

TechNotes Issue # 404 October 9, 2018

Best of September 2018

This edition of TechNotes was written by Kevin Hall, P.E., NFSA's Manager of Engineering Research.

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 September 2018. This information is being brought forward as the "Best of September 2018." If you have a question for the NFSA EOD (and you are an NFSA member), send your question to 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 - 6 in. Rod Rule for Pipes Greater than 2-inch Diameter

Does the 6 in. rod rule (NFPA 13-2013 Section 9.3.5.5.10) apply to both cross mains and branch lines (regardless of size), permitting omission of lateral bracing?

A sprinkler system is installed with 6 in. cross mains and 3 in. branch lines. Pipe is supported by rods less than 6 in. from top of pipe to point of structural attachment. Based on sections 9.3.5.5.1*, 9.3.5.5.10*, and 9.3.5.6.1, is it permitted to omit lateral bracing on the cross mains and omit restraint, lateral, and longitudinal bracing on the branch lines? We were told that, in this case, the 6 in. rod rule does not apply to pipes larger than 2 inches in diameter. Please clarify.

Answer: This is a topic that has changed a bit in recent editions of NFPA 13, but because the question references the 2013 edition, the answer will reference the same document.

Upcoming Technical Tuesdays

October 16, 2018

NFPA 20 Updates

Presented by Bob
Upson, Manager of
Engineering Services

[Register Here](#)



View older issues in the
"Member's Only" section

Did You Know??

The NFSA keeps a member of the Engineering Department staff on duty every business day to answer your technical questions live. We call this the Expert of the Day (EOD) program and it is available to our members by phone, fax or e-mail. Call us at (845) 878-4200 and press 2, or you can send a fax to (845) 878-4215, or you can e-mail us at eod@nfsa.org. Last year we answered more than 2600 requests for assistance.

In the original copy of NFPA 13-2013, Section 9.3.5.5.10 may state that it waives the requirements of Section 9.3.5.3 for "pipes individually supported by rods less than 6 in. long measured between the top of pipe and the point of attachment to the building structure." Section 9.3.5.3 is unfortunately an improper reference, carried over by accident from the 2010 edition of the standard. This was corrected by an erratum such that the NFPA's online version of the 2013 correctly references Section 9.3.5.5, the section entitled Lateral Sway Bracing. Since the wording of 9.3.5.5.10 references "pipe" rather than "mains" or "branch lines", its intent is to waive all lateral bracing requirements found within Section 9.3.5.5 for both mains and branch lines.

As such, you are correct that the short hanger rod rule allows omission of lateral braces from both mains and branch lines per Section 9.3.5.5.10 regardless of the size of the pipe. There is no short hanger rod rule exception for longitudinal bracing, but there are no longitudinal bracing requirements for branch lines. And, as explained above, Section 9.3.6.5 provides the short hanger rod rule waiver for branch line restraint. Sprigs 4 ft. or longer must nevertheless be restrained per Section 9.3.6.6.

Question 2 - Suspended Obstructions

Large artwork pieces shaped like continents, typically over 4 ft. in width, are suspended at heights between 7 to 13 ft. below a 29 ft. high ceiling. Does the artwork need to be protected per NFPA 13-2016, Section 8.5.5.3.2 regarding wide obstructions below sprinklers?

Answer: Yes, sprinklers are required below any portion of the artwork that is over 4 ft. wide in plan view. Note that the expanded language for locating sprinklers under wide obstructions in Section 8.5.5.3, which was new in NFPA 13-2016, applies to this situation. This new language states that any sprinklers protecting the area under an obstruction do not require an arm-over to place them directly underneath the obstruction. They can be located within 3 in. adjacent to the outer edge of the obstruction with the deflector up to 12 in. below the lowest level of the obstruction. Sprinklers placed adjacent to the outer edge of the obstruction must be intermediate level rack type sprinklers (e.g. provided with a guard to protect against cold soldering from the ceiling level sprinklers).

8.5.5.3* Obstructions that Prevent Sprinkler Discharge from Reaching Hazard. Continuous or noncontinuous obstructions that interrupt the water discharge in a horizontal plane more than 18 in. (450 mm) below the sprinkler deflector in a manner to limit the distribution from reaching the protected hazard shall comply with 8.5.5.3.

