Obstructed vs. Unobstructed Construction](#)
- [Question #9 - Car Stacking](#)
- [Question #10 - NFPA 13R FDC](#)
- [Question #11 - Maximum Protection Area of Residential Sprinklers](#)
- [Question #12 - Freestanding FDC](#)

### Question #1 - Interstitial Sprinklers

A residential apartment building is protected with an automatic sprinkler system and the building construction includes combustibile interstitial spaces which will require protection. The sprinklers in the interstitial space are fed from the same branch lines as

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Presented by Kevin Hall, P.E.,  
Manager of Engineering  
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the sprinklers covering the floor below. Using the area/density method, do the interstitial sprinklers need to be included in the remote area calculation for the floor below?

**Answer:** No, the sprinklers in the concealed space would be considered a separate level of protection and would not be required to be calculated with the room below. It must be noted that if the sprinklers in the concealed space are listed combustible concealed space sprinklers, they are considered "special sprinklers" and they would need to be calculated per the manufacturer's instructions; however, if the sprinklers are standard spray sprinklers, then the calculation method and hydraulically most demanding area would be per NFPA 13.

### **Question #2 - NFPA 25 Sprinkler Testing**

Where a facility has a system which uses sprinklers with varying temperature ratings installed, do representative samples for all of the different temperature rated sprinklers have to be taken for laboratory testing?

**Answer:** No, NFPA 25 does not require the minimum sample to include sprinklers having each temperature rating to be sent for testing. Per NFPA 25-2014:

*5.3.1.2\* A representative sample of sprinklers for testing per 5.3.1.1 shall consist of a minimum of not less than four sprinklers or 1 percent of the number of sprinklers per individual sprinkler sample, whichever is greater.*

*A.5.3.1.2 Within an environment, similar sidewall, upright, and pendent sprinklers produced by the same manufacturer could be considered part of the same sample, but additional sprinklers would be included within the sample if produced by a different manufacturer.*

It should be noted that it is good practice to submit sprinklers having varying temperature ratings for samples, but it is not required. Sample selection should be discussed between the owner and service provider to determine where to gather the samples. These samples should be chosen based on the varying conditions in the facility and not solely on ease of access.

### **Question #3 - Preaction Valves in Stairwells**

Is it acceptable to put the control equipment and riser for a preaction sprinkler system protecting a hospital in the stairwell?

**Answer:** Yes. While the model building and fire codes



don't prohibit the equipment itself, IBC section 1023.5 prohibits any penetrations of the stairwell for building equipment. The theory is that if the stairwell wall can't be penetrated, the equipment is not allowed to be installed. However, this section in the IBC/IFC contains a specific exception for fire sprinkler and standpipe equipment. Since fire sprinkler equipment is specifically permitted to penetrate the stairwell wall, the equipment is allowed to be installed in the stairwell and penetrate the wall to protect the rest of the building as long as the sprinkler control equipment is clear of any portion of the stairwell necessary for egress.

#### Question #4 - Hose Connections at Horizontal Exits

According to NFPA 14-2019, how close must the required hose valve be to a horizontal exit?

**Answer:** Although NFPA 14-2019 section 7.3.1.1 specifies that the height of the hose connection above the floor must be between 3 ft and 5 ft, it is not so specific in the plan view, merely requiring in section 7.3.2.2 that hose connections be located on each side of the wall "adjacent to the exit openings of horizontal exits". The subsection that follows allows a single hose connection if a single connection can be used to cover all floor areas. Figure A.7.3.2.2.1 illustrates the intent of the subsection. Although the hose connection in the figure appears to be located immediately adjacent to the door, the standard has no set requirement. It is no doubt assumed that the placement of such connection will be reasonable for its intended purpose, and subject to the approval of the AHJ. Just as the AHJ has authority over tolerances in NFPA codes and standards, the AHJ would be in a position to decide if in fact the location was reasonably "adjacent". In addition, all areas must be within the spacing requirements for hose connections.

#### Question #5 - Fire Pump Test Header

A fire pump is being installed with a flow meter and a test header. If there is a means to provide the required flow for fire pump testing through another outlet such as a roof manifold, can the test header be omitted?

**Answer:** No. NFPA 20-2019 section 4.22.2.10 requires a test header downstream and in line with the flow meter so that the flow meter can be calibrated in place. This requirement was new to the 2013 edition (see NFPA 20-2013 section 4.20.2.10.1) and it has been continued in the 2016 and 2019 edition.

Even if the test header was omitted, it would not really save the building owner in the long run. Testing from a roof of a high-rise building can be a challenge. Roof drains need to be upsized to handle the extra flow and

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communication with the pump room would be difficult.

## Question #6 - Hydrants and Calculations

If wall hydrants are being added to a warehouse for plastic storage should the hydrants be included into the hydraulic calculations for the system demand?

