

Best of December 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 December 2020. This information is being brought forward as the "Best of December 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 – Sprinklers Below Beams

In a single-family home with exposed wood beams with a depth of 9 inches, is it allowed to install fire sprinklers under the false beams or are sprinkler required between every beam? If the sprinklers are installed under the beams, the maximum deflector distance below the ceiling will be exceeded.

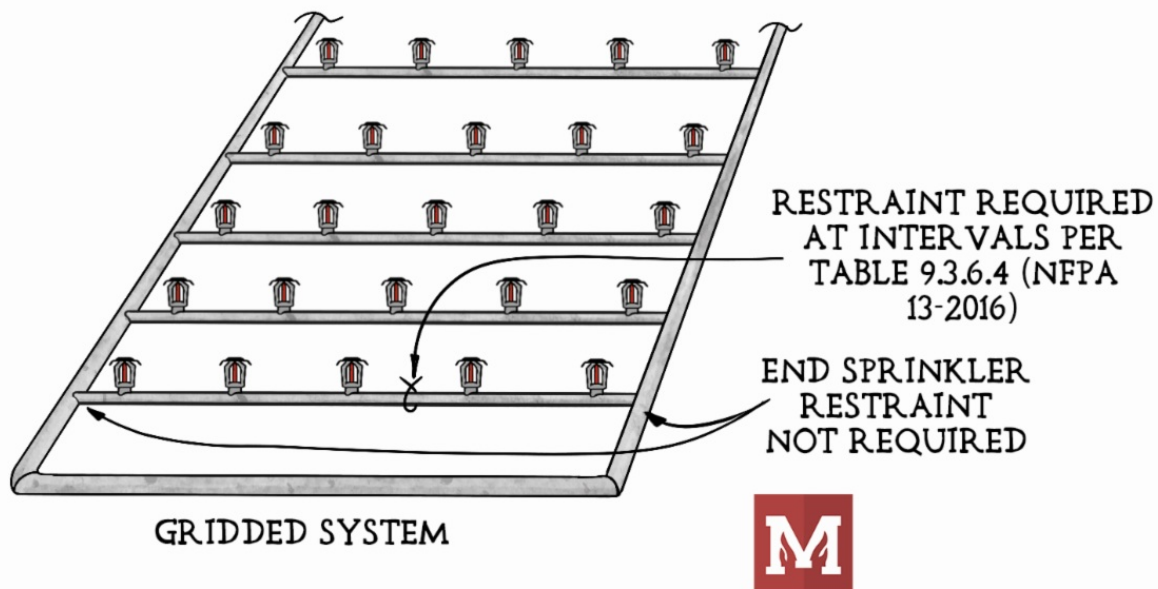
Sprinklers are permitted to be installed under or adjacent to the beams. Section 8.2.1.2(1) of the 2019 edition of NFPA 13D states that pendent, recessed pendent, and flush-type pendent sprinklers are permitted to be installed directly under a beam having a maximum depth of 14 in. with the sprinkler deflector 1 in. to 2 in. below the beam, or in accordance with the manufacturer's instructions for recessed or flush sprinklers if the deflector is less than 1 in. below the beam.

It must be noted that if concealed sprinklers are used, the maximum beam depth is 4 inches as noted in Section 8.2.1.3. This 4-inch limitation will likely be eliminated in the 2022 edition of the standard (and concealed sprinklers would be allowed under beams of up to 14 inches). This edition, however, will not be published until the Fall of 2021 and as of now the limitation is 4-inch maximum beam depth for concealed sprinklers.

Question #2 – Branch Line Restraints on Gridded Systems

Does a branch line need to be restrained if it is on a gridded system?

Yes, restraints are required on branch lines including gridded systems as required by Section 9.3.6 of the 2016 edition of NFPA 13. The difference with a grid is there are mains on each end of the branch lines. As the main will have sway bracing on it, it is acceptable to go from the main (on each end) up to the maximum distance permitted based on the diameter of pipe for the branch line. In other words, it is not required to install restraints on the end sprinkler on the branch lines per section 9.3.6.3 (as these are restrained by the mains), but restraints are required at the intervals required by Table 9.3.6.4(a).



Question #3 – Soundproof Booth

A building has a free-standing soundproof booth used for hearing testing. The booth is approximately 8 ft. X 8 ft. X 8 ft. and located within a sprinklered room with a 10 ft. ceiling. The walls of the booth are metal clad. Is there an exception for omission of sprinklers?

