NFSA The Voice of the Fire Sprinkler Industry

TechNotes

Editor-Victoria B. Valentine, P.E. **Issue# 307** **December 9, 2014**

Best of November 2014

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 November 2014." 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.

Amendment to Issue #305 – Best of October 2014, Question #4

Although the information presented in Question #4 was correct, there was an additional piece of information needed for the user to understand the concerns with using higher concentrations of antifreeze solutions that are grandfathered under NFPA 25. The reprint with the last sentence added for clarification, found below, shows that when the temperatures are such that high levels of antifreeze concentration are necessary a deterministic risk analysis is needed to make sure this is the correct solution to cold temperatures for the protected property.

Replacing Antifreeze in Existing Systems
Is it permissible to replace the antifreeze in an existing system as part of the maintenance for that system?

Answer: Yes. It is permissible to continue to use and refill antifreeze in existing antifreeze systems subject to the limitations imposed by NFPA 25, 2014 Edition, Section 5.3.4.2 and its subparagraphs. This applies to systems that were installed before September 30, 2012 and will apply through September 30, 2022 at which time antifreeze solutions must be listed.

When concentrations are tested during their normal maintenance and need to be recharged, or following a system activation, the antifreeze solution can be refilled in the system. The limits for antifreeze solution are 50 percent glycerine or 40 percent propylene glycol, both measured by volume. In

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addition, to comply with the requirements of NFPA 25, the solution must be premixed by the manufacturer. *The language also notes that concentrations above 38 percent glycerin or 30 percent propylene glycol have to be approved by an authority having jurisdiction based on deterministic risk assessment completed by qualified personnel.*

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Question 1 – Quick Response and Residential Sprinklers in Dwelling Units

A hotel is being protected with fire sprinklers in accordance with NFPA 13R. There are exposed wooden joists in the bedroom areas. The entryway and the bathroom have installed gypsum board ceilings. Can quick response and residential sprinklers be mixed in the dwelling unit?

Answer: No. NFPA 13R in Section 6.2.1.3 states, "Listed quick-response sprinklers shall be permitted to be installed in dwelling units meeting the definition of a compartment, as defined in Section 3.3, where no more than four sprinklers are located in the dwelling unit." This only permits the use of quick response sprinklers inside dwelling units meeting the definition of a compartment. While it may be argued that the bathroom could be treated as separate compartment if it requires a sprinkler, this is not the intent of the committee. In this exception, it is the committee's intent to treat the entire dwelling unit as a single compartment protected with the same sprinkler type, quick response sprinklers, throughout.

Question 2 – Flow Testing with a Single Hydrant

A hydrant flow test, where the residual pressures were taken from the flowing hydrants and not from a separate "residual" hydrant where that hydrant would not be flowing, is being reviewed. Is this a valid flow test for evaluating the water supply?

Answer: This is not a simple yes or no answer, and will be dependent on what is acceptable to the AHJ. The test described is not the methodology recommended by NFPA 291, but as NFPA 291 is a recommended practice and not a code or standard it does not rise to the same level as a required procedure.

NFPA 291 states that both the static and residual pressure be recorded at a non flowing hydrant (residual hydrant) and the pitot pressure (flow) be taken at a separate flow hydrant. This method is recommended as it will give an accurate estimation of the capabilities of the water main itself. By observing the residual pressure at the non flowing hydrant, the pressure is indicative of the capabilities of the water supply itself which is the overall intent of the water flow test.

By contrast, measuring the residual pressure at a flowing hydrant is more a look at the characteristics of the individual fire hydrants. Residual pressure read at a flowing hydrant would include friction losses of the water flowing from the main, through the hydrant valve, up the hydrant barrel and out the outlet. Turbulence in this flow path could also skew the results. This reading is more indicative of the hydrant itself and not necessarily of the water supply.

