NATIONAL FIRE SPRINKLER ASSOCIATION, INC.

Tuesday e-Tech Alert
February 5, 2008
Number 107

Best Questions of January 2008

We have selected the following questions as the "Best of January 2008" answered by the engineering staff as part of the NFSA's EOD member assistance program:

Question 1 – Automatic Refill for Water Storage Tanks

We have two questions regarding a fire protection system installation with a 300,000 gallon tank as the water supply. First, is an automatic fill required for this situation? Also, is it permitted to shut down the fire pump while filling the tank to avoid activating the fire alarm?

Answer: This question addresses aspects of NFPA 13, NFPA 20, NFPA 22 and NFPA 25. The answer to the first question is that an automatic fill is not required provided the usable volume of the tank (storage of water above the anti-vortex plate) meets the duration demand of the fire protection system. NFPA 22 is the standard that governs the design of the tank and its equipment and there is no requirement in that standard (or any other NFPA standard) to automatically fill any tank that already meets the duration demand of the fire protection systems fed by the tank.

With regard to your second question, yes, it is permitted to shut down the fire pump while filling the tank to avoid activating the fire alarm. NFPA 25 permits fire pumps to be turned off during the process of testing and maintaining a fire protection system, however, the system needs to be treated as an "impaired" system and procedures put in place to mitigate the risk of having the pump off. One way to mitigate the risk would be to have a person standing by the pump (who is in communication with people throughout the facility) that can turn the pump back on at a moments notice in case a fire occurs during filling operations.

Question 2 – Status of Floor Check Valves in Combined Risers

Is the 2003 version of NFPA 14 the current accepted standard in accordance with the 2006 ICC building and fire codes? If so, is it required to have a check valve included in the fire sprinkler floor control assembly supplied off of a standpipe riser? The July 27, 2004 *eTechAlert* stated that NFSA was proposing a reconsideration of the requirement for floor check valves on sprinkler zone controls supplied from a combined standpipe and sprinkler system.

Answer: The 2006 edition of the IBC does reference the 2003 edition of NFPA 14. The NFPA 14 committee did not agree with the elimination of the requirement for having a check valve after the control valve in a floor control assembly when the sprinkler system is connected to a standpipe in a combined riser, and it continues to be a requirement in the 2007 edition. We also asked the NFPA 13 Committee to determine if they felt this should be a requirement. While they did not see a need for these check valves for the purposes of the sprinkler system, they did yield

to the NFPA 14 Committee and agreed to include this requirement in the 2007 edition of NFPA 13 within Section 8.17.5.2.2(1).

Question 3 – Double-Interlock Sprinklers in Racks

We have an ceiling sprinkler system providing a density of 0.44gpm/sq. ft. over 2000 sq ft, and an in-rack sprinkler system s designed on the basis of 14 sprinklers flowing. The owner has accidentally broken several sprinklers resulting in much damage, and wants to substitute a double interlock system. Do we have to add additional sprinklers to the in-rack calculations?

Answer: The answer to your question is "no." For double-interlock preaction systems, the ceiling sprinkler design is required to be increased by 30% but there is no requirement to increase the in-rack demand.

We are somewhat concerned with the proliferation of double-interlock systems. If you are going to install a preaction sprinkler system, a single interlock is usually much better. You will have all of the protection that you need in terms of not getting water flow when a sprinkler gets knocked off of an in-rack installation, but you will get water to the fire faster because you do not have to wait for the sprinkler to open to start the water flowing into the system piping. A double interlock system is appropriate where the introduction of water into the piping in the absence of a fire would be a problem, such as in a freezer.

Question 4 – Manual Standpipe Isolation Valves

NFPA 14 (2003 edition) Section 6.2.2 states" Valves shall be provided to allow isolation of a standpipe without interrupting the supply to other standpipes from the same source of supply" Questions: 1) Are isolation valves still required on a manual dry standpipe? 2) If the valves are required - are they also required to be supervised?

