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

TechNotes

Editor - Roland Asp, CET #539 07/09/2024

Best of June 2024

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 June 2024. This information is being brought forward as the "Best of June 2024." 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 - 3 Times Rule- Standard Spray Sprinkler

In reference to Figure 8.6.5.2.1.3 (B) of NFPA 13 (2013), what is the minimum distance of a sprinkler to a column regardless of the dimension of the column? Is it 24 inches?

Yes, in accordance with Section 8.6.5.2.1.3 (three-times rule) of the 2013 edition of NFPA 13, the maximum distance between a sprinkler and an obstruction in the vertical orientation (column) is 24 inches. This requirement is found in Section 8.6.5.2.1.3 (B) which states that the maximum clear distance required is 24 inches.

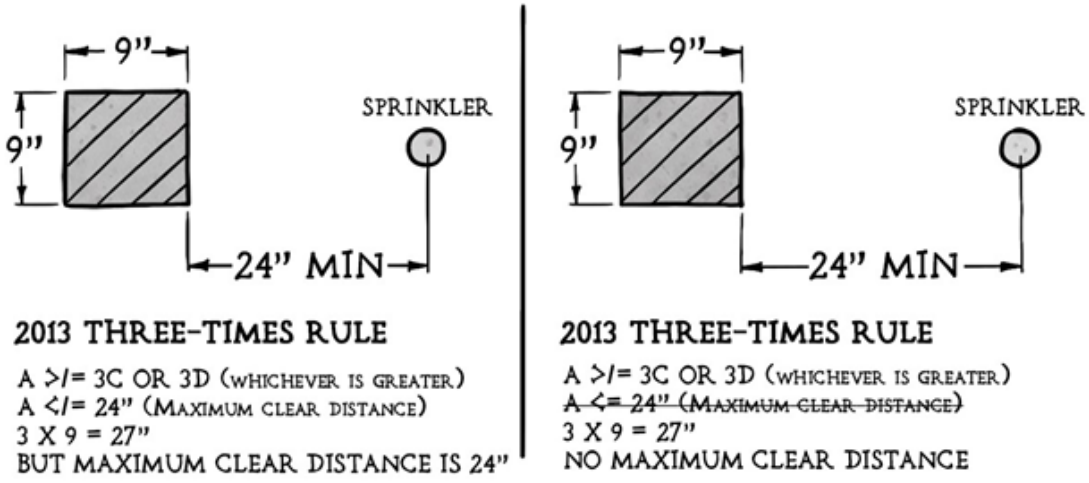
It must be noted, however, that this requirement was changed in the 2016 edition (and all subsequent editions) of NFPA 13. Starting in the 2016 edition, the 24-inch maximum clear distance was removed for obstructions in the vertical orientation such as columns. This means for obstructions such as columns, the minimum distance from the sprinkler to the column is solely based upon the three times rule. As an example, if a column was 10 inches by 10 inches the sprinkler would need to be located 30 inches from the column to meet the requirements of 8.6.5.2.1.3.

To explain this change, the following is an excerpt from the issue #328 of NFSA's TechNotes which was published on October 2, 2015, and was titled: Changes in the 2016 Edition of NFPA 13 Installation Criteria."

Minimum Distance from an Obstruction in the Vertical Orientation (8.6.5.2.1.3). *When applying the rules of 8.6.5.2.1.3, commonly known as the "three times rule", the maximum clear distance of 24 inches has been eliminated for obstructions in the vertical orientation such as columns. Work by the NFSA E&S committee task group on shadow areas and fire testing has shown that there is an issue with the maximum clear distance of 24 inches allowed by the "three times rule". This testing showed that when this maximum clear distance allowance is used to locate sprinklers from large obstructions, the fire may not be controlled. As this testing was limited to vertical columns the elimination of the maximum clear distance is limited to obstructions in the vertical orientation.*

Similar changes were made to this rule ("three times rule" and "four times rule") for other sprinkler types as well.

It is important to note that this revision does not change the base three times rule or four times rule but will only remove the maximum clear distance to obstructions in the vertical orientation such as columns. This proposed change would only become applicable when applying this rule to large vertical obstructions in excess of 8 inches (or 9 inches for the four times rule). The three times or four times rule may still be applied to these large columns without utilizing a maximum clear distance allowance of 24 or 36 inches.



