NFSA NATIONAL FIRE SPRINKLER ASSOCIATION
The Voice of the Fire Sprinkler Industry

TechNotes

Editor - Roland Asp, CET | #451 | 11/10/2020

Best of October 2020

The following are a dozen questions answered by the NFSA's Codes, Standards, and Public Fire Protection staff as part of the Expert of the Day (EOD) member assistance program during the month of October 2020. This information is being brought forward as the "Best of October 2020." If you have a question for the NFSA EOD submit your question online through the "My EOD" portal.

It should be noted that the following are the opinions of the NFSA Engineering, Codes, and Standards staff, generated as members of the relevant NFPA and ICC 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 or ICC Council Policy #11 and should therefore not be considered, nor relied upon, as the official positions of the NFSA, NFPA, ICC, or its Committees. Unless otherwise noted the most recent published edition of the standard referenced was used.

Question #1 – Ceiling Pocket or Change in Ceiling Elevation

When a ceiling elevation changes on one side of a room only, like shown on the attached sketch, is it considered a ceiling pocket or is it a change in ceiling elevation? How big would the higher ceiling need to be before it is considered a change in ceiling elevation vs a ceiling pocket?

This ceiling configuration could be considered either a ceiling pocket or a change of elevation and either the rules of NFPA 13 (2016) Section 8.6.4.1.1.3 (for vertical change of ceiling elevation) or Section 8.6.7 (for ceiling pockets) may be applied.

These two sections are concerned with different concepts as described below:

Section 8.6.4.1.1.3 is more concerned with deflector distance and spacing requirements when there is a change in ceiling elevation and these sections require a sprinkler in the upper ceiling area.

Section 8.6.7 is an allowance to omit sprinklers in the upper ceiling of a ceiling pocket as long as the 6 conditions of 8.6.7.2 are met. The ceiling configuration described could be considered a ceiling pocket.

Ceiling pockets are defined in Section 3.3.4 as:

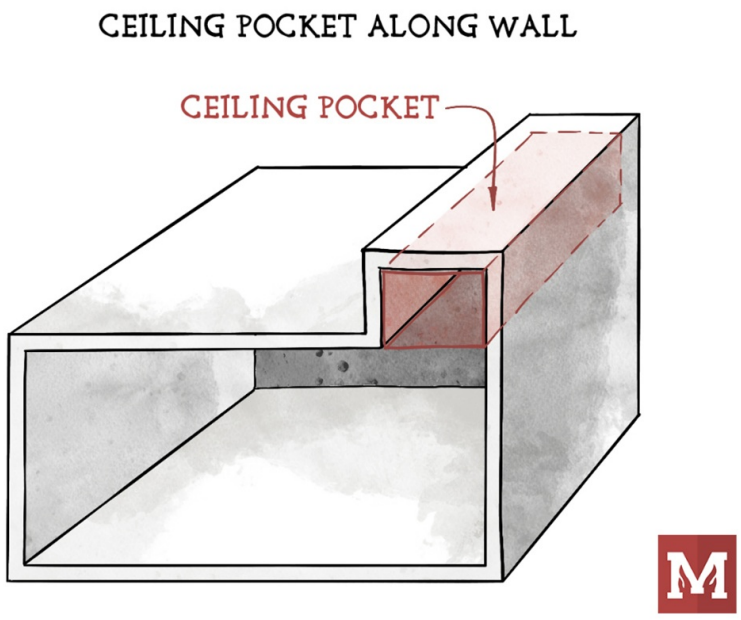
"An architectural ceiling feature that consists of a bounded area of ceiling located at a higher elevation than the attached lower ceiling."

The ceiling configuration that you have described meets this definition. There is a higher ceiling bounded by a lower ceiling on one side. As long as the conditions of 8.6.7.2 are met, sprinklers may be omitted from the upper ceiling.

The second question is: How big would the higher ceiling need to be before it is considered a change in ceiling elevation vs a ceiling pocket?