Answer: Yes, the valves are required, even on manual-dry standpipes. The method of supervision depends on the building code or the fire code. NFPA 14 recognizes both mechanical and electrical supervision. Mechanical supervision, with chains or padlocks, and electrical supervision are considered the same as far as NFPA 14 is concerned. However, some building codes and fire codes require the electrical supervision.

Question 5 – Supervisory Air

As I recall, NFPA 13 states somewhere that a low air supervisory signal is to be sent when the system pressure drops 10 psi. What is typically the cut-in pressure (differential) to start the system air compressor? For example, if the system is set as below what corrections might be needed?

40 psi is the system side air pressure
30 psi - compressor starts
20 psi - low air signal sent (for whatever reason compressor can't keep up)
10 psi - dry valve trips

The maximum city water supply pressure is 40 psi and the dry valve has a 4:1 ratio.

Answer: Section 5.15.2.2(2) of NFPA 72 (2007 edition) requires a pressure supervisory signal-initiating device for a dry pipe sprinkler system to indicate both high and low pressure conditions. The off-normal signal is to be initiated when the pressure increases or decreases by 10 psi (70 kPa). NFPA 72 is applicable when the sprinkler system is provided with a central station or other signaling system in accordance with Section 6.9.4.1 of NFPA 13, generally in response to building or fire code requirements. Otherwise, NFPA 13 addresses the high pressure through the Section 7.2.6.4 requirement for a relief valve set no less than 10 psi above system air pressure, and requires a low air pressure alarm for refrigerated spaces maintained below 32°F (0°C) in Section 7.9.2.2.

In the example provided, since NFPA 72 would require the low air pressure signal at 10 psi below the normal air pressure of 40 psi, the cut-in for the air compressor should be set at some value higher than 30 psi. With the cut-in pressure closer to the normal pressure the compressor will cycle more often, but the total run time should be approximately the same based on system air leakage rates.

It should also be noted, however, that Section 7.2.6.6.1 of NFPA 13 sets the requirements for the maximum air pressure that should be held in the dry pipe system piping at 20 psi over the trip point when considering the maximum water pressure under the dry pipe valve. If the maximum water pressure is really going to be 40 psi and if the dry-pipe valve has a differential ratio of 4:1, then the trip point of the valve would be 10 psi and the maximum pressure that should be held in the system is 30 psi (10 + 20). The low air alarm should be set for 20 psi, ten under the maximum pressure that should be held in the system, and the compressor cut-in pressure somewhat higher.

You would want to be cautious about a maximum static pressure from the water supply of 40 psi. It might be as high as 70 or 80 psi in the water mains at night. If the maximum static pressure from the water supply is really 80 psi, then the trip pressure of the valve would be 20 psi and the system should be held at 40 psi with the low air alarm set at 30 psi and the compressor cut-in pressure somewhat higher.

Question 6 – Clearance for Suspended Ceiling Penetrations in Earthquake Areas

I am going nuts trying to find the section in the building code that requires a large clearance around a sprinkler head escutcheon in a category D or higher classification. Can you point me in the right direction?

Answer: The rule is actually in ASCE 7, which is referenced by the building code. The 2002 edition of ASCE 7 is referenced in the 2003 IBC, and the 2005 edition of ASCE 7 is referenced in the 2006 IBC. In the 2002 edition, Section 9.6.2.6.2.1 requires ¼-inch (6 mm) clearance on all sides of sprinkler and other ceiling penetrations through suspended ceilings in Seismic Design Category C and Section 9.6.2.6.2.2 requires a 2-inch (50 mm) oversize ring, sleeve or adapter through the ceiling tile to allow for free movement of at least 1 inch (25 mm) in all horizontal directions in Seismic Design Categories D, E, and F. In the 2005 edition there is no mention of the 1/4-inch requirement for Seismic Design Category C, but the 2-inch requirement for Seismic Design Categories D through F appears in Section 13.5.6.2.2.

