NFSA The Voice of the Fire Sprinkler Industry

TechNotes

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Best of February 2014

This month, we have selected the following dozen questions as the "Best of February 2014" answered by the engineering staff as part of the NFSA's EOD member assistance program. If you have a question (and you're a member of the NFSA), you can send your question to eod@nfsa.org and we'll answer it as soon as we can.

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.

Question 1 – Least Dimensions in Closets

All three sprinkler standards (NFPA 13, NFPA 13R, and NFPA 13D) allow sprinklers to be omitted from certain closets. In each case, the standard requires the closet to have a "least dimension" that is 3 ft or less in order to leave sprinklers out of the space. While the least dimension is obvious in a rectangular closet, how do you measure the least dimension in a closet that is not a simple rectangle? Do you take some diagonal measurement across remote corners? Do you take the short leg or a triangle?

Answer: The NFPA committees responsible for all three standards recently wrestled with this question at their most recent meetings while they were working on the 2016 editions of the standards. Ultimately, they could not come up with a statement that they could use that would clearly explain how to measure the least dimension in all potential arrangements. More importantly, they could not justify the 3 ft limitation given what we have learned about sprinkler protection in dwelling units over the last 30 years. The committees have given tentative approval to completely eliminate the 3 ft dimension requirement. This is not a final decision on the subject. The committees will meet again in June 2014 to consider the subject again and to finalize their action.

Until the actions of the committees are finalized, good judgment needs to be used. The purpose of the 3 ft least dimension requirement originally came from the concern that a fire in a very deep closet would be very far from a sprinkler when it eventually broke out of the closet and into the adjacent room that was sprinklered. There was no intent to measure the least dimension across any angle or on any diagonal. In most cases, the least dimension of a closet is the dimension perpendicular to the wall between the closet and the adjacent room. The location of the sprinkler in the adjacent room and the potential discharge from that sprinkler can mitigate the affect of a fire in an unsprinklered closet that is more than 3 ft deep as measured

perpendicularly to the wall of the room.

Question 2 – Antifreeze Solutions

There are two antifreeze solutions that are being advertised as being in conformance with NFPA standards: GL48 and PG38. Are these antifreeze solutions listed? If not, how can they be advertised as being in conformance with NFPA standards?

Answer: These solutions are not listed, but there are still a few ways that they can be used in accordance with NFPA standards. In the following discussion, all percentages of solutions are percentages by volume. The GL48 product is a mixture of glycerine and water that is 48% glycerine and 52% water. The PG38 product is a mixture of 38% propylene glycol and 62% water. The use of propylene glycol with ESFR sprinklers that have been specifically listed to work with the propylene glycol continues to be allowed by NFPA 13 and is not the focus of this discussion. For all other types of sprinkler systems, there are six different situations to consider:

1. A new system being designed in accordance with NFPA 13 – New antifreeze systems are required to use listed solutions under NFPA 13 (section 7.6.2.1). Since neither of these solutions is listed, they would not be permitted in new systems that need to meet NFPA 13.

2. A new system being designed in accordance with NFPA 13R – New antifreeze systems are required to use listed solutions under NFPA 13R (section 5.4.2). Since neither of these solutions is listed, they would not be permitted in new systems that need to meet NFPA 13R.

3. A new system being designed in accordance with NFPA 13D – New antifreeze systems are permitted to be glycerine or propylene glycol if the antifreeze is limited to the portion of the building subjected to freezing conditions and if the AHJ has been convinced that no other option is available (section 9.2.2.2). In these cases, the solutions are limited to 48% glycerine and 38% propylene glycol, so the GL48 and PG38 products would be allowed to be used in these circumstances.

4. An existing system that was installed in accordance with NFPA 13 – The rules of new editions of NFPA 13 do not apply to existing systems installed under older editions. Maintenance of existing systems is generally performed in accordance with NFPA 25, which allows existing antifreeze systems that were installed under older editions of NFPA 13 to have the solution replaced with propylene glycol or glycerine with the following limitations (section 5.3.4.2.1 of NFPA 25):

   a. The system would have to have been installed prior to September 30, 2012.

   b. The solution is limited in concentration to 50% glycerine or 40% propylene glycol (since these two specific solutions are less than these limits, they are okay with this limitation, but we are trying to be complete in this summary).

   c. Antifreeze systems with solutions in excess of 38% glycerine or 30% propylene glycol have to be justified by an approved risk assessment conducted by a "qualified person"

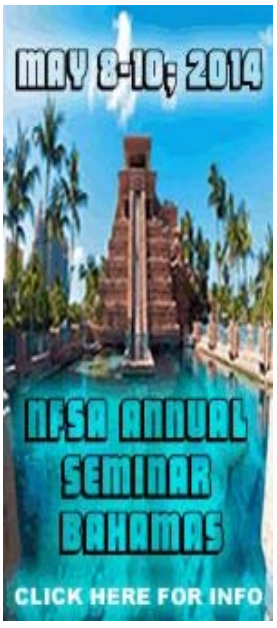
Upcoming Technical Tuesdays

Mar 18
Discharge Piping and Appurtenances

Apr 8
Diesel Engine Drivers for Fire Pumps

Apr 22
Electric Motors for Fire Pumps

Register Here



and approved by the AHJ.

d. Systems with glycerine and propylene glycol can only continue in place until September 30, 2022. At that time, they will either need to be replaced with a listed antifreeze solution (of which there are none yet) or a system that complies with NFPA 13 such as a wet pipe system with pipes in a heated space, a dry-pipe system or a preaction system.