8.5.5.3.1* Sprinklers shall be installed under fixed obstructions over 4 ft (1.2 m) in width.

8.5.5.3.1.1 Sprinklers shall be located below the obstruction and not more than 3 in. (75 mm) from the outside edge of the obstruction.

8.5.5.3.1.2 Where sprinklers are located adjacent to the obstruction, they shall be of the intermediate level rack



type.

8.5.5.3.1.3 *The deflector of automatic sprinklers installed under fixed obstructions shall be positioned no more than 12 in. (300 mm) below the bottom of the obstruction.*

8.5.5.3.1.4 *Sprinklers shall not be required under noncombustible obstructions over 4 ft (1.2 m) wide where the bottom of the obstruction is 24 in. (600 mm) or less above the floor or deck.*

Question 3 - Rubber Hose Used for Air Supply Connections

On an annual fire and life safety inspection I discovered that a dry pipe sprinkler system air compressor had been replaced recently. At time of replacement, the fire sprinkler contractor used a rubber air hose as the connection from the air supply (compressor) to the dry pipe valve. Please see the attached photos.

NFPA 13 refers to a connection "pipe" but I do not see anything in the standard stating that the use of a rubber hose is prohibited.

The air compressor manufacturer's online installation manual depicts a 30-inch stainless steel flex hose from the compressor to 1/2-inch diameter hard pipe.

Is a rubber hose permitted by NFPA 13 to be used as the connection between the air supply and dry pipe valve?

Answer: The requirement of NFPA 13-2016 Section 7.2.6.4.1 for connection pipe between the air supply and the dry pipe valve addresses minimum size and connection point but does not specify any material requirements. The term "pipe" is not separately defined in NFPA 13, and the NFPA Glossary of Terms contains multiple and varied definitions from other codes and standards, some implying rigidity, others specifically including tube, and others simply requiring a containment of pressure. In common parlance, "pipe", "tube" and "hose" are often used interchangeably and as synonyms. Because the NFPA 13 Committee has not chosen to define the term or require the connection to be listed, the manufacturer is free to utilize any type of connection they choose, and the marketplace is left to decide which types are suitable for the application.

This issue has been clarified in NFPA 13-2019 Section 8.2.6.4 and is provided with explanatory material in the Annex. In order to use hose, it should meet the vibration, pressure, and temperature requirements identified.

8.2.6.4 Air Supply Connections.

8.2.6.4.1* *The connection from the air supply to the dry pipe valve shall not be less than 1/2 in. (15 mm) in diameter and shall enter the system above the priming water level of the dry pipe valve.*

A.8.2.6.4.1 *The connection from an air compressor to the dry pipe valve should be of a type recommended by the manufacturer and approved by the authority having*

Victaulic
FIRELOCK IGS
INSTALLATION-READY
SPRINKLERS



SIMPLIFY.
SAVE.
CONFIRM.



Upcoming In-Class Seminars

Two Week Layout
Technician Training
October 15 - 26, 2018
Seattle, WA

Layout Technician Training
- Blended Learning IN-
CLASS
PRACTICUM

jurisdiction, taking into consideration the pressures, temperatures, and vibrations that the connection and adjacent equipment will endure. Flexible hose should be considered suitable when capable of withstanding expected vibration, a maximum pressure of 175 psi (12 bar) or greater, and a maximum temperature of 150°F (66°C) or greater.

As such, there is no prohibition against the use of rubber hose for this application as long as it meets the above criteria.

Question 4 - Dry Pipe System Trip Test Connection and Acceptance Testing

NFPA 13-2013 Section 8.17.4.3.4 indicates that systems not more than 500 gallons do not require specific water delivery requirements such as first water at the most remote location test orifice within 60 second as a light hazard in this case. The contractor suggested that the test connection can be located anywhere on the system due to this requirement. Shouldn't the test connection be required to be located at the most remote location?