No, there is no exception for omitting sprinklers in this space. This space will be occupied by individuals and therefore would be required to be protected.

The 2022 edition of NFPA 13 is under development now, and there is a potential revision that will allow sprinklers to be omitted in small isolated temporarily occupied spaces (such as hearing testing booths) that do not extend to the ceiling and do not exceed 24 sq. ft.

As the hearing test booth in question exceeds 24 sq. ft., this language would

not be applicable, and sprinklers would be required in this booth based upon this potential change to the standard.

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Question #4 – Water Storage Tank Sizing

A project in a rural area is without a municipal water supply. There is a 25,000 gallon water reservoir planned to be built into the building foundation which would supply a fire pump for the sprinkler system only. There are no standpipe systems, or hydrants being fed from this fire pump.

Does the fire pump or tank need to be sized to accommodate any inside hose allowance? Calculations indicate the stored water is adequate for the sprinkler demand at the required duration, however, if a hose allowance is required to be added the planned reservoir would not be sized adequately.

Assuming there are not standpipe system hose valves or occupant use hose valves in the building and the tank does not serve fire hydrants or wall hydrants for fire department use, the tank can be sized for the sprinkler system demand only.

Section 24.1.2 of the 2016 edition of NFPA 13, indicates that the capacity of the water supply shall be capable of providing the required flow and pressure for the remote design area determined using the requirements and procedures as specified in Chapters 11 through 22 including hose stream allowance where applicable for the required duration.

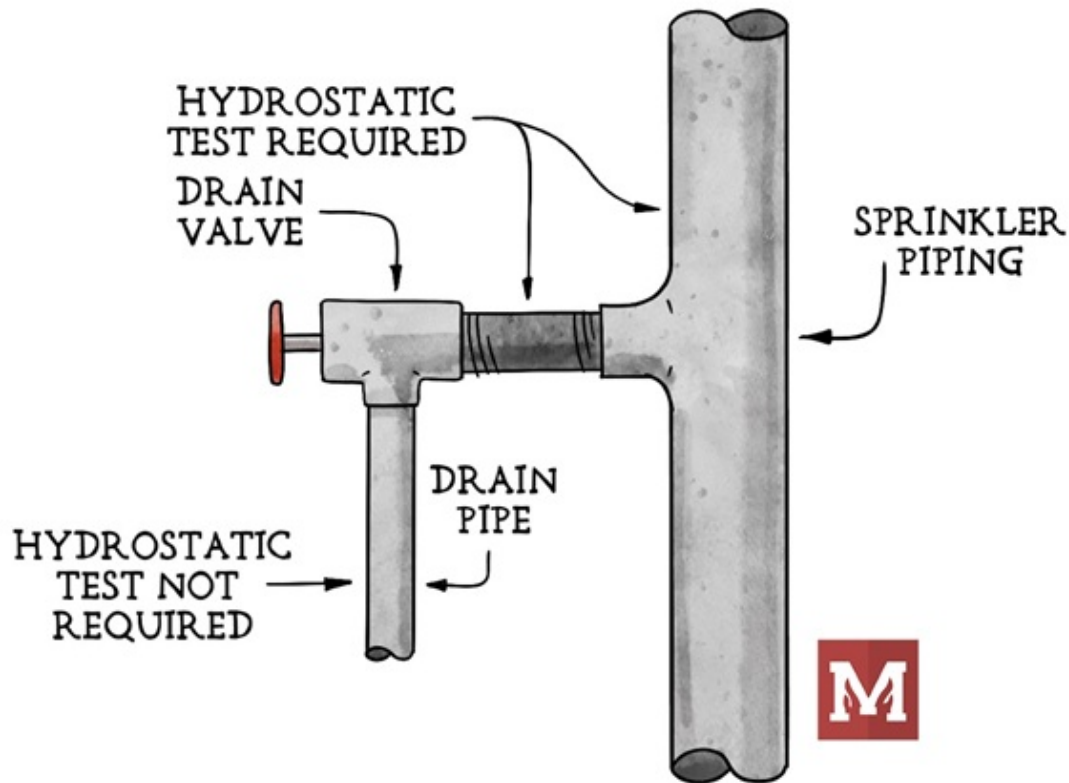
Section 11.1.5 requires the tank to be sized to supply the equipment they serve. Section A.11.1.5 indicates where tanks serve sprinklers only, they can be sized to provide the duration and required flow for the sprinkler system, ignoring the hose stream demands.

