NFSA The Voice of the Fire Sprinkler Industry

TechNotes

Editor-Kenneth E. Isman, P.E. Issue# 268 June 11, 2013

Best of May 2013

This month, we have selected the following baker's dozen (13) questions as the "Best of May 2013" answered by the engineering staff as part of the NFSA's EOD member assistance program.

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. These 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.

Question 1 – Sprinklers in a Paint Spray Booth Duct

We are protecting multiple-row rack storage of Class IV commodity in accordance with Chapter 16 of NFPA 13. We have proposed in-rack sprinkler spacing of 12 ft between branch lines and 6.5 ft between sprinklers on the branch line. The AHJ has questioned our proposed in-rack sprinkler spacing because he says that the maximum allowable horizontal distance between sprinklers is 8 ft and we are violating that by going 12 ft between our branch lines. Is the AHJ correct in this case?

Answer: No. Section 16.2.1.4.2.2 of NFPA 13 (2013 edition, similar section in previous editions) specifies that the maximum horizontal spacing on branch lines is 8 ft (and that the maximum area limitation is 80 sq ft per sprinkler). Since your proposed spacing of in-rack sprinklers along the branch line is 6.5 ft and your maximum area is 78 sq ft (6.5 x 12 = 78), you meet the requirements of NFPA 13. The horizontal spacing between the branch lines is not regulated except for the issue of the maximum area of coverage of the sprinkler.

Question 2 – Remote Dry System Connected to Wet System

Can a dry pipe system for an ordinary hazard occupancy covering 10,000 sq ft at the remote end of a building from the water supply be connected to a wet pipe system covering the rest of the building (also ordinary hazard), which is 45,000 sq ft?

Answer: No. The purpose of section 8.2.1 is to limit the amount of area that would be unprotected when a single valve is closed. For ordinary hazard occupancies, the intent is to make sure that when a single valve is closed, no more than 52,000 sq ft of area per floor is taken out of service. In the situation that you have described, when the single valve on the wet pipe system is closed, it would take 55,000 sq ft of area out of service on a single floor, which would violate section 8.2.1.

One way to solve the problem would be to run a separate pipe out to the dry-pipe system from the water supply entrance. That would be a significant amount of extra pipe, but it would satisfy the standard.

Another way to solve the problem would be to connect a dry-pipe system to a wet system, as long as the total area downstream of the wet system does not exceed 52,000 sq ft. You could do this and save a great deal of pipe by splitting the portion of the building covered by the wet piping into two systems. This would cause you to install an extra set of wet system equipment (check valve, control valve, alarm and drain) but would save on pipe. No physical barrier or wall would be required between the two portions of the wet system.

Question 3 – Exit Signs and Residential Sprinklers

Can exit signs be ignored when using residential sprinklers?

Answer: No. Sections 8.10.6.2 (residential upright and pendent) and 8.10.7.2 (residential sidewall) do not have the same rules as do the standard spray upright and pendent sprinklers installed in light hazard occupancies. Obstructions when using residential sprinklers must meet Section 8.10.6.2 for upright and pendent or Section 8.10.7 for sidewalls. In this case, the four times rule (8.10.6.2.1.3 or 8.10.7.2.1.3) would apply. Depending on the size of the exit sign, you would need to place the sprinkler a distance from the sign of at least four times the width of the sign, up to a maximum of 36 inches.

Question 4 – Soffits Against Walls over 30 Inches Wide

If a soffit against a wall is more than 30 inches wide, are we required to put a sprinkler under it? We ask because Section 8.6.5.1.2(3) of NFPA 13 is only allowed to be used for soffits up to 30 inches wide.

Answer: No. Section 8.6.5.1.2 provides a series of options to the user. One of those options (number 3) is only allowed to be used with soffits up to 30 inches wide. For soffits over 30 inches wide, you have other options including the use of the beam rule in accordance with Table 8.6.5.1.2.

Question 5 – Swimming Pool as a Secondary Water Supply

Can we use a swimming pool to meet the requirements for a secondary water supply in a seismic zone?

Answer: Probably not. Whenever anyone asks the question about using a pool as a water supply for a fire protection system, we warn them about the following issues that would need to be overcome, which we think would be too difficult to deal with for a fire sprinkler system:

1. When sprinklers are installed in Seismic Design Category C, D, E or F there are multiple requirements for seismic bracing components of that system to insure the system stays in place during an event. We have concerns that an open source secondary supply, such as a pool, has undergone the appropriate level of scrutiny. Will the pool be able to withstand the seismic forces or will it crack and allow the water to leak out? How much of the water supply will slosh out of the pool during a seismic event? The answers to questions like these will generally prevent a pool from being used for a secondary supply for seismic purposes.

2. You must also ensure that the suction from the pool will not bring foreign material into the fire pumps. This will mean some sort of

strainer on the intake for the pump. NFPA 13 requires that the strainers be sized to be much larger than the diameter of the piping so that objects caught by the strainers don't cut off the flow of water to the pump while it is running. This is difficult to do with a pool.

