



TechNotes

Editor-Victoria B. Valentine, P.E.
February 10, 2015
Issue #312

Best of January 2015

Following are a dozen questions answered by the engineering staff as part of the NFSA's EOD member assistance program being brought forward as the "Best of January 2015." If you have a question for the NFSA Expert of the Day (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 a formal interpretation in accordance with the NFPA Regulations Governing Committee Projects and should therefore not be considered, nor relied upon, as the official position of the NFPA or its Committees. Unless otherwise noted the most recent published edition of the standard referenced was used.

Question 1 – Diameter for the “10 Times Rule” with Fire Pump Suction Piping

A 500 gpm fire pump with a 5-inch suction flange will be supplied through a 6-inch backflow preventer. Does the NFPA 20 Section 4.27.3 requirement to place the backflow assembly at least 10 times the pipe diameter away from the suction flange apply to the diameter of the backflow preventer outlet or the pump suction inlet?

Answer: The diameter of the actual pipe selected to supply the pump should be used. The language of the standard is based on pipe diameter. The *minimum* pipe size permitted to supply the pump, given in Table 4.26(a), is 5 inches but 6-inch pipe with an eccentric reducer at the suction flange would be permissible as well. Whichever option is used, the pipe diameter would dictate the distance between the backflow assembly and the pump suction flange. For this example, 50 inches would be required (10 x 5 inch).

Question 2 – ESFR Sprinklers Closer than 8 Feet

Can ESFR sprinklers be installed closer than 8 feet from one another if baffles are provided?

Answer: In short, no. The minimum acceptable distance between ESFR sprinklers is 8 feet, regardless of the existence of solid structural members or baffles between the sprinklers. There is no language in NFPA 13 Section 8.12 that permits the installation of ESFR sprinklers closer than 8 feet apart when baffles are present. In fact, NFPA 13 Section 8.4.6.3 states that where ESFR sprinklers are being used with obstructed types of construction more than 12 inches deep, the sprinklers need to be in every channel formed by the structural members and the sprinklers still must be at least 8 feet apart.

The concern is not just one sprinkler spraying on the adjacent sprinkler. Instead, in occupancies where high challenge fires are possible, the concern is that the water droplets that leave the sprinkler and head down to the floor might be picked up by the vertical momentum of the fire plume and deposited on a nearby sprinkler. Tests have shown that this effect can be minimized by putting the sprinklers at least 8 feet apart.

Question 3 – Pipe Couplings Subject to “3 Times Rule”

There is a 1½-inch grooved pipe coupling on a cap at the end of a branch line with a sprinkler 6-inches from the end of the pipe. Is the pipe coupling considered with regards to the 3 times rule with regard to the placement of the sprinkler?

Answer: No. With regard to Standard Spray Upright and Standard Spray Pendent sprinklers, NFPA 13 Section 8.6.5.2.1.8 states that “the requirements of 8.6.5.2.1.3 (three times rule) shall not apply to sprinkler piping less than 3 inches”. As long as the branch line is less than 3 inches (the coupling is 1½-inch) you are not required to follow the 3 times rule in reference to the coupling.

When Section 8.6.5.2.1.8 says that piping less than 3 inches in diameter can be ignored, it also means that the associated fittings, caps, couplings, and other parts that make up the piping network can be ignored as long as the pipe is a nominal 2½ inches in diameter or smaller.

Section 8.16.2.3 is another good example. It says that “piping” in dry-pipe systems needs to be pitched. This has to be interpreted as the whole system including couplings, caps and valves. Otherwise, if you interpret it as only the pipe needs to be pitched, we would be allowing water to be trapped in level sections where there are couplings, fittings, and valves. But rather than saying that, “piping, couplings, fittings and valves need to be pitched towards a drain”, we simplify the subject and the term “piping” to incorporate all of the other items as well.

Question 4 – NFPA 13R Bucket Test

A local AHJ has requested a “bucket test” to verify that a NFPA 13R sprinkler system will perform in accordance with its hydraulic calculations. Is this required by the standards?

