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

TechNotes

Editor - Roland Asp, CET #525 12/12/2023

Best of November 2023

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 November 2023. This information is being brought forward as the "Best of November 2023." 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 recently published edition of the standard referenced was used.

Question #1 – Sprinklers Required Above an Almost Full Height AHU Unit

There is a large and tall air handling unit (AHU) unit that sits with its top 4 inches down from the I-beam. The I-beams are 16 inches deep. There is not a way to install fire sprinkler piping in this area unless somebody literally crawls in that 20-inch gap between the I-beams.

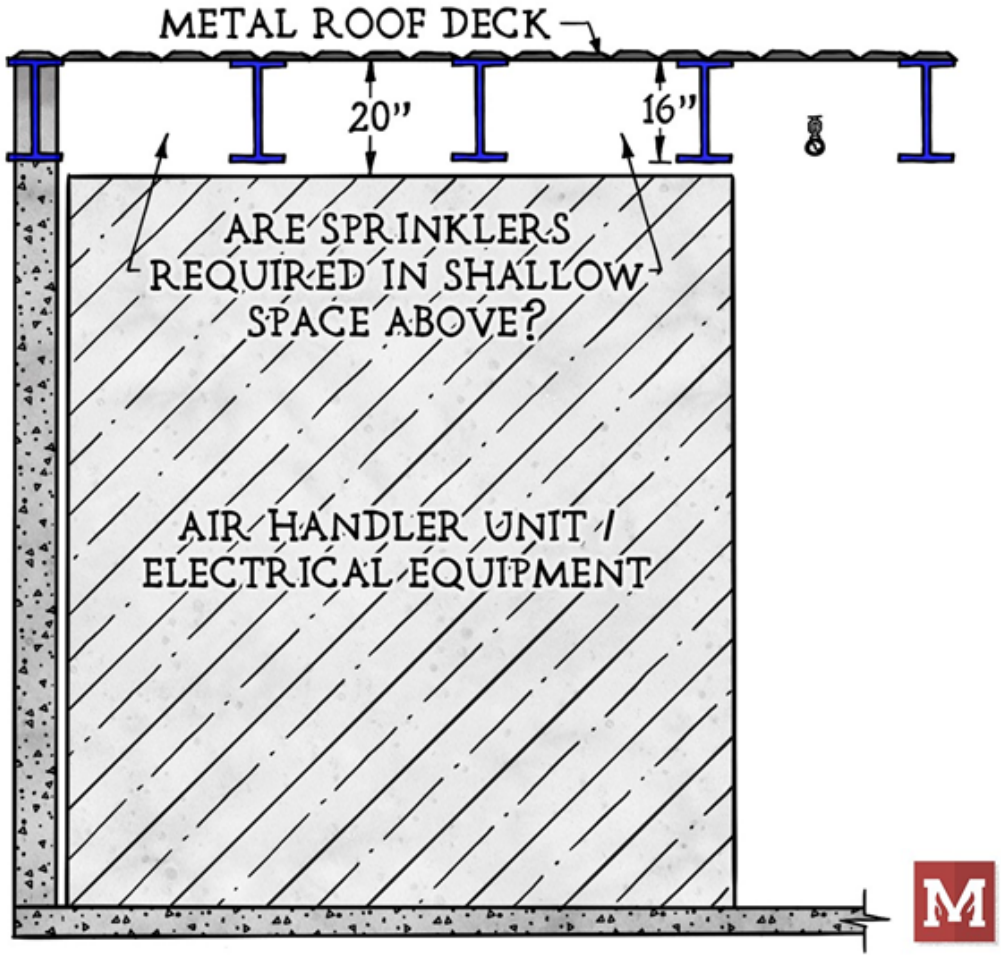
Can fire sprinklers be omitted above the AHU unit?