THREE-TIMES RULE FOR OBSTRUCTIONS IN VERTICAL ORIENTATION
2013 EDITION (AND EARLIER) OF NFPA 13 VS. 2016 EDITION (AND LATER)

Question #2 - Sprinkler Omissions in Closets

In a Light Hazard space (hallway), there is a closet under 5 square feet.

Is it acceptable to omit a sprinkler in this closet in a building covered by 2016 edition of NFPA 13 due to the tight nature of the space?

No. Generally, sprinkler installation is required in closets, but there are specific exceptions depending on the occupancy or use of the building.

NFPA 13 exempts closets less than 24 square feet within hotel and motel dwelling units and closets in hospital patient rooms that are less than 6 square feet. Outside these specific examples, sprinklers are generally required in closets regardless of size. There is an installation exception for closets under 400 cubic feet, allowing a sprinkler to be placed in the ceiling without considering obstructions.

Additionally, there are exceptions for tight spaces, but these only apply to sprinklers in concealed spaces.

Question #3 – Fire Pump Testing

We have a project where calculations show the fire pump will only be able to flow around 130% of its rated flow when we go to test. We want to confirm this is acceptable per Section 14.2.6.2.4?

Yes, this is acceptable per NFPA 20, 2016 edition, Section 14.2.6.2.4 as long as the maximum flow demand of the fire protection system(s) can be met as well.

Section 14.2.6.2.4 indicates where the maximum flow available from the water supply cannot provide a flow of 150 percent of the rated flow of the pump, the fire pump shall be operated at the greater of 100 percent of rated flow or the maximum flow demand of the fire protection system(s) maximum allowable discharge to determine its acceptance.

In this case, if acceptance testing the fire pump at 130% of the rated flow of the pump also satisfies the maximum flow demand of the fire protection system(s), Section 14.2.6.2.4 considers this an acceptable test even if 150% of the rated flow of the pump cannot be achieved do to the available water supply.

Section 14.2.6.2.4.1 goes on to indicate this reduced capacity shall constitute an acceptable test, provided that the pump discharge exceeds the fire protection system design and flow rate.

Question #4 – Protection Criteria Class I Through Class IV Commodities Stored Up to 12 feet in Height

Is there anything in NFPA 13, 2019 that allows us to use Table 4.3.1.7.1 which is titled *Discharge Criteria for Miscellaneous Storage Up to 12 ft in Height* for non-miscellaneous storage (Class I – IV) that does not exceed 12 feet in height?

Yes, NFPA 13, 2019 edition, Section 4.3.1.7 for protection criteria for miscellaneous and low-piled storage in 4.3.1.7.1 indicates the protection criteria for miscellaneous and low-piled storage protected by ceiling sprinklers only shall be selected from Table 4.3.1.7.1 and Figure 19.3.3.1.1 in accordance with the density/area method of 19.3.3.2. Even though Table 4.3.1.7.1 is labeled with a header indicating *"Table 4.3.1.7.1 Discharge Criteria for Miscellaneous Storage Up to 12 ft (3.7 m) in Height"* as noted in the body of the standard in Section 4.3.1.7 this table is applicable to low-piled storage as well.

Question #5 – Open-Grid Ceiling Sprinklers Above and Below Ceiling

A waffle grid ceiling is deeper than its least dimension of the opening, so it cannot be treated as an open-grid ceiling. Sprinklers were installed above the ceiling, and below the waffles.

Should the lower-level sprinkler have a water shield to avoid cold soldering?

Yes, it is permitted and advisable to install intermediate type sprinklers with water shields for sprinklers installed below open grid ceilings when sprinklers are also installed above that open grid ceilings. While not directly applicable, NFPA 13 (2016) Section 8.5.5.3.4 dictates that sprinklers installed below open grating shall be intermediate/rack type sprinklers or otherwise shielded from discharge from above. While this section applies to open grating walkways the intent still applies to open grid ceilings.

