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

Editor - Roland Asp, CET #501 12/13/2022

# Best of November 2022

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 2022. This information is being brought forward as the "Best of November 2022." 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.

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## Question #1 – Test Header Height

**A building with a fire pump will include a test header located on the exterior of a building.**

**Does NFPA 20 (2013) require a specific minimum and maximum height for the test header?**

No, NFPA 20 does not provide a required maximum or minimum height for the test header or hose valves. NFPA 20, 2013 edition, Section 4.20.1.4 for water flow test devices, requires where a test header is installed, it be installed on an exterior wall or in another location outside the pump room that allows for water discharge during testing. Section 4.20.3.3 for hose valve locations does not provide a required minimum or maximum installation height. This is the same in the 2022 edition of NFPA 20.

The intent of the standard is to require the hose valves outside, at a safe location, and capable of properly testing the fire pump. Clearance is needed to properly operate the hose valves and connect hose. Because the test header is used for testing and not emergency operations, access and installation height are not as critical as it is for fire department connections.

The most common installation height is in line with that of NFPA 13, 2013 edition, Section A.8.17.2 for the fire department connection, 18 in. to 48 in. above finished grade. To facilitate connection of the hose, it is generally preferable to be on the lower side of this height range with the fire pump test header.

## Question #2 – Live/Work Area and Sprinkler Protection

**Does an R-2 Live/Work unit in accordance with the International Building Code consisting of a single dwelling over a small office require a sprinkler system?**

Live/Work units are required by the IBC to be protected with an automatic sprinkler system in accordance with Section 903.2.8. This requirement can be found in Section 508.5.7 of the 2021 edition of the IBC. Since Section 903.2.8 requires an automatic sprinkler system in all occupancies with a Group R fire area, there are no exceptions to the fire sprinkler requirement.

Some jurisdictions have modified the Group R sprinkler requirements by state/local amendment. This would be the only scenario where sprinkler protection could possibly be exempted.

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## Question #3 – Geothermal Water Tank

**A project's primary water source is to be a geothermal water storage tank with water heated to 108-degrees Fahrenheit. This supply has been accepted by the AHJ as an acceptable water source.**

**Will this hot water be an issue with the fire sprinklers?**

NFPA 13 currently does not have any specific guidance on this issue. However, in the 2013 edition of NFPA 13 there is Section 7.7.1 which addresses circulating closed-loop systems. This type of sprinkler system used heated (or cooled) water in the sprinkler pipes for either heating or cooling purposes and this section did include guidance on the use of elevated temperature water within the sprinkler pipe.

This section stated that the maximum allowed water temperature flowing in sprinkler piping is 120-degrees Fahrenheit and required the use of intermediate or higher temperature-rated sprinklers where the water temperature exceeds 100-degrees Fahrenheit.

This section was deleted from NFPA 13 in the 2016 edition (See FR-64) with the following statement:

> *Sprinkler systems have become more and more specialized with multiple components being used. With the issues of compatibility rampant in our industry, connection to systems that could cause failure of individual components should be avoided. Users of the standard can refer back to previous editions of this design concept.*

Although this section is no longer part of NFPA 13 - it still may provide good guidance regarding elevated temperatures in sprinkler piping.

It should also be noted that NFSA did submit a Public Comment to the 2019 edition of NFPA 13 (See Public Comment No. 103) to require the use of intermediate or higher rated sprinklers where the water temperature exceeds 100-degrees Fahrenheit. This comment was rejected by the committee with the statement that *"There is no practical way of measuring temperatures throughout the sprinkler pipe."*

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## Question #4 – Including Friction Loss for Valves Larger Than 2 Inches in Calculations

**Based upon Section 23.4.4.8.1 (1) of the 2016 edition of NFPA 13, can the friction loss for valves larger than 2 inches be ignored when performing hydraulic calculations?**

No, you may not ignore pipe fittings and devices on piping larger than 2 inches in hydraulic calculations. Section 23.4.4.8.1 states "Pipe friction loss shall be calculated in accordance with the Hazen-Williams formula with C values from Table 23.4.4.8.1 as follows:"

- *Pipe, Fittings, and devices such as valves, meters, flow switches in pipes 2 inches or less in size, and strainers shall be included, and elevation changes that affect the sprinkler discharge shall be calculated.*

The way it is written, the "2 inches or less in size" portion only applies to the device within that comma section which is flow switches. Therefore, flow switches in pipes larger than 2 inches do not need to be included in the calculation; however, all other fittings and devices regardless of the pipe size need to be included as an equivalent length in the hydraulic calculations.

