NFSA The Voice of the Fire Sprinkler Industry

e-TechNotes

Editor-Kenneth E. Isman, P.E. Issue# 264 April 16, 2013

Best of March 2013

This month, we have selected the following dozen questions as the "Best of March 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 – Small Orifice Sprinklers in Dry Systems

Can sprinklers with orifice sizes smaller than k-4.2 be used in dry pipe systems in light hazard occupancies as long as the piping is corrosion resistant?

Answer: No. Section 8.3.4.4 of NFPA 13 specifically limits the smallest size k-factor allowed for dry pipe systems to k-4.2, which can only be used in situations where the occupancy is light hazard and the pipe is corrosion resistant or internally galvanized.

Question 2 – Protecting Feed Mains

If a feed main runs through unsprinklered spaces (such as a crawl space or utility tunnel), does it have to be protected with a row of sprinklers?

Answer: No. Section 8.16.4.3.2 of NFPA 13 says that private service main aboveground piping is permitted to be located in hazardous areas protected by an automatic sprinkler system. Note that this section only applies to situations where the pipe is being run through hazardous areas. A crawl space or utility tunnel is not a hazardous area. Sprinkler piping needs to be protected from mechanical damage, but there is no requirement to protect it from fire with sprinklers. If the space does not contain sprinklers, then someone has already concluded that a fire in the space is not intended to be controlled with sprinklers. The worse-case scenario for a fire starting in this space is that it causes the main to fail and water gets discharged on the fire anyway.

Question 3 – The Ark in a Synagogue

We are designing a sprinkler system for a synagogue. Mounted to the wall within the sanctuary is a large cabinet for the storage of sacred scrolls (called an Ark). Do we need to put a sprinkler in this cabinet?

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Answer: No. As a fire protection engineer who is also very active in the Jewish Community and is studying to be a Cantor, I have been involved in the design of a number of sprinklered synagogues and dealt with the Ark (or Aron ha'Kodesh) in each of them. In each case, I have treated the Ark as a piece of furniture, similar to a cabinet. Even though it is connected to the wall, it is still a piece of furniture. Section 8.1.1(7) of NFPA 13 allows sprinklers to be omitted from inside pieces of furniture, regardless of the size of the furniture. However, section 8.5.3.2.3 requires that the sprinkler at the ceiling be spaced from the wall behind the Ark (as if the Ark was not there) and not the front edge of the Ark if the Ark goes as high as the ceiling.

I hope that this additional perspective from someone very knowledgeable in both the Jewish religious aspects of synagogue construction and the design of fire sprinkler systems is helpful.

Question 4 – Return Bends

On a sprinkler system where the water supply is an open pond, are return bends required for the pendent sprinklers when the fire pump has a strainer?

Answer: Yes. The strainer protects the fire pump from rocks and other obstructions that could clog the piping or damage the interior of the fire pump. However, it is not fine enough to keep sediment from getting in the water stream and then collecting in the top of the pendent sprinklers in the system. Therefore, the return bends are needed to keep the sediment from gathering at the sprinklers.

Question 5 – Rod Stiffeners

An authority is requesting seismic bracing within 6 inches of a hanger and this authority is also requiring that rod stiffeners be applied to hangers where the rod span is greater than 19 inches. Are these requirements part of NFPA 13?

Answer: No. However, sway braces located near a hanger or rod stiffeners being required are common when tension-only bracing systems are used. The requirements for these systems are in the manufacturer's installation instructions. Where rigid sway bracing is used the concerns for vertical reaction are found in Section 9.3.5.10 of NFPA 13, 2013 Edition (similar text exists in earlier editions). Should the conditions there be applicable, then rod stiffeners may be one way to address the vertical reaction.

Question 6 – Beam Clamps for Trapeze Hangers

For trapeze hangers, can beam clamps be used as the point of attachment to the angle iron both to attach the trapeze to the structure and to hang the sprinkler system pipe from the trapeze?

Answer: Yes. There is nothing in NFPA 13 that would prohibit the use of a beam clamp in the trapeze hanger arrangement. However, I should caution you that Section 9.1.1.7.4 (2013 Edition as well as earlier versions) states, "The trapeze member shall be secured to prevent slippage." This should be looked at for a beam clamp option to make sure the trapeze arrangement is solid for the life of the system. In addition, if seismic forces are a factor for the building, restraining straps will be needed, although it may be a better option to use a different attachment method in that case.

