NATIONAL FIRE SPRINKLER ASSOCIATION, INC.

Tuesday e-Tech Alert
October 2, 2007
Number 96

Best Questions of September 2007

We have selected the following questions as the "best of September 2007" answered by the engineering staff as part of the NFSA's EOD member assistance program:

Question 1 – NFPA 1 Override re. Spare Sprinklers in 13D Systems

In Question 1 of NFSA *eTechAlert* No. 94, it was stated that NFPA 13D does not require spare sprinkler cabinets. What about the requirements of Section 13.3.3.7.1 of NFPA 1 (2006 edition)?

Answer: NFPA 1, the *Uniform Fire Code*, can be enforced for all new and existing buildings and does contain Section 13.3.3.7.1, which states the following:

> 13.3.3.7.1* A supply of spare sprinklers (never fewer than six) shall be maintained on the premises so that any sprinklers that have operated or been damaged in any way can be promptly replaced. [**25**:5.4.1.4]

Note that the reference at the end of the paragraph indicates this material has been extracted from NFPA 25. The scope of NFPA 25 specifically exempts itself from being applied to NFPA 13D systems:

> 1.1.1 This standard does not apply to sprinkler systems designed and installed in accordance with NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes.*

The intent of the NFPA extract policy is that text from one document be incorporated into the text of another document without changing the meaning of the text. The copying is intended for convenience of the user, not to change the requirement from one document to the other. Since NFPA 13D systems do not need to comply with NFPA 25, they also do not need to comply with NFPA 1 where the text in NFPA 1 is extracted from NFPA 25. This is not to say that NFPA 1 cannot create its own requirement for spare sprinklers in dwellings. It could process a proposed change and attempt to justify that change. But it cannot do it through an improper extract from NFPA 25.

Question 2 – Fire Pump Acceptance Tests at Less than Rated Pressure

If a fire pump is utilized for a demand that is less than 100% of the total rated head, but no less than the minimum 65%, is it still required to be tested at 100% of the rated capacity? For example, if the demand (or design point) is 100 psi @ 1000 gpm, and a pump curve is

selected for a pump which is rated at 85 psi @ 1250 gpm, is it still required to be tested at 1250 gpm?

Answer: Yes, the pump is still required to be tested at its rated flow (1250 gpm in your example) and at 150% of its rated flow (1875 gpm in your example). The purpose of the acceptance test is to check the performance of the pump across its full performance range, not just the demand flow of the fire sprinkler system that it is attached to. The only exception is if the water supply is not capable of supplying the 150% point, you are then just required to flow the maximum that the water supply will provide. Generating this performance curve at the beginning of the life of the pump helps to establish the ground rules under which the pump will be evaluated for the rest of its life.

Question 3 - Use of Pressure Restricting Devices Above 175 psi

We have a single zone 24-story building needing 100 psi residual at the top of the standpipes with the hose requirements flowing. We have about 280 psi static pressure at the lower standpipes. We intend to use 2 ½-inch 300 psi pressure restricting valves on the standpipes. Do these need to be flowed at their expected flow rate after installation (and during inspections) as required for pressure reducing valves – NFPA 13 Section 16.2.4 (2002 edition)? NFPA 13 and 25 only refer to "pressure reducing valves" as needing to be flowed. Quite a few municipalities around Chicago require pressure restricting valves instead of the PRVs, with the explanation they are "fool-proof".

Answer: We think that the problem may be in your use of the term "pressure restricting" valves, which seems to be different than its use in the NFPA standards. Per the NFPA standards, a pressure restricting device is one that reduces residual (flowing) pressure but does not reduce the static pressure (see the definition in Section 3.3.9 of NFPA 14). These devices are typically restrictor orifice plates that create friction loss in order to reduce flowing pressures. NFPA 14 does not allow the use of pressure restricting devices for standpipe systems where the static pressure exceeds 175 psi (Section 7.2.1.2 of NFPA 14 – 2007 edition). Instead, NFPA 14 requires the use of a pressure regulating device that limits both static and residual pressures, i.e. a pressure reducing valve, in these situations. Therefore, you are either using a pressure restricting device outside of the rules of NFPA 14, or you are using a device that someone is calling a pressure restricting device that NFPA 14 would define as a pressure reducing valve.

