

Best of November 2021

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 2021. This information is being brought forward as the "Best of November 2021." 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 – Sprinkler Coverage under Equipment

In a mechanical room, there is HVAC equipment and ducts that are more than 4 feet in width. This equipment is elevated above the floor and the distance from the bottom of these obstructions to the floor varies from one to four foot.

In accordance with the 2013 edition of NFPA 13, is sprinkler protection required under this equipment?

Beginning in the 2016 edition, sprinkler protection is required underneath noncombustible duct obstructions greater than 4-feet wide when the bottom of the obstruction is located 24-inches or less above the floor or deck; however, the 2013 edition does not include the 24-inch provision.

NFPA 13, 2013 edition, Section 8.5.5.3 for obstructions that prevent sprinkler discharge from reaching the hazard requires sprinkler protection under obstructions located more than 18 inches

below the sprinkler deflector that are over 4 feet wide.? This edition does not address or specify a minimum height of the space below the obstruction from which sprinklers would be permitted to be omitted.

The 2016 edition, Section 8.5.5.3.1.5 addressed this issue by adding that sprinklers shall not be required under noncombustible obstructions over 4 feet wide where the bottom of the obstruction is 24 inches or less above the floor or deck.

Question #2 – Dedicated Electrical Space

The 2019 edition of NFPA 13 requires sprinkler protection to be provided in electrical rooms (with certain exceptions). However, the 2017 edition of NFPA 70, National Electrical Code, specifically states in Article 110.26(E)(1)(a) that no piping or other equipment foreign to the electrical installation is allowed in the dedicated electrical space.

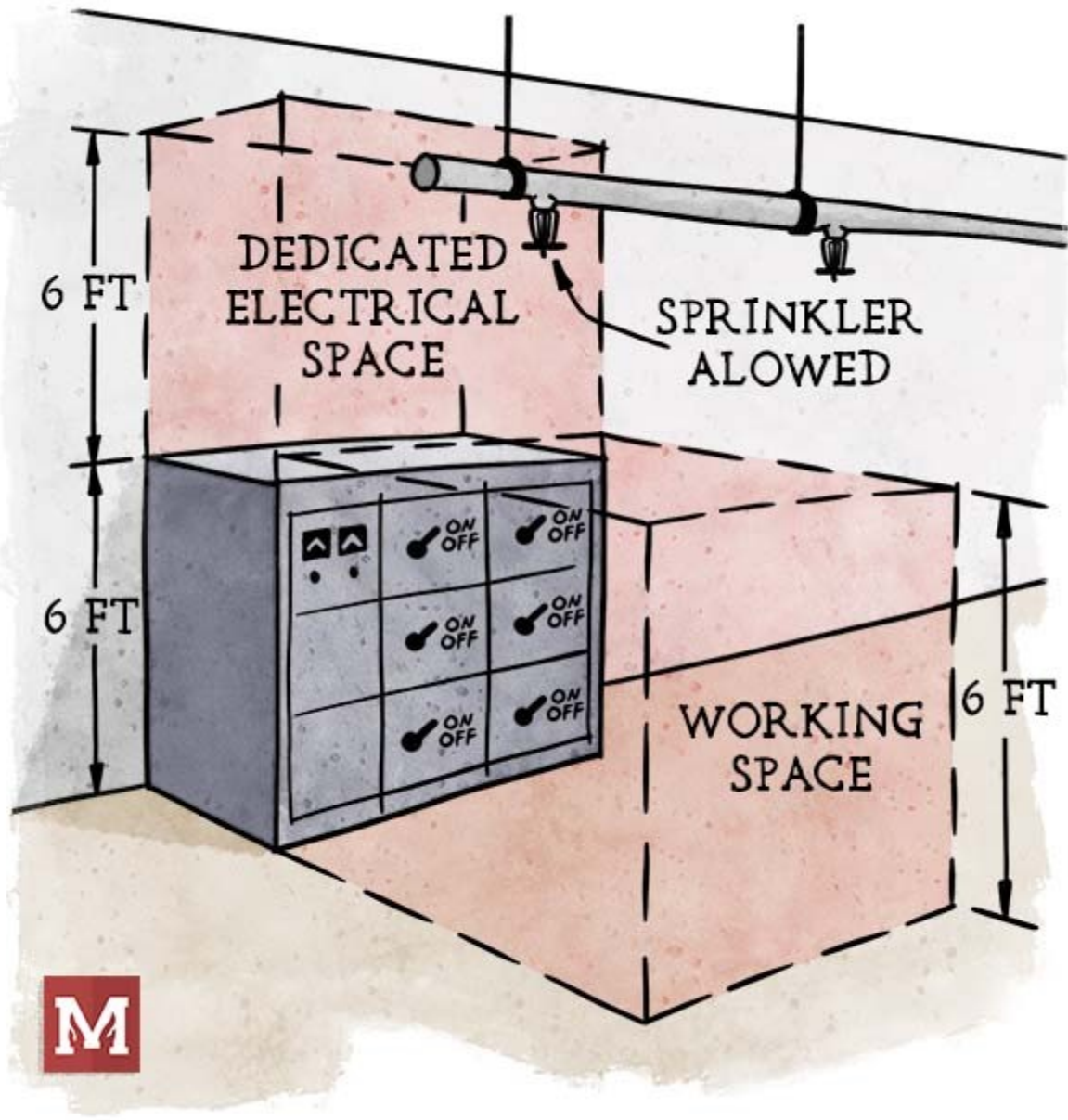
Is sprinkler piping permitted to be in electrical rooms?

