NFSA The Voice of the Fire Sprinkler Industry TechNotes

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Best of June 2015

Following are a dozen questions answered by the engineering staff as part of the NFSA's Expert of the Day (EOD) member assistance program being brought forward as the "Best of June 2015." 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 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.

This is a redistribution of Issue #322 with Question #8 corrected.

Question 1 - Four-Times (4X) Rule for Obstructions
There is a building that is using extended coverage (EC) sprinklers, specifically uprights and pendents. There is an exit sign, which is 12 inches by 12 inches near one of the sprinklers. Following Section 8.8.5.2.1.3 in NFPA 13 (the four-times rule), is the sprinkler required to be 48 inches away from the sign?

Answer: No. This obstruction rule is generally used to ensure that water from the sprinkler gets to two sides of the obstruction (either above and below or to both sides). When applying the "four-times" rule the extended coverage sprinkler is required to be located four times the maximum distance of the obstruction up to a maximum of 36 inches. So in the case of a 12-inch obstruction, an EC sprinkler is required to be at least 36 inches away from the obstruction.

This maximum distance will allow for water to reach two sides of an obstruction. It may mean there will still be a small impact to the spray pattern from the obstruction, but the water is in the space. The cooling effect from the spray will work to control the fire even with the obstruction 36 inches away from the sign.

Question 2 - Height Requirements for Using NFPA 13R
What are the specific requirements for building height in order to use NFPA 13R? Also, where are these specifications located?

Answer: The decisions of whether NFPA 13R is appropriate for a specific building is dependent on the applicable building code and NFPA 13R. The 2013 edition of NFPA 13R does include more information than previous editions on when NFPA 13R is appropriate and this information is based primarily on the International Building Code (IBC) requirements. The scope of NFPA 13R, revised for the 2013 edition, states that it is appropriate for "residential occupancies up to and including four stories in height in buildings not exceeding 60 ft in height above the grade plane".

The height is not directly based upon the lowest level of fire department access, but on the grade plane which is defined in NFPA 13R in section 3.3.6 as:

> ***Grade Plane.*** *A reference plane representing the average of the finished ground level adjoining the building at all exterior walls. When the finished ground level slopes down from the exterior walls, the grade plane is established by the lowest points within the area between the building and the lot line or, when the lot line is more than 6 ft (1830 mm) from the building, between the building and a point 6 ft from the building.*

The height of a building above grade plane is determined by model building codes, which base the height on the average height of the highest roof surface above grade plane. Basically this means if the building has a flat roof, the building would be measure to the roof level. Where the roof is sloped, the height would be the average roof height of that slope. The NFSA also has a Video Expert of the Day (VEOD) on how to measure building height for NFPA 13R, "VEOD - Measuring Building Height for NFPA 13R - Jeffery M. Hugo, CBO". This can be found in the "Members Only" section of the website.

It should also be recognized that there are some jurisdictions, like the cities of Atlanta and New York, that have specifically allowed NFPA 13R to be used with a broader scope over the years (up to 6 stories), and the legally-adopted code takes precedence over the published scope of NFPA 13R as to where the protection of NFPA 13R can be applied.

Question 3 - Corrosive Water
Steel suction piping prior to the fire pump is galvanized or painted on the inside prior to installation with a paint recommended for submerged surfaces where corrosive water conditions exist. This fire pump is connected to a municipal water supply. Does the chlorine and other chemicals in the municipal water supply make this water a corrosive water condition?

Answer: No, chlorine and other additives added to the water at levels acceptable for potable water supplies does not rise to the level of a corrosive condition. All water is to some extent corrosive and the addition of chlorine may increase the corrosion to steel pipe. However, the water coming from the potable supply would not normally be considered a "corrosive condition". The corrosiveness of water usually is based upon such factors as pH, salts such as chlorides, and harmful gases such as carbon dioxide (CO_2) or hydrogen sulfide (H_2S) that is present in concentration greater then is found in potable water.

Question 4 - Intake Pipe for a Fire Pump
Figure B.1(x) of NFPA 22 shows an underground water tank feeding a vertical shaft turbine type pump. There is a pipe from the tank supplying water to a pump vault (wet pit). The vertical shaft pump intakes water from this vault. Should the pipe supplying the wet pit be sized for the system demand or 150% of the pump's rated capacity?

Answer: The intake pipe should be sized to handle 150% of the pump's rated capacity. This pipe is in effect a suction pipe and NFPA 20, Section 4.14.3.1 states that the size of the suction pipe shall be based upon the pump operated at maximum flow (150% of rated capacity).

Question 5 - FDC Location
The location of a fire department connection (FDC) varies with the type of fire sprinkler system that is installed. On a dry pipe system, why is it required for the FDC to be connected between the system control valve and the dry pipe valve of a system?

Answer: The answer is that if the FDC was located downstream of the dry pipe valve (the location where the FDC connects for a wet pipe system), the FDC check valve would be exposed to the supervisory air of the system on one side. The check valve required in the FDC piping is not "tight" enough to prevent air leaks. These air leaks would lead to the pressure maintenance device to be constantly running to keep up with the loss and could lead to false tripping of the dry pipe valve. Therefore, the FDC is on the supply side of the dry pipe valve, which means the check valve is exposed to the water supply pressure on one side instead of air.

Question 6 - Steel Column Protection
A building has steel columns that need to be protected using fire sprinklers. There are requirements for this type of protection in both NFPA 13 and NFPA 409. Can these requirements be applied interchangeably?