The answer is: There is no exact size that differentiates a change in ceiling elevation and a ceiling pocket however the conditions of 8.6.7.2 (ceiling Pockets) does provide size limitations (depth and volume) that would allow sprinklers to be omitted from the upper ceiling.

The ceiling pocket section (8.6.7.2) limits its application to ceiling pockets of no more than 1000 cubic feet total (See subsection (1) and (4) and limits the total depth of the pocket to 36 inches (See subsection (2)).



Question #2 – Standpipe Flow Requirements for Sprinklered/Non-Sprinklered Buildings

For Class 1 standpipes, NFPA 14 (2016) states that the maximum required flow for a fully sprinklered building is 1,000 gpm and is 1,250 gpm for a non-sprinklered building. Additionally, Section 4.1 of NFPA 13R (2016) indicates that a NFPA 13R sprinkler system is considered "sprinklered throughout". Is the maximum standpipe flow for a building protected with a sprinkler system installed in accordance with NFPA 13R 1,000 gpm as it is fully sprinklered in accordance with NFPA 13R?

No, the fully sprinklered maximum required flow of 1,000 gpm found in the standard does not apply to building protected by a NFPA 13R sprinkler system. Section 7.10.1.1.5 of NFPA 14 requires buildings not sprinklered throughout, in accordance with NFPA 13 to have a maximum flow rate of 1250 gpm. While buildings protected with 13R systems are, by definition, considered fully sprinklered throughout, they are not designed in accordance with NFPA 13. The thought process is that NFPA 13R is primarily concerned with the life safety of building occupants and does not provide the same level of protection as NFPA 13 which is needed for fire fighter safety.

Question #3 – ESFR Sprinkler Under Open Grating

A facility is protected with a ceiling level sprinkler system with ESFR sprinklers. There is a mezzanine that consists of open grating and it is proposed that under the open grating, K-8 intermediate rack sprinklers be installed. In an ESFR protected space, do the intermediate level/rack sprinklers under grated mezzanines need to be ESFR sprinklers and equivalent to those as the ceiling level?

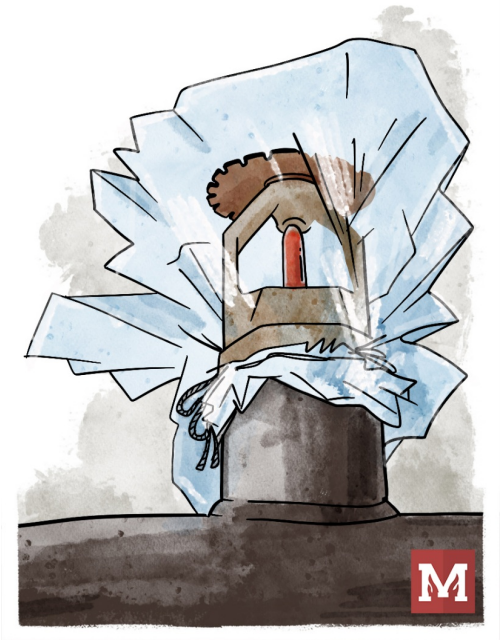
Yes, the standard requires sprinklers under open grating to be the same style as the sprinklers installed at the ceiling. The 2016 edition of NFPA 13 contains no specific direction on this issue in Section 8.12 for ESFR sprinklers. Therefore, we default back to Section 8.5 for the position, location, spacing and use of sprinklers which is applicable to all sprinkler types.

NFPA 13, 2016 edition, Section 8.5.5.3.3 requires sprinklers under obstructions that prevent sprinkler discharge from reaching the hazard to be the same type as installed at the ceiling, except as permitted by Section 8.5.5.3.3.1 for overhead doors. The type would include ESFR. Section 8.5.5.3.4 requires the sprinkler located under open grating to also be equipped with a water shield.