Yes, sprinklers and sprinkler piping are permitted to be in electrical rooms as long as the piping is not within the dedicated electrical space as defined by NFPA 70.

As described in Section A.9.2.6 (which is new to the 2019 edition of NFPA 13), sprinkler piping cannot run through a dedicated electrical space as defined by NFPA 70. A dedicated electrical space is defined in 110.26 (E)(1)(a) of NFPA 70 as the space equal to the width and depth of the equipment which extends from the floor to 6 feet above the equipment or to the structural ceiling.

The next Article (110.26 (E) (1) (b) however states that foreign systems (which includes sprinklers) are permitted above the dedicated electrical space as long as the equipment below is protected from leaks, condensation, and breaks. Based upon this requirement, it may be prudent not to locate sprinklers and sprinkler piping directly above the electrical equipment.

Finally, Article 110.26 (E)(1)(c) specifically states that sprinkler protection is permitted as long as the piping complies with this section. Additionally, sprinklers and sprinkler piping cannot be located within the working space required by NFPA 70.



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Question #3 – New Single-Family Residence with Indoor Basketball Court and Hockey Rink

Can a proposed new single-family residence with an indoor basketball court and an indoor hockey rink be protected by a NFPA 13D fire sprinkler system, or is another NFPA Standard, such as NFPA 13R, or NFPA 13, required to be applied to the indoor basketball

court and indoor hockey rink areas?

If the house is considered a single-family residence (or a two-family), the entire structure, including the basketball court and hockey rink, can be protected by a NFPA 13D sprinkler system. If the building is truly just being built as a single-family dwelling, it is allowed to use NFPA 13D, regardless of the size or features. This concept is clearly outlined in the scope of NFPA 13D (Section 1.1.1) which states that NFPA 13D covers the design, installation, and maintenance of sprinklers to protect against fire hazards in one- and two-family dwellings and manufactured homes.

NFPA 13D requirements may not be “the best” protection for this large residence with features that are not typical for a residential occupancy.

There are three concepts to discuss with the owner and the architect:

1) The goal of NFPA 13D is only life safety, with very little property protection. For a home of this size, it is common to exceed the requirements of NFPA 13D in order to also provide better property protection. Better protection could be achieved in at least three different ways:

- Use NFPA 13R
- Use NFPA 13
- Individually go beyond the minimum requirements of NFPA 13D by adding additional sprinklers and/or increasing the water supply as the designer deems adequate

2) As noted, the basketball court and hockey rink are not typical to residential occupancies and as residential sprinklers have been tested and listed for dwelling units in residential occupancies only and it is not clear that this technology is appropriate for these untypical areas. This is similar to installing sprinklers in garages. Like basketball courts and hockey rinks, garages are not typical of a residential hazard. The residential committee recognizes this and has also recognized that there are times that garages are to be protected in a 13D system and that although residential sprinklers have not been tested or listed for such spaces, residential sprinkler provide some level of protection by alerting the occupants to a fire, by reducing the possibility of flashover and help the occupants to escape the house in the event of a fire. This concept is discussed in annex Section A.8.3.4.