In both editions there are some alternatives to the 2-inch clearance. One exception is where rigid braces to be used to limit lateral deflections, although NFPA 13 requires that only 2-1/2-inch and larger sprinkler branch lines be provided with lateral bracing. Another alternative is to have the suspended ceiling engineered to move with the sprinkler system. A third alternative is to provide

each sprinkler drop with a swing joint capable of accommodating the 1-inch free movement in all horizontal directions, which is increasingly being met through the use of flexible sprinkler drops.

ASCE 7 is somewhat confusing in that it references an A through F classification system for site class (soil types) as well as Seismic Design Categories. It is important to note that the ceiling penetration clearance requirements relate to the overall Seismic Design Category classifications D through F, not the site soil classifications D through F.

Question 7 – Emergency Power for Multiple Pumps

Can you shed some light on a situation I have in our city? A high-rise building is provided with two electric pumps, with one primary and one secondary. A diesel generator is provided for the emergency power. Both pumps are connected to the generator. Is it required that the generator and conductors be sized for both pumps running?

Answer: If the fire protection system demand is satisfied by a single pump, then you only need to size the generator for the single pump running. The only time that the other pump will run is if the first one fails to run.

Question 8 – Inspecting Sprinklers in Small Concealed Spaces

I have a project with combustible concealed spaces 55 sq. ft. or less located on the 3rd floor of a three story NFPA 13 multi-residential project. They are essentially closets with no access located next to the exterior walls over rooms below generally larger than 55 sq. ft. See attached drawing. NFPA 13, 2007 8.15.1.2.9 states these areas do not require sprinkler protection if they are over isolated small rooms. I'm probably grasping at straws here, but does my situation comply with the exception? If we put sprinklers in these spaces do we have to put access panels in each space big enough for a man to crawl through and inspect heads?

Answer: In order to leave sprinklers out of the space, both the concealed space and the space below it need to be less than 55 sq ft. While your space is less than 55 sq ft, it would appear that the space below it is larger than 55 sq ft, so the concealed space needs to be sprinklered (unless you comply with one of the other exceptions such as facing the exposed combustibles with dry-wall. Putting sprinklers in the space does not then force you to provide access. There is no rule that states that sprinklers need to be accessible. NFPA 25 specifically states that sprinkler in inaccessible spaces are not required to be inspected. Of course, building owners may want the access to be able to troubleshoot any problems easier, but that is something that is an alternative, not a requirement.

Question 9 – Sidewall Sprinklers Across a Steep Slope

I'm currently designing a sprinkler system for a church that was built in the 1840's. The church sanctuary, as in many churches, has a steeply sloped ceiling. I was intending to run branch lines up the slope with sidewall sprinklers on either side of the arch beams. Someone questioned my intentions citing NFPA 13 Section 8.7.4.2.2 (2007 edition). Does this apply to my situation and am I wrong in thinking I can accomplish this installation with sidewall sprinklers?

Answer: Standard spray sidewall sprinklers are intended to be installed under sloped ceilings in accordance with Section 8.7.4.2.2, which requires the sprinklers to be at the top of the slope, spraying down the slope. These standard sidewall sprinklers are not intended to be installed

across the slope as you have proposed and, to the best of our knowledge, they have not been tested in that position. Still, some authorities have accepted the installation of such sidewall sprinklers in retrofit applications where there are few options. Such acceptance is permitted by NFPA 13 in sections 1.5 and 1.6 as an alternate arrangement.

There are some residential sidewall sprinklers that have been specially listed for installation across a slope, but you can't use residential sprinklers in a church. We are not aware of any extended coverage sidewall sprinklers that have received a special listing for installation across a slope as you have proposed.

Question 10 – Evaluating Alternative Pumps

We have a 10-story condo project under construction in our district. The original sprinkler contractor and engineer were dismissed from the project, and the condo project has now hired a new sprinkler company to complete the project. The new sprinkler contractor has re-calculated the water flow and would like to change the fire pump from a 750 gpm to a 500 gpm rated pump. He advised the fire district if he did not change the pump size that it would delete the water capacity. If this is allowed to happen, the 10th floor of the building would only have 65 psi in the standpipe. Would you please advise us of the best way to resolve this situation?