Answer: Although it is true that NFPA 13-2013 Section 7.2.3.3 does not require that a system under 500 gallons capacity serving a light hazard occupancy with no dwelling units meet a 60-second or any other water delivery time requirement, this does not avoid the need for compliance with Section 8.17.4.3.2, which requires that the test connection be located at the remote point of the upper story.

Even with the absence of a time requirement, the water delivery time for a dry pipe system must be recorded at the time of initial system acceptance and during the 3-year full flow trip tests mandated by NFPA 25. NFPA 25-2017 Section 13.4.5.2.5.2 requires that the records of the water delivery times be maintained. A 50 percent increase in the water delivery time is identified as a trigger for an obstruction investigation of system piping per NFPA 25-2017 Section 14.3.1(15).

Question 5 - Mains Encased in Concrete

An architect wants the main feeding a canopy dry system to be routed underground. The main runs underground to one of the canopy columns. The main then rises up, concealed inside the column base. The column base is concrete. To accomplish this, we would:

1. Install the pipe
2. Reinforce around the pipe
3. Pour concrete column around the pipe and fitting

October 22 - 26, 2018
Seattle, WA

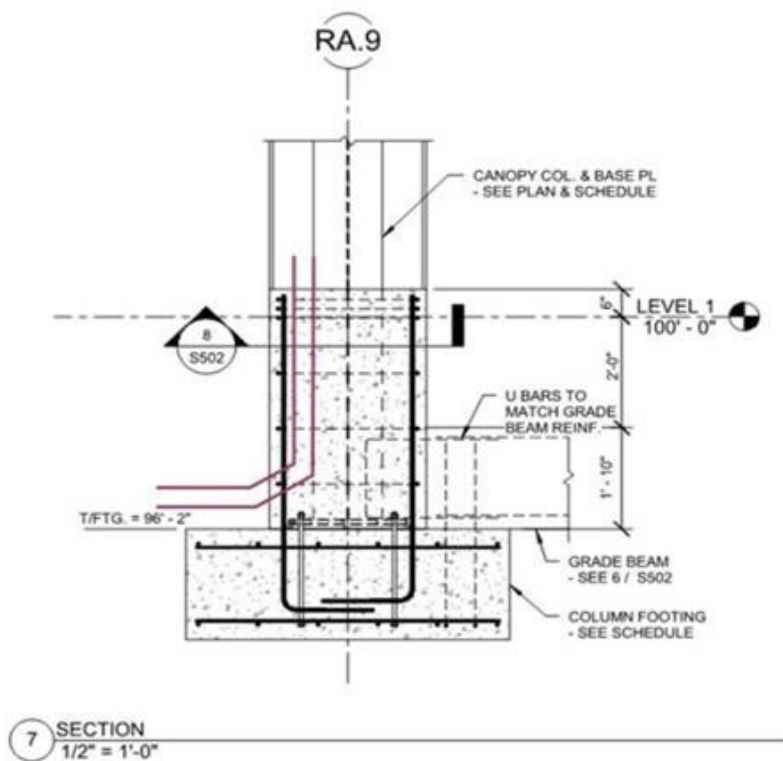
[Register Here](#)

This Month in Engineering

**NFPA 25, 2nd Draft
Meeting**
October 16 - 18, 2018
Tampa, FL

Preparing for
**Top Tech 2019
Competition**
Nashville, TN
May 15 - 18, 2019





Is it acceptable to have an underground fitting entirely encased in concrete like this?

Answer: While it is always advantageous to consider future maintenance of fire sprinkler system components, there is no prohibition against the arrangement you describe. NFPA 13-2016 Section 8.15.21 specifically addresses the use of pressurized dry piping underground, with the most important requirement be that the pipe be protected against corrosion, since this is the most likely maintenance concern. This concern is addressed again by the standard in Section 8.16.4.2. Note that Section 8.15.21.2 allows the use of unprotected cast-iron or ductile iron underground when joined with a gasketed joint listed for air service underground. While you have not indicated materials, we certainly would recommend the use of such a listed gasket if applicable, but would still recommend the provision of corrosion protection, since any steel components of the fittings would be especially vulnerable to corrosion.