The purpose of NFPA 13 is spelled out in Section 1.2.1 which states: "The purpose of this standard shall be to provide a reasonable degree of protection for life and property from fire through standardization of design, installation, and testing requirements for sprinkler systems, including private fire service mains, based on sound engineering principles, test data, and field experience." The phrase "to provide a reasonable degree of protection" should be emphasized here. NFPA 13 cannot contemplate protection for all possible building arrangements and component installations.

Most of the model building and fire codes have language dealing with practical difficulties; here is what the International Fire Code says on this topic: "104.8 Modifications. Where there are practical difficulties involved in carrying out the provisions of this code, the fire code official shall have the authority to grant modifications for individual cases, provided that the fire code official shall first find that special individual reason makes the strict letter of this code impractical and the modification is in compliance with the intent and purpose of this code and that such modification does not lessen health, life and fire safety requirements."

Installing sprinkler piping above the AHU in question appears to be a practical difficulty. Here are some possible options, although there certainly could be others:

1. Request an exemption from providing sprinkler protection based on reasonableness and practical difficulties using the language above. Perhaps a compelling argument is that the AHU is non-combustible and poses no discernable fuel load.
2. Request an alternate means of compliance; perhaps move the branch line beyond the perimeter of the AHU and provide sidewall or extended coverage sprinklers to spray into the area.
3. Enclose the area above the AHU with non-combustible construction (such as gypsum or metal) to create a non-combustible concealed space where sprinklers are not required per NFPA 13 (2022 edition) – Section 9.2.1.2.



Question #2 – Floor Drains for Pump Rooms

A new fire pump is being installed for a system upgrade in an existing riser/pump room. The existing riser room does not have a floor drain.

Are there other approved methods where the casing relief and the pump packing can be discharged other than to a floor drain?

A floor drain is required for protection of the room, regardless of how the casing relief and pump packing are piped to drain. The casing relief and pump packing simply must be piped to drain. This could be the floor drain, but it does not have to be.

NFPA 20, 2013 edition, Section 4.12.7 for equipment protection drainage indicates floors shall be pitched for adequate drainage of escaping water away from critical equipment such as the pump, driver, controller, and so forth and the pump room or pump house shall be provided with a floor drain that will discharge to a frost-free location. This is to protect the equipment in the pump room from the buildup of water on the floor.

Section 4.11.1.4 for the circulation relief and automatic relief valve indicates provisions shall be made for discharge to a drain. It does not require this to drain to the floor drain, although this is the most common application in the field. The circulation relief valve could discharge to a drain other than the floor drain required by Section 4.12.7.

Question #3 – Hydrostatic Testing of Wet System to Avoid Freezing

A fire sprinkler system is designed as a wet sprinkler system based on normal conditions after a building is complete. However, the system may be subject to winter weather and/or rely on temporary heaters during construction phase.

Does NFPA 13 specify requirements on how to proceed with testing of wet sprinkler systems under these conditions?

Section 28.2.1.4 of the 2019 edition of NFPA 13 may be appropriate for this situation. This section allows the use of a temporary air test (as used for dry pipe and preaction systems - see section 28.2.2.1) as a substitute for a hydrostatic test in cases where cold weather does not allow testing with water. This air test is a temporary means and a standard hydrostatic test must be performed as soon as weather conditions permit.

Additionally, as the building is under construction, NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations* may provide additional guidance. This standard outlines steps for fire protection during building construction. The owner must develop a Fire Prevention Program which will address the issues in providing fire protection including sprinkler systems in buildings undergoing construction. See Section 4.2.2 of the 2022 edition of NFPA 241 for an overview of this fire prevention program.

Section 4.3.2 of this standard addresses fire sprinkler system requirements for the situation described.

Question #4 – Buried Tank and Fire Pump

Project specifications call for a buried tank feeding an aboveground fire pump. The underground pipe from the buried storage tanks rises to feed a floor level horizontal split case fire pump.

