NFSA The Voice of the Fire Sprinkler Industry

TechNotes

Editor-Kenneth E. Isman, P.E. **Issue# 287** **February 25, 2014**

This month, we have selected the following dozen questions as the "Best of January 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 – Dealing with a Frozen System

We have a building where the utilities were shut off and the fire sprinkler system froze and was physically damaged. Are there any standardized practices for repairing/replacing the fire sprinkler system?

Answer: No. Unfortunately, there are no specific practices to follow. Such practices would be too difficult to write because each scenario would be different. The amount of damage can vary with the time the system was frozen, how much of the system was frozen, as well as where the air pockets within the system were located. The location of trapped air in a system significantly changes what sort of damage that there might have been because the air space gives the expanding water somewhere to go as it turns to ice. Each case would need to be looked at individually for the amount of damage as well as the best solution for repair.

Each of the materials in a sprinkler system have a different level of durability when it comes to the stresses involved in a hard freeze. Deciding to leave any specific component in the system carries with it a level of risk, and that risk will vary depending on how durable the component is. Ultimately, it is the judgment of the building owner as to how much risk they are willing to accept. Also, there is the cost to balance. At some point, it will become more cost effective to replace, rather than repair, the system.

A hydrostatic test at the maximum working pressure of the system can be performed to determine which of the system components was damaged to the point where it will no longer be capable of holding the system pressure. Whether or not the building owner is comfortable in running the hydrostatic test at a higher pressure (like 200 psi) would depend on how old the system was, how much visual damage was apparent, and how much risk the owner was interested in taking.

Question 2 – Leaving Sprinklers Out of Attics with Heat Detectors

An engineer is telling us that the International Building Code (IBC) allows sprinklers to be omitted from combustible attics in buildings protected by NFPA 13 as long as a heat detector is installed in the attic. Is this correct?

Answer: No. What might be happening is that someone is reading section 903.3.1.1.1 of the IBC incorrectly. This section gives six locations where sprinklers can be omitted from spaces in buildings that are protected in accordance with NFPA 13. These spaces are places where the application of water is a problem, such as rooms for the storage of chemicals that would chemically react with water or machine rooms for occupant elevators. Since sprinklers are being omitted from these rooms, the IBC requires the installation of a fire detection system to make up for the fact that the room should be sprinklered, but some safety consideration is making the sprinkler system a problem.

There are people that read this section and then assume that they can leave sprinklers out of any space in any building as long as they use a detection system. But that would not be an accurate representation of what this section allows.

Question 3 – Safety Margins for Hydraulic Calculations

Our local AHJ has a written requirements as follows, “Hydraulically calculated fire sprinkler systems shall be designed to ensure the required system pressure is a minimum of ten (10) psi below the available supply pressure.” Can we meet this rule by subtracting 10 psi from the static pressure when we plot the results from the water supply test?

Answer: No, if all you are doing is subtracting 10 psi from the static pressure. You would need to subtract 10 psi from both the static pressure measured during the test and the residual pressure. This new water supply curve, which would be parallel to the test results curve and 10 psi lower, would represent the water supply that you have available to the sprinkler system in order to meet this AHJ’s requirement. This would be the same result as using the water supply test results without any adjustment and just adding an additional 10 psi to the hydraulic calculations as the last step.

It should be noted that NFPA 13 requires or recommends (depending on which edition you are using) that the water flow test results to be adjusted down to account for daily and seasonal fluctuations, future expected use of the water supply, and other factors. When encountering situations where a 10 psi safety margin is required by local law, it should be clarified that this is a 10 psi margin from the original test data and not any adjusted water supply information. To put a 10 psi margin on top of already adjusted data would be putting a triple penalty on the sprinkler system. There are already multiple safety margins built into the sprinkler system calculations. If additional margins are built into the water supply data, there is no need to add an additional 10 psi margin on top of these already included in the calculations.

Question 4 – Sprinkler in Portion of a Bathroom

You have described a bathroom that exceeds the 55 sq ft in area, so it will have a sprinkler. But the toilet for this bathroom is separated by a pocket door with no lintel. Can the portion of the bathroom behind the pocket door be unsprinklered or is another sprinkler required over the toilet?

Answer: The area over the toilet probably does not need to be sprinklered. The definition of a bathroom (section 3.3.2 in the 2013 edition,

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similar sections in previous editions) permits a room with just a toilet to be considered its own bathroom. As long as this room meets the definition of a compartment (section 3.3.6 in the 2013 edition with similar sections in previous editions) it will not require its own sprinkler (assuming that it is less than 55 sq ft, and has walls or ceilings of non-combustible or limited combustible construction).