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## Question #5 - Distance from Hose Stations in Parking Floors

**Based upon the 2013 edition of NFPA 14, in a parking lot, should the distance to hose connections be calculated based on the walking distance outside parking spots or it is permitted to calculate the distance based on running hoses across parking spaces?**

The 2013 edition of NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*, does not provide any guidance on how travel distance is measured. However, the technical committee has defined the term "travel distance" in the upcoming 2023 edition of the standard giving some guidance moving forward.

The new language (in section 3.3.33) shows an intent of travel distance to be inclusive of obstacles and requiring the measurement to be calculated based on a natural walking path around vehicles.

This section defines travel distance as the “natural path of travel” and states the travel path is measured “curving around any corners or obstructions.”

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## Question #6 - Standpipe Drain Risers

**In accordance with the 2016 edition of NFPA 14, when is a drain riser required and what are the requirements for this drain?**

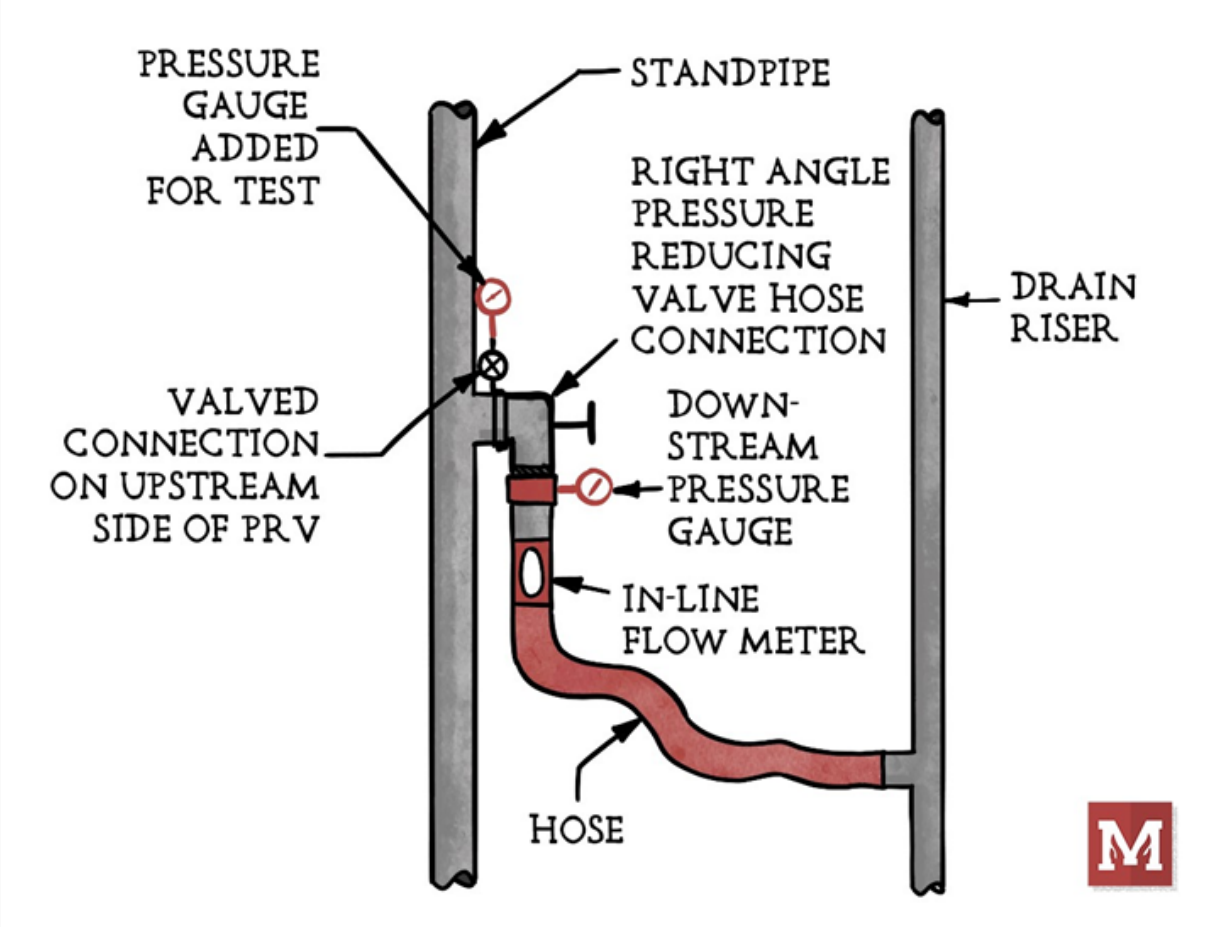
A drain riser is only required when standpipe pressure-regulating valves (PRVs) are installed. When PRVs are installed on a standpipe, the drain riser must be installed adjacent to each standpipe and must have a connection point for testing on at least every other floor.