When the pump gets activated, it will suck the air inside the pipe first. Is this allowed? Secondly, when the pump sucks the water out of the tank does the tank need air ventilation so it will not collapse?

No, the fire pump is not permitted by NFPA 20, 2022 edition, to suck or draft water from a tank located below it. This is detailed in Section 4.16.3 for suction piping. Negative pressures are not permitted by the standard in the pump suction piping. A tank located below grade is typically gravity fed to the fire pump with the fire pump located below the

bottom of the tank or a vertical fire pump is provided into the tank or adjacent wet well or vault such that the pump itself is located near the bottom of the tank.

Yes, a water tank for fire protection is required to be vented. This is detailed in NFPA 22, 2023 edition, Section 4.15 for roof vents and additionally in Chapters 5-13 based on the type of tank used.

Question #5 - Low Differential Dry Pipe Valve

Section 7.2.5.4.2 of the 2016 edition of NFPA 13 states: "...for low differential dry pipe valves..." The dry valve being used on this project is a differential valve but is not called out as low differential in the manufacture cut sheets.

What classifies a valve as low differential?

Older editions of NFPA 13 (including the 2016 edition that has been referenced); it was intended to address the issue of water stacking above the valve and potentially exerting pressure due to elevation which could cause the valve not to operate. The next section of NFPA 13 (2016 edition, Section 7.2.5.4.3) offered options for addressing this concern (high water signal or automatic drain).

Manufacturers classify dry-pipe valves into two types: differential and mechanical so the word “low” is probably not in their literature (“cut-sheets”). The word “low” was removed from the phrase “low differential dry pipe valves” in the 2019 edition of NFPA 13. In addition, new definitions were added; one for “Differential Dry Pipe Valve” and one for “Mechanical Dry Pipe Valve”.

The pressure from “stacking” water is a concern in differential dry pipe valves but not in mechanical dry pipe valves. Definitions were added in the 2019 edition for these types of dry pipes valves (see Sections 3.3.206.4.1 and 3.33.206.4.2.)

Additionally, NFPA 13 (2019 edition) omitted the word “low” from the applicable section. There was no clear definition or consensus as to what constituted a “low differential dry pipe valve”. Since the stacking issue was believed to be a problem with all differential dry pipe valves, the word “low” was removed making the requirement applicable to all differential dry pipe valves.

Question #6 – HVLS Fan

A clubhouse building has an 8 foot diameter high volume low speed (HVLS) fan in a fitness room.

Do the standard spray quick response sprinklers really need to be spaced at the four corners around the fan even though the sprinklers, as shown, are far enough away to not be obstructed by the fan?

Yes, if the fan in question is considered a HVLS fan, NFPA 13 requires that the fan be centered (approximately) between four sprinklers.

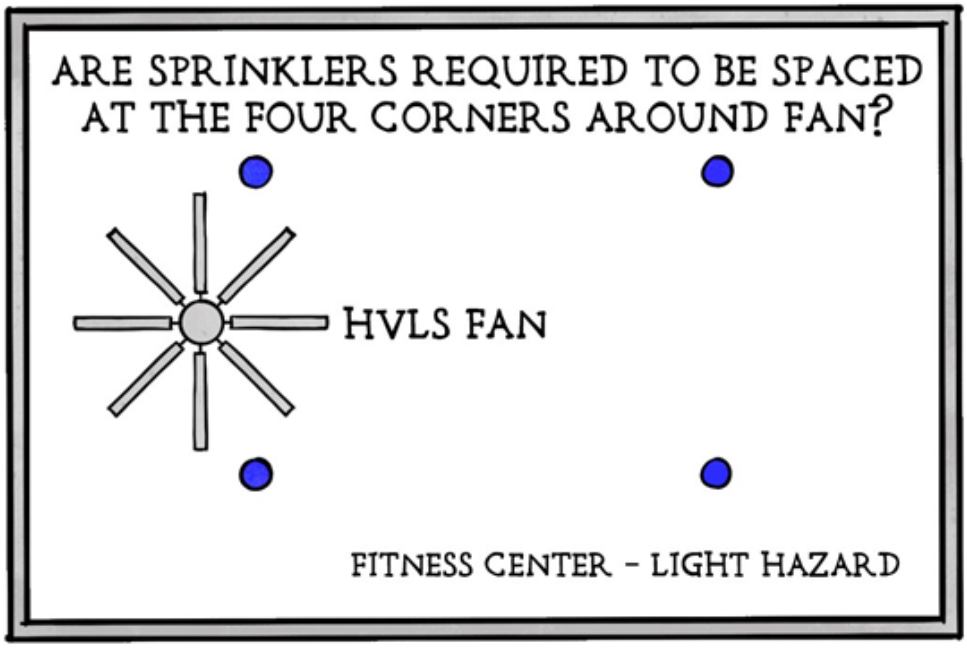
NFPA 13, 2016 edition, Section 3.3.14 defines a high-volume low speed fan as a ceiling fan that is approximately 6 feet to 24 feet in diameter with a rotational speed of approximately 30 to 70 revolutions per minute.