Answer: No, column protection must be provided in accordance with the requirements of the standard appropriate to the installation. If column protection is being provided in a hangar that is protected using NFPA 409, Section 5.6 of that standard must be followed. If column protection is being required in storage that is protected using NFPA 13, the appropriate requirements from that standard must be followed.

The concept of the requirements in each of the documents is similar. The surface of the column needs to be wetted from one side. However, the discharge rates are different in NFPA 13 than in NFPA 409. There are also differences in the required locations of the sprinklers and their required characteristics. This makes it important to use the protection scheme that is appropriate to the type of occupancy being protected - aircraft hangers or rack storage arrangements.

Question 7 - Different Temperature Ratings in One Compartment
There is a building with a space that will have a cloud ceiling. Fire sprinklers will be needed both above and below the clouds. Quick response standard spray upright sprinklers that have a temperature rating of 200F will be installed below the metal deck and above the clouds. Can the sprinklers installed below the clouds be rated for 155F even though those at the higher elevation have a higher temperature rating?

Answer: Yes. As Section 8.3.2.1 states in NFPA 13 "Unless the requirements of 8.3.2.2, 8.3.2.3, 8.3.2.4, or 8.3.2.5 are met, ordinary- and intermediate-temperature sprinklers shall be used throughout the buildings." As 200F quick response sprinklers are considered intermediate type sprinklers, they meet this section and are permitted to be installed in the area with the ordinary temperature sprinklers. The caveat is that the sprinklers have to have the same thermal sensitivity, which requires them either all to be quick response or all be standard

response. As long as the sprinklers below the clouds are also quick response sprinklers, they can be installed in the same space.

Question 8 - Clearance to Storage - REVISED
There is a storage room within an office building. Typically, the clearance from the standard spray sprinkler deflector would be 18 inches. Are there any exceptions to allow less than 18 inches clearance?

Answer: Yes. NFPA 13 requires the clearance to the top of storage be 18 inches or more for standard spray sprinklers in Section 8.5.6.1. This is done so that the storage does not interfere with the spray pattern of the fire sprinklers. There are no sprinklers currently on the market that have a listing with clearances less than 18 inches to the deflector as permitted by Section 8.5.6.4. However, if this concern is for the storage that is along a wall, Section 8.6.6.2 and its subsections note that the shelving against a wall and /or its storage is permitted to reach above the 18-inch clearance plane. Yet the storage cannot impede the sprinkler spray from reaching part of its coverage area. The water from the sprinkler would not be trying to spray beyond that high level of storage, but would be planned to protect the floor area as is done with other furniture. There are also benefits of the passive fire protection offered from the wall itself. Therefore, this is permitted when the storage is not directly below the fire sprinkler.

Question 9 - Fire Pump Serving Two Buildings
There is a situation where a single fire pump has been installed for a single building and it is being proposed to use the same fire pump and water supply for an additional building. Is it possible for a single fire pump and water supply to supply both buildings?

Answer: Yes, a single fire pump and water supply can be used to protect two different buildings. However, it really depends on the height of the two buildings. NFPA 14 requires a separate fire pump for each zone in Section 7.9.1, unless the lower zones have pressure regulating devices (as described in Section 7.2.4). Also, NFPA 20 requires very tall buildings to have redundant fire pumps in Section 5.6.2.

It should be noted that the fire pump and water supply would have to be sized for both buildings. Fire pumps provide the system demand for the buildings served. Each building system is designed for a fire event. For example, a NFPA 13 system is designed for a single fire in a building. If there are multiple buildings on a fire pump, each building has a "single fire" demand. A simultaneous fire of each building would have to be considered. While NFPA 14 does not have the same statement, the premise is the same. The fire pump would need to accommodate both buildings, which is really no different than a public or private water main.

Question 10 - Modifying an Existing System
An existing sprinkler system has plugged the old outlets and installed new mechanical tees. Does the entire system have to be hydrostatically tested at 200 psi for 2 hours?

Answer: No. NFPA13 Section 25.2.1.6 states that existing systems that are modified and the modifications cannot be isolated are tested at the working system pressure. The standard gives one example within the section of relocated drops, but it certainly is not limited to relocated drops and new mechanical tees would be another common situation where this applies. When the system was first commissioned, it was hydrostatically tested. Adding new mechanical tees would not significantly justify a reason to re-test the system above the working pressure. It would be very difficult and costly to isolate each mechanical tee and test it. The working pressure will be sufficient to confirm that the system is not leaking and is operational.

Question 11 - Pilot Line Hanger Spacing
A system is using a pilot line for detection of a deluge valve. The pipe for this pilot-line will be ½-inch schedule 40 steel. What spacing is used for supporting the ½-inch schedule 40 steel pipe?

Answer: According to Section 8.14.10 of NFPA 13, the supports or hangers are permitted to be installed from "the same points of hanger attachment as the piping system it serves." The pilot line is strictly used as a detection method. This means that many of the support concerns are not extended to this pipe. If the system piping were 2-inch diameter steel, then the hangers both for the system and the detection line would be permitted up to 15 ft apart following the spacing in Table 9.2.2.1(a).

Question 12 - Sizing Manual Wet Standpipes
Can the pipe schedule method be used for a manual wet standpipe system?

Answer:
No, hydraulic calculations must be used to size the piping for the standpipe system. NFPA 14 Section 7.8.1.2 requires the manual wet system to be sized to provide 100 psi at the topmost outlet. Hydraulic calculations are required by Section 8.2. Pipe schedule design was eliminated in the 2010 edition, and all standpipe systems are now required to be hydraulically calculated..