**Answer:** Yes, but NFPA 13 does not have any specific requirements for the use of wall hydrants. Per NFPA 13-2016:

**23.4.6 Hose Allowance.** *Water allowance for outside hose shall be added to the sprinkler and inside hose requirement at the connection to the city water main or a yard hydrant, whichever is closer to the system.*

A wall hydrant would be most similar to a yard hydrant. As such, the outside hose stream should be added at this connection if it is the closest connection to the system and intended to be used by the fire department in the event of a fire. This flow should be considered and calculated though the sprinkler system (whichever route it may take) back to the effective point of the known water source.

## Question #7 - Sprinklers in Non-required Concealed Spaces

A sprinkler system was installed with sprinklers in a concealed space above a ceiling to provide localized protection of what was supposed to be an exposed, combustible wooden beam in an otherwise limited-combustible space that would allow omission of sprinklers per NFPA 13-2016 section 8.15.1.2.1. During construction, the contractor decided to cover the wood beam with gypsum board so that there is no longer any exposed combustible construction in the concealed space. Can the sprinklers remain in the concealed space or are they required to be removed?

**Answer:** The sprinklers do not need to be removed. There is nothing wrong with leaving sprinklers in this concealed space. Even though NFPA 13-2016 does not require sprinklers in the concealed space, it does not prohibit them either. NFPA 13 provides the minimum requirements for design. There is nothing in the standard that should prohibit additional sprinkler protection.

### 1.1\* Scope.

**1.1.1** *This standard shall provide the minimum requirements for the design and installation of automatic fire sprinkler systems and exposure protection sprinkler systems covered within this*

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## Question #8 - Obstructed vs. Unobstructed Construction

The following construction scenario applies to three separate questions that are answered below as questions 8a, 8b, and 8c:

Beam/Girder ceiling construction with large 25 in. deep beams (approx. 10'-4 x 30'-0 = 309 sq. ft.), and with two shorter 16 in. deep beams inside that create roughly 10'-0 x 10'-0 bays.

### Question #8a -

If a ceiling has beam and girder ceiling construction that has bays less than 300 sq. ft, can it be considered Panel construction, and can the beam distance described in section A.3.7.1(1) apply?

**Answer:** Yes, each panel is less than 300 sq. ft so this would be considered panel construction and meet the definition for obstructed construction. Panels areas are determined by the spacing of the smaller members and not the bays as long as there are no unfilled penetrations (See answer to Question #2 below). Obstructed construction is defined in NFPA 13-2016 section 3.7.1:

**3.7.1\* Obstructed Construction.** *Panel construction and other construction where beams, trusses, or other members impede heat flow or water distribution in a manner that materially affects the ability of sprinklers to control or suppress a fire.*

The text included in the annex is advisory in nature and not intended to apply to every specific scenario. The solid 25 in. and 16 in. beams would material effect the heat flow of a fire and make the construction obstructed as well as meet the explanation of panel construction.

### Question #8b -

To consider that ceiling "Panel" construction, can the area be measured between the smaller bays created by the 16" deep beams (100 sq. ft bays) or the 25" deep beams (309 sq. ft bays)?

**Answer:** Since the panels created by the 16" beams are capable of trapping heat and there are no unfilled penetrations, this arrangement would be considered panel construction.

### Question #8c -



The advertisement features a vertical banner with a dark background at the top showing a close-up of a Victaulic pipe fitting. Below this, the text "SPECIAL HAZARDS REQUIRE A SPECIAL SYSTEM" is displayed in large, bold, orange and black letters. At the bottom, the Victaulic logo is shown, consisting of a checkmark symbol and the word "Victaulic" in a bold, sans-serif font. Below the logo is an orange button with the text "Learn More" in white.

The building in question has many walls that go to the ceiling and create smaller bays or panels creating mixed covered areas. If the full height walls create pockets where the beams are not present, can the obstructed construction positioning rules still be followed?

**Answer:** The structure remains unchanged with additional walls. The structure is still considered obstructed construction. The sprinklers are still permitted to be positioned per obstructed construction and spaced a sufficient distance away from the solid structural members to satisfy the obstruction rules.

### **Question #9 - Car Stacking**

In a project with car stackers where the applicable standard is the 2013 edition of NFPA 13, should the occupancy be considered an ordinary hazard group 1 or should the density and design approach be increased?

**Answer:** Questions regarding hazard or commodity classification are difficult except in those circumstances where some NFPA occupancy committee has specifically addressed the issue. This is especially true because hazard classification is considered in many states and jurisdictions to be the most important aspect of fire protection system design, and an obligation of the responsible design professional. One reason many states require involvement of a responsible design professional is to ensure that the site-specific attributes of the project are recognized and properly addressed, which cannot be accomplished in a generic manner.