Based on this definition, the 8 foot diameter fan in your case would meet the definition assuming the fan speed is 30 to 70 revolutions per minute.

Section 11.1.7 for design approach and high-volume low speed fans indicates the installation of HVLS fans in buildings equipped with sprinklers, including ESFR sprinklers, shall have the HVLS fan centered approximately between four adjacent sprinklers. The standard does not provide an exception to this requirement.

In this case, assuming the fan meets the definition of a high-volume low speed fan provided in Section 3.3.14, Section 11.1.7 would be applicable to center the fan approximately between the four adjacent sprinklers. It may be possible to determine the fan speed does not meet the definition.

The Annex Section A.11.1.7 references the test data reports. It may be possible to review these reports and provide an equivalent design as permitted by Section 1.5. It appears the intent of the standard is to center the fan to provide the minimum effect on both sprinkler activation time as well as obstruction to sprinkler pattern development.



Question #7 – Remote Area Reduction

There is a maximum ceiling height of 9 foot 6 inches inside a remote area. There is an adjacent room next to the remote area with a ceiling height of 12 foot 8 inches.

Which ceiling height do you use to determine the remote area reduction?

The more restrictive 12 foot 8 inch ceiling height could be calculated in the remote area for a more conservative approach. Or two hydraulic calculations could be performed, one with a 9 foot 6 inch ceiling height in the most remote area and a second hydraulic calculation for the area with the 12 foot 8 inch ceiling height to prove which is more hydraulically demanding.

NFPA 13, 2013 edition, Section 11.2.3.2.3.1 allows the quick response area reduction for a system or portion of a system having the same hydraulic design basis.

The intent of the standard as noted in Section 23.4.4 for hydraulic calculation procedures and the area density method is to use the design area that creates the most hydraulic demand. In this case, using quick response sprinklers and the permitted area reduction based on ceiling height, this may be the area with the 9 foot 6 inch ceiling or the area with the 12 foot 8 inch ceiling height.

To ensure the system is calculated to the highest hydraulic demand, the conservative approach would be to provide hydraulic calculations based on the higher ceiling height of 12 foot 8 inches for the entire system, or separate hydraulic calculations for each portion of the system with different ceiling heights and different hydraulic design areas could be performed.

Question #8 – Bathrooms and Noncombustible Construction

A residential project is utilizing the 2019 edition of NFPA 13. Sprinklers are proposed to be omitted in small bathrooms in accordance with Section 9.2.4.1.1.

The authority having jurisdiction is stating that the studs in the bathroom walls must be noncombustible even though they are covered with 5/8 inch drywall in order to apply this section.

Do the studs of this bathroom need to be noncombustible in order to omit sprinklers in these bathrooms?