Based upon this reasoning, it may be acceptable to utilize residential sprinkler for the basketball and hockey area even though they are not typical of residential dwelling units.

It must be noted that NFPA 13D does not have an allowance to use sprinklers other than residential sprinklers except in unheated areas not used for living purposes, in mechanical closets and in saunas and steam rooms. (See Section 7.5.1).

3) If residential sprinklers are used as discussed above, it needs to be determined if the typical two-sprinkler design of NFPA 13 is appropriate. If the room configuration of the basketball and hockey areas does not meet one of the situations noted as acceptable to use the two-sprinkler design in NFPA 13D in Section 10.2 then Section 10.2.4 would apply. This section states that for

situations not meeting one of the conditions where the two-sprinkler design is applicable, the authority having jurisdiction (AHJ) should be consulted as to the number of sprinklers in the design area. The protection goals for these spaces and input from the AHJ should lead to an appropriate hydraulic demand for the home.

A discussion with the architect, building owner, and/or insurance company might be necessary to determine if the requirements of NFPA 13D is appropriate or if the minimum requirements of NFPA 13D should be exceeded based upon the attributes of this specific residence.

Question #4 – Dry System and the Room Design Method

Quick response sprinklers on a dry system are to be used to protect a two-story employee housing occupancy in accordance with the 2019 edition of NFPA 13. The doors serving the dwelling units are not self-closing.

Can the room design method be used to calculate a dry-pipe system that contains dwelling units?

Yes, the room design method may be utilized with a dry pipe system using quick response sprinklers and serving dwelling units. There is no language in the room design section (Section 19.3.3.3) or other sections of NFPA 13 that would restrict this design method to wet pipe systems or to non-residential occupancies.

All conditions of the room design must be met including:

Walls must have a fire-resistance rating of 30 minutes per Section 19.3.3.3.3 and Table 19.3.3.1.2

As the doors are not self-closing, the provisions of Section 19.3.3.3.5 (2) must be met. (Two sprinklers in the communicating space nearest each opening must be included in the calculation)

Additionally, as the occupancy is residential dwelling units, the water delivery time for the dry system serving these units must be 15 seconds or less in accordance with Section 8.2.3.1.1.

It should be noted that the design area increases (30% for dry systems) do not apply when utilizing the room design method.



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Question #5 - Revamping Pipe Schedule Systems

A new full height demising wall being added to an existing warehouse that is protected with a pipe schedule fire sprinkler system. This new wall will bisect 60 existing branchlines. Due to this new demising wall, an additional sprinkler must be installed which would exceed the number of sprinklers per the pipe schedule.

Is it permissible to add a sprinkler on the other side of the new wall without increasing the pipe size as the demising wall would in effect create a new fire area?

No, the pipe sizes would need to be increased to meet the requirements of the pipe schedules. It does not appear that the presence of demising walls is accounted for in the pipe schedule method. Section 23.5.1.3 in the 2013 edition of NFPA 13 clearly indicates that the number of sprinklers on a given pipe size on a floor shall not exceed the values of the pipe schedule for a given occupancy.

As it was indicated that this is a warehouse occupancy, it must also be noted that the pipe schedules can only be used with K5.6 sprinklers (see Section 23.5.1.2). This section also specifically states that new extra hazard occupancies be hydraulically calculated. Pipe schedules are permitted to be used for extensions to existing pipe schedule systems (as described in Chapter 11) however, it may be prudent to ensure that the existing system is adequate for the hazard being protected.

Question #6 - Pressure Tank Aboveground Housing Requirement

The 2013 edition of NFPA 22, Section 7.1.9 (Housing) states that where subject to freezing, the pressure tank shall be located in a substantial noncombustible housing.

If the pressure tank is insulated and heated and is located aboveground, does this pressure tank need to be located within a substantial noncombustible housing per 7.1.9.1 or can it be exposed to the elements?