Answer: No, NFPA 13R does not require a “bucket test” nor does the International Building Code. The initial assessment of the water supply and hydraulically calculated system demand are

deemed sufficient by the standard for the modeling of system behavior. The only acceptance tests required by NFPA 13R are those detailed in Section 10.2. Any requirement to perform a “bucket test” would typically originate from the authority of a state or local ordinance.

Question 5 – Sizing Water Supplies

A one million square-foot Type IIB building project involves a fire pump and ESFR sprinklers. The governing standards are NFPA 13 and IBC/IFC. Does NFPA 13 or IFC Appendix B take precedence when determining the size of the water storage tank?

Answer: NFPA 13, as adopted by Section 903 of IBC/IFC, is the appropriate basis for determining the system demand and duration of water supply required. IFC Appendix B is a suggested or guidance document and not part of the enforceable building/fire codes unless specifically adopted. Whereas NFPA 13 provides a prescriptive design standard for the specific ESFR sprinkler system, Appendix B is more of a general planning document for the fire suppression services.

Question 6 – Sprinklers Under Two Tiers of Obstructions

In an ESFR project, some sprinklers are obstructed by ducts over 2 feet wide. In certain areas, there are two tiers of ducts one below the other (one at 24 feet above the floor, another at 18 feet above the floor). NFPA 13 Section 8.12.5.3.1 requires sprinklers under continuous obstructions. Is it necessary to provide sprinklers under both levels of obstructions created by the two tiered duct arrangement?

Answer: Yes, by the letter of the standard, each duct is a separate obstruction, however, a good argument could be made to the AHJ that the *intent* of the standard is to assure that water reaches the stored combustibles under the ESFR system. As there are no expectations of storing combustibles between the tiers in this particular case, a sprinkler placed under the *upper* tier duct is essentially doing nothing more than protecting the top of the duct directly beneath it. It is the sprinkler located under the *lower* duct that is providing protection to the combustibles stored below in support of the obstructed ceiling sprinklers.

Question 7 – Dumbwaiter System

Which provisions of NFPA 13 should be applied to protect a dumbwaiter system and its associated vertical shaft?

Answer: A dumbwaiter is essentially a special use elevator subject to ASME A17.1 so the requirements found in Section 8.15.5 Elevator Hoistways and Machine Rooms would apply. The presence of the dumbwaiter car itself along with its supporting electrical and mechanical systems in the shaft would reasonably require that the rules applicable to hoistways be applied rather than the rules for simple open vertical shafts. The typical sprinkler requirements at the top and bottom of the shaft could be exempted or modified depending on the specifics of the dumbwaiter itself.

Question 8 – Replacement Circulation Relief Valve

Two fire pumps in an existing series arrangement serving a 35-story building are in need of new circulation relief valves. The high zone pump has a discharge pressure of 334 psi at the demand flow. Suitable replacement circulation relief valves are only available listed for use up to 400 psi with a maximum set pressure of 300 psi. What is the appropriate set pressure for the replacement high zone valve and will opening at 300 psi or less interfere with the pump's performance at the demand flow of 334 psi?

Answer: This can most accurately be answered by the pump's installation and maintenance documents or by the pump manufacturer directly. Since the purpose of the recirculation valve is to provide cooling for the pump rather than to substantially limit discharge pressure, it is probably safe to assume that the small amount of water bled off by the recirculation valve would not have a major impact on the discharge flow and pressure but the definitive answer would have to come from the manufacturer.

If it is determined that this recirculation valve should *not* operate below the maximum rated flow of 334 psi and no such listed valve is available, it would be necessary to discuss acceptable alternative options with the pump manufacturer and the AHJ.

Question 9 – Omitting Sprinklers on Lanai

A 3-story garden style apartment project of Type IIIB construction is to be protected in accordance with NFPA 13R. A balcony portion of the dwelling units is identified by the architect as a "lanai". These balconies are only accessible from the dwelling units and are open to the exterior. The amount of open is dependent on the configuration of the lanai. Can sprinklers be omitted from the lanai as per Section 6.9.5?