No, NFPA 13 does not require the studs to be noncombustible. Section 9.2.4.1.1 in the 2019 edition of NFPA 13 allows sprinklers to be omitted from bathrooms located within dwelling units when the following conditions are met:

- Bathroom does not exceed 55 square feet in area.
- Walls and ceilings are noncombustible or limited combustible, and
- Walls and ceilings, including walls and ceilings behind any shower enclosure or tub, comply with a minimum 15-minute thermal barrier rating.

Gypsum, or drywall, is considered limited combustible. The 5/8 inch thickness will meet the 15-minute thermal barrier requirement.

It's important to clarify that Section 9.2.4.1.1 only applies to bathrooms located in dwelling units. It should also be noted that if the bathrooms are in a limited care facility or nursing home (as defined in NFPA 101), or the bathroom(s) open directly to a public corridor or exit way, sprinklers are required even if Section 9.2.4.1.1 is met.

Question #9 – Access Panel Under Stairs NFPA 13D

We have an area under the stairs that has an access panel. The floor space is over 24 square feet but there is no door, just an access panel.

Are sprinklers required in a space like this?

No. Sprinklers are not required in this concealed space.

NFPA 13D (2019) Section 8.3.5 states that sprinklers are not required in concealed spaces that "… are not used or intended for living purposes."

Even with the access panel, this space is not intended for living purposes, therefore, it does not require sprinkler protection.

Question #10 – Fill Controls for Water Storage Tank

A high-rise building includes a gravity water storage tank sized for the fire demand and a fire pump to feed the top standpipe zone. The automatic water filling valves are operated by controls monitoring the water level in the tanks.

Is the automatic fill mechanism required to be listed for fire protection?

No, if the tank capacity provides the complete fire protection system demand, the fill valve and mechanism is not required to be listed.

NFPA 22, 2018 edition, does not provide any general requirement for all equipment to be listed. Section 14.4 provides the requirements for tank fill and does not include a requirement for the fill valve and mechanism to be listed.

However, if the tank is a break tank, then the refill mechanism is required to be listed. A break tank is defined by Section 3.3.2.2 as a tank providing suction to a fire pump whose capacity is less than the fire protection demand (flow rate times flow duration). You have indicated this is not the situation in your case. Section 14.5.2 is specific to break tanks and requires the refill mechanism to be listed and arranged for automatic operation.

Question #11 – ESFR Design Area

Section 14.2.9.4.2 in the 2022 edition of NFPA 13 allows ESFR sprinklers spacing closer than 8 feet on center.

Is the intent to keep the 12-sprinkler design area per Section 23.2.2 or the minimum remote area size of 768 square feet per Section 24.1.8.2?

The answer to your question is that both Sections 23.2.2 and 24.1.8.2 in the 2022 edition of NFPA 13 must be followed. Most ESFR sprinkler systems have at least 12 sprinklers in the design area. Section 24.1.8.2 says, "once the number of sprinklers for a demand area has been established", then the minimum operating design area must (also) be at least 768 square feet.

The purpose of this 768 square feet minimum design area is to prevent a larger number of sprinklers from activated in a fire situation where 12 closely spaced sprinklers encompass a small floor area

In summary, even with the reduced spacing permitted in the 2022 edition of NFPA 13 for ESFR, the minimum 12 sprinkler and 768 square foot design area must both be met.