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Question #5 - Drain Piping

Does drain piping need to be hydrostatically tested? The authority having jurisdiction failed a hydrostatic test in a high rise because it did not include the drain piping with the testing.

Yes, drain piping is required to be hydrostatically tested but only the sections that are subject to system working pressure. Section 25.2.1.1 of the 2016 edition of NFPA 13 states that all piping and attached appurtenances subjected to system working pressure are required to be hydrostatically tested. The portion of the drainpipe subject to normal system working pressure (i.e., up to the closed drain valve) would be required to be tested. However, the drain piping beyond the closed drain valve is not subject to normal system pressure and would be exempt from testing.



Question #6 - Slowing Corrosion

What can be some low cost means to extend the lives of existing wet systems?

If the corrosion process is extended when it consumes the oxygen and corrosion nearly stops until new oxygen is introduced:

1. Is that belief valid?
2. Is air migrating from the public main a common threat and therefore considered a source of new air?

Answer to question 1: Yes, oxygen trapped in the water will be consumed as a result of corrosion activity. As this oxygen is consumed, corrosion activity within the system is reduced. New oxygen is reintroduced when new water is added to the system which starts the corrosion process over again. For this reason, the 2016 edition of NFPA 13 added a requirement to add a single air vent (either manual or automatic) to all wet pipe systems using metal pipe (see Sections 7.1.5 and 8.16.6). To support the notion that new water introduces new oxygen (causing corrosion) to a system is found in

annex Section A.8.16.6 which recommends that “Each wet pipe sprinkler system should be vented every time the system is filled.”

Answer to question 2: New oxygen is introduced when new water is added to the system from the public main, when the system is drained and refilled, and to a lesser extent during testing activity. Typically, unless water within the system is drained, air from the main does not migrate from the public main to the sprinkler system.

A low cost means to reduce corrosion activity within a wet pipe sprinkler system and extend the life of the system can be accomplished with venting. Venting the air certainly can help with reducing corrosion activity within the wet pipe system. As stated in Section A.8.16.6: “A manual or automatic air venting valve can be a reasonable approach on wet pipe sprinkler systems to reduce corrosion activity.” This annex section goes on to say, “The objective of venting is to reduce the amount of oxygen trapped in the system that will fuel corrosion and microbial activity.”

This vent needs to be installed a high point of the system which is where air generally congregates. It must be noted that the air vent will not and is not intended to exhaust all the trapped air in the systems but rather to reduce the trapped air and to minimize corrosion activity. It will not stop all corrosion activity. This new air venting requirement only requires a single air vent to be installed per system. Additional air vents are not prohibited and may be beneficial depending on the configuration of the specific system.

The vent can be either automatic or manual. The manual valve will be cheaper to install but is more labor intensive as this valve must be vented every time the system is filled while an automatic valve will as its name implies automatically vent any air in the system.

Review the 2016 edition of NFPA, Sections 7.1.5 and 8.16.6 including annex Section A.8.16.6. Although this section is for new systems, they could be beneficial to existing systems as well. Annex Section A.8.16.6 provides a lot of information on this topic.

In addition to venting, there are other methods, such as replacing the oxygen in a wet pipe system with nitrogen, prior to filling the system with water. As wet systems are filled, pockets of air get trapped. By filling with nitrogen first, the nitrogen pockets that form and remain will not contribute to corrosion.



Question #7 - Fire Department Connection Piping Above Grade

Can the piping between the exterior remote fire department connection

(FDC) and interior check valve be installed above grade? The concern is the distance between the FDC and check valve. Is there a maximum distance? The project location is in climate subject to freezing temperatures.

Yes, the piping between an exterior remote FDC and the check valve located inside the building to protect the FDC piping from freezing can be installed above grade. It would be subject to the requirements of the 2016 edition of NFPA 13, for the installation of above grade piping.

No, there is no maximum distance between the FDC inlet and the required check valve in the standard. Section 8.17.2.4 provides the requirements for the arrangement of the FDC and the required check valve. Annex Section A.8.17.2.4, while not enforceable as part of the standard, recommends locating the check valve for the FDC to reduce the length of non-pressurized pipe. In this case, the FDC check valve would be required to be located inside the building to protect the pipe from freezing. The remote FDC could be located closer to the check valve if acceptable to the AHJ as a means to reduce the length of non-pressurized pipe.