3. Elevated chlorine levels – The water in the pool is generally going to have much more chlorine in it than treated city water. This will have a detrimental effect on pump packing, metallic parts of the pump and sprinkler systems, and rubber gaskets and seals in the piping. While there is no question that this will significantly increase the cost of maintaining the fire protection system, there are also no long-term studies that show that this exposure will allow the system to work. For example, it is possible that the sprinkler seats will corrode under the elevated chlorine level and stick closed; preventing the sprinklers from opening if there is a fire.

4. Safety of Swimmers – When the fire pump starts under a load condition such as a few sprinklers being open or a hose valve being opened, the is a significant suction in the body of water serving the pump that tends to pull down bodies in the water and keep them under water. While I'm not aware of a death from this happening in a pool due to fire protection, I am aware of such deaths happening from suction intakes for much smaller pumps that re-circulate pool water or Jacuzzi water. Special small multiple intakes had to be mandated for pool and Jacuzzi filtering systems to make sure that these deaths stopped. Such multiple small intakes for a fire pump would not be in keeping with NFPA 20.

5. Anti-vortex plates – NFPA 20 requires an anti-vortex plate to make sure that the water is not turbulent when it gets to the pump. Such a plate is not consistent with swimming pool design.

6. If you got through all of the above issues and still wanted to use the pool, you would have to set up an impairment procedure (see NFPA 25) to ensure that proper care is taken if the pool ever needs to be drained. If it becomes necessary to drain the pool (which happens frequently for pool maintenance) then the impairment procedures needs to be followed, which may require the building to be evacuated.

Question 6 – Head Guards

Are steel wired head guards required to be listed, and if so why?

Answer: Yes. This is clearly stated in NFPA 13 section 6.2.8 (2013 edition, similar section in previous editions), which states that sprinklers subject to mechanical injury shall be protected with listed guards. As for why, components are listed to ensure that they meet the appropriate standard or have been tested and found suitable for a specified purpose. For sprinkler head guards, this includes providing some level of protection from mechanical damage without disrupting the spray distribution pattern of the sprinkler.

Question 7 – Sprinklers Under Intermediate Stair Landings

Under section 8.15.3 of NFPA 13 regarding the protection of combustible stairs, do sprinklers need to be installed under intermediate landings?

Answer: No. This has been clarified in the 2013 edition of NFPA 13 where the text of section 8.15.3 has been modified to require sprinklers only at the

floor landings. Sprinklers at intermediate landings are not required except under the lowest intermediate landing where there might be storage. There is an annex note that encourages the sprinkler at the floor landing to be positioned so that it can spray towards the intermediate landing, but this is not legally enforceable. Even if the local authority is not using the 2013 edition yet, this should be considered as an interpretation of previous editions.

Question 8 – Flexible Couplings

Does section 9.3.2.1 requires us to use flexible couplings as the couplings for all pipe 2½ inch and larger when they are installed in one large building that has no separate sections or seismic separations?

Answer: No, however, there is a caution that will be discussed later in this response, so please read all the way to the end.. Nothing in NFPA 13 requires all couplings on sprinkler pipe to be flexible couplings. Even where flexible couplings are required by NFPA 13, you would never want to make all of the couplings on a pipe system flexible. The whole point of NFPA 13 is to keep the piping system rigid to the ceiling assembly above the pipe. If all of the couplings were flexible, the pipe would not stay in place using the bracing rules of NFPA 13 and the system would move significantly during an earthquake, causing serious damage to the sprinkler system and potential damage to surrounding portions of the building. See the opening statement in section 9.3.2.3 and section 9.3.5.3.7, which would require additional bracing at every other flexible coupling if you were to install the system with all flexible couplings.

The purpose of section 9.3.2.1 is to introduce the reader to the concept of flexible couplings. As a separate section, it is trying to tell the user that we are going to require flexibility in the system near locations where parts of the building will move differentially from each other. The specific list of where we will require the flexible couplings is in section 9.3.2.3. The intent of section 9.3.2.1 is just to be introductory material and not to have any specific requirement of its own. As introductory material without any specific requirement, it is probably better placed in the annex, but the committee has not gotten around to making that change.

If you go back to the 1999 and previous editions of NFPA 13, you will see that the material that is now in sections 9.3.2.1, 9.3.2.2 and 9.3.2.3 used to be in one section. This single section had three sentences, the first of which introduced the subject, the second gave a suggestion on placement and location, and the third gave the actual requirements. This made some sense and helped the user understand something that people in the sprinkler business were not all that comfortable with.

While writing the 2002 edition of the standard, the NFPA staff enforced a rule from the NFPA Manual of Style that said that no section was allowed to have more than a single sentence or idea. They broke the section up into three separate sections for each of the sentences and insisted that it did not create a difference in meaning. The committee did not have much of a choice in the matter, the staff forced the change on the committee. As you can see, the separation of the separate sentences into three separate paragraphs makes it harder to see that section 9.3.2.1 is not supposed to be a requirement of its own. It's just supposed to be introducing 9.3.2.3 and the list of places that you need flexible couplings.