Answer: Unfortunately, there isn't enough information given about your situation to draw any specific conclusion. Fire pumps are rated for both flow and pressure capabilities and you have only provided information on the flow ratings, not the net pressure produced by the pump. There are pumps rated at 500 gpm that can produce more net pressure than other pumps rated at 750 gpm. We can understand the concern of installing a 750 gpm pump where one is not needed. Not only will the 750 gpm pump cost more, but it should be tested at 1125 gpm (150% of rated flow). The water supply may not be able to handle this increased flow for testing. NFPA 20 and NFPA 25 allow the user to take this into account and not test the flow at 1125 gpm as long as they can test the flow at the system demand, but many people don't know about this allowance or are reluctant to use it.

Ultimately, there is nothing wrong with a 500 gpm pump as long as it meets the demand of the fire protection systems. We take it from the comment that it would only provide 65 psi at the top of the standpipe that the local authority is enforcing newer versions of NFPA 14 that have a demand of 100 psi at the top of the riser and is concerned. We certainly can't issue a statement that it is okay to provide less pressure, but the local AHJ is allowed to accept 65 psi if they use nozzles that can operate at this pressure and agree to waive the requirement for 100 psi at the top of the riser.

Another option would be to pick a different pump rated at 500 gpm that produces more pressure. The problem with this solution will be that the pump might over-pressurize the system at churn (static condition). This could be handled with pressure reducing valves or the installation of a variable speed drive that slows the pump down at low flow conditions so that it does not produce so much pressure.

A third option would be to use the 750 gpm pump and not run it out past the flow demand of the fire protection systems during flow tests.

Question 11 – Purity of Antifreeze Solutions

The 2007 NFPA 13 Section 7.6.2.1 (2007 edition) uses the term "pure" to describe glycerine. Does this also apply to propylene glycol?

Answer: The term "pure" as used in Section 7.6.2.1 must be interpreted to apply to propylene glycol as well as glycerine for at least three reasons:

1) Propylene glycol is used in systems connected to potable water without requirements for backflow devices (see section and Figure 7.6.3.1). Without the backflow device, the potable water supply would be contaminated by the corrosion inhibitor.
2) Corrosion inhibitors are not allowed in sprinkler system piping because they have not been evaluated for their effect on fittings, valves and sprinklers. There have been incidents in the past of chemical pollutants in water reacting with the seat of a sprinkler and causing the sprinkler to remain closed during a fire condition. Propylene glycol (in its pure form) has been severely tested to make sure that it will not react with the parts used in sprinklers, but corrosion inhibitors have not been tested in this manner and could prevent a sprinkler system from operating properly.
3) The addition of a corrosion inhibitor would probably change the density and viscosity of the antifreeze solution, which would make the values in Figure 7.6.2.5(b) and Table 7.6.2.3 incorrect. Fire sprinkler contractors that rely on these figures for precise calculations would not be creating solutions with adequate antifreeze protection and might not be sizing expansion tanks properly.

Question 12 – Hose Stations from Branch Lines

We have a gridded system in a storage area with branch lines of 2-inch diameter. Per NFPA 13 can we connect all hose cabinets to the branch lines? Our other question is whether these hose stations in storage areas must be connected to adjacent sprinkler systems?

Answer: Yes, since your system is gridded and the branch lines are 2 inches in size, you can attach the pipes for the 1-1/2-inch (38 mm) hose connections directly to the branch lines in accordance with Section 8.17.5.1.4(2) of the 2007 edition. It is important to recognize that these are not Class II standpipe system hose stations.