During a meeting in preparation of the 2010 edition of NFPA 13, the technical committee was asked to require check valves in FDC lines to be within 25-ft. of the FDC. The committee rejected this language, and instead adopted an annex note that states: "It is recommended that the user locate the check valve to reduce the length of non-pressurized pipe in the FDC supply line." Since this text is in the annex, it is not legally enforceable, but it gives some guidance to the designer when deciding where to put the equipment.

Question #8 – Pressure Reducing Valves

Are pressure reducing valves (PRVs) required for fire department connection (FDC) pressures exceeding 175 psi? The system is a manual wet standpipe combined with a fire pump serving only the sprinklers with a static pressure of 150 psi. However, the FDC inlet pressure is 210 psi in order to obtain the required pressure at the roof level. Is the FDC pressure factored in when applying this code section?

No, PRVs are not required at the FDC inlet. Section 7.2.3.2 of the 2019 edition of NFPA 14 requires a listed pressure-regulating device, such as a pressure-reducing valve, capable of limiting both static and residual pressures, at the standpipe hose connection, only when static pressure exceeds 175 psi.

The pump pressure required to provide system demand pressure must be marked at the FDC when greater than 150 psi as per Section 6.4.5.2.2.1

Section 6.4.5.2 also requires manual standpipes to have signage indicating whether the system is WET or DRY. This requirement allows the fire department to recognize the design of the system and is a direct indicator of static pressure. The 175 psi static requirement limits system pressure that



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Question #9 – Concealed Space Sprinkler Design Calculation

Concealed combustible space sprinklers have a hydraulic calculation procedure in their listing that could potentially lead to four sprinklers being calculated to meet the 1,000 sq. ft. requirement. As these sprinklers are listed as quick-response sprinklers, would the quick response reduction in Section 11.2.3.2.3.2 of the 2013 edition of NFPA 13 apply to quick response concealed combustible space sprinklers? In other words, which takes precedence, the section of NFPA or the sprinkler listing?

The sprinkler listing takes precedence, and it is not permitted to apply the reduction noted in Section 11.2.3.2.3.2. Listed concealed space sprinklers have a specified remote area per the manufacturer's installation sheet. Specifically, Tyco's CC2, Viking's COIN, and Reliable's KFR-CC all have 1,000 sq. ft. design areas. Some of the sprinkler manufacturers specify a minimum number of sprinklers for the remote area calculation (six) and some have additional details for CPVC protection and draft curtains. It is important to follow these listings. NFPA 13, Section 11.2.3.2.3.2 would not further reduce the design area.

Question #10 – Greenhouse and NFPA 13D

A greenhouse is constructed off a 13D sprinklered home. There is a gap of 2 inches between the house and the structure. There may be 2-hour separation between the house and the greenhouse (with a 2-hour door). Can fire sprinklers be omitted in this space (which looks like it will become a dining area once the house is built)?

The International Residential Code (IRC) requires homes to be sprinklered per NFPA 13D. Additions to existing sprinklered homes, are treated the same. If the greenhouse is an addition, yes, sprinklers are required. If the greenhouse, conservatory, or potting room is intended to be occupied; it should be treated the same as the living area. If the greenhouse is considered a separate building, then sprinklers may not be required.

The 2-hour exterior wall and rated door are serving an unknown purpose from this perspective. If the rating and the 2-inch separation are intended to separate the uses, then the IRC is no longer applicable, and the International Building Code (IBC) should be used. This gets into a longer explanation but buildings on the same lot without proper separation are treated as one building and any building with a residential fire area triggers sprinkler throughout the building (IBC Section 903.2.8). In the end, passive

fire protection (fire-rated walls and doors) is usually not traded off for active fire protection (fire sprinklers) in the IBC and when it does occur, it typically applies only to NFPA 13 systems. In the IBC, only a true fire wall (IBC Section 706) would separate the residential (R) use from the utility (U) use, negating the sprinkler requirement (IBC Section 903.2.8) from the greenhouse.

Question #11 – Hydrostatic Test of a Storz Connection

After replacing a Storz fire department connection coupling that failed the initial hydrostatic test; is a new hydrostatic test required after the replacement?