5. An existing system that was installed in accordance with NFPA 13R – The situation is the same as with existing systems installed in accordance with NFPA 13. See above.

6. An existing system that was installed in accordance with NFPA 13D – Systems installed in accordance with NFPA 13D do not need to meet NFPA 25. Therefore, these systems are not required to follow the rules discussed above for existing systems installed in accordance with NFPA 13 or NFPA 13R. Instead, NFPA 13D has its own section to deal with antifreeze in existing systems (9.2.2.1.1). This section allows glycerine systems to be replaced with up to 50% solutions and propylene glycol to be replaced with up to 40% solutions. Since the two products mentioned in the question meet these limits, they could be used in this situation.

In summary, the GL48 and PG38 solutions can be used in new and existing NFPA 13D systems as well as existing NFPA 13 and NFPA 13R systems subject to all of the limitations discussed above.

Question 3 – Stainless Steel

Is stainless steel pipe permitted to be used under the NFPA sprinkler standards?

Answer: There are two ways that stainless steel pipe would be permitted to be used. The first would be if a manufacturer of the stainless steel pipe was to get a listing for use in fire sprinkler systems. The second would be if an AHJ was convinced that the stainless steel pipe was manufactured in a manner that “met or exceeded” any of the ASTM pipe standards in Table 6.3.1.1 of NFPA 13. For example, if an AHJ was convinced that a certain manufacturer’s stainless steel pipe was made in such a manner that it met or exceeded ASTM A795, then it would meet section 6.3.1.1 of NFPA 13 and could be used without any special listing.

View older issues in the "Members Only" section.

Question 4 – Trip Test Connection for Preaction Systems Protecting Computer Rooms

Are all preaction systems required to have a trip test connection? We have a preaction system protecting a computer room and the owner does not want us to install a trip test connection because he does not want water in the pipes. In addition to the typical water discharge fears, this owner is also concerned with corrosion in the pipes as water is introduced from frequent trip testing.

Answer: Section 8.17.4.4.1 of NFPA 13 requires a test connection on all preaction systems using supervisory air. This pretty much includes all preaction systems since even single-interlock systems are supervised with some small amount of air.

Sections 13.4.3.2.3 through 13.4.3.2.5 of NFPA 25 cover the testing requirements of preaction systems. Regardless of the type of preaction systems (non-interlock, single-interlock or double-interlock), all preaction systems are required to be trip tested in some fashion each year. The full trip test is performed once every three years. A partial trip test is done on the years when a full test is not done. There is an exception for systems serving freezers, but that does not appear to apply in your case since you have a preaction system protecting a computer room.

We agree that excessive testing can cause additional corrosion. But this is why the full trip test is limited to three-year intervals. In order to meet both NFPA 13 and NFPA 25, you do need a trip test connection, and you do need to do a full trip test of the system every 3 years.

Question 5 – Dry-Pipe System Volume Limitations

Chapter 7 of NFPA 13 places certain limits on the size of dry-pipe systems based on the number of gallons of the system (see sections 7.2.3.3 and 7.2.3.4 for example). Are the units here correct in gallons? Wouldn't the flow demand of the system in gallons per minute (gpm) be correct? Is this just a typo in NFPA 13?

Answer: No, this is not a typo. The correct units are gallons. The intention of section 7.2 is to limit the size of the system based on the volume of the system piping. The more volume the piping network has, the longer it will take the air to evacuate when the system operates. Commercial systems with smaller volumes, under 500 gallons, do not have to meet a specified water delivery time because they have historically shown to deliver water to the fire in an adequate amount of time.

Question 6 – Sprinklers in Concealed Space Cause for Access Panels

We are installing sprinklers in a building in accordance with NFPA 13. The building will have concealed spaces that need to be sprinklered to meet that standard. Will we also have to install access hatches just so somebody can get to the sprinklers and piping to inspect them?

Answer: No. There is no requirement in NFPA 13 or NFPA 25 for access panels for concealed spaces. This is why NFPA 25 specifically says that sprinklers, pipe, hangers and braces in concealed spaces are not required to be inspected. From a functional standpoint, a building owner might want access to these concealed spaces, but they would need to communicate that desire through written specifications. There is no such requirement in the referenced NFPA standards.

Question 7 – Trash Chutes in NFPA 13R Building

We are protecting a building in accordance with NFPA 13R that has a trash chute. Are we required to sprinkler the trash chute?

Answer: Yes. You need to sprinkler the trash chute. It's not a concealed space and it does not fall into any of the sections where NFPA 13R says that you can leave sprinklers out, so you need to put sprinklers in it.