Although NFPA 13-2016 Section 10.4.3.1.1 and NFPA 24-2019 (there were problems with 2016 wording) does not permit pipe joints to be located directly under foundation footings, you are proposing to enter the column base above the footing. As such, however, you should provide some means of providing flexibility to accommodate possible settling of the column footer. Otherwise, damaging mechanical stresses could be transferred to the joint buried within the column base. It is also recommended to hydrostatically test the pipe prior to the pouring of the concrete.

Question 6 - Multiple Buildings Supplied by A Single FDC

One backflow preventer assembly and one fire department connection are located on a private fire protection main near the edge of a property. The fire protection main serves multiple

buildings on the same property. Is this arrangement permissible under NFPA standards?

Answer:Yes, this arrangement is addressed in NFPA 24-2013 Section 5.9 Remote Fire Department Connections. However, the use of a remote FDC versus individual system based FDCs is subject to the requirement or approval of the AHJ as noted in Section 5.9.1. (Note that the appropriate AHJ for this requirement is typically the local fire department chief officer or other fire department designee.)

5.9.1 General. *Where the AHJ requires a remote fire department connection for systems requiring one by another standard, a fire department connection shall be provided as described in Section 5.9.*

Note that both NFPA 24-2013 Section 5.9.5.1 and NFPA 13-2016 Section 8.17.2.4.6 establish that it is the AHJ who determines where FDCs are to be installed.

5.9.5.1* *Remote fire department connections shall be located at the nearest point of fire department apparatus accessibility or at a location approved by the AHJ.*

A.5.9.5.1 *The requirement in 5.9.5.1 applies to fire department connections attached to underground piping. If the fire department connection is attached directly to a system riser, the requirements of the appropriate installation standard apply.*

8.17.2.4.6* *Fire department connections shall be located at the nearest point of fire department apparatus accessibility or at a location approved by the authority having jurisdiction.*

NFPA 13-2016 Section 8.17.2.4.3 and Section 8.17.2.4.4 makes it clear that a remote FDC can serve multiple systems. Section 8.17.2.4.3 states that for multiple systems the FDC must be connected between the supply control valves and system control valves. Section 8.17.2.4.4 goes on to state that the requirements of 8.17.2.4.3 for multiple systems does not apply where the FDC is connected to the underground piping.

Question 7 - Hydrostatic Testing of Existing Systems

An existing pipe schedule sprinkler system (45 to 50 years of age) is being renovated. Two cross mains have been added to the system and all the existing sprinklers have been replaced with quick response sprinklers. In reference to subsections of NFPA 13-2007 Section 24.2.1 regarding hydrostatic testing for system modifications:

24.2.1.5 *Where addition or modification is made to an existing system affecting more than 20 sprinklers, the new portion shall be isolated and tested at not less than 200 psi (13.8 bar) for 2 hours.*

24.2.1.6 *Modifications that cannot be isolated, such as relocated drops, shall not require testing in excess of system working pressure.*

Three questions followed:

Question 7.1: Is necessary to perform a 200 psi hydrostatic test on the entire system?

Answer:No, it is not the intent of the standard to ever apply a full 200 psi hydrostatic test to the existing portions of the system.

Question 7.2: Would it be appropriate to perform a 200 psi hydrostatic test on the new cross mains?

Answer:Yes, as they can reasonably be isolated from the existing system as per Section 24.2.1.5. The new piping should be tested to 200 psi while disconnected from the existing. The entire system would need only pass a working pressure test once the new piping is connected to the existing piping to verify the integrity of the connections between the existing and new pipe.

Question 7.3: Would it be appropriate to perform a working pressure test on the whole system to verify the integrity of the new sprinkler connections?

Answer:Yes, as they cannot reasonably be isolated from the existing system as per 24.2.1.6 except on the new cross mains where they would be subject to a full 200 psi hydrostatic test.

Question 8 - Pipe Pitch Requirements for Standpipe Systems

Is there a requirement in NFPA 14 regarding dry standpipe systems with horizontal branches? Specifically, horizontal branches for pressure reducing hose valves? If no specification on pitch, is there any other type of requirement for installation on a pressure reducing hose valve on a dry standpipe system?