Here's the caution that I mentioned earlier. Although you have one large building without separations, I'm sure that there are expansion joints in the

structure. As temperatures change, building components expand and contract and the structural engineer has to put expansion joints in the building to prevent the build-up of stress in the structural elements when materials expand and contract. Section 9.3.2.3(4) would require a single flexible coupling within 24 inches of each of these expansion joints. So you will need a few flexible couplings in your system. You will need to talk to the structural engineer to find out where these expansion joints are.

Question 9 – Plugging Sprinklers in Concealed Space

We are converting an old system that used to have upright sprinklers into one with pendent sprinklers below a drop ceiling. We will do it such a way that the upright sprinklers are still in the concealed space and are still functional. Since the concealed space is not required to be sprinklered (limited combustible construction), are we required to remove the upright sprinklers from the concealed space and plug the outlets where they used to be?

Answer: No. There is nothing wrong with leaving sprinklers in a non-combustible or limited combustible concealed space. Even though NFPA 13 does not require sprinklers in the concealed space, it does not prohibit them either. Having sprinklers in the concealed space is just extra protection, which is never a bad thing.

Question 10 – Distance from FDC to Check Valve

Within our company, we have always had a practice of putting a minimum of 4 ft of piping between the FDC inlets and the check valve prior to tying in the piping to the fire sprinkler system. We actually can't find this rule in NFPA 13. Is this an actual rule that we have to follow?

Answer: It's not a specific rule in the standard, but in areas subject to freezing, it is a very good practice to follow. Section 8.16.2.4.8 of NFPA 13 (2013 edition, similar sections in previous editions) requires a distance of a minimum of 4 ft in a heated area before drain lines go outside in areas subject to freezing. Even though the FDC is not technically a drain line, it is the same exact concern about making sure that water is not in the pipe too close to the outside where conduction might allow that water to freeze and do damage.

You are required to prevent water filled pipe from freezing. If you don't follow the 4 ft guideline for drains, then you would have to justify some shorter distance with some sort of calculation.

Question 11 – Rooftop Terrace and NFPA 13R

We are protecting a four story building in accordance with NFPA 13R. The building has stairs that go to the roof, where there is a rooftop terrace with a nice floor, but no ceiling or covering. Does the rooftop terrace make this a fifth floor and then negate the allowance for NFPA 13R?

Answer: No. The definition of a "story" in the NFPA codes and standards as well as the ICC Codes is, "That portion of a building included between the upper surface of a floor and the upper surface of the floor or roof next above." In your case, the rooftop terrace does not have a floor or roof above it. Therefore, the terrace is not a "story" and the building is still considered a four story building and NFPA 13R can still be used.

Question 12 – NFPA 13R and Limited Combustible Elevator Shafts

NFPA 13R allows sprinklers to be omitted from all noncombustible elevator shafts. But not all elevator shafts are noncombustible. The codes allow

Did You Know??

The NFSA keeps a member of the Engineering Department staff on duty every business day to answer your technical questions live. We call this the Expert of the Day (EOD) program and it is available to our members by phone, fax, or e-mail. Call us at (845) 878-4200 and press 5, or you can send a fax to (845) 878-4215, or you can e-mail us at eod@nfsa.org. Last year we answered more than 2600 requests for assistance.

elevator shafts to be of combustible construction with limited combustible sheathing (many layers of gypsum board on wood studs) in buildings of Type V (wood frame) construction. In these buildings with limited combustible gypsum board on wood studs, are we required to sprinkler the elevator shafts in an NFPA 13R system?

Answer: Since this is an area outside the dwelling unit, without specific installation criteria in NFPA 13R, the user needs to go to NFPA 13, which does not require a sprinkler at the top of a non-combustible or limited-combustible shaft/hoistway when the car complies with ASME A17.1. A sidewall sprinkler is required at the bottom of the shaft not more than 2 feet above the floor of the pit unless the shaft is non-combustible and does not contain combustible hydraulic fluids. In the 2013 edition of NFPA 13, additional provisions were inserted for omitting sprinklers from hoistways for traction elevators as long as they met certain fire resistance requirements, which can be met with gypsum board. See new section 8.15.5.3 for more information.

Question 13 – Hydrostatic Tests of Standpipes

Under NFPA 25, which types of standpipe systems are required to be hydrostatically tested at least once every five years?

Answer: There are three types of standpipe systems that are required to be hydrostatically tested every five years (see section 6.3.2 of NFPA 25):

1) Manual dry standpipe systems
2) Manual wet standpipe systems that are not a part of a combined sprinkler/standpipe system
3) Semiautomatic dry standpipe systems

Those are the only three types of standpipe systems that need a hydrostatic test. Other types of systems like automatic wet, automatic dry and manual wet systems that are a part of a sprinkler system are not required to be hydrostatically tested. These systems have water or air pressure in them on a regular basis and would show problems through leaks.