NATIONAL FIRE SPRINKLER ASSOCIATION, INC.

Tuesday e-Tech Alert
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Best Questions of April 2008

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

Question 1 – Attic with Fire Retardant Treated Wood

Would an attic space that is constructed of metal truss assemblies but with a wood FRT (fire retardant treated) roof deck need to be protected with sprinklers? The architect is saying it is a noncombustible space and we can't find a code section to dispute it.

Answer: If we understand the situation correctly, the entire concealed space is noncombustible except for the roof deck which is FRT wood. If this is the case, sprinklers are not required. Section 8.15.1.2.11 of NFPA 13 (2007 edition, similar sections in previous editions) permits sprinklers to be omitted from concealed spaces if the only combustible structural members are FRT wood (meeting NFPA 703, Standard for Fire Retardant Treated Wood).

Question 2 – Horizontal Standpipe Demands in Multi-Story Building

I have a two-story mall with a Class I horizontal standpipe system. I have calculated the Class I standpipe for 750 gpm at three most remote hose valves. I have a horizontal standpipe on the second floor as well. Do I have to add 250 gpm to the point of connection on the second floor for the first floor standpipe system so as to have a total of 1000 gpm?

Answer: The 750 gpm flow from a horizontal standpipe would be calculated in accordance with Sections 7.10.1.1.2 and 7.10.1.2.2 of the 2007 edition of NFPA 14. Although it is possible that the standpipe you described may not be classified as a horizontal standpipe because it supplies two floors. Section 3.3.11 indicates that the horizontal portion of a standpipe delivers water to two or more hose connections on a single level. If the hose connections on the second floor are supplied from hose connection piping from the floor below then it would not be considered a horizontal standpipe. If the hose connections on the second floor are supplied from a riser and horizontal piping located on the second floor then it could be considered a horizontal standpipe (or 2 horizontal standpipes, one on the first floor and a second horizontal standpipe on the second floor). A horizontal standpipe can only supply hose connections on any one floor level, not two floors.

Once you determine if it is a horizontal standpipe then it must be capable of flowing 750 gpm. If the system is not a horizontal standpipe then it must be capable of flowing 1000 gpm.

Question 3 – Metal Strip Ceilings

I have a ceiling made of 3-½-inch metal strips with a 1-inch gap between each strip. My question is this: do I need to provide sprinklers both above and below this ceiling?

Answer: Yes, sprinklers will be required both above and below this metal ceiling. The sprinklers are required above the metal ceiling because sprinklers need to be within 12 inches of the top of the space in order to provide cooling for the structure. Sprinklers are required below the metal ceiling because the slats of metal are significant obstructions to the spray from the sprinklers above the ceiling.

Question 4 – U-Shaped Water Spray Systems for Transformers

What is a "U-shaped or AEP design water spray system" relative to NFPA 15 deluge exposure systems for transformers?

Answer: AEP is American Electric Power. They have specifications that they have used to protect power transformers. If you have been asked to provide such a system you should contact AEP to get a copy of their latest specifications for this type of transformer protection. Some of this information is available at www.aep.com. The U-shape system is an alternate arrangement to a system going all the way around the transformer, allowing for removal of the transformer, if necessary, without disassembling the water spray system. The NFPA 15 committee was recently asked to comment on this type of system and expressed concern about ensuring that the transformer is completely covered as required in NFPA 15. However, it may be that large monitor-type nozzles are used and that the spray areas are planned to overlap and the transformer is protected this way. The NFPA 15 members also questioned how the detection portion of this system would be accomplished. The details should be sought from the designer specifying the system.

Question 5 – Basement Ceilings in NFPA 13D Applications

I've been working on a 13D system this week that has raised a number of questions for me. 13D has only one reference to unfinished basements in 8.2.4 - where future finished ceiling installation is anticipated. "Anticipated" leaves a lot open to interpretation. We believe that since there are no residential sprinklers currently listed for use under exposed combustible construction such as an unfinished basement presents, 8.2.4 is intended to provide a code "bridge" through a transitory phase. Increasingly we are seeing unfinished basements being protected using residential sprinklers and being left that way indefinitely. What are your thoughts on this?

If the intention is to leave a basement constructed with composite wood joists (at say, 11 7/8" deep and 16" O.C.) unfinished for the anticipated life of the dwelling, the only option would be quick response sprinklers installed with coverage per 8.1.3.2 & positioning per 8.2.3 (NFPA 13 design criteria). Per Table 8.6.2.2.1(a) of NFPA 13 we'd go to 130 sq. ft. per sprinkler and per 8.6.4.1.2 deflectors would be located 1-6 inches below the bottom of the TJI's and within 22" of the deck above. But where and how would the number of design sprinklers and design discharge be decided? Does the discharge become a 0.10 gpm/sq. ft. density per NFPA 13? Can a two-sprinkler design still be used? Or do we fall back to NFPA 13's residential section 11.3.1.1 and

calculate four sprinklers? If so, the doubled flow would be in excess of the capacity of most every domestic lead-in, water meter, etc. and make single family fire protection significantly more expensive.