Answer: NFPA 14-2016 Section 6.1.3 requires a minimum 1/4 in. in 10 ft pitch for dry and semiautomatic systems, and Section 6.1.4 requires a minimum 1/2 in. in 10 ft pitch for such systems protecting refrigerated areas. It was discussed that there are additional requirements that should be added regarding the orientation of hose valves to ensure that those devices are also effectively pitched to drain. This response will be placed in our file to consider at the appropriate time to submit new proposals to the standard.

Question 9 - Protection of Butane Lighters

Introduction: I am dealing with various aspects of an inspection that yielded the discovery of hundreds of thousands of lighters being stored at a single facility. No manufacturing or usage of the lighters occurs on site; strictly storage of the pre-packaged (boxed [cardboard] and wrapped [plastic encapsulation]) lighters that contain Isobutane (classified as a liquefied, flammable gas) as the fuel and the majority of the rest of the articles are plastic. The boxes of lighters are on wooden pallets that are stored both on the floor (two pallets high) or on racks (20ft or greater). The current facility was listed as a 'Storage'

occupancy; however, it is looking like they should be classified as a 'High-Hazard Group 2' occupancy. The sprinkler system that was in the building before the storage of the lighters consists of an ESFR system (main overhead coverage, no in-rack sprinklers provided) and most sprinkler heads were identified to be of a 14 K-factor.

My question is this: do you know of any specific requirements regarding the sprinkler system that would need to be identified and modified to accommodate the existing commodity hazard and/or H-2 occupancy classification? The fire protection engineer said the solution would be to provide larger K-factor sprinkler heads both for general overhead and in-rack. Would this affect the fact that the building needs explosion control and smoke/heat vents which are restricted when utilizing ESFR systems? Do you know of any other location that store such large quantities of liquefied, flammable gases in articles such as lighters like this location?

Answer: According to the 2018 edition of the IFC, Chapter 32 on high-piled combustible storage, a butane lighter (blister-packed and cartooned) is a high-hazard commodity (NFPA 13-2016 classifies as a Group A unexpanded plastic). The application for high-hazard commodities in Table 3206.2 calls for smoke and heat removal, however, footnote h provides an exception for ESFR systems. This exception would apply regardless of the occupancy classification. Smoke and heat vents in combination with ESFR systems have a negative effect on the reaction time and opens too many sprinklers beyond the area of origin and design area.

If the storage area exceeds 300,000 sq. ft., IFC Table 3206.2 footnote f allows the code official to apply additional fire protection features, such as in-rack sprinklers. It appears the FPE is heading in this direction to accommodate the area and commodity, although NFPA 13 does allow an ESFR system using K-14 sprinklers, without in-racks, for this commodity, stored on racks up to 25 feet.

While the IFC prescribes the hazard for this scenario, it should be noted that it is recommended that the owner enlist the services of a professional engineer to perform a hazard analysis of the building in accordance with NFPA 25-2017 Section 4.7.

Question 10 - Existing Antifreeze Systems

An existing residential care facility, protected under NFPA 13R, is provided with an antifreeze system. There is a small building addition (6) sprinklers, which is required to be protected and accomplished by extending the existing antifreeze system to this area. Once the system is drained to make the connection, the system would require refilling with a premixed 48% glycerin solution.

Is it the intent of NFPA that would not allow the addition of (6) sprinklers to this system?

Answer: NFPA 13R-2019 Section 5.4.2 (1) allows the use of an

antifreeze solution in a NFPA 13R system "using a listed antifreeze solution in accordance with NFPA 13." As you are no doubt aware, there are no listed antifreeze solutions available currently. However, the corresponding annex section of the newly-released 13R states the following: "The use of antifreeze solutions in all new sprinkler systems should be restricted to listed antifreeze solutions only." Because you are not dealing with a new system this suggests that the intent of the committee is to allow the extension of the existing system into the new building area.

It should be pointed out that a deadline is approaching on September 30, 2022, for sprinkler systems installed prior to September 30, 2012. Per NFPA 25-2017 Section 5.3.3.4.1, all antifreeze systems must utilize listed antifreeze solutions after that date. Because there is a possibility that no listed antifreeze solution will be available, we would suggest extending the system piping in a manner that could reasonably accommodate future conversion of the system to a wet pipe or dry pipe system.