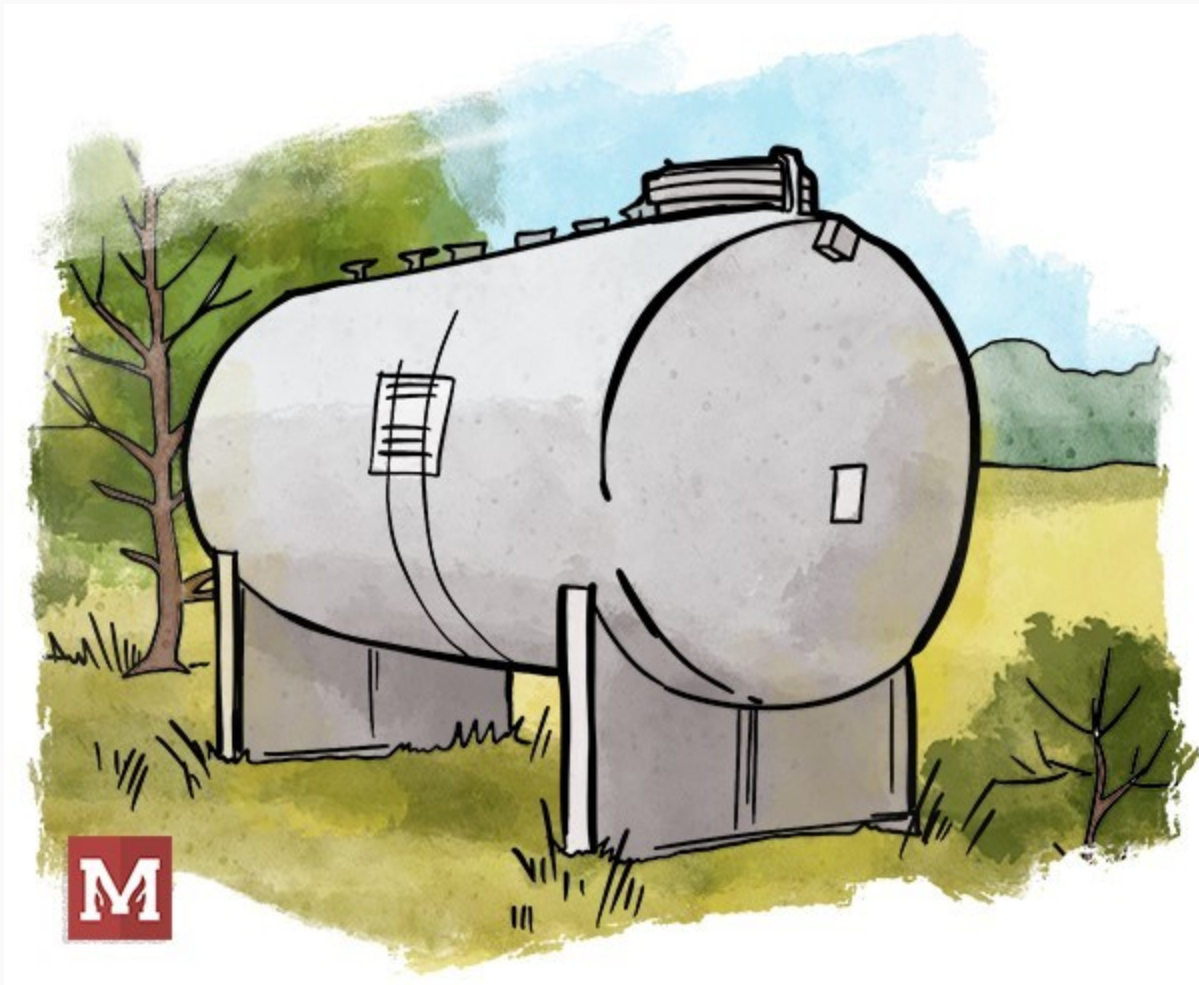
This is a question that would require a discussion with the AHJ. The prescriptive requirements of Section 7.1.9 of the 2013 edition of NFPA 22 require that all pressure tanks subject to freezing shall be in a substantial noncombustible housing with the required access and clearance all-around of 18 inches (7.1.9.2), 3 ft above floor (7.1.9.3), watertight floor with provisions for draining (7.1.9.4), and heat and lighting (7.1.9.5).

As it was indicated that the tank is insulated and includes a heating element, the argument can be made that this tank is not “subject to freezing” and therefore the provisions of 7.1.9 would not apply. However, as stated above, this is something that needs to be discussed with and approved

by the AHJ.