Question #6 - Tire Storage Piling Method

Table 18.4(a), (1)(a) in the 2013 edition of NFPA 13 describes a piling method of pyramid piles, on-side.

Is this saying that the tires "have" to be stacked on side or is this an alternative? Is on-side is the only way tires could be pyramid stacked?

When Table 18.4(a), (1)(a) describes the storage arrangement as *"Pyramid piles, on-side"*, it is describing tires stored in a pyramid configuration which provides stability (see definition in 3.9.4.8) and the tires are stored on their sides. In order to use the design criteria for *"Pyramid piles, on-side"* the tires must be stored on-side.

On-side is not an alternative to pyramid piles. If this was the case, it would be noted as "*Pyramid piles or on-side."* See Table 18.4(a), (3) for an example. This section is describing Palletized portable rack storage with tires stored either on-side or stored on-thread. As can be seen, this alternate storage arrangements are described as *"On-side or on-thread"*

To answer the second question, pyramid piles could include tires stored either on-side or on-thread. In fact. Exhibit 3.45 of the 2013 edition of the *Automatic Sprinkler Systems Handbook* shows an example of a pyramid pile of tires stored *on-thread*.

Question #7 – Regenerative Air Dryer

In a refrigerated area, is it acceptable to use a regenerative air dryer to provide air, as a gaseous medium with galvanized piping, as an alternate to nitrogen to maintain a c-factor of 120?

No. The 2022 edition of NFPA 13 does permit a regenerative air dryer as an alternative to nitrogen as outlined in Section 8.8.2.4 (2). However, Table 28.2.4.8.1 only allows a C value of 120 when nitrogen is used. Therefore, the answer to your question is, no, a C-factor of 120 is not permitted when regenerative air dryer only is used.

To use the C factor of 120, nitrogen must be used in accordance with Section/Table 28.2.4.8.1. Condition #13 (new in the 2022 edition) in Section 28.2.4.8.1 states the C value of 120 is (only) permitted where nitrogen is provided in the system in accordance with Section 8.2.6.9 and all the conditions outlined in this section are met. It's worth mentioning that the 2025 edition of NFPA 13 will likely allow a C-factor of 120 when a vapor corrosion system is used. But the 2025 edition will not specifically address the regenerative air dryer.

Question #8 – Design Criteria for Exposed Expanded Plastic

What is the design criteria for storage of Exposed Expanded Plastic up to 35 feet and maximum ceiling height of 40 feet in the 2019 edition of NFPA 13?

The 2019 edition of NFPA 13 has exposed expanded Group A plastics criteria for using K-25.2 ESFR sprinklers in Section 23.7. It requires a 12-sprinkler design (Section 23.7.5) with 60 psi (23.7.6) to each sprinkler. A physical vertical barrier is required for this application (23.7.8) every 16 ½ feet. Please review this section in its entirety for additional details.

Question #9 – Exterior Canopy

A project includes a greater than four-foot exterior canopy that has non-combustible finishes but exposed plywood backing. All other elements are non-combustible.

Can a field applied coating complying with NFPA 703 be used on the plywood to avoid installing sprinklers inside and below canopy?

No, field-applied coatings do not meet the criteria in Sections 8.15.1.2.11 or 8.15.7 for fire retardant treated wood (FRTW). These rules specifically apply to FRTW and do not extend to fire retardant coatings applied in the field. NFPA 13 permits the use of NFPA 703-compliant FRTW, which is defined in the 2009 NFPA 703, Section 3.3.2, as a "wood product impregnated with chemicals by a pressure process." Therefore, by definition, FRTW must be pressure treated in a factory setting and cannot be achieved through field application.

While NFPA 703 does provide criteria and definitions for field-applied coatings, these coatings do not qualify as FRTW since they do not meet the pressure impregnation requirement. Consequently, untreated plywood in the concealed space is considered combustible, and field-applied coatings are not sufficient to avoid the installation of sprinklers.

However, covering the plywood with a limited-combustible material, such as drywall, would be a permissible alternative to omit sprinklers in this space. This approach ensures compliance with NFPA 13 and other codes without relying on field-applied coatings.

