

Best of October 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 October 2023. This information is being brought forward as the "Best of October 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 – Exterior Projections with Occupied Spaces Above

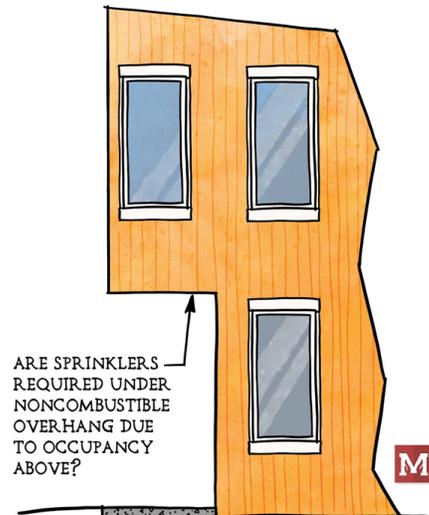
An occupied 2nd floor of a building is overhanging the first floor, but the building is entirely of non-combustible construction. The annex note to Section 9.2.3.1 suggests that sprinklers are required if there is occupancy above.

Would the exterior non-combustible area below the 2nd floor require sprinkler protection?

No. Section 9.2.3.2 of the 2022 edition of NFPA 13 would exempt sprinklers from the underside of second story cantilever if it meets all the criteria within the section. It must be noted that section 9.2.3.2.1 is new to the 2022 edition of NFPA 13 and requires sprinklers below porte-cocheres with occupied floors above. This new prescriptive requirement supports the annex language of A.9.2.3.1 which suggests that "...drive-in bank windows or porte-cocheres at hotels and motels normally do not require sprinklers where there is no occupancy above..." This section is specifically limited to porte-cocheres and does not extend to other exterior projections with occupancy above.

As annex language is not considered part of the requirements of NFPA 13, prior to the 2022 edition, the suggestion found in A.9.2.3.1 that sprinklers be installed where there is occupancy above was not a requirement but rather a consideration that the responsible

design professional would need to address. The reason that the technical committee added 9.2.3.2.1, which now requires sprinklers below porte-cocheres with occupied floors above, was simply because while porte-cocheres are generally used for unloading/loading of occupants and due to this transient nature, NFPA allows omission of sprinkler protection for these areas. However, the reality is that port-cocheres are often used for long term parking (such as the hotel shuttle parked overnight) and this new requirement is intended to protect from a fire risk in these situations.



Question #2 – Underground Fire Main Under Buildings

Is there any limitation on how far a water service can be run under a slab in a building?

Yes, the water service can be run 10 feet maximum under a building unless it is in a covered trench.

NFPA 24 (2019) addresses this subject in Section 10.4.3 which is titled “Private Fire Service Mains Beneath Buildings”. This information is also found in NFPA 13 (2019) section 6.4.3.

Section 10.4.3.1 states that the private fire service main is “permitted to extend horizontally no more than 10 feet (3.0 m) cumulatively, as measured from the outside of the building, under the building to the riser location.” The subsection to 10.4.3.1 states that pipe joints cannot be located under the footings and that the piping needs to be installed 12 inches below the footings or foundations or sleeved with an approved material.

The only way that it would be permitted to run an underground pipe more than the 10 feet discussed above would be in a covered trench as outlined in section 10.4.3.2.1.

This covered trench must be:

- Accessible from within the building
- Have rigid walls and base
- Be noncombustible

- Have a valve where pipe enters trench

It should be noted that the pipe in the trench may be underground or aboveground type piping.

NFPA 24 discourages piping under buildings because if the pipe were to break or develop a leak, it could be extremely difficult to repair if it is located under the building and water discharging from the pipe can undermine the building's foundation.

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Question #3 – Determining Number of FDC Inlets on an NFPA 13R System with Standpipes

A four-story residential building is equipped with an NFPA 13R sprinkler system and an NFPA 14 standpipe system. It has been stated that as NFPA 13R only requires a single 1 ½ inch fire department connection, this requirement overrides the NFPA 14 fire department requirement.

Which standard takes precedence when sizing an FDC and number of inlets for buildings sprinklered with an NFPA 13R system equipped with standpipes?