Section 4.6.2 already requires that the layout of all tanks be submitted to the AHJ for approval. As part of this approval, heat loss calculations must be provided to ensure that the insulation and heating provision are sufficient. While not specifically addressed in this section, as the insulated pressure tank will be exposed to the elements, it should be noted that the exterior (insulation) needs to be appropriate for an exterior environment and would not be subject to degradation in this exterior use.

Also, in keeping with the noncombustible housing portion of Section 7.1.9 it would appear that the insulation itself would need to be noncombustible.



Question #7 – Hydraulic Calculations for a New Freezer

A new freezer is being installed in an existing warehouse which is equipped with an existing sprinkler system. The existing sprinklers are connected to the branchlines with $\frac{3}{4}$ inch outlets.

New sprinklers are to be installed in the freezer as follows: the existing $\frac{3}{4}$ " sprinklers are to be removed from the existing outlets, a tee is to be installed with new upright above the freezer, and using the same tee, pipe down to a dry pendent into the freezer. The applicable standard is the 2007 edition of NFPA 13,

When performing the hydraulic calculations, is it permitted to calculate only one level, or is it required to include both the uprights and dry pendants that are within the design area?

Based upon the description, the area above the freezer and the area within the freezer are considered separate and the hydraulic calculations would not need to include both the uprights (above freezer) and the dry pendants (within the freezer) in a single calculation.

The reasoning is that a fire in the freezer is not expected to activate sprinklers outside the freezer and a fire outside the freezer is not expected to operate sprinklers within the freezer. This concept is found in the 2007 edition of NFPA 13 in Section 22.4.4.5.5 and its annex section. This section states that in the case where two separate areas are supplied from a common set of branch lines, the branch line must be calculated to the largest water demand.

Additionally, as this is an existing system at the ceiling level where additional sprinklers are to be added to the existing branch lines to feed the dry pendants in the freezer, Sections 8.15.19.4 (for existing pipe schedule systems) and 8.15.19.5 (for hydraulically calculated systems) needs to be reviewed. The section pertains to revamping of existing sprinkler systems as described. Assuming the arrangement is similar to that illustrated in Figure 8.15.19.4.3 (two sprinklers fed by a $\frac{3}{4}$ -in nipple not exceeded 4-inches) then hydraulic calculations to verify that the design flow rate is required per Section 8.15.19.4.3, Section 8.15.19.5.2 and Section 8.15.9.5.3.

It should be noted that a new annex section was added to the 2010 edition of NFPA 13 which states that "it is not the intent of this section to require a full hydraulic analysis of the existing piping system in addition to new sprinkler layout."

Based upon the above, a calculation for new portion (freezer) should be performed as well as a separate calculation proving that the required design flow to the ceiling sprinkler (if using a $\frac{3}{4}$ inch nipple as illustrated in Figure 8.15.19.4.3) is achieved.

Question #8 – Individual or Grouped Obstruction

A sprinkler system in accordance with the 2019 edition of NFPA 13 is being designed for a

facility with light, ordinary, and storage occupancies. Standard spray and Control Mode Specific Application (CMSA) sprinklers will be used.

For areas utilizing standard spray uprights/pendants and CSMA sprinklers, what is the minimum distance required between similar objects (pipe conduits, cable trays, refrigeration lines) to be considered individual objects for obstruction? Is there a different recommendation when protecting in light and ordinary hazard compared to storage applications?

The prescriptive requirements of NFPA does not provide a minimum distance between obstructions for standard spray or CMSA sprinklers to be considered individual objects. Also, there are no different requirements when protecting light and ordinary hazard occupancies compared to storage occupancies except for when using ESFR sprinklers.

NFPA 13, 2019 edition, does not address this question within the prescriptive requirements of the standard for standard spray or CMSA sprinklers.? The only place this is addressed in the standard is in Section 14.2.11.3.3 which is specific to ESFR sprinklers.? This section states for pipes, conduits, or groups of pipes and conduit to be considered individual, they shall be separated from the closest adjacent pipe, conduit, cable tray, or similar obstructions by a minimum of three times the width of the adjacent pipe, conduit, cable tray, or similar obstruction.?

The committee discussed including similar language for standard spray sprinklers, but never took action to include in the standard.