The connection must be sized for the discharge in accordance with Section 7.11.1, to include a 2 ½ inch valve and a 3 inch drain.

Standpipes without pressure-regulating valves (standard hose valves) do not require drain risers and are only required to have a system main drain. The main drain must be installed or meet the requirements found in Section 7.11.2.

The standard has sizing requirements for drains using common pipe in Section 7.11.1.3. Where drain risers are interconnected and run to a common discharge point, the common piping shall be sized for the combined flow.

The use of multiple drains is often utilized in acceptance testing but drain sizing and area of water discharge must be considered.




## Question #7 – Water Shields for Sidewall Sprinklers

**Based on special FPE/AHJ requirements, water shields are required for the sidewall sprinkler installed beneath the car levels of a car stacker.**

**Are there listed water shields for sidewall sprinklers and if not are there any requirements for the size, location, and orientation of water shields in the 2016 edition of NFPA 13?**

To our knowledge, there are no listed water shields for sidewall sprinklers; however, it may be prudent to check with the sprinkler manufacturer.

There is, however, guidance in NFPA 13. NFPA 13 does recognize the use of water shields other than intermediate level rack sprinklers. For example, Section 8.5.5.3.4 states that sprinklers under open gratings must be intermediate level or “otherwise shielded from the discharge of overhead sprinklers.” The annex to this section also suggests:

- Water shields over automatic sprinklers should be “not be less, in least dimension, than four times the distance between the shield and fusible element…”.

As this requirement is not specific to the situation described and is likely addressing upright sprinklers. It is suggested that the specifics of the water shield be discussed with the project engineer and the AHJ.

It must also be noted that while it is a requirement that sprinkler guards be listed (see 6.2.8) there is no specific requirement for “water shields” to be listed. However, care should be taken to ensure that any “water shield” used does not disrupt the spray pattern of the sprinklers and is sufficient to serve the intended purpose. Again, it is suggested that the specifics of the water shield be discussed with the project engineer and the AHJ and possibly the sprinkler manufacturer.

Finally, it needs to be noted that “heat collectors” are not permitted to be used to assist in the activation of a sprinkler. (See 8.5.4.1.4.)

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## Question #8 – ESFR Skylights

**A project consists of a storage facility equipped with pendent 25.2K ESFR sprinklers. The structure has multiple skylights, which are 35 square feet in area and 2 feet 9 inches deep.**

**How are these to be addressed in the 2019 edition of NFPA 13?**

As the skylights in question exceed 32 square feet in area, the allowance to omit sprinklers per section 9.3.16 would not apply. Additionally, as K-25.2 ESFR sprinklers are required to be positioned between 6 inches and 18 inches below the ceiling and the skylights are 2 feet 9 inches deep, there is no way to position the sprinklers to protect both the ceiling and the skylights (with the same sprinkler).

Based upon this, there appears to be two options:

1. Extend sprinklers in each of the skylights. Note that in accordance with Section 9.4.2.5 (4) and Table 9.4.2.5(b), the sprinkler protecting the skylight is required to be an intermediate temperature sprinkler.
2. Another option, if the recessed area is truly a skylight and not a heat vent, is to install a sheet of glass or other transparent material at the base of the skylight to eliminate the recess. This would allow the heat from the fire to travel to the sprinkler without an additional delay, equivalent to any smooth flat ceiling and the skylight could be considered a noncombustible concealed spaced not requiring sprinklers.

It should be noted that if the skylight (of any size) that allows venting (opens), it is required to be protected per Section 9.2.17.1. Additionally, as this is likely a storage facility, if the skylights are considered a roof heat or smoke vent, the provisions of Section 20.6.6.2 and 20.6.6.3 would apply.