This is not a case of one installation standard taking precedence over another but rather of meeting the minimum requirements of both installation standards. In the case described, it appears that the system is a “combined system” which is defined as a “standpipe systems that supplies both hose connections and automatic sprinklers” (see section 3.3.20.3 of the 2019 edition of NFPA 14.) In this case, the applicable requirements of both NFPA 13R and NFPA 14 must be met. Where both standards have differing but common requirements, the more stringent requirement would need to be adhered to. In the case of combined systems, the calculations are based upon the greater of the sprinkler system demand or the standpipe demand. This concept is stated in NFPA 14 (2019) section 7.10.1.3.1.1.

This concept is directly related to the size of the fire department connection needed for combined systems. While it is true that NFPA 13R simply requires a single 1 ½ inch inlet FDC, NFPA 14 requires a single 2 ½ inch inlet for every 250 gpm of system demand (see NFPA 14 (2019) section 7.12.3) or an appropriately sized large diameter hose connection (see NFPA 14 (2019) section 7.12.3.1.)

This disparity is due to the different expectations of the use and purpose of an FDC between NFPA 13R and NFPA 13 and that of NFPA 14. The purpose of the FDC in a sprinkler system is to “supplement the water supply but not necessarily provide the entire sprinkler system demand. Fire department connections are not intended to deliver a specific volume of water.” (See NFPA 13 Section A.16.12.3.1.) By contrast an FDC in accordance with NFPA 14 is expected to provide the required standpipe demand. In fact, NFPA 14 defines an FDC (3.3.4.1.1) as a: “connection through which the fire department can pump the secondary water supply to an automatic standpipe system at the required system demand.”

As stated above for combined systems, the minimum requirements of both installation standards must be met. In this case, as the FDC requirements of NFPA 14 (one 2 ½ inch inlet for every 250 gpm of system demand) is more stringent and would override the single 1 ½ inch inlet” FDC requirement of NFPA 13R.

Question #4 – Flow Test for Hydrant Marking

For the purpose of marking a fire hydrant is it correct that only one hydrant needs to be flowed and the static/residual readings are also taken from that single flowing hydrant?

Yes, starting in the 2022 edition of NFPA 291, a new flow test method was added (Section 4.5) which is titled “Layout of Test and Procedure to Evaluate the Available Flow Through a Fire Hydrant.”

The reason that the committee added this new test method is that the traditional test method predicts the flow available in the underground main, not the hydrant. This new test method uses a single hydrant. This hydrant capacity test more accurately predicts flow available through the hydrant and uses the static/residual hydrant as the flow hydrant and automatically accounts for the friction loss and any obstructions between the main and the hydrant outlet. This method is intended to be used for the marking of hydrants.

It should be noted that Section 4.4, which utilizes two or more hydrants, is intended to evaluate the available water supply for use in designing fire protection systems.

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Question #5 - Velocity in Fire Hydrants

What is the maximum velocity allowed by NFPA 13 in fire mains as well as fire hydrants?

NFPA 13 does not mandate any velocity limitations nor does NFPA 24, which is the applicable standard for fire mains and fire hydrants.

NFPA 13 (2022) does state this when dealing with hydraulic calculations (specifically the Hazen Williams formula) see Section 28.2.1.4.

The reason that NFPA 13 does not specifically limit the velocity when dealing with hydraulic calculations is because as the velocity increases so does the friction loss. Therefore, the velocity is inherently limited as excessive friction loss will lead to increasing the pipe size to reduce the friction loss (which will also reduce the velocity.)

We have also reviewed AWWA C503 which is the AWWA Standard on Wet-Barrel Fire Hydrants. There are no velocity limitations for fire hydrants found in this document. This document does limit the head loss caused by friction through the hydrant. (AWWA C503-18, Section 4.6.6.1.) The maximum allowable head loss must be corrected for inlet and outlet velocity, so while there are no specific velocity limitations, like NFPA 13, velocity is inherently limited by the friction caused by high velocity.