Answer: Yes, these areas would not require sprinkler protection. Section 6.9.5 states that sprinklers are not required in any porches, balconies, corridors, and stairs that are open and attached. The term lanai is defined in Merriam-Webster's 11th Collegiate Dictionary as a porch or veranda and this definition would apply to Section 6.9.5 of the standard. The word "open" in this section is intended to apply to areas that are open to the outside atmosphere. There is no set percentage that the balcony is required to be open for Section 6.9.5 to apply.

A requirement to sprinkler areas outside the building would require the use of dry systems which would drastically increase the cost of the sprinkler system. As few deadly fires start in areas outside the building, this increased cost would not result in a corresponding increase in life safety.

It should be noted that if the construction of this building was of Type V (wood frame) construction, the IBC Section 903.3.1.2.1 would require this space to be provided with sprinklers

if the balcony has a roof or ceiling above. This requirement was added to the 2013 edition of NFPA 13R. As the building is of Type IIIB construction, this requirement would not apply.

Question 10 – High-Rise Building Occupiable Floor Height

A proposed building has an occupiable floor height of 64 feet above street level if the mechanical penthouse is disregarded or 78 feet if you include it as per NFPA 14 Section 14.3.3.6.

Should the mechanical penthouse level be considered an “occupiable story”, requiring the building to be protected as a high-rise?

Answer: Yes, by the letter of the standard, a mechanical penthouse is an occupiable space. However, it should be noted that the definition included in Section 3.3.6 is an extract from NFPA 5000 3.3.69.10 which includes some useful commentary annex language.

A.3.3.69.10 High-Rise Building. It is the intent of this definition that, in determining the level from which the highest occupiable floor is to be measured, the enforcing agency should exercise reasonable judgment, including consideration of overall accessibility to the building by fire department personnel and vehicular equipment. Where a building is situated on a sloping terrain and there is building access on more than one level, the enforcing agency might select the level that provides the most logical and adequate fire department access.

An AHJ might reasonably determine that the mechanical penthouse, although technically “occupiable” will only occasionally be occupied and typically only by trained maintenance personnel. With this in mind, it might be possible to avoid classifying the entire structure as a “high-rise building” based simply on the penthouse floor exceeding 75 feet.

Question 11 – Back-Up Power for Electronic Accelerators

Does NFPA 13 require emergency power for an electronic accelerator installed on a dry pipe system?

Answer: No, electronic accelerators do not need emergency power. They are provided with battery back-up as a part of their design.

The sprinkler system will operate upon activation of the sprinklers. The air may not evacuate as quickly as intended if power to the accelerator is lost. Yet, the battery in the device is sufficient back-up and loss of power should not be an issue.

Question 12 – Painting Sprinkler Piping

Does NFPA 13 require sprinkler piping to be painted?

Answer: No, NFPA 13 is typically the standard used for installing a fire sprinkler system. However, even through other NFPA standards there is not a requirement that the fire sprinkler piping would have to be painted. I have seen paint used as a barrier so that the piping material is not exposed to the "air" of the space where the system is installed. In some instances, this can reduce the corrosion of the pipe exterior. There are also applications where the piping is painted for aesthetics or identification purposes. For example, all piping for fire protection systems may be designated red and then in a ceiling where there are multiple piping systems identification is simpler. Yet, there is nothing in the standards that says the pipe has to be painted.

It should be noted that an AHJ may require piping to be left *unpainted* until it has been inspected to verify its identifying markings.

NFSA Tuesday TechNotes is c. 2015 National Fire Sprinkler Association, and is distributed to NFSA members on Tuesdays for which no NFSA Technical Tuesday Online Seminar is scheduled. Statements and conclusions are based on the best judgment of the NFSA Engineering staff, and are not the official position of the NFPA or its technical committees or those of other organizations except as noted. Opinions expressed herein are not intended, and should not be relied upon, to provide professional consultation or services. Please send comments to Victoria B. Valentine, P.E. at valentine@nfsa.org.