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## Question #9 – Small Hose Connections in Storage Occupancy

**Section 8.17.5.1.3(2) in the 2013 edition of NFPA 13 states that hose connections can be supplied from separate piping system for small hose connections.**

**Should this be a separate sprinkler zone, or is it acceptable to connect this piping after the flow switch of the sprinkler system? This is storage occupancy with only one sprinkler zone.**

NFPA 13, 2013 edition, Section 8.17.5.1.3(2) requires the use of a separate piping system for small hose connections. The intent of this requirement is noted in the handbook commentary for Section 8.17.5.1.1 and states “when specifically required, the hose connections can be supplied from separate or adjacent systems or outside hydrants, so that the ceiling sprinklers can be shut off during the clean-up operation.” In this case, with only one sprinkler system, a separate piping system is permitted to serve the small hose connections. The connection of the separate piping system that serves the small hose valves to the sprinkler system shall be such that the overhead sprinkler system can be shut off during the clean-up operation and the small hose connections remain in service for clean-up operations.

The standard does not require small hose connections to be hydraulically designed to provide a specific flow and/or pressure. Small hose connections are not intended for fire department or firefighting use, they are intended for mop up operations only, and therefore no minimum flow or pressure requirements are provided. It should be noted, however, that Section 11.1.6.3 does require an inside hose allowance be added for inside hose connections (50 gpm for a single hose connection and 100 gpm for multiple hose connections).

Section 8.17.5.1.4 provides the requirements for sizing pipe serving small hose connections. As noted in Section 8.17.5.1.4(3) all piping could be 1 ½ inches.

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## Question #10 – Floor Control Valve for Parking Level Dry System

**A project consists of a large three-story apartment building plus one underground level of parking. The total area of all floors combined exceeds 52,000 square feet. A sprinkler system is to be provided in accordance with the 2013 edition of NFPA 13. The system will consist of a wet pipe system on the occupied floors and a dry system in the attic (fed from a dry pipe valve on the 3rd floor) and the parking level. Section 8.16.1.5 requires a floor control valve assembly on each floor. Section 8.16.1.5.2 allows the attic level to be supplied from the 3rd floor level.**

**Is it allowed to run a dry supply from the 3rd floor dry valve to feed the dry system at the parking level or would it need to have its own control valve located on the same level per NFPA 13 (2013 edition) 8.16.1.5.1?**

Yes, but this situation may need to be approved by the AHJ. The 2013 edition simply states that a floor control valve assembly be located on each floor with two exceptions. The top level of the building may be supplied by a floor control valve assembly on the floor below and floor control valve assemblies are not required where the total area of all floors combined does not exceed the system area limitations found in Section 8.2.1.

Two changes were made to this requirement in the 2016 edition of NFPA 13 that may address the situation described. It should be noted that the requirements found in Section 8.16.1.5 in the 2013 edition of NFPA 13 were moved to Section 8.2.4 in the 2016 edition.

For the 2016 edition, the wording of this section was changed from requiring floor control valve assemblies “on each floor level" to "for each individual floor level." This change allows the required floor control valve assemblies to be located on a level remote from the level being served. It is, at times, more practical to locate all sprinkler equipment in a central location such as a riser room or another area remote from the floor being served.

An additional revision was made to this section to exempt dry systems in parking garages from the requirement for floor control valves for each level. This change recognizes the difficulty in protecting unheated parking garages with a single dry-pipe valve and then installing separate floor control valves downstream of the dry pipe valve.

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## Question #11 – Pressure Relief Valve Requirement for Diesel Fire Pump

**A diesel pump (without a pressure limiting driver) rated for 60 psi will have 67.5 psi churn with maximum suction pressure of 56 psi. Components are rated for 175 psi.**

**As 121% of churn pressure (81.68 psi) + suction pressure = only 138 psi, does NFPA 20 require, or would there be any advantage to installing a pressure relief valve?**

No, a relief valve is not required by the standard. NFPA 20, 2013 edition, Section 4.18.1.2 indicates that a pressure relief valve is required for diesel fire pumps “where a total of 121 percent of the net rated shutoff (churn) pressure plus the maximum static suction pressure, adjusted for elevation, exceeds the pressure for which the system components are rated. As noted in your case, 121% of net pressure plus maximum suction pressure does not exceed the maximum system working pressure of 175 psi, therefore a relief valve is not required by the standard.