It should also be noted that FM Data Sheet 2-0, Installation Guidelines for Automatic Sprinklers, Section 2.5.2.5.3 addresses this issue. This section which is titled “Individual or Grouped Objects Located Below Ceiling-Level Non-storage Pendant and Upright Sprinklers” indicates that an object can be considered to be individual if it is located a minimum of 3 times its width from an adjacent object that is either the same size or larger. See Figure 2.5.2.5.3.1 for an example of applying this guidance. If, however the distance between the two objects is less than 3 times the width of the smaller object, the obstructions would be considered to be “grouped”. See Figure 2.5.2.5.3.1 for an example of applying this guidance. The width of this “grouped object” would be the collective sum of each of the objects. In other words, the open space between the objects do not need to be included.



Question #9 – Garage in NFPA 13R

In a building to be protected in accordance with the 2016 edition of NFPA 13R, there is a series of garages, each exceeding 500 square feet, that serve only specific dwelling units but are not directly connected to the dwelling units. One garage is only accessible from the exterior and the other garages are from a shared corridor, but all are accessible to occupants from one dwelling unit only.

As these garages are not directly connected to the actual dwelling unit, are they required to be protected per NFPA 13 instead of 13R?

No, as all of these garages are accessible from a single dwelling unit only, they are considered as part of the dwelling (see Section 7.3.3) and can be protected in accordance with Section 7.3.3.1.

There is no requirement that in order to apply Section 7.3.3 that the garage must open directly into a single dwelling unit. In fact, the 2019 edition clarified this concept and added a new section (7.3.4) which states that garages that are "accessible from a single dwelling unit" are considered part of that dwelling unit. The annex to this new section states that this section applies to both garages directly connected to the dwelling unit and to garages that are served by a common hallway as long as the access is limited to a single owner or tenant.

Although this substantiation speaks about garages "from a shared hallway" the concept would be the same for a garage accessed from the exterior as long as the access is limited to a single dwelling unit.

Question #10 – Water Storage Tank Sizing

A water storage tank feeding a sprinkler system is connected to the municipal water supply. It is understood that the tank capacity must meet the system demand for the required duration.

Is it permissible to reduce the tank size based upon the flow entering the tank from the municipal water supply?

Yes, as long as the refill mechanism is automatic and is considered "reliable" the refill rate can be included in the tank size capacity.

This concept is found in Section 4.1.6 of the 2018 edition of NFPA 22. This section states that the tank capacity may include the: "stored supply plus reliable automatic refill" in order to meet the system demand for required duration.

It should also be noted that if this tank is considered a suction tank, the total capacity is measured from the inlet of the overflow to the level of the vortex plate as noted in Section 4.1.4



Question #11 – Test Header for Fire Pump

Can a “Storz” type outlet be used in lieu of hose valves in a test header for a fire pump?

Yes, Storz type hose valves can be used in lieu of 2-½” threaded connections if approved by the AHJ and equipped with a control valve on each outlet where more than one is required.? Table 4.28(a) in the 2022 edition of NFPA 20 provides the number and size of required non-threaded connections as well.? Note (5) indicates other types of test outlets, sizes, and quantities are permitted when approved by the authority having jurisdiction.? Note (d) indicates to provide a control valve on each outlet where more than one non-threaded connection is required.

For 1,250 or 1,500 gpm rated fire pumps, Table 4.28(a) permits the use of one 5-in. outlet.? For a 2,000-gpm rated fire pump, Table 4.28(a) requires two 5-in. outlets and note (d) requires each of them to be equipped with a control valve.

This concept (of non-threaded connections) was introduced in Table 4.28 (a) in the 2019 edition of NFPA 20 and is continued in the 2022 edition.?

Question #12 – ESFR sprinkler protection in obstructed construction

An ESFR system is being installed in a building with obstructed construction. Based upon the structural details of the building and the spacing requirements for the ESFR sprinklers, it is difficult to meet the requirements of the 2013 edition of NFPA 13.