Question 4 – Scheduling 5-Year Internal Inspections

We have a hospital with 31 separate zones over 6 stories. Our question is what actually constitutes a system as far as internal inspections go? Also, do they have to be done in the same time frame or can we do a certain percentage per year until completed? If so, what is the percentage?

Answer: A sprinkler system can be defined by the presence of a control valve, a waterflow alarm and a downstream drain. As such, the sprinkler piping on any single floor of a typical high-rise building with floor control valves can be considered a separate fire sprinkler system. Since there is no requirement to test all systems on a property at the same time, the systems could be identified and tested in any rotation. For example, making sure that 20% of them receive the 5-year inspection each year should allow costs to be stabilized. Note that the committee chose the 5-year cycle to correspond to the internal inspection for check valves. Since the system needs to

be drained once every five years so that the check valves (and wet alarm valves) can be inspected on the inside, the internal inspection of the piping can be carried out at the same time. Also note that the internal inspections can be conducted any time that the system is drained down. If you are going to drain down a system for some other renovation, repair or maintenance reason, schedule your internal inspection at the same time and save yourself the trouble of draining the system down again for a separate internal inspection.

Question 5 – Risers vs. System Risers

Please help us identify "system riser" piping in a current job per the NFPA 13 definition. In this particular case the general contractor believes "system riser" piping is more than the vertical risers located in the valve room. The specifications call for schedule 40 pipe for all system risers, schedule 10 for all other piping.

Answer: The definition of "system riser" in NFPA 13 is intentionally loose in order to allow many different arrangements of fire sprinkler systems. A history of the definition of "system riser" will probably help this situation.

In the 1994 and prior editions of NFPA 13, the definition of "system riser" was "The aboveground supply pipe directly connected to the water supply." There were a number of problems with this definition. The first was that the term "riser" implied that this pipe was only vertical. The second was that the definition did not cover the need for, or the purpose of, a system riser. The situation was amplified when AHJ's started to require that the sprinkler system on each floor of a high rise building had to have vertical piping in which to place the control valves and waterflow alarms because the water supply was the standpipe system and they wanted a vertical riser between the standpipe system and the mains feeding each floor. This was clearly a ridiculous interpretation of the standard, but many AHJ's started to force sprinkler contractors down this road.

In the 1996 edition of NFPA 13 the committee clarified the meaning of "system riser" as the "aboveground horizontal or vertical pipe between the water supply and the mains (cross or feed) that contains a control valve (either directly or within its supply pipe) and a water flow alarm device."

This definition established some important facts:

1) Frequently, a section of horizontal pipe is installed between a floor flange where the underground ends and the vertical piece of pipe feeding the cross mains at the ceiling in order to install a backflow preventer or line up the underground pipe with the vertical piece. This horizontal section of pipe would be considered part of the "system riser" for the sprinkler system if it only served a single system. If multiple systems are served from this horizontal piece of pipe, then it is not a "system riser" because it does not contain a system control valve for only one system and it does not contain a waterflow alarm for a single system.
2) Sprinkler systems on each floor of a high rise building are each considered separate systems, each with its own horizontal "system riser" running from the standpipe riser to the cross mains on the floor they are protecting. The "system riser" is the horizontal piece of pipe containing the control valve and waterflow alarm.
3) The purpose of the "system riser" is to provide a location for the system control valve and the waterflow alarm. Although not specifically mentioned in the definition, it is assumed

that a drain is also included because it is necessary to flow test the alarm and to get the water out of the system for repair or maintenance.