Over the past few years, composite wood joist (i.e. TJI, BCI, etc.) construction has largely replaced dimensional lumber for a variety of reasons. This has modified the "look" of unfinished basements. Yet many sprinkler contractors seem to be installing CPVC piping in these exposed applications, despite the fact that CPVC manufacturer manuals don't appear to permit such an exposed installation unless the ceilings are constructed of specific size dimensional lumber on specific on-center spacing - there is no mention of composite wood joists. Additionally, the manuals seem to indicate such an exposed installation, even if it is with a dimensional joist application, is a temporary configuration anticipating a future ceiling since the brochure references NFPA 13D, Section 8.2.4. Does this mean CPVC is not an appropriate choice for potential lifetime exposed applications?

Answer: The intent of NFPA 13D is to allow residential sprinklers in unfinished basements for indefinite periods of time. The “anticipation” of a finished ceiling language was drafted to let people know where the deflectors would go. In other words, put the sprinklers where the deflectors would go if the ceiling ever did get finished. The intent was to allow the two-sprinkler design for residential sprinklers under the exposed members. The logic for this is that while the basement is unfinished, the probability of someone sleeping in the basement is low. A fire that starts in the basement might be delayed in operating a sprinkler, but without a person sleeping in the room of fire origin the goal of NFPA 13D can be met, which is to control the fire for at least 10 minutes so that people can evacuate and to give the fire department time to arrive and address the fire. In the event the basement is converted to living space, the committee thought that there would be a good chance that the ceiling would be finished at that point in time.

The issue of CPVC pipe needs to be completely separated from the issue of residential sprinklers. CPVC pipe has one listing for use under flat smooth ceilings and another listing for use under exposed wood joist construction. If CPVC is to be used under exposed wood joists, the rules in the listing for exposed wood joists must be met.

Question 6 – Electrical Equipment in Elevator Rooms

Are you aware of anything in the codes or standards that restrict sprinkler piping from passing thru electrical or elevator equipment rooms?

Answer: Section 110.26(F)(1) of the National Electrical Code prohibits sprinkler pipe from passing through an electrical room directly over the electrical equipment within 6 ft of the top of the equipment. This means that the sprinkler pipe can pass through the electrical room as long as it is not directly over the top of the electrical equipment or if it is more than 6 ft above the top of the equipment. If the sprinkler pipe does pass over the electrical equipment (more than 6 ft above) the electrical equipment needs to be shielded from potential leakage of the pipe. There is no prohibition against sprinkler pipe in the elevator equipment room in the National Elevator Code. However, we are aware that the State of Massachusetts passed a law prohibiting any sprinkler pipe from the elevator equipment room. Other local jurisdictions may have done the same thing.

Question 7 – Location of Check Valve in the FDC

The City of Phoenix is concerned with corrosion of the underground piping to the FDC if it is allowed to be left dry by check valves inside the building and is asking that they be buried on the line outside. Other local authorities have also made these underground FDC lines wet out of fear that if the line is dry and is damaged during nearby excavation it may be deemed abandoned and not repaired before being buried again.

Answer: NFPA 13 currently is silent on the issue of exactly where the check valve is to be located in the fire department connection. There are positive and negative aspects to having pressurized underground pipe. While you are correct that water in the underground pipe helps to supervise the piping, it also makes it difficult to service the check valve as required by NFPA 25. Also, water tends to leak from underground pipes, so the FDC connection might become a source of problems for the building owner with the constant discharge of water. Given how rare it is that FDC connections are needed or used, it might be better to leave the FDC lines dry with the check valve inside the building. Even if there is a small leakage problem in the pipe, the fire department can still pump into the pipe and get water into the system. Remember that the FDC is not intended as a full source of supply for the sprinkler system but as an auxiliary source.

During a recent meeting in preparation of the 2010 edition of NFPA 13 the Sprinkler Committee was asked to require check valves in FDC lines to be within 25 ft of the FDC. The committee rejected this language, and instead adopted an annex note that states: "It is recommended that the user locate the check valve to reduce the length of non-pressurized pipe in the FDC supply line." Since this text is in the annex, it is not legally enforceable, but it gives some guidance to the designer when deciding where to put the equipment. This is being addressed in proposals 13-234 and 13-507 in the Report on Proposals (ROP) for the Annual 2009 meeting cycle.