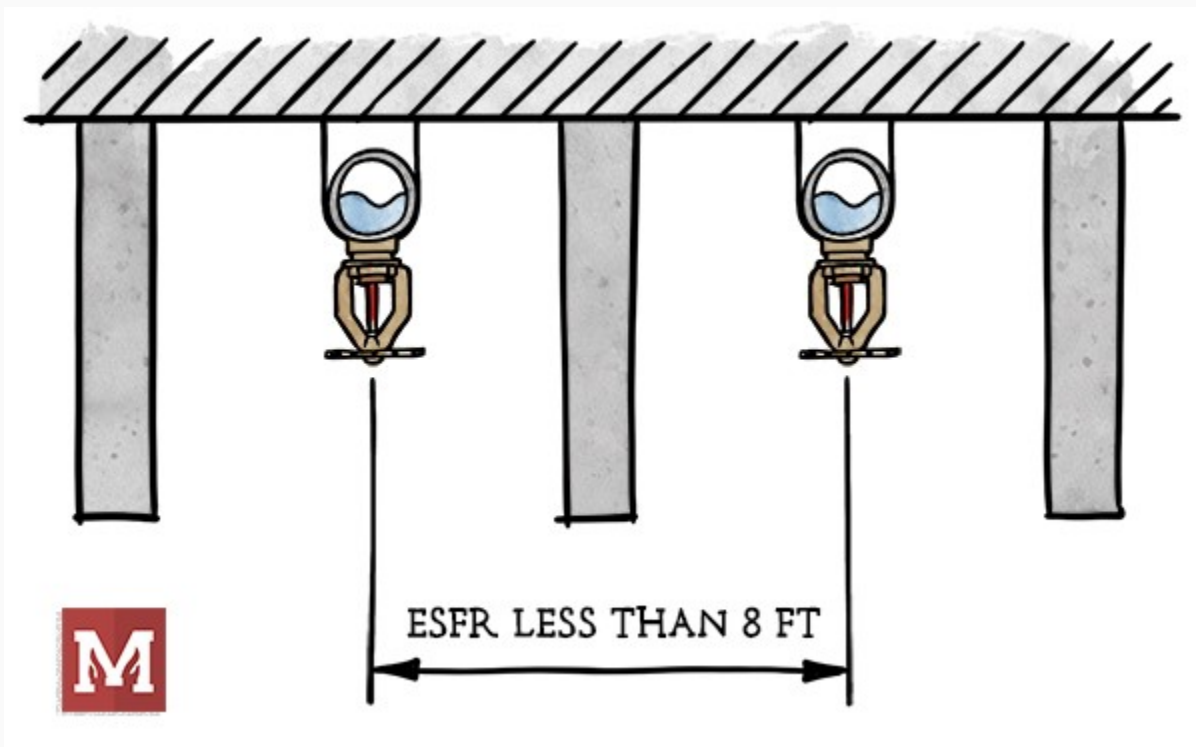
Is it acceptable to have ESFR sprinklers spaced at less than 64 square feet and less than 8 feet apart if separated by solid beams?

No, it is not acceptable to the 2013 edition of NFPA 13 to have ESFR sprinklers spaced less than 8-ft. on center and/or less than 64-sf per sprinkler.? Section 8.12.3.4 indicates sprinklers shall be spaced not less than 8-ft on center.? There is no provision in the 2013 edition to permit ESFR sprinklers to be spaced less than 8-ft on center even with baffles or solid members.? Section 8.12.2.3 indicates the minimum allowable protection area of coverage for an ESFR sprinkler shall not be less than 64-sf.? The 2013 edition did not provide any exceptions to the minimum spacing and minimum area of coverage for ESFR sprinklers.

This situation was however addressed and revised in the 2022 edition of NFPA 13. Section 14.2.8.3 indicates the minimum allowable protection area of coverage for a sprinkler shall not be less than 64-sf. However, Section 14.2.8.3.1 was added to indicate in buildings with unobstructed construction where sprinklers are located entirely above the bottom plane of an adjacent solid structural member, the requirements of 14.2.8.3 shall not apply to the sprinklers on either side of the solid structural member.

Section 14.2.9.4 indicates sprinklers shall be spaced not less than 8-ft on center. However, Section 14.2.9.4.1 was added to indicate in buildings with unobstructed construction where sprinklers are located entirely above the bottom plane of an adjacent solid structural member, the requirements of 14.2.9.4 shall not apply to the sprinklers on either side of the solid structural member.

Section 23.2 for the ESFR design criteria indicates the ESFR design criteria shall be selected from Section 23.3 through Section 23.6 and all design areas shall consist of the most hydraulically demanding 12 sprinklers, with four sprinklers on each of three branch lines, unless otherwise specified.



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National News



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And, we look forward to a prosperous new year, bring on 2022!

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Layout Technician Training

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- No more post-assessments
- Time change (12:30 Eastern)
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- Additional technical webinars will be available at varying times

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