We have seen many ESFR projects for places like FedEx, UPS, and Amazon with open graded mezzanines located less than 12 ft above the finished floor that use sprinklers other than ESFR sprinklers under the mezzanine. It is our understanding that these projects are done as an equivalency or compliance alternative coming from the design professional and do not follow the prescriptive requirements of NFPA 13.

Question #4 – Sprinklers Covered with Plastic Bags

Is it acceptable to cover sprinklers with plastics bags (in accordance with NFPA 13, 2013 edition 6.2.6.4) in areas other than paint spray areas, such as areas in which sprinklers are subject to frequent loading from oily residue (or other residue or particles) in production area environments?



No. NFPA 13 permits cellophane or paper bags over sprinklers in spray areas because they load so quickly from the overspray. The bag protects the heat element and operating function of the sprinkler, but without frequent bag changeouts, the bag could be technically considered loading also.

The International Fire Code (IFC) has similar requirements in Chapter 24, Section 2404.5 for spray booths, spray rooms, and spaces that may loosen a bit from NFPA 13, however, the code official or AHJ should be consulted if this route is taken. It is important to note, that NFPA 25, Section 5.4.1.9.3 only requires these bags to "…replaced periodically…"so, perhaps where a defined and more aggressive frequency is proposed (and adhered to by the owner), the AHJ may consider allowing this.

Question #5 - Purpose of Grouting Fire Pumps

What is the purpose of the grouting requirement in NFPA 20, 2013 edition, Section 6.4.1?

The purpose of grouting the base plate is to help absorb pump vibrations, compensate for uneven foundations, distribute the unit's weight, and help prevent shifting. This is all in an attempt to maintain proper pump and motor/engine alignment at the shaft coupling. Flexible couplings alone are not sufficient to maintain proper alignment. The manufacturer's foundation and setting instructions should be followed as well.

Question #6 Firefighter Living Quarters

The living quarters contains bedrooms, kitchen, living room, dining area, bathrooms, laundry rooms, firefighter office, etc. Recognizing that residential sprinklers are specifically designed to maintain tenability, and firefighters work 48 hours shifts, would their use provide a higher level of safety to the occupants living in this area?

Firefighter living quarters is considered a residential occupancy per the building code. This means, per International Building Code (IBC) for new buildings, Section 903.2.8 requires buildings with a residential occupancy to be sprinklered throughout. Fire stations that have residential areas are sprinklered throughout, including administration and apparatus bays, using NFPA 13. NFPA 13 considers residential occupancies as a light hazard classification and would allow either a quick response or residential sprinkler per the 2016 edition of NFPA 13, Section 8.3.3.1 (1) or (2).

Question #7 - Fire Department Connection and Gridded Systems

A facility is protected with a gridded system as follows: It is a single 2 1/2 in. connection fed with 2 in. pipe from the secondary 2 in. main. To be clear - all mains, wet riser, and FDC feed piping are 2" Sch. 40. All gridded branch lines are 1 1/4 in. Sch. 40. The fire department connection is to be tied into the system at the 2-inch secondary main.

NFPA 13 (2019) 16.12.5.1 state that a single wet system can have the FDC attached to any point of a feed main or cross main in the system provided you use the required pipe sizes. It also states the FDC connection is not attached to branch lines. It does not call out any exceptions for a grid system.

We are being told that we cannot tie the FDC into the secondary main unless we tie the primary & secondary mains together with 2 in. pipe because the 1 1/4 in. branch lines are not big enough to get water to the primary main from the FDC. We are being told that NFPA 13 does not allow a remote FDC be attached to a secondary main off of a grid system. Is this true?

No. The FDC is permitted to be connected to the system as described.
It is important to first understand the intent of the fire department connection requirements of the standard.

NFPA 13, 2019 edition, Sections 16.12.3.1 and A.16.12.3.1 indicate the intent of the fire department connection is to supplement the water supply and not to provide the entire system demand or a specific volume of water. Sections 16.12.4 and A.16.12.4 again indicate the intent of the fire department connection is to supplement the pressure and does not require them to be sized based on system demand.