Question 8 – Areas Reductions for High Temp Sprinklers for Plastic Commodities

Is a design area reduction for high temperature sprinklers available for protection of plastic commodity storage? I could find no positive statement on what temperature sprinkler to use except in chapter 8 of NFPA 13, where it says all sprinklers must have a minimum rating of 150^{o} F. I know we always use 286^{o} F sprinklers, but I was unable to find any section that requires this.

Answer: If you go back to the time when NFPA 231 and NFPA 231C contained the sprinkler protection requirements for storage, those standards required high temperature sprinklers at the ceiling when trying to protect Group A plastics. The purpose for the high temperature sprinklers was to limit the number of sprinklers that opened remote from the fire once fire control had been established. Back then, the sprinklers at the ceiling were most frequently K-8 (17/32-inch) orifice sprinklers. Then, along came the K-11.2 and K-14 spray sprinklers. Fire tests showed that ordinary temperature K-11.2 and K-14 (and later K-16.8) sprinklers provided better fire control than high temperature K-8 sprinklers. For this reason, we now allow K-11.2 and larger sprinklers to use the high temperature curves for protecting Class I-IV commodities even if they are of ordinary temperature rating (see section 12.6.9 of NFPA 13). When it comes to protection of Group A plastics, the densities are usually so high (over 0.34 gpm per sq ft) that we have to use K-11.2 sprinklers, so it does not matter if they are ordinary temperature rated or not. As such, the committee dropped the discussion on what temperature rating was needed for the ceiling sprinklers. Theoretically, there are a few situations where K-8 sprinklers can still be used (where the Group A plastics can be protected with a density of 0.3 at the ceiling). If K-8 sprinklers are used in these situations, high temperature sprinklers should be employed, but this is not a

requirement of NFPA 13. The committee has reviewed these few circumstances and feels comfortable with the idea of just leaving the requirement out of the standard.

Question 9 – Sizing Pump Test Header

We've got an installation with 3000 gpm diesel driven fire pumps with a long run to the test header and we'd rather not upsize it from 10-inch to 12-inch due to the length of that run. I note in the 2007 edition of NFPA 20 there is in Figure A.5.16.3.4(2) a sample test header size calculation, but I'd like to clarify the pass/fail criteria. The last line of the sample calculation highlights that the required pump discharge is 40.8 psi. If the pump discharge pressure at 150% of rated flow is greater than this calculated value, does that prove that the chosen test header pipe size is sufficient?

Answer: Yes, you are correct. In this particular example, the situation will work if the discharge pressure is at least 40.8 psi at the discharge flange of the pump at a flow of 2250 gpm. With the flow of 2250 gpm going to the test header, the water will lose 5.5 psi of energy getting to the test header. The flow will then split and the water will lose 3.2 psi in the 2-1/2 inch connection and then lose another 14.1 psi going through the hose. When the water gets to the end of the hose, there will be 18 psi left to push against the pitot gage.

Question 10 - Pump Bypass Valve Position and Check Valve Requirement

I recently looked at an older installed fire pump for a 19-story building, equipped with a back-up diesel generator for the electric driver. I noticed the bypass valve was closed. There was no check valve or flow meter in the bypass header. Should the bypass valve be in the closed position? My concern is that although the pump has diesel backup, if the fire department ever fed the system through the FDC with the valve closed, there would be a problem.

Answer: The bypass valve is always required to be open (see Section 5.16.1 in the 2007 edition of NFPA 20, there is a similar section in all previous editions of NFPA 20). The problem with the system you observed is that there is no check valve in the bypass line. When the pump starts, the water will flow backwards through the bypass line to the suction side of the pump instead of going out to the fire protection system. Ultimately, a check valve will need to be installed in the bypass line and control valves will need to be positioned on either side of the check valve so that it can be isolated for service.

Question 11 – Use of Special "Big Box" Retail Criteria and Column Protection

Section 12.7.2.1 in the 2002 edition of NFPA 13 is geared towards Home Depot. Can 12.7.2.1 be also used for Sam's Club and, if so, will the 12.7.2.1 design satisfy the requirements for fire protection of steel columns in Section 12.3.1.7 of NFPA 13?