With regard to your second question, NFPA 13 (Section 8.17.5.1.3) wants the hose attached to sprinkler systems that protect different floor space than the hose. That way, when the valve is closed because the sprinklers are out of service in an area of the building, the hose will still work in that part of the building if there is a fire. In other words, where NFPA 13 says "adjacent sprinkler systems" it means "a sprinkler system protecting floor area that is different from the floor area protected by the hose stations." The exception is where in-rack sprinklers are provided in the same area through a separate control valve from the ceiling sprinklers.

Upcoming NFSA "Technical Tuesday" Seminar – February 12th

Topic: Dry and Preaction Systems Update
Instructor: Russell P. Fleming, P.E., NFSA Executive Vice President
Date: February 12, 2008

The 2007 edition of NFPA 13 incorporated some important new changes with regard to both dry pipe and preaction systems. The new rules affect water delivery times, pitching requirements, and freezer protection options. Discussion will also be included on system attributes that affect valve trip, water delivery time and other aspects of system performance. It will also address variations of preaction systems, including some that are not specifically addressed within NFPA 13.

Upcoming NFSA "Business Thursday" Seminar – February 21st

Topic: Water Utility Fees
Instructor: Dom Kasmauskas, NFSA Northeast Regional Manager
Date: February 21, 2008

The critical topic of water utility fees will be featured in this presentation. Many areas of the country are facing important issues regarding the use of our precious water resources. This presentation will take a look at water tap fees and standby fees, and provide suggestions on how to deal with unreasonable local requirements. It will also address how some areas are recognizing the importance of home fire sprinkler systems and how that recognition leads to improved water supply infrastructure, creating a win-win situation for all of the stakeholders.

Information and registration for the above seminars and both the "Technical Tuesday" and "Business Thursday" 2008 series are available at www.nfsa.org or by calling Dawn Fitzmaurice at 845-878-4200 ext. 133 or email: dawn@nfsa.org.

Additional NFSA training opportunities include…

NFSA Two-Week Technician Training Classes

April 7-18, 2008	Orlando, FL
August 4-15, 2008	Providence, RI
October 13-24, 2008	Chicago, IL
November 10-21, 2008	Houston, TX

For more information, contact Nicole Sprague using Sprague@nfsa.org or by calling 845-878-4200 ext. 149.

In-Class Training Seminars

The NFSA training department also offers in-class training on a variety of subjects at locations across the country. Here are some seminars scheduled for 2008:

Feb 19	Ft. Walton Beach, FL	Inspection, Testing & Maintenance
Feb 20	Ft. Walton Beach, FL	Sprinklers for Dwellings
Feb 21	Ft. Walton Beach, FL	Standpipe Systems (a.m)
Feb 21	Ft. Walton Beach, FL	Underground Piping (p.m.)
Mar 4	Murfreesboro, TN	Sprinklers for Dwellings
Mar 5	Murfreesboro, TN	Hydraulics for Fire Protection
Mar 6	Murfreesboro, TN	Residential Homes to High Rise

Mar 10	Winston-Salem, NC	Sprinklers for Dwellings
Mar 11	Winston-Salem, NC	Plan Review Policies & Procedures
Mar 12	Winston-Salem, NC	NFPA 13 Update 2002
Mar 25	Jacksonville, FL	Pumps for Fire Protection
Mar 26	Jacksonville, FL	Residential Homes to High-Rise
Mar 27	Jacksonville, FL	Sprinklers for General Storage
Mar 28	Jacksonville, FL	Sprinklers for Dwellings

For more information on these seminars, or to register, please visit www.nfsa.org or call Dawn Fitzmaurice at 845-878-4207 or email seminars@nfsa.org.

About the National Fire Sprinkler Association

Established in 1905, the National Fire Sprinkler Association (NFSA) is the voice of the fire sprinkler industry. NFSA leads the drive to get life-saving and property protecting fire sprinklers into all buildings; provides support and resources for its members – fire sprinkler contractors, manufacturers and suppliers; and educates authorities having jurisdiction on fire protection issues. Headquartered in Patterson, N.Y., NFSA has regional operations offices throughout the country. www.nfsa.org.