Question 7 – Forcing Compartments in a Wide Open Home

We are designing an NFPA 13D system for a home with some large compartments (kitchen, dining room, and family room are all not separated by walls or lintels). The kitchen/dining room/family room compartment might need 8 or 10 sprinklers to protect it. The AHJ is saying that the homeowner need to put up walls or 8 inch lintels to separate the spaces into separate compartments of 2 sprinklers or less to meet NFPA 13D. Is the AHJ correct?

Answer: No. NFPA 13D does not limit the size of a compartment. Residential sprinklers are designed to control or suppress a fire with only two sprinklers opening, even when there are more than two sprinklers in the compartment. In order to be listed, residential sprinklers need to be able to control a fire in a room with more than two sprinklers in it. If, during the fire test that is a part of the listing, a third sprinkler opens in the room, the sprinkler fails the test. This is one of the reasons why NFPA 13D does not care if there are more than two sprinklers in any compartment.

Question 8 – NFPA 13R and Sprinklers on Breezeways

Section 903.3.1.2.1 of the International Building Code and International Fire Code requires sprinklers on the outside of buildings protected using NFPA 13R to protect porches, balconies, and patios that are part of a dwelling unit. Does this section also require sprinklers to protect balconies and breezeways going between buildings?

Answer: The purpose of section 903.3.1.2.1 is to provide extra protection on balconies and decks belonging to individual dwelling units, which is why the section specifically says “of dwelling units”. Corridors and breezeways between buildings are not “balconies of dwelling units” or “decks of dwelling units”. Instead, they are common to the whole building and would not be expected to have the fuel load due to storage that was the basis of the justification for the sprinkler requirement.

Question 9 – Setting Relief Valves for Fire Pumps

NFPA 20 requires the fire pump system to be designed so that the maximum discharge pressure does not exceed the rating for which the system components are designed. Then NFPA 20 requires a pressure relief valve for diesel engine driven pumps in case the pump goes into overspeed and overpressurizes the system before it gets to overspeed shut-down. Under normal operating conditions, the pressure relief valve will not open. So, how do we set the relief valve during the acceptance test since the pump won’t produce

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enough pressure to open the valve?

Answer: I can think of two ways to set the relief valve when the pump will not reach the pressure at which it needs to open under normal circumstances. The first would to be to connect a temporary pump somewhere upstream of the pressure relief valve temporarily for the purposes of setting the relief valve. The second would be to adjust the governor on the diesel engine to increase the discharge pressure to the point where the relief valve should open. In many cases, you would only need an increase in speed of about 5% to get the discharge pressure up to the point where it would open. It should be fairly easy to adjust the governor to increase the speed by 5%, and this may be the best option for setting the relief valve.

Question 10 – Manifolding the Discharge from Pump Relief Valves

We have two fire pumps in the same pump room. The pumps are for different zones in the building, so they should not be running at the same time. Can we manifold the discharge from the two pressure relief valves to each other and then run a single pipe to the drain that is just sized for the flow of one relief valve?

Answer: There is no prohibition against manifolding the discharge pipes together, but there are a number of concerns that need to be worked out. First, I think that you do need to size the discharge pipes so that they can handle the flow from both relief valves operating simultaneously. There is a chance that a fire on one of the floors near the transition from one zone to the other could cause both fire pumps to be operating simultaneously. During that time, if both pumps go into overspeed or if an unusual pressure comes from the water supply, both relief valves would open. While this would be a rare combination of events, it is certainly foreseeable and should not be ignored in the design.

Second, you would need to put check valves in the individual discharge from each relief valve before making the connection to the manifold in order to prevent the discharge from a single relief valve from putting pressurized water on the back side of the other relief valve. These check valves will be in piping that does not have pressurized water in it most of the time. This will mean that you will need to find check valves that work when exposed to air (at atmospheric pressure) most of the time and then periodically experience water under pressure on the downstream side. I don't know if there are check valves that work reliably under those circumstances. Once you install the check valves, maintaining them will be a significant challenge. Usually we install control valves on either side of the check valves so that we can isolate the check valves for service (5-year internal inspection). But section 4.18.9 of NFPA 20 prohibits the installation of control valves in the relief valve discharge piping, so you're going to have to figure out a procedure for safely doing the internal inspection of the check valves. This might include a procedure for locking out the pump and tagging it once every five years so that it does not start during the check valve internal inspection. This would be an impairment of the fire protection system and would have to be treated as such according to NFPA 25. This would place a significant burden on the owner, so you may need to get concurrence from the owner that they are willing to take this step to safely maintain the check valves.