As the purpose of performing hydrant flow tests is to confirm that the water supply is capable of providing the required system demand, the procedures outlined in NFPA 291 are recommended. There may be additional information through the water authority. It may be that a single hydrant flow test is the most appropriate options for some water supply arrangements. Therefore, if the AHJ concludes that an alternate method, such as flow testing with a single hydrant, is acceptable, then this would be considered a valid flow test.

Question 3 – Armover at the End of a Branch Line
A system is installed using steel piping. The end of the branch line and the armover are 1-inch diameter piping. NFPA 13 indicates that a hanger is needed on an armover more than 24 inches (measured as cumulative horizontal distance) and on a 1-inch branch line within 36 inches of its end. If the last sprinkler on the branch line is on a 24-inch armover, does that require the last hanger to be within 12 inches of the last armover at the end of the line?

Answer: No. The requirements for hanger locations do not get combined. The last hanger on the branch line is located per Section 9.2.3.4.1. Based on the example of 1-inch steel pipe, the hanger needs to be within 36 inches from the end of the branch line. The length of the armover does not need to be applied to this measurement. The hanger requirements for armovers are addressed separately in Section 9.2.3.5.

However, caution should be used as every possible scenario in the field cannot be addressed by NFPA 13. The sprinklers need to stay in place for the life of the system so if the weight of the armover appears to be sufficient such that the cantilevered load from the branch line is a concern, than it may be a good idea to install an additional hanger to help support this piping.

Question 4 – Floor Control Valves
A NFPA 13R system is being installed in a 4-story apartment building. Is it required to have control valves on each floor?

Answer: No. NFPA 13R does not require floor control valves on each floor. Section 6.8 of NFPA 13R indicates that a single control valve for the system is adequate. By contrast, NFPA 13 does require floor control valve assemblies on each floor of a multistory building exceeding 2 stories in height. This requirement may be found in NFPA 13 in section 8.16.1.5. NFPA 13R, however does not have a similar requirement. Lastly, it could be required based on local jurisdiction codes, even though not in NFPA 13R.

Question 5 – Fire Department Connection with Building Addition
There is an existing warehouse with a single sprinkler system that has a 3-inch riser and cross main controlled with 4-inch control and alarm valves. The existing fire department connection (FDC) is connected to the 3-inch main. Additional bays have been added to the building and the sprinkler system has been extended through a 4-inch cross main to the addition connected to the top of the original 3-inch riser. Both the original system and the addition were hydraulically calculated. Is the original 3-inch FDC connected to the 3-inch main still permissible for this system given that the

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addition utilizes a 4-inch cross main?

Answer: Yes, this arrangement is permissible. The standard requires that the FDC must be at least as large as the riser providing the water supply to the hydraulically designed system as noted in Section 8.17.2.3 of NFPA 13. Even though the cross main supplying the addition is 4 inches, it is relying on the 3-inch riser for its water supply so the 3-inch FDC should be adequate to supplement it.

Question 6 – Built-in Wardrobes
A rehabilitation hospital project has 4 square-foot built-in wardrobes in the patient rooms. Following NFPA 13, can sprinklers be excluded from inside the wardrobes?

Answer: This is a very common question. Section 8.1.1(7) in NFPA 13 states, "Furniture, such as portable wardrobe units, cabinets, trophy cases, and similar features not intended for occupancy does not require sprinklers to be installed in them. This type of feature shall be permitted to be attached to the finished structure." Even though a sprinkler is not required inside the wardrobe unit, the sprinkler system would need to be laid out to provide coverage for the floor area including the portion occupied by the wardrobe. Should this object be considered a closet and not a wardrobe unit, Section 8.15.9 would still permit the omission of a sprinkler inside. The floor area would still have to be protected as noted before.

Question 7 – Backflow Preventer Replacement Testing
An aboveground strainer/backflow assembly has been replaced with a new backflow assembly and pipe as a strainer is no longer required for this system. The control valves to isolate this replacement are an underground valve approximately 10 feet upstream and a control valve in the pump room approximately 300 feet downstream of the work. Should Section 25.2.1.6 in NFPA 13 be applied for acceptance testing the replacement valve in this situation?