Section 4.18.1.1 also indicates pressure relief valves shall be used only where specifically permitted by this standard. The intent of the standard is to only provide a relief valve when needed to prevent system over pressurization if the engine speed is out of adjustment. There would be no advantage to installing a relief value unless it is possible for the fire pump churn pressure to approach or exceed the maximum system working pressure. In this case that is not possible without a drastic (over 35 psi increase) change to the city water supply to the pump.

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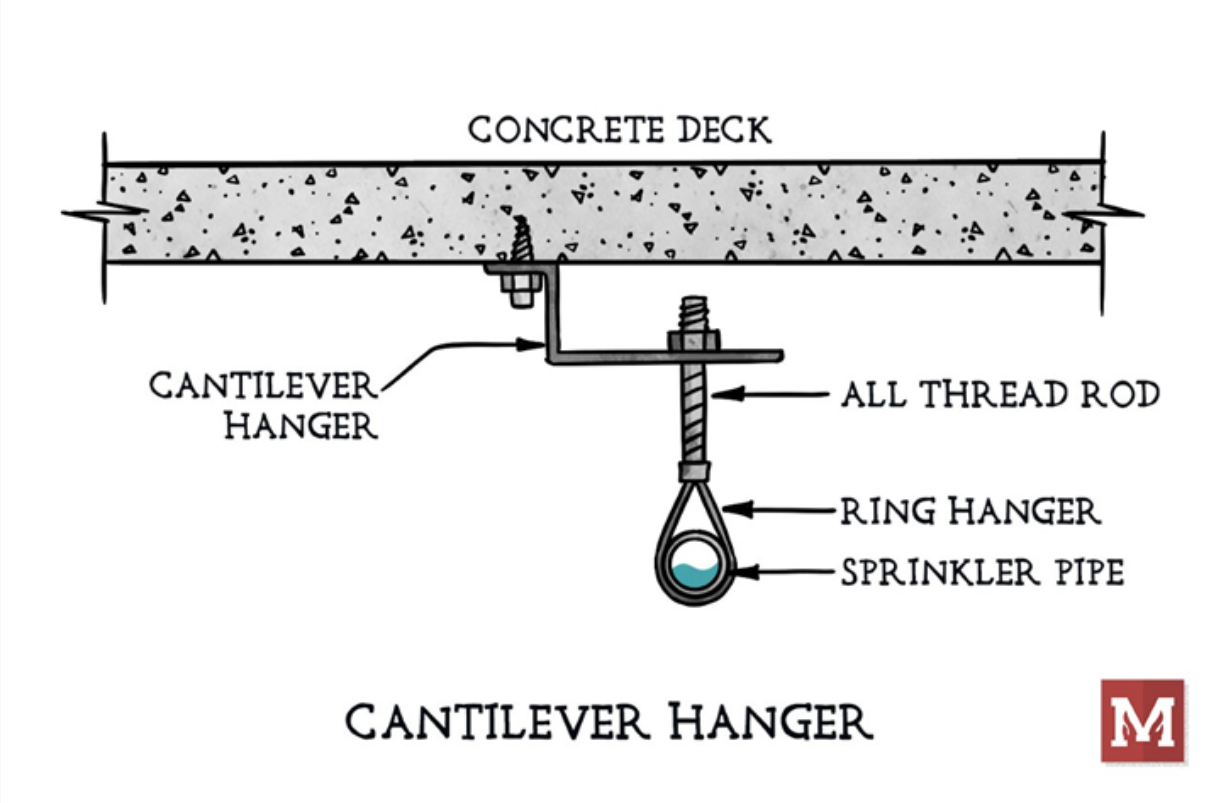
## Question #12 – Cantilever Hanger

**A project includes a unique hanger style (cantilever hanger). Is there a way to calculate this hangar style as a reviewer, or is this something that needs to be certified by a structural engineer?**

Any hanger that is not prescriptively listed in Chapter 9 of the 2016 edition of NFPA 13 would not be permitted unless certified by a registered professional engineer (PE) confirming the conditions 1-5 of Section 9.1.1.2 are met. It is not the responsibility of the plan reviewer to determine if a performance-based hanger assembly complies with NFPA 13. The project engineer should submit documentation signed by a registered PE indicating all the conditions in Section 9.1.1.2 have been met.

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