Secondly, we have to review the acceptable fire department connection arrangements in the standard for a single wet pipe system.
Section 16.12.5.1 requires the fire department connection to be connected on the system side of the water supply check valve.

Section A.16.12.5.1 further indicates that for single systems, the fire department connection can be connected to any point in the system provided the pipe size meets the requirements of Section 16.12.4.
Section 16.12.4 (3) indicates that for a hydraulically calculated system, the fire department pipe size shall be not less than the largest riser size being served.

Section 16.12.5.1.1 indicates the fire department connection shall not be attached to branch line piping.

Branch lines are defined by Section 3.3.19 as the pipe supplying sprinklers either directly or by sprigs or drops return bends or arm-overs. Cross mains are defined by Section 3.3.53 as the pipes supplying branch lines.

The fire department connection as described is not connected to a branch line, it is connected to a cross main, is connected to a point on the single system past the water supply check valve, is properly sized to be equal to or greater than the riser size, and meets the intent of the standard to allow the fire department to adequately supplement the system flow and pressure.

In this case using a simple rectangular grid, hydraulically it would not matter if the fire department connection were connected to the riser side “live” cross main or the opposite side “floating” cross main. Both locations would function hydraulically the same when the fire department supplies the connection.

Question #8 – Corroded Sprinkler

We have a client that has some "corroded" dry sprinklers in an under-building parking area. NFPA 25 says "corroded" sprinklers shall be replaced, however we are not sure who or how to determine what corrosion means or if there are levels of corrosion. The client requested sample testing and we sent some to UL for testing and they came back noted as corroded but all operated "normal". Is that sufficient or do they need to all be replaced because they are "corroded" even though they operated normally.

The sprinklers only have to be replaced if they have failed the testing or if the corrosion is detrimental to sprinkler performance. Section 5.2.1.1.1 states that corroded sprinklers must be replace when there is “Corrosion detrimental to sprinkler performance”.
The annex to this section does include advice on determining when corrosion is deemed detrimental to sprinkler performance. The annex states that severely corroded sprinkler should be replaced and also states that

these sprinklers:

"…could be affected in their distribution or other performance characteristics not addressed by routine sample testing."

The annex goes on to state:

"Corrosion found on the seat, or built up on the deflector that could affect the spray pattern, or a buildup on the operating elements that could affect the operation can have a detrimental effect on the performance of the sprinkler"

This annex also states that sprinklers with limited corrosion:

"…does not impact the water distribution characteristics can continue to be used if the samples are selected for testing in accordance with 5.3.1 based on worst-case conditions and if the samples successfully pass the tests. Surface discoloration that does not impact the performance of the sprinkler should not warrant replacement or testing."

As this is annex language and is not legally enforceable and given the importance of the issue, great care should be taken in making the determination as to whether the corrosion noted is detrimental to sprinkler operation.

Question #9 – 3,000 sq ft Design Area to Omit Sprinklers in Attic

There is a building with a combustible attic to be equipped with a NFPA 13 sprinkler systems. The owner request is to omit a dry system for the attic. Can we use NFPA 13 (2016) NFPA 13 11.2.3.1.4 (3) and calculate 3,000 SQ FT below the ceiling only and omit the sprinklers in the attic?

The adjacent design area increase of 3,000 sq. ft. can be used, however, the area without sprinklers has to be specifically allowed by the standard. Increasing the adjacent design area does not exempt a space from sprinklers.

Sections 8.15.1.2 and 8.15.6 (special situations) allows sprinklers to be omitted. Section 11.2.3.1.4 (3) (water demand) applies an increased area of operation to the areas adjacent to the spaces where sprinklers are omitted. If an area is exempt from sprinklers, the fire load (or chance of) increases, so, an additional demand (in terms of 3,000 sq ft) is put on the system surrounding the exempt area. Some of the exempted areas in 8.15.1.2 and 8.15.6 are also exempt from the 3,000 sq ft area increase, meaning, no increase of 3,000 sq ft to the adjacent area is required.