It is common to see requirements in specifications for Schedule 40 pipe to be used on the system riser. Since this pipe supports heavy valves and drains, many specifying engineers are concerned that the pipes have adequate strength to support these materials. The new definition of "system riser" helps to reinforce this situation as well because horizontal pipe also needs to be able to support the weight of the valves and drains attached. For the horizontal and vertical piping beyond the valves, waterflow alarms, and drains, there is less weight to support.

Question 6 – College Science Laboratory Hazard Classification

I'd like some advice on how a new college science laboratory should be classified. Should it be light hazard (as educational) or ordinary hazard?

Answer: In order to fully answer the question, you may need a copy of NFPA 45, *Fire Protection for Laboratories Using Chemicals*. Material extracted from NFPA 45 appears in Section 13.8 of the 2002 edition of NFPA 13 and Section 21.9 of the 2007 edition.
Class A and B laboratories are to be protected in accordance with the Ordinary Hazard Group 2 rules of NFPA 13. Class C and D laboratories are to be protected in accordance with the Ordinary Hazard Group 1 rules of NFPA 13. Laboratories are divided into these four classes based on the quantity of flammable liquids and whether or not they will be stored in cabinets. So, while NFPA 13 specifies the protection, you'll need NFPA 45 to determine into which class your lab falls.

Question 7 – Earthquake Restraint Using Slender Hangers

Why does Section 9.3.6.1 (5) of NFPA 13 (2007 edition) now require hangers used for restraint to have a slenderness ration of 300 or less? It has been common practice for many years to use hangers installed on a 45 degree angle for restraint against seismic motion.

Answer: The Committee agreed that the restraint option using angled hanger rods should be specifically included since it was reported that some AHJs were prohibiting this practice. The maximum slenderness ratio was added to the text without much discussion in Committee. In our opinion, since restraining devices are not required to be listed, and since this option has field experience behind it, it may be still possible to use a hanger with a slenderness ratio higher than 300 with the approval of the Authority Having Jurisdiction. We should caution that, in some instances, the rod could get long enough where it may exhibit similar characteristics to wire. This means that the compressive strength of the rod would be negligible and a second angled hanger on the opposite side should be installed. In order to comply with the letter of the 2007 edition of NFPA 13, the maximum slenderness ratio does need to be met. This would mean for 3/8-inch rod the maximum length permitted is 2 feet 4 inches as noted in Table 9.3.5.8.8 (c).

Question 8 – Suction Piping Materials

We have 100 ft inside a building to get between the service entrance and the pump flange. We seem to recall the suction piping for a fire pump was required to be galvanized. The piping up to the check valve or backflow preventer would meet the local water utility's requirements for materials, which in our area means galvanized. We are talking about the portion between the

check valve and the pump suction flange. Looking in NFPA 20, Section 5.13.1.2 is the closest we can find to a specific requirement, although this just says when corrosive water conditions exist, galvanize or paint. Arguably, the suction piping is subject to no more corrosion than the system piping. Is there anything more specific or any further suggestions on the suction piping materials?
Also, how do we interpret the term “corrosive water conditions”? Is this section only referring specifically to MIC-related issues or is there more to it? If it is referring to more than MIC concerns, is there some sort of industry standard that can guide us in determining at what point water qualifies as “corrosive”?