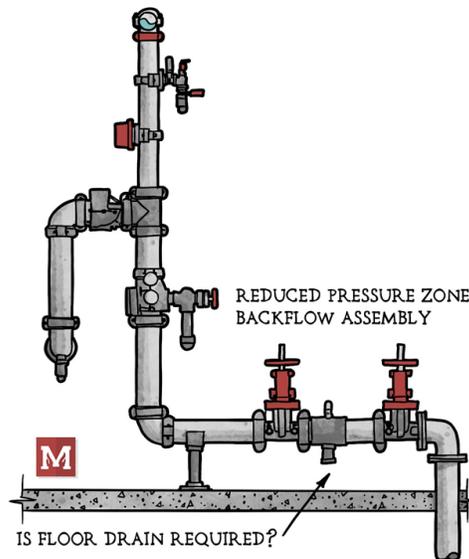
Question #6 - Floor Drain Requirements - Fire Sprinkler Riser Room w/ RPDA Style Backflow

Are there any code requirements detailing a requirement to install a floor drain within a fire sprinkler riser room when there is an RPDA style backflow?

The 2013 edition of NFPA 13 does not speak directly to a specific requirement for a floor drain. But NFPA 13 Section 6.1.1.2 does require equipment considered essential for the system to function to be listed.

The Plumbing Code in Section 604.4.6 requires backflow devices to be installed per the listing and the manufacturer's installation instructions. The specific requirements for a drain will be found in the manufacturer's installation instructions for the backflow preventer. After reviewing several installation instructions online for RPDA backflows, all the manufacturer's literature reviewed requires a floor drain in the room.

Lastly, the Plumbing Code in Section 803.4.8 requires drain lines serving the backflow preventer to be sized in accordance with the discharge rates of the manufacturer's flow charts of the device or assembly.



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Question #7 – Necessity of Return Bends in Dry Systems

A dry pipe system will include dry pendent sprinklers.
As these are pendent sprinklers, are return bends required?

NFPA 13 (2016 edition) – Section 7.2.2 lists the five (5) sprinkler arrangements for dry-pipe systems. Item (3) allows pendent sprinklers on return bends (in a space not subject to freezing temperatures). Item (2) allows listed dry pendent sprinklers. If dry pendent sprinklers are used, return bends are not necessary.

This section is intended to limit conditions where water can accumulate in the piping and freeze. This is especially a concern with pendent sprinklers as they are lower than the sprinkler branch lines, and water can collect in these “drops”.

Question #8 – Remote Area

A project includes a 34' x 89' attic with a 3/12 pitch and the required area of sprinkler operation is 2,535 square feet.

When the 1.2 factor is applied, the area is less than 2,535 square feet; however, Section 23.4.4.1.1.4 states that the calculation need only include the available floor area.

Does the calculation need to exceed the 1.2 factor to include 2,535 square feet or can Section 23.4.4.1.1.4 be applied to stop at the 1.2 factor?

Based upon the information given, it is required that the “remote” design area includes a minimum of 2,535 square feet. (As you indicated the design area as 2,535 square feet, it is assumed that this system is not only sloped but is also a dry system.) This requirement applies even if you must exceed the 1.2 shape factor.

As you have referenced section 23.4.4.1.1.4 it is assumed that the applicable edition of NFPA 13 is the 2013 edition.

Section 23.4.4.1.1.1 states that that the design area (2535 square feet) is a “...rectangular area having a dimension parallel to the branch lines at least 1.2 times the square root of the area of sprinkler operation...” Note that the 1.2 shape factor is the minimum length of the design area. This dimension is permitted (and is often required) to exceed 1.2 times the sq ft of the design area in order to meet the required design area.

Section 23.4.4.1.1.4 (which you identified in this EOD) cannot be used to arbitrarily end the area of sprinkler operation at the 1.2 dimension. This section states that where the

available floor area is not available to meet the minimum design area, the calculations are permitted to only include the sprinklers available.

This is not the case in the described situation. The attic space is 34' x 89' (3,026 square feet) and therefore there is adequate floor area to meet the required design area of 2,535 square feet. Therefore section 23.4.4.1.1.4 would not apply, and you cannot "stop at the 1.2 factor."



Question #9 – Diesel Engine and Alternate Power Requirement

A diesel fire pump is to be installed within a warehouse fire pump room. The power utility in the area is considered unreliable. The room will have unit heaters.