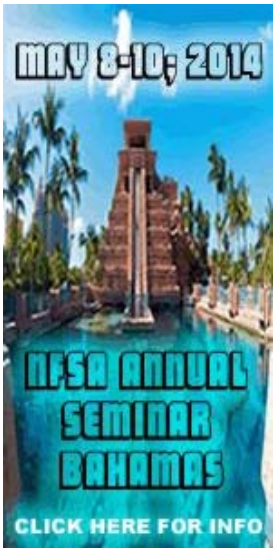
The definition of a compartment allows the space to have openings to other spaces (such as adjacent bathrooms) without lintels, as long as the opening is 36 inches in width or less and as long as this is the only opening from the space with the toilet. Assuming that the space with the toilet meets all of these limitations, a sprinkler could be omitted from this space even though there is no lintel separating it from the other part of the bathroom.

Question 5 – Dry-Pipe System with CMSA Sprinklers

We are protecting storage of a Class III commodity using CMSA sprinklers in a dry-pipe sprinkler system in accordance with Table 16.2.2.1 of NFPA 13. The table specifically tells us how many sprinklers we need in the design area for a dry-pipe sprinkler system. Do we need to also increase this number of sprinklers by 30% in accordance with section 12.5.1?

Answer: No. Section 12.5.1 only applies to density/area designs.

Question 6 – Listed Antifreeze



Is there a listed antifreeze product yet?

Answer: No. We are aware of manufacturers that are currently seeking a listing for their product as an antifreeze solution. Underwriters Laboratories is working to develop a standard by which to test these fluids. We were hoping that they would have finished by now, but they are not yet able to say that their products are listed. We are hopeful that the situation will change by the fall of 2014 but we cannot guarantee that.

Question 7 – CPVC Pipe for Ordinary Hazard Spaces

NFPA 13 permits CPVC pipe to be used in Ordinary Hazard spaces of otherwise Light Hazard Occupancies when the space does not exceed 400 sq ft (section 6.3.7.8.2 in the 2013 edition, similar sections in previous editions). Is this 400 sq ft supposed to be the cumulative size of all of the Ordinary Hazard rooms in the building, or can CPVC pipe be used in multiple rooms, each up to 400 sq ft in area, in the same building?

Answer: CPVC can be used in multiple rooms of Ordinary Hazard, each one up to 400 sq ft in area, in the same building as long as the building is “otherwise Light Hazard”.

Question 8 – NFPA 13R and Elevator Shafts

In a building being protected in accordance with NFPA 13R and an elevator shaft that will be constructed of wood studs and gypsum wallboard, are sprinklers required in the top of the shaft or in the pit.

Answer: No. Sprinklers are not required in elevator shafts of buildings protected in accordance with NFPA 13R as long as the elevator installation meets the ASTM elevator code. We do admit that NFPA 13R is written poorly on this subject, but that is the intent of the committee.

Section 6.6.6 of NFPA 13R covers this concept. It currently uses the term

"noncombustible" to describe the elevator shaft where sprinklers can be omitted, but there is a long history associated with this word. First, you need to understand that the people writing the sprinkler rules were not completely familiar with the elevator code. Many thought that the elevator code required the use of noncombustible construction for the shaft. Second, you also have to understand that wherever the sprinkler committee uses the term "noncombustible" they also typically mean to include gypsum wallboard, even though that technically falls under the category of "limited combustible". The problem is that the standard gets too wordy if we have to spell out "noncombustible or limited combustible" everywhere, especially since then you have to start spelling out whether or not you will treat fire retardant treated wood in the same category.

The NFPA committee met back in August of 2013 and this specific subject was on their agenda. The committee voted unanimously to change the standard to just say that sprinklers can be omitted from elevator shafts as long as the shaft and elevator car are installed in accordance with the elevator code. The specific action can be viewed on the NFPA website in the First Draft Report for NFPA 13R. The change was successfully balloted through the committee and expresses the committee's official position on the subject. Until the publication of the standard catches up with the change, this could certainly be viewed as an interpretation of the committee's intent.

Question 9 – Manual Dry Standpipe with Multiple FDC's

In a manual dry standpipe system (demand of 1250 gpm) with two fire department connections (FDC's), one each end of the building, can we perform the hydraulic calculations assuming both FDC's are being supplied simultaneously?