Question 11 - Sprinklers Below Suspended Round Duct

A duct is installed in excess of 48 in. in width and will pass over a pool area 12 to 15 ft below the ceiling level. Are sprinklers required under this wide obstruction?

Answer: Yes, NFPA 13-2016 Section 8.5.5.3 requires sprinklers below all obstructions more than 48 in. in width". Note that this general rule applies to all spray and extended coverage spray type sprinklers (e.g. as per Sections 8.6.5.3.3 and 8.8.5.3.2).

8.5.5.3* Obstructions that Prevent Sprinkler Discharge from Reaching Hazard. *Continuous or noncontinuous obstructions that interrupt the water discharge in a horizontal plane more than 18 in. (450 mm) below the sprinkler deflector in a manner to limit the distribution from reaching the protected hazard shall comply with 8.5.5.3.*

8.6.5.3.3* Sprinklers shall be installed under fixed obstructions over 4 ft (1.2 m) wide.

8.8.5.3.2 Sprinklers shall be installed under fixed obstructions over 4 ft (1.2 m) wide such as ducts, decks, open grate flooring, cutting tables, and overhead doors.

Note that the 2016 edition has expanded and clarified the language for positioning sprinklers below obstructions in the subsections of 8.5.5.3. Sprinklers must be placed within 12 in. below the lowest level of the obstruction but may be placed anywhere directly under the obstruction or adjacent to the outer edge of the obstruction within 3 in. outside of its outer perimeter in plan view. This allows sprinklers protecting the area below an obstruction to be placed on straight drops without arm-overs to locate them directly under the obstruction. When sprinklers are placed outside of the obstruction's perimeter, they must be intermediate rack type to protect against cold soldering from sprinklers at the ceiling.

8.5.5.3.1* *Sprinklers shall be installed under fixed obstructions over 4 ft (1.2 m) in width.*

8.5.5.3.1.1 *Sprinklers shall be located below the obstruction and not more than 3 in. (75 mm) from the outside edge of the obstruction.*

8.5.5.3.1.2 *Where sprinklers are located adjacent to the obstruction, they shall be of the intermediate level rack type.*

8.5.5.3.1.3 *The deflector of automatic sprinklers installed under fixed obstructions shall be positioned no more than 12 in. (300 mm) below the bottom of the obstruction.*

Note that all spray/extended coverage spray sprinklers placed below round ducts are required to be of the be intermediate rack type as per Sections 8.6.5.3.7 and 8.8.5.3.6.

8.6.5.3.7 *Sprinklers installed under round ducts shall be of the intermediate level/rack storage type or otherwise shielded from the discharge of overhead sprinklers.*

8.8.5.3.6 *Sprinklers installed under round ducts shall be of the intermediate level/rack storage type or otherwise shielded from the discharge of overhead sprinklers.*

Question 12 - Air Compressor Listing

Do air compressors for a dry pipe system need to be listed?

Answer: No, air compressors are not considered essential to successful system operation and are exempt from listing as per NFPA 13-2016 Section 6.1.1.2

6.1.1.2 *Unless the requirements of 6.1.1.3, 6.1.1.4, or 6.1.1.5 are met, all materials and devices essential to successful system operation shall be listed.*

Note, however, that a listed air maintenance device is required regardless of air pressure source as per Section 7.2.6.6.1 unless the compressor supplying the system is very small as permitted by Section 7.2.6.6.2.

7.2.6.6.1* *Unless the requirements of 7.2.6.6.2 are met, where the air supply to a dry pipe system is maintained automatically, the air supply shall be from a dependable plant system or an air compressor with an air receiver, and shall utilize an air maintenance device specifically listed for such service and capable of controlling the required air pressure on, and maximum airflow to, the dry pipe system.*

7.2.6.6.2 *Where the air compressor supplying the dry pipe system has a capacity less than 5.5 ft³/min (160 L/min) at 10 psi (0.7 bar), an air receiver or air maintenance device shall not be required.*

should not be relied upon, to provide professional consultation or services. Please send comments to Mark Hopkins, P.E. at Hopkins@nfsa.org.