Is it a requirement of NFPA 20 to install a generator to meet the 2019 edition of NFPA 20 Section 11.6.5.2? The owner was hoping to avoid a generator by installing a diesel pump.

Yes, an alternate power source is required to maintain the diesel fire pump room temperature, battery charging, engine block heater, and lighting when there is no reliable power.

NFPA 20, 2019 edition, Section 11.6.5 for diesel pump temperature maintenance indicates the temperature of the pump room, pump house, or area where engines are installed shall be designed so that the temperature is maintained at or above the minimum recommended by the engine manufacturer. In locations where electrical power is not reliable and where there is a risk of the pump room freezing, an alternate power source shall be provided to maintain space heating, battery charging, engine block heating, and lighting.

Question #10 – Breezeway

Section 6.6.7 in the 2010 edition of NFPA 13R states that sprinklers are not required in exterior closets on exterior balconies and breezeways.

What is the definition of an Exterior Breezeway?

There is no definition of a breezeway in either NFPA 13R or the IBC. In fact, that term is no longer found in the current editions of NFPA 13R. This term was removed in the 2019 edition of NFPA 13R (See FR No. 18) with the following committee statement:

The term "Breezeway" is not defined in this standard or the IBC. The correct term is corridor.

It should also be noted that starting in the 2019 edition of NFPA 13R, the allowance to omit sprinklers in open corridors has also changed. These changes were based upon the following substantiation (from Public Input 26: *"The 2015 IBC has added section 903.3.1.2.2 which requires sprinklers in open ended corridors and associated stairways that are not separated. This requirement has been included in 1027.6 but the ICC felt it needed to flag the requirement in the NFPA 13R section."* Based upon this, section 6.6.5 which in the 2010 edition stated that sprinklers were not required in corridors that are open and attached to read in the 2022 edition that sprinklers are permitted to be omitted in "Corridors that are not part of a means of egress."

Additionally, Section 6.6.7 on the 2010 edition (which you referenced) was also changed. The current edition of NFPA 13R omitted the allowance to omit sprinklers in closets on "exterior breezeways/corridors" this section in 2022 now reads that sprinklers can only be omitted in closets on "exterior balconies."



Question #11 – Outdoor Stages

A four-story building being proposed with an outdoor stage. The canopy above the stage is not attached to the building.

Are sprinklers required?

NFPA 13, 2019 edition, Section 1.3.2 states: "1.3.2 Level of Protection. A building, where protected by an automatic sprinkler system installation, shall be provided with sprinklers in all areas except where specific sections of this standard permit the omission of sprinklers."

If this stage is considered a building, NFPA 13 (2019 edition) – Section 9.3.13 contains sprinkler requirements. If this is not attached or part of the building, NFPA 13 would likely not require this stage to be sprinkler-protected.

The requirements for providing sprinkler protection typically fall under the adopted building and/or fire code. According to the International Building Code (IBC) and International Fire Code (IFC), this sounds like it would fall under an A-5 occupancy classification (outdoor amusement or performance). The only sprinkler protection required by the IBC / IFC in Group A-5 occupancies are enclosed accessory spaces greater than 1,000 square feet.

IBC (2018 edition) - Section 914.6 requires sprinkler protection for stages that are over 1,000 square feet in size, over 50 feet in height, and that have curtains, scenery, or other combustible hangings that move vertically.

Your state or local codes may contain more restrictive requirements and should be consulted.

Question #12 – Required Protection Underneath Deck of Combustible Construction

A residential building includes balconies (with no roof) over a driveway. The building is of combustible construction and is to be protected in accordance with the 2016 edition of NFPA 13R.

The AHJ is requiring sprinklers below the deck and has referenced Section 903.3.1.2 of the International Fire Code as justification.

Are sprinklers required under the balcony deck?

No. sprinklers would not be required below this balcony deck. Section 903.3.1.2.1 is a requirement to protect balconies, decks, and ground floor patios of dwelling units with a roof above.

In this case, sprinklers located below the balcony deck would not provide protection from a fire originating on the balcony but rather would be protecting the driveway below. This is not a requirement of this section of the IFC and is not required by NFPA 13R.

The origin of this requirement was fires originating from barbeques on balconies. It is not anticipated that grills will be used in the driveway below.



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