Answer: No, this situation is outside of NFPA 13 but is addressed directly by NFPA 25. The latest edition of NFPA 25 addresses maintenance and testing requirements after the replacement of a valve in Section 13.8.1 and its associated table. It states, "Whenever a valve, valve component, and/or valve trim is adjusted, repaired, reconditioned, or replaced, the action required in Table 13.8.1 shall be performed."

The procedures required by Table 13.8.1 after replacement of a backflow prevention device are: (1) inspect for leaks at system pressure per Section 13.6, (2) forward flow test per 13.6.2.1, (3) test supervisory device and alarm, and (4) main drain test.

Question 8 – Flushing Following Backflow Preventer Replacement.
Is flushing required after replacing a backflow preventer?

Answer: No, flushing is not required by NFPA 25 but careful considerations should be exercised. For example, debris in the suction line supplying a fire pump can cause serious damage to the pump impeller reducing the pump's

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effectiveness and service life. Presumably the underground pipe supplying the pump was flushed during its original installation so the current concern would be the possibility of any debris introduced into the suction pipe during the valve assembly replacement process. If there is a reasonable certainty that no debris has entered the supply line, flushing should be unnecessary. Possible sources of concern might include debris dislodged from the equipment being replaced, broken parts from inside the backflow assembly, or foreign objects introduced into the pipe during any period while it may have been unsupervised.

Question 9 – Sprinklers inside HVAC Unit
Is a HVAC unit in an enclosure required to be sprinklered within it?

Answer: No. Section 8.1.1(8) in NFPA 13 does not require sprinklers in mechanical equipment. These types of applications do not permit occupancy, or access, except for maybe a panel to access the inside of the unit and filter.

Similar to the exception for furniture, the floor area still needs to be protected by sprinklers within the space, but sprinklers are not needed inside of the equipment.

Question 10 – System Modification Using Flexible Sprinkler Hose
A project was originally designed with standard drops to the sprinkler using steel pipe. It is being replaced with flexible sprinkler hose. Would this system be required to be re-calculated?

Answer: Yes. Re-calculating the system is necessary. Without the details of the specific system, it is difficult to estimate the impact of this change relative to the hydraulics. However, the friction loss, c-factor, lengths, type of pipe, inside diameter, etc. could all be modified by this modification to the system. The calculation will need to be completed with the criteria from the manufacturer of the specific flexible sprinkler hose being installed.

Question 11 – Hydraulic Demand with In-Rack Sprinklers and Ceiling Systems
In reviewing NFPA 13, is it required for the in-rack sprinkler system to be balanced with the ceiling system when performing the hydraulic calculations?

Answer: NFPA 13 has always required the in-rack sprinkler demand to be added to the ceiling demand. The way to do that is to balance the flow demands to the pressure at the point of connection. Chapters 16 and 17 of NFPA 13 require a certain number of in-rack sprinklers to be calculated when in-rack sprinklers are installed. The same chapters also require a certain number of ceiling sprinklers. Neither chapter ever tells the user to calculate one or the other. Since both systems need to be calculated, the water supply has to be adequate for both, which is determined by balancing the flow demands to the pressure at the point of connection.

Chapters 16 and 17 do not use the term "balancing", but they require both the in-rack sprinklers and the ceiling sprinklers to be operating simultaneously. Chapter 23 tells the user how to perform hydraulic calculations. This is where the user is to balance the flows to the pressure at

the connection node.

Question 12 – Check Valve for Manual Dry Standpipe
Is a manual dry standpipe that is equipped with clappers inside of the fire department connection (FDC) required to also have a check valve?

Answer: Yes. The requirement for a check valve does apply to a manual dry standpipe. Typically, the clapper in the "snoot" of the FDC is not considered a listed check valve, which means the listed valve would still be needed.