The sprinkler system in the attic is required and is only exempted from sprinklers if the space meets 8.15.1.2. For example, if the attic is constructed entirely of fire-retardant treated wood, or is filled entirely of non-combustible insulation, etc. it can omit sprinklers. These two examples are also not required to have the adjacent areas increased to 3,000 sq. ft. (see

11.2.3.1.4 (4) (c) and (f)). These spaces do not support combustion or provide significant material to burn uncontrolled, so, they are not expected to burden an adjacent area to the point of overtaxing the system.

To conclude, the exempt area first has to be permitted and an entire attic is not allowed to be exempt from sprinklers unless some special construction provisions are made. Increasing the design area may or may not be required, however, nothing in the standard allows an increased design area to exempt a space from sprinklers.

Question #10 – Trash Chutes in an Unsprinklered Building

There is a non-sprinklered parking garage that is open on three sides. It has a five- story apartment complex attached on the one side. Inside the garage area there is an elevator lobby (no sprinklers) and a trash chute next to it. Do sprinklers need to be provided in the trash chute if it is located inside a non-sprinklered building?

Yes, The International Building Code (IBC) (2018) Section 713.13 governs the construction of waste and linen chutes and incinerator rooms. It states that these chutes are to comply with NFPA 82 and the rest of this section. Section 713.13.6 says a sprinkler system is required to be installed in accordance with Section 903.2.11.2. Section 903.2.11.2 states that a sprinkler system is required to be installed at the top of rubbish and linen chutes and in the terminal rooms. There are additional requirements for sprinkler locations within the chute.

Finally, in Section 6.2.6.1.1 of NFPA 82 (2019) states that gravity chutes are required to be protected. There are some exceptions for masonry waste chutes and lined metal waste chutes.

Question #11 – Mixed Use System Size

In a project with concrete tee construction, sprinkler piping will penetrate the stems of the concrete tee construction. This job is required to have seismic protection. The owners do not want to provide a hole large enough for proper clearance per NFPA 13 (2016) Section 9.3.4. and we cannot put flex couplings on each side of the beam. Can Section 9.3.4.13 be used to omit the clearance requirement and what does "laterally supported by the side edges of holes" mean?

Yes, Section 9.3.4.13 can be applied to omit the clearance required by Section 9.3.4. Section 9.3.4.13 is stating that the required clearance of

Section 9.3.4 is not required when the pipe penetrates a structural member (such as concrete tee) through holes that are just big enough for the pipe to fit through. This is why this section state “tight fit”. The wording "laterally supported by the side edges of the holes” simply means that the pipe will not move laterally (side to side) differently than the structure. With the pipe being tight in the hole penetrating the structural member, the pipe will not impact the structural member due to seismic movement and no damage is likely.

In this case, the clearance is not required because in a seismic event the sprinkler pipe is expected to move with the structure.