Question 8 – Height Limit for NFPA 13D

We have been asked to put sprinkler systems in some single family homes that are five stories high. Can we use NFPA 13D or is there some height limit?

Answer: While there is no specific height limit in NFPA 13D, the use of NFPA 13D is limited to buildings that meet the definition of one or two-family dwelling units under the building code. Most building codes limit one and two-family dwellings to three story buildings. In your question, you stated that the buildings are single family homes that are five stories in height. If the building code actually allows them to be classified as single family homes when they are five stories in height, then NFPA 13D would be permitted. But most building codes would not allow a five story building to be classified as a single family dwelling. Since the scope of NFPA 13R stops at four story buildings, any five story building that is not a single family dwelling would need to be protected in accordance with NFPA 13 unless the AHJ decided to waive some provision of the code to permit a different standard to be used.

Question 9 – Time Information on Dry-Pipe System Trip Test

We have noticed on your Inspection, Testing and Maintenance forms the blanks for the time it takes the valve to trip and for the water delivery time to the inspector's test connection during the full-flow trip test of the dry-pipe system. We have also noticed that NFPA 25 contains no pass/fail criteria for these times. If there are no pass/fail criteria, why should we collect the times?

Answer: The trip time of the valve can provide valuable information when the water delivery time is questionable. For example, consider a situation where the water delivery time during a test was 50 seconds on the original acceptance test and 90 seconds 12 years later. When trying to understand the reason for the 40 second increase in water delivery time, the valve trip time needs to be considered. If the valve trip time of the two tests was the same, and the water transit time accounted for all of the difference, then that points to one kind of problem. But if the valve trip times between the two tests were vastly different, then that points to a completely different set of problems that need to be investigated.

So, even though the trip time of the valve is not required to be any specific time in order to pass the NFPA 25 trip test, it is important to record this time during the test and keep that data for future use.

It also might be interesting to note that the valve trip time can be accurately calculated using a formula in the SFPE Handbook. This formula has been validated by a number of research projects including one performed by the NFSA in 2000.

Similarly, it is important to record the water delivery time. Comparison of this time to previous times can help significantly in assessing the overall condition of the dry-pipe system. While one specific time is not mandated by the standard, a much longer time on a recent test as compared to an older test might be an indication that something is wrong inside the system.

Question 10 – Automatic Refill on Tanks

For a tank that is sized to completely supply the demand of the fire protection system that is not in a high-rise building, does NFPA 22 mandate an automatic refill?

Answer: No. NFPA 22 does not require automatic filling of the tank as long as the tank is sized to meet the duration demand of the fire protection system without the need for refill. In fact, section 14.4.1.1 specifically allows manual filling when the procedure has been accepted by the AHJ.

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.

Question 11 – Pressure Relief Valves and Master Pressure Reducing Devices

Section 7.2.4 of NFPA 14 requires a special arrangement of two pressure reducing valves in series (sometimes referred to as a Master Pressure Reducing Device or Assembly). This section also requires a pressure relief valve downstream in case both of the pressure reducing valves fail in the open position. How do we size the pressure relief valve?

Answer: NFPA 14 does not have any sizing requirements for the relief valve required by section 7.2.4(8).

The only guidance on sizing pressure relief valves in the NFPA standards is in Table 4.26(a) of NFPA 20. This might be pretty good information considering the role of the pressure relief valve. This relief valve is installed in order to save the lives of firefighters and protect the equipment in case the pressure reducing valves both fail in the fully open position (a common failure mode). This would expose the pipe to the total discharge pressure of the pump (minus any elevation change between the pump and the relief valve).

It is possible that calculations could be done to show how a smaller relief valve would work. Those calculations would not be difficult for someone with a background in fluid dynamics, but due to the tremendous number of different situations, there is no single formula that we could give you that would be correct.

Question 12 – NFPA 409 and Unfueled Aircraft

The latest edition of NFPA 409 (2011) has a new Chapter 12 for protection of hangars that are reserved for unfueled aircraft. The fire protection requirements are vastly less stringent than the requirements in Chapter 6 for Group I hangars and Chapter 7 for Group II hangars. For example, there is no requirement in Chapter 12 for a redundant fire pump. So, if we are protecting a Group I or Group II hangar that is reserved for unfueled aircraft, do we need to follow Chapter 6 or Chapter 7, or can we just follow Chapter 12?

Answer: It appears to be the intent of the NFPA 409 committee that you only have to follow Chapter 12. This would be true for any hangar (Group I, Group II, Group III or Group IV) that was specifically designated for unfueled aircraft. Once it has been determined that the hangar is for unfueled aircraft, you can ignore the Chapter in NFPA 409 for that Group hangar and you only have to meet the requirements of Chapter 12.

If the aircraft is under construction, it is easy to show the AHJ that the aircraft is unfueled. If the hangar is for planes that get flown on a regular basis, the AHJ might want significant proof of strict policies and procedures that will be used to remove the fuel from the aircraft prior to it being placed in the hangar. The AHJ will be the sole arbiter of what procedures will be acceptable for making sure that the aircraft in the hangar does not have fuel on board.