Answer: No. Section 7.7.1 of NFPA 14 requires that calculations be provided to show that the system demand can be supplied from "each fire department connection, which is provided in accordance with Section 7.12." Since the section uses the term "each", it means that the remote one has to work as well as the closer one, assuming that both are being installed due to section 7.12.

Question 10 – Roof Manifolds for Standpipe Systems

In a building where there is no access from the stairwells to the roof, do all standpipe risers need to extend to the roof?

Answer: No, only one roof outlet is required. It is not the committee's intent to require all standpipes go to the roof and it is not their intent to require all portions of the roof to be within any specific distance of an outlet. In the 2013 edition, section A.7.3.2(5) was added to say (in part), "Access to the roof can be via a stairwell that terminates at the roof level." By saying "a stairwell" the committee is clarifying that only one stairwell is sufficient to meet the designation of providing "access". Since this is just a new annex note to an existing section of the standard, this should be interpreted as applying to previous editions as well. Also, in the 2013 edition, the committee added section 7.3.2.2.1 saying that the distance requirements do not apply to the roof unless the roof is used intended to be used as a part of the occupancy of the building. This should also be seen as a clarification of previous edition intent.

Question 11 – Fire Hydrants and Pressure/Flow Demands

We are being asked to design a private fire service main with fire hydrants for a client in order for them to meet certain fire flow requirements. We

know what flow needs to be available at the hydrant, but we don't know what pressure it needs to be at. What pressure should we prove we can get to the hydrant at the flow demand?

Answer: Most codes require the fire flow demand to be available at the hydrant at a minimum pressure of 20 psi. There is some concern that at a pressure lower than 20 psi, a sudden change in system water usage could pull water backwards through a fire truck and such water that is no longer potable back into the system. There is also some concern for pipe wall collapse at low pressure.

A third reason for keeping a minimum pressure of 20 psi in the water coming out of a hydrant is to make sure that the friction loss through the suction hose is accounted for so that the water gets to the pump in the fire truck at a positive gage pressure. If the water in the hydrant was at a much lower pressure, there is a chance that it will not get to the pump suction flange in the fire truck at a positive gage pressure, which might cause damage to the pump. Once the water gets to the pump, the pressure will be increased so that it will be available for firefighting.

Question 12 – Additional Requirements from an Insurance Company

We are reading through the engineer's specifications on a project and we are finding all kinds of items that are not required by NFPA 13 for the sprinkler system. The response that we have gotten from the engineer is that these additional requirements are from the insurance company. Since NFPA 13 is adopted as law, not the insurance company's requirements, do we need to provide these additional items, or are we only required to follow NFPA 13?

Answer: You need to provide everything requested/required in the specifications, even if these items are not required by NFPA 13. This becomes a matter of contract law. If you are hired as a contractor, to provide work in accordance with contract documents, those documents include the engineer's specifications. Therefore, you need to follow those specifications or you will be found in breach of contract.

There are certainly legitimate ways to amend a contract. But before going down that road, consider the fact that the insurance company may be giving significant discounts in their insurance in return for a "better than minimum standard" sprinkler system. Also consider that the building owner may be looking to perform some future function in the building that is more hazardous than what they are doing today. Just because NFPA 13 does not require something for the lower hazard of today, it might be necessary for the planned future use. An owner that accounts for this planned future use up front is saving money in the long run by addressing their future demands during initial construction.

A third reason that the engineer's specifications might exceed NFPA 13 is that the engineer received some sort of code variance or equivalency based on the additional protection. If you don't provide the additional protection, the building may no longer comply with the intent of the code.

For all of these reasons, it is always a good idea to follow the engineer's specifications when they exceed the requirements of NFPA 13.

March 5-April 30 Fundamentals of Fire Sprinkler Hydraulic Calculations-Distance Learning

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.

Over a course of nine weeks, basic hydraulic calculations for fire sprinkler systems will be covered so that the participant will be able to recognize and apply the terminology used in the fire sprinkler industry, calculate flow and pressure demands for a sprinkler system by hand, prepare the input for a computer program to perform hydraulic calculations, and interpret the output from a program. The seminar will be taught live online on NFSA.tv. Lectures will be broadcast live to facilitate real-time interaction with participants anywhere in the world. (Recorded lectures will be available online for review; typically within 24 hours.) Sample exercises will be presented in class and homework will be assigned each week. Completed assignments received by noon on Monday will be graded and returned with comments; typically prior to the following class.

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