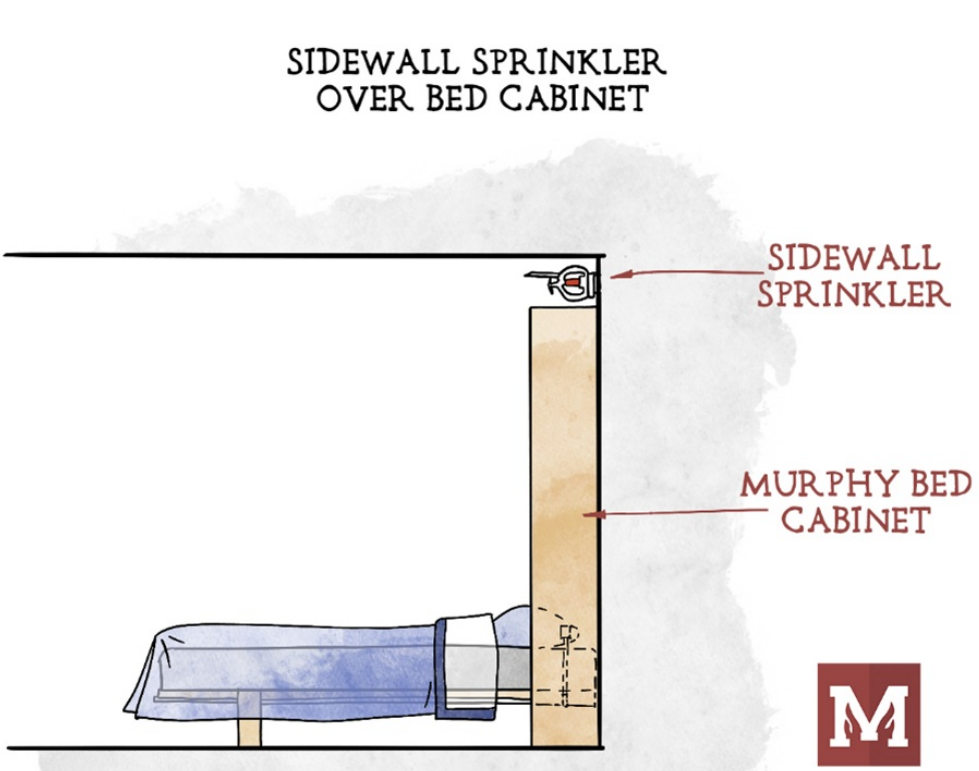
Question #12 – Murphy Bed Cabinet and Obstructions to Sidewall Sprinklers

There is a quick response sidewall sprinkler located approximately 4-inches above a Murphy bed cabinet (see diagram) in a residential occupancy. Would the Murphy bed and its cabinet be considered obstructions to the sidewall sprinklers in accordance with the 2013 edition of NFPA 13?

Yes, the Murphy bed would be considered an obstruction to sprinkler discharge as it will be within 18 in. vertically from the sprinkler’s deflector. As the sprinkler is a standard spray quick response sprinkler in a light hazard occupancy, the vertical obstruction to sprinkler discharge rules in NFPA 13, 2013 edition, Section 8.7.5.2.2 would be applicable.

8.7.5.2.2 Suspended or Floor-Mounted Vertical Obstructions. *The distance from sprinklers to privacy curtains, free-standing partitions, room dividers, and similar obstructions in light hazard occupancies shall be in accordance with Table 8.7.5.2.2 and Figure 8.7.5.2.2.*

With the sidewall sprinkler located 4 in. above the obstruction (B Dimension), the obstruction could only be a maximum of 9 in. in front of the sprinkler (A Dimension) as shown in figure 8.7.5.2.2.



Join the NFSA Team

We are searching for a Fire Protection Engineer to join Team NFSA!

Fire Protection Engineer

This position supports the mission by providing technical services including representation on committees, research of sprinkler system performance, preparing written reports and developing and teaching seminars. Please view the entire position description and apply here: **Fire Protection Engineer Position**

Manager of Training and Education

This positions supports the mission by providing direction for the development and delivery of all Association education and training programs. These programs should be available for a broad delivery system of on-line and in-classroom training. This position must provide a high level of coordination between multiple departments of the processes for the development and delivery of technical seminars within the subject expertise of NFSA. Please view the entire position description and apply

here: **Manager of Training and Education**.

New EOD Process

Starting on July 15, 2020, the NFSA has a new EOD process where members can submit questions, track the progress, and view their EOD cases. The step by step process is detailed in **TechNotes #442**.

National Fire Sprinkler Association
514 Progress Dr, Ste A,
Linthicum Heights, MD 21090
1-800-683-NFSA (6372)

Contact Us