Question #10 – NFPA 24 - Control Valves

A site fire loop that feeds multiple fire risers. Does each line off of the site loop need a control valve per 6.2.1 of the 2022 edition of NFPA 24.

Yes, it is our opinion that each “lead-in” to a fire protection system fed from a site fire loop needs a control valve.

As noted, Section 6.2.1 states that “each pipeline from each water supply” must be equipped with a control valve. While the term “pipeline” is not defined in NFPA 24 it is defined in other NFPA documents as: “A length of pipe including pumps, valves, flanges, control devices, strainers, and/or similar equipment for conveying fluids” which would include the lead-ins to a fire protection system.

To support the above, Section 6.2.9 of the 2025 edition of NFPA 24 also states that: “All connections to private fire service mains for fire protection systems” must have a control valve and this section gives 8 options.

Question #11 – Fire Pump Acceptance Testing

For fire pump acceptance testing is it required to flow water and test with pitot gauges, or can a closed looped flowmeter be used?

Yes, NFPA 20 requires the initial acceptance test to include flow to the atmosphere and the use of known nozzles and a measured discharge pressure. The initial fire pump acceptance test is not permitted to use a flow meter to measure the flow or a closed loop system with discharge back to the suction side of the fire pump. This is to ensure the accuracy of the flow test flow rate and include testing of the water supply to the pump.

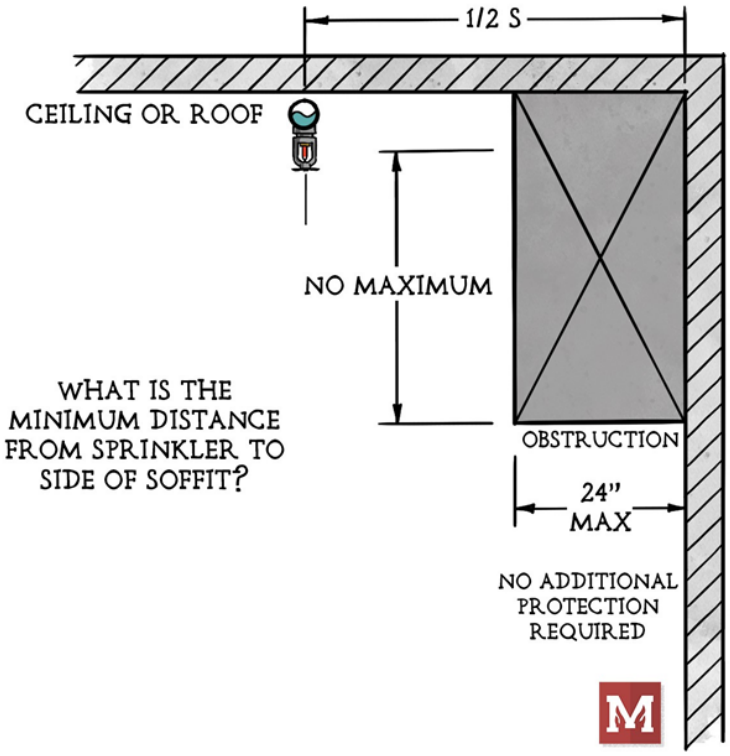
Question #12 – Obstructions Along a Wall

A project includes soffits along a wall that are under 24 inches or less. We didn't put a residential sprinkler under the soffit per Section 12.1.10.2 (b). Spacing of our residential sprinklers are 16 x 16 so ½ of S would be 8 feet.

8 feet is the maximum the sprinkler needs to be from the wall. How close to the soffit is the sprinkler permitted to be?

When applying the criteria in NFPA 13 (2022) Section 12.1.10.2, you are permitted to install sprinklers without regard to the soffit obstruction, the sprinklers must, however, be spaced to the wall behind the soffit properly. While you are permitted to be closer to the soffit, you must

still be a minimum of 4 inches away for maintenance purposes. Section 12.1.8.6.1 states “Sprinklers shall be located a minimum of 4 in. from an end wall." While this is a soffit and not a wall, the purpose of the minimum 4 inches is to allow for removal or reinstallation of the sprinkler in the future, and this would still be necessary for the distance to the soffit as well.



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