Question #12 – Fabric Ducts

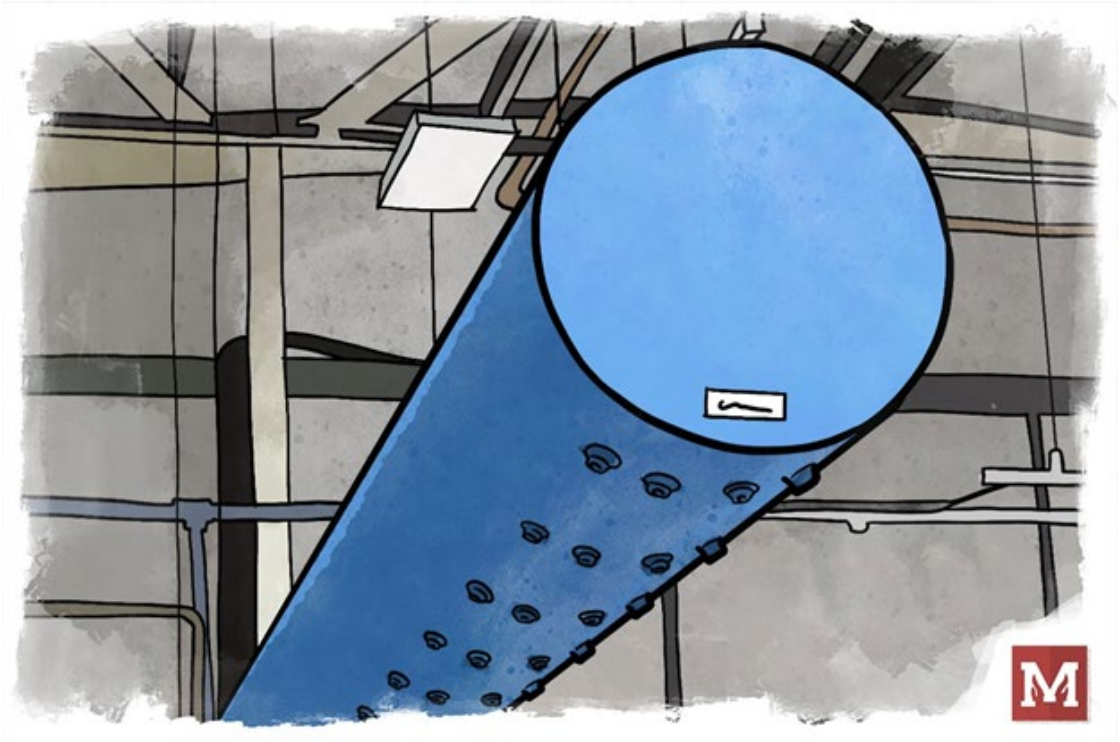
A project includes "fabric ducts" that are in excess of 4 feet when inflated.

Do these fabric ducts qualify as a continuous obstruction as it is not "permanent" in nature and can be deflated when not in use.

The duct described requires sprinklers below per NFPA 13 (2022 edition) Section10.2.7.4.2 which requires sprinklers to be installed under fixed obstructions over 4 feet wide.

Section 9.5.5.3.2 does state that sprinklers are not required below obstructions that are "not fixed in place." However, this section is intended for objects such as tables and other movable furniture. The duct is a part of a fixed building system therefore it is not movable and would still create an obstruction when inflated and should be treated as an obstruction.

This topic was informally discussed by the installation committee recently and the consensus was that these fabric ducts should be treated as obstructions (when over 4 feet in width when inflated.) It was also noted that many of these fabric ducts include a rigid frame and would not collapse when not in use.



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Our next Tech Tuesday will be December 19, 2023, from 12:30 pm to 1:30 pm eastern time. The topic will be 2024 Codes and Their Standards.

This course will provide attendees with the updates to the 2024 editions of the International Building Code, International Fire Code, NFPA 1 Fire Code, and NFPA 101 Life Safety Code. Updates to the referenced standards will also be addressed.

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With this process, once you have registered for the event you be sent an email with a Microsoft link that will bring you to the Microsoft Teams Event registration page. You must provide simple identifying information here to generate your email with the "Join" link to the Webinar.

We must be able to identify each participant as accessing, being present, engaging, and evaluating the course to issue a CEU Certificate.

Thank you for your patience, we will continue to improve the user experience as we continue this transition back to Microsoft Teams. Your feedback is always welcome!

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