In this case, the responsible design professional should review the annex suggestion of NFPA 13, 2016 edition in regard to protecting car stackers as an extra hazard group 2 occupancy. Although this language was not in the 2013 edition, the committee did address this issue in the 2016 edition. Although car parking is suggested to be an ordinary group 1 occupancy, the addition of car stackers introduce a significant obstruction to the ceiling sprinkler system. As extra hazard group 2 densities are appropriate for occupancies where "shielding of combustibles is extensive" (see section 5.4.2) and should be sufficient in preventing the fire from spreading to adjacent cars in the parking garage. To further explain the committees reasoning in making this change to the 2016 edition, I am including the committee statement for this revision. The committee statement for Second Revision No. 127 is as follows:

*The parking garage can be reasonably protected with sprinklers only at the ceiling if the hazard*

classification is increased to Extra Hazard Group 2. The definition of Extra Hazard Group 2 includes, "occupancies where shielding of combustibles is extensive" (Section 5.4.2 of the 2013 edition of NFPA 13). The basic concept in this section is that hazards that would normally be classified as Ordinary Hazard can be protected with sprinklers only at the ceiling by increasing the density and area of coverage, and by decreasing the sprinkler spacing, in accordance with the Extra Hazard rules. Examples of such situations include factories where manufactured homes are built. During the process of building a manufactured home, sprinkler protection is not extended down inside the manufactured home, but sprinklers at the roof of the factory are expected to control any fire, including one starting inside a home being manufactured. By upgrading the design basis of the sprinkler system to Extra Hazard Group 2 (increasing the density by 167% and increasing the area of operation by 67%) the sprinkler system is expected to handle the additional challenge of a shielded fire (see A.5.4.2 of the 2013 edition), and should be sufficient to handle the fuel load of two cars (one above another), preventing the fire from spreading to the adjacent cars while maintaining acceptable conditions for the structural members within the structure.

Another design approach that the design professional may consider is to design the ceiling sprinkler system as an ordinary hazard occupancy and install additional sprinklers under the cars in the car stacker in accordance with the wide obstruction rule (NFPA 13-2013 section 8.5.5.3.1). This is an evolving subject which requires additional research to provide requirements for the ever-increasing list of scenarios involving car stacking equipment.

#### **Question #10 - NFPA 13R FDC**

In accordance with NFPA 13R-2013, can a single fire department connection serve two buildings that is supplied by the same main?

**Answer:** Yes, as long as the AHJ approves this arrangement. NFPA 13R-2013 states:

**6.11.1** *At least one fire department connection shall be provided for buildings, accessible by a fire department, that exceed 2000 ft<sup>2</sup> (186 m<sup>2</sup>) or are more than a single story.*

NFPA 13R does not have a lot of information pertaining to FDCs but if the AHJ is convinced that the arrangement that you have proposed is meets the requirements of NFPA 13R, and the FDC is arranged

to feed both the building it may be acceptable. As the FDC is to be used by the Fire Department, their buy-in should be obtained as well.

If the FDC is to be connected to the underground private fire main, NFPA 24-2016 does provide some guidance. Section 5.9 of NFPA 24 is titled "Remote Fire Department Connections". This section states that control valves shall not be installed in the piping from the FDC to the fire service main (Section 5.9.3.2) but does permit control valves in the piping downstream of the fire department connection (Section 5.9.3.2.1). Additionally, section 5.9.5.7 states:

*5.9.5.7 Where a remote fire department connection services multiple buildings, structures, or locations, a sign shall be provided indicating the buildings, structures, or locations served.*

Based upon the wording of NFPA 24 (which is suggested by NFPA 13R to be used if the main is 4 inches or greater) a remote FDC connected to the underground and serving two buildings may be acceptable. As this concept is not specifically addressed in NFPA 13R, the AHJ (including the Fire Department) should be consulted.

### **Question #11 - Maximum Protection Area of Residential Sprinklers**

NFPA 13-2010 states:

*8.10.3.4 Residential sidewall sprinklers shall be permitted to be installed on opposing or adjacent walls, provided no sprinkler is located within the maximum protection area of another sprinkler.*

Does maximum protection area apply to the maximum area the sprinkler is calculated to, or to the maximum area that the sprinkler is listed to protect?

**Answer:** The language of section 10.3.4 is not clear. This issue was recently brought up at the NFSA Engineering and Standards (E&S) Committee meeting. It was the opinion of this committee that the intent of "maximum protection area" in this section referred to the calculated area (16 ft in the above example) and not the maximum area that the sprinkler is capable of protecting. It must be noted that this was the opinion of the E&S Committee and cannot be interpreted as a formal NFPA interpretation of this section.

NFSA is planning on submitting a public input to the next edition of NFPA 13 to clarify this issue.

### **Question #12 - Freestanding FDC**



A freestanding FDC is installed on a project and during the acceptance testing for the system the 200-psi hydrostatic test was unable to maintain pressure due to loss out of a ball drip and the hydrostatic test failed. If the freestanding FDC piping includes an automatic ball drip, how is the hydrostatic test performed?

**Answer:** The remote fire department connection must pass a 2-hour hydrostatic test as required by NFPA 13-2016 section 25.1.7. For buried pipe, the proper procedures would be found in NFPA 13-2016 section 10.10.2. If the automatic ball drip is preventing this portion of piping from maintaining pressure, it is not uncommon to plug the ball drip for testing. This would isolate the ball drip and maintaining the pressure. Additionally, the acceptance testing protocols for underground piping recommend that the test be done with the fittings exposed so that leakages are apparent visually, and the appurtenances are accessible to plug if necessary.

### ***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](mailto:eod@nfsa.org). Last year we answered more than 1400 requests for assistance.

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