Yes, Section 28.2 of the 2019 edition of NFPA 13 requires a successful hydrostatic test as part of the initial system acceptance testing procedure. This includes the piping between the check valve and fire department connection as indicated in Section 28.2.1.7. If the initial testing was not successful, additional testing is required by the standard once repairs have been made.

Question #12 – Break Tank Sizing

If a break tank is used for backflow protection only and NOT to supplement the water supply, is it still required to size the tank based on Section 14.5.2 of the 2013 edition of NFPA 22? Are there any exceptions? Where does the 15-minute duration come from?

Yes, break tanks (even when used a backflow prevention method and not to supplement the water supply) must meet the sizing requirements found in Section 14.5.2. This section requires that the break tank be sized for a minimum duration of 15-minutes with the pump operating at 150 percent of rated capacity.

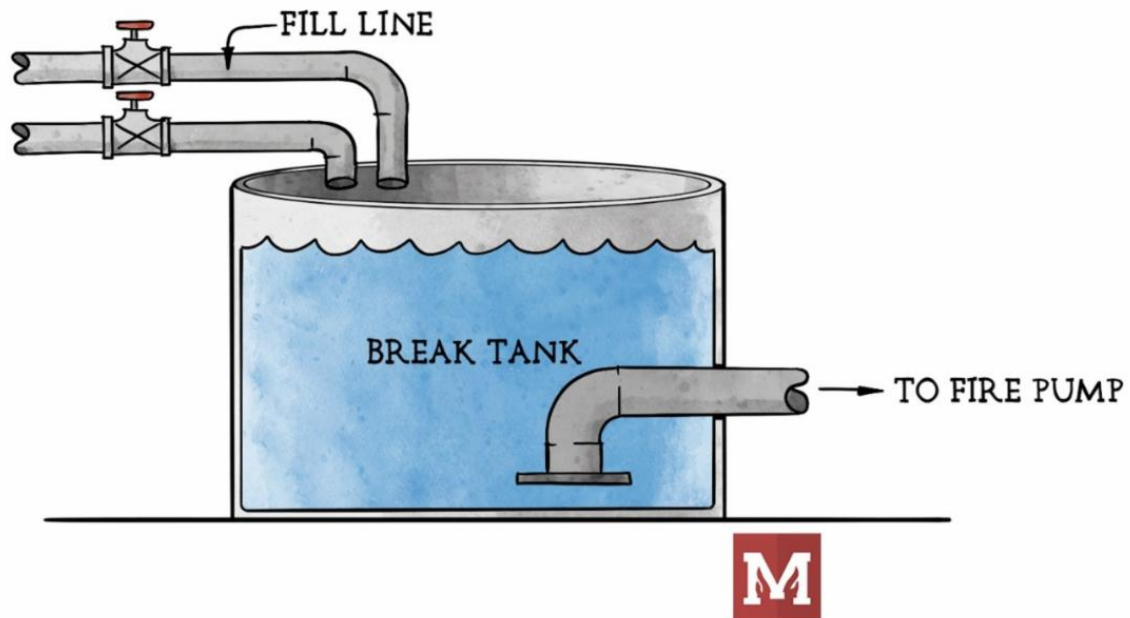
Section 14.5 clearly states that break tanks shall meet all the requirements of Section 14.5. Section 14.5.1 (1) does list backflow prevention as one reason for using break tanks but this section does not provide any exemption to the 15-minute duration sizing requirement.

It should also be noted that if the break tanks have a capacity of less than 30 minutes of system demand, all the requirements listed in Sections 14.5.3.1.1 through 14.5.3.1.5 must also be met. These sections require dual automatic refills, a manual tank refill bypass, and a local low water alarm.

The reason for the 15-minute duration is to provide some level of protection if the refill mechanisms fail. These requirements were originally found in the 2007 edition of NFPA 20 and the first draft comment (#57) that brought these requirements into NFPA 20 stated that the minimum size (15-minute duration) was because:

Guidance is needed to make sure the tank refills at an acceptable rate and that

the tank has some minimum size in case the refill mechanism does not work.



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Top Tech Competition



The 2021 Top Tech Competition will be held in October 2021. The window for testing will open summer 2021. We look forward to your participation. More details will be out soon. Keep studying!

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
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