Question 11 – Low Pressure Cut-Off for Fire Pumps

Our state code requires that we install fire pumps in accordance with NFPA 20. We have an AHJ (a water purveyor in this case) that is also insisting that the law in his jurisdiction requires the installation of a low pressure cutoff device to protect the public water supply. We are insisting that this would violate NFPA 20. Are we correct that NFPA 20 prohibits the installation of low suction

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cut-off devices?

Answer: Yes, you are correct that NFPA 20 prohibits the installation of low-pressure cut off devices. The section number is 4.14.9.1 in both the 2010 and 2013 editions. In previous editions, this statement is in Chapter 5. Since NFPA 20 is adopted and enforced in the state, it would be a violation of state law to install a low pressure shut off device on the pump. Whenever a situation occurs where two laws are in conflict, you need to go back and look at the intent of each law and work out a reasonable solution to the situation.

The intent of the law that the water purveyor is quoting has to do with the integrity of the water purveyor's mains. While they have a valid concern about the pressure in their main, the concern does not extend to the portion of the pipe leading to the pump and state law in most states does not allow their jurisdiction to extend to private fire mains on private property. I am not aware of the law that the water purveyor is citing, and he may not even be reading the law correctly. If he is, we need to change the law in that jurisdiction because there is an obvious conflict that needs to be resolved. In all of the other states where this issue came up in the 1980's we were able to change it.

The intent of the rule in NFPA 20 is both firefighter safety and protection of the fire pump during emergencies. If a firefighter is using the water from a fire pump to fight a fire inside a building, they are protecting themselves from the heat of the fire with the water from the pump coming through their hose. If a device suddenly shuts off the pump, the firefighter will be exposed to the heat from a fire, and will be severely injured or killed. Even if the pump is being used for fixed systems and not firefighters, the sudden shutting down of the pump can ruin the pump and set up water hammer in the system that will damage parts of the system. In addition, if that much flow was being used for fire protection, the fire will grow and do considerable damage once the pump is shut down.

Assuming that the water purveyor is correct and that the laws are in conflict, we still have the situation where one of the laws does not make much sense and the other one is a matter of firefighter safety and good fire protection. Good fire protection and firefighter safety should trump a law that does not make much sense.

If you really need a compromise position, NFPA 20 does allow a low suction throttling valve. This device senses the line on the suction side and partially closes a valve on the discharge side if the suction pressure gets too low. In this case, water still flows to the fire protection system under low suction pressure conditions, but it's less than what is needed for the system. It is not a great solution, but it is better than a cut-off device and it is allowed by NFPA 20 in section 4.14.9.2(2). This is not a great device, but in all of the states where we have raised this issue, they have changed their requirements from a low-pressure cut off to a low pressure throttling valve. The situation that pushes the need for this device should be the pressure in the water purveyor's main, not the pressure at the suction flange of the pump.

If this is a situation where there are conflicting laws, we will notify our Regional Manager in the area, who will look into the feasibility of clarifying the law(s) so that contractors installing fire pumps can follow NFPA 20 as required by the state law.

Question 12 – Inspection of Roadway Boxes

Does NFPA 25 require roadway boxes to be physically inspected and/or exercised?

Answer: NFPA 25 requires all valves that are a part of a fire protection system

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to be inspected and exercised. Whether or not the roadway valve belongs to the fire protection system is a function of the agreement between the building owner and the water utility. In some cases, the water utility will claim ownership of the roadway valve and will agree to maintain it. This makes the valve part of the utility's water distribution systems and beyond the scope of NFPA 25. In other cases, the contract with the water utility states that the owner is required to maintain the roadway valve. In that case, the valve is considered part of the fire protection system and needs to be inspected and tested in accordance with NFPA 25. Since these valves are non-indicating valves, there is no way to determine that they are open through a simple inspection. In the 1992 and 1995 editions of NFPA 25, roadway valves were required to go through a "torsion test" on a quarterly basis to prove that they were open. This test was eliminated in the 1998 edition with no real technical substantiation from the committee.

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