Answer: It makes no difference whether a building is a Sam's Club, Home Depot, or any other store. They can use any section of NFPA 13 so long as they comply with all of the rules of that section. NFSA has published the sources of the specific storage arrangements used in the testing

that led to these protection options (see March 28, 2006 eTechAlert) to help members zero in on the rules faster when making proposals for specific clients, but the rules are not necessarily tied to particular companies. As far as the column protection goes, the columns need to be protected if they are within the rack structure. Technically, if the columns are only in the aisles, they are not in the racks and do not need protection. If the columns need protection, there is an option of 1 hr fire resistive construction. If a person does not want to use 1 hr fire resistive construction, there are four sprinkler options: 1) Using sidewall sprinklers to protect the column, 2) Using spray sprinklers at the ceiling with specific densities, 3) Using large drop, specific application control mode, or ESFR sprinklers, or 4) Using in-rack sprinklers. Section 12.7.2 utilizes K-25.2 spray sprinklers, which are not large drop, specific application control mode, or ESFR sprinklers, so you need to pick one of the other three options if you need to protect the bare steel. One option would be to increase the densities from the ceiling sprinklers. Another option would be to use sidewall sprinklers on the columns. Of course, the other options are to put the columns in the aisles or cover them with fire resistive materials.

Question 12 – Using Pendent Sprinklers Where Uprights Are Typical

Can a pendent sprinkler be used in a location where an upright sprinkler would typically be used? The original drawing for a large renovated auditorium/theatre called for upright sprinklers under the bottom chord of the metal truss assemblies that supported walkways, etc. Upon final inspection it was observed that pendent sprinklers were installed. The contractor claimed that the pendent sprinklers allowed them to gain added space under the trusses. As the AHJ, I asked the contractor to verify that the pendent sprinklers installed were listed for this application. I was always under the impression that pendent sprinklers could only be used under a suspended ceiling and that uprights are to be used when exposed and positioned up against a roof deck assembly. Are pendent sprinklers allowed as long as they are orientated properly (i.e. deflector in the down position)? Any thoughts and/or section references?

Answer: Pendent sprinklers can be used anywhere that upright sprinklers can be used. The only thing that you have to watch out for is that the deflector can't be too far from the ceiling, so the branch line leading to the sprinkler typically needs to be closer to the ceiling to use the pendent sprinkler.

Upcoming NFSA "Technical Tuesday" Seminar – May 20th

Topic: Water Cooling Towers
Instructor: Michael J. Friedman, P.E., NFSA Consultant
Date: May 20, 2008

Protection of cooling towers falls under the umbrella of "Special Hazards" in the fire protection industry. This seminar will provide an overview of design considerations such as type of cooling tower, materials of construction for towers and system piping. It shall also cover types of fire protection systems, devices, detection methods and design criteria and system testing based on NFPA 214, Standard on Water-Cooling Towers, 2005 Edition.

Upcoming NFSA "Business Thursday" Seminar – June 19th

Topic: Safety for Contractors

Instructor: Ray Lonabaugh, NFSA Mid-Atlantic Regional Manager
Date: June 19, 2008

As virtually every employer in the country is aware, the health, safety and welfare of a company's workforce are major concerns. An effective and comprehensive safety program can reduce risk to the company and help bring workers compensation costs down. This presentation will review some of the important aspects of an effective safety program and examine why it should be a high priority for every fire sprinkler contractor.

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

Additional NFSA training opportunities include…

NFSA Two-Week Technician Training Classes

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:

May 13 Quincy, MA	Sprinklers for Dwellings
May 14 Quincy, MA	Basic Seismic (a.m.)
May 14 Quincy, MA	Standpipe Systems (p.m.)
May 15 Quincy, MA	Pumps for Fire Protection
May 20 Willoughby, OH	Plan Review Policies & Procedures
May 21 Willoughby, OH	Inspection, Testing & Maintenance
May 22 Willoughby, OH	Underground Piping (a.m.)
May 22 Willoughby, OH	Commissioning & Acceptance Testing (p.m.)
May 28-29 Reading, PA	NFPA 13 Overview & Intro to Plan Review
May 30 Reading, PA	Hydraulics for Fire Protection
June 3 Albany, NY	Inspection, Testing & Maintenance
June 4 Albany, NY	Standpipe Systems (a.m.)
June 4 Albany, NY	Fire Pump Layout & Sizing (p.m.)
June 5 Albany, NY	Plan Review Policies & Procedures
June 10 Oak Creek, WI	Introduction to Sprinklers (a.m.)
June 11 Oak Creek, WI	Plan Review Policies & Procedures

June 12	Oak Creek, WI	Commissioning & Acceptance Testing (a.m.)
June 12	Oak Creek, WI	Underground Piping (p.m.)
June 17	Centennial, CO	Sprinkler Protection for General Storage
June 17	Seattle, WA	Plan Review Policies & Procedures
June 18	Centennial, CO	Sprinkler Protection for Rack Storage
June 18	Seattle, WA	Commissioning & Acceptance Testing (a.m.)
June 18	Seattle, WA	Fire Pump Layout & Sizing (p.m.)
June 19	Centennial, CO	Sprinkler Protection for Special Storage
June 19	Seattle, WA	Sprinkler Protection for Special Storage

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.