Answer: Section 5.13.1.1 of NFPA 20, (2007 edition) states, "Steel pipe shall be used above ground except for connection to underground suction and underground discharge piping." Steel is required for its strength and resistance to impact. However, there is no requirement that calls for galvanized steel. Galvanizing is one way to protect the steel pipe if there are corrosive water conditions as noted in Section 5.13.1.2, but if the water conditions are not corrosive then black steel can be used. Typically, the water authority would know if the water is corrosive. The section is meant to address all types of corrosion, not just MIC. In fact, the section was written before the fire sprinkler industry became aware of MIC. If you go back to the 1990 (and prior) editions of NFPA 20, you’ll find that section 2-8.1 reads, “To prevent tuberculation, suction pipe shall be galvanized or painted on the inside prior to installation, with a paint recommended for submerged surfaces. Thick bituminous linings shall not be used.” As you can see, the Committee was trying to prevent deterioration of the suction pipe, which would increase friction loss and potentially have the pump running at a negative gage pressure at the suction flange. There was also a concern about pipe scale getting caught in the impellor of the pump, especially those pumps with narrow distances between the shrouds. For the 1993 edition of NFPA 20, the committee changed the language to what you see today. They did it with the following statement, “Committee experience is such that most water quality is good enough that this provision is typically not practical for all situations. The provisions should remain for those situations where the water is of a corrosive nature.” (See the Committee Statement on proposal 20-25 in the Technical Committee Report for the NFPA Annual Meeting in 1993, page 133 of the TCR). So, as you can see, the committee believes that typical water supplies are not the problem. But there are some water supplies where the chemical composition is such that the water tends to corrode steel more quickly than the typical situation. Unfortunately, the committee was not able to quantify these issues, so the situation is left up to the judgment of the Authority Having Jurisdiction. The intent of the Committee seems clear that the paint or protection should only be required where the water supply tends to corrode steel faster than normal. Experience with other steel pipes on the same water supply should be sufficient for determining whether there is a problem or not.

Question 9 – Hazard of Diesel Fire Pump Rooms

Is there any written code or guideline that classifies what hazard a diesel-driven fire pump room is? I've been directed to use a 0.25 gpm per sq ft density for the area, but I've also been told by others that the room should also be considered an Extra Hazard Group 1 hazard, regardless of density. I would like to utilize Extended Coverage Ordinary Hazard sprinklers in the area, but if it is technically an extra hazard then I cannot do that.

Answer: There is nothing directly addressing the classification for pump rooms in either NFPA 13 or NFPA 20. However, there is guidance in NFPA 37, the standard for protecting Stationary Combustion Engines used for fire protection. Section 11.4.5 of the standard (2006 edition)

specifies a density of 0.3 gpm per sq ft over 2500 sq ft and sprinkler spacing at a maximum of 100 sq ft. The annex note to this section references the use of Extra Hazard Group 1 for the protection of the room.

Question 10 – Control Valve Positions During Fire Pump Testing

In performing a pump test on a diesel pump protecting a high rise building, is it mandated that the control valve serving the sprinkler systems be closed?

Answer: NFPA 25 expresses a preference for keeping the control valves to the fire protection system open during fire pump testing. This can be found in Section 4.5.2 of NFPA 25 (2002 edition), which states that water supplies to fire protection systems, including fire pumps, need to remain in service during testing. This section in NFPA 25 does provide the option of closing the control valve and taking the system out of service if you follow the impairment procedures of Chapter 13 in that document. This would require some special conditions such as evacuating the building or providing a fire watch or limiting the activities in the building until the water supply was restored to service.
This section was added to NFPA 25 after a significant loss in a facility where a fire occurred while a pump was being tested. The control valve had been closed during the testing and, by the time word got back to the pump room to open the valve, significant damage occurred. However, in the newly-issued 2008 edition of NFPA 25, the closing of valves will not be considered an impairment provided qualified personnel are in attendance so as to be able to promptly open the valves in the event of an emergency.

Note: All of the changes in the 2008 edition of NFPA 25 will be highlighted in the Technical Tuesday online seminar scheduled for November 20, 2007.

Question 11 – Racks Over 15 Feet in Height with Solid Shelves

I am working with a unencapsulated Class IV commodity stored on solid shelves. The top of the shelves are at 14 ft. However, the client stores smaller boxes on the top shelf that sometimes are more than a foot high, some a bit more than 2 ft high. The protecting sprinklers will be located less than 10 ft above the shelves. Are in-rack sprinklers needed? NFPA 13 Section 12.2.2.1.1(2) (2002 edition) states that shelves up to 15 ft can be protected by density/area methods. Can our storage height be a little above that since the shelf height is technically 14 ft?

Answer: With the exception of some paper record storage tests and the some of the special tests that led to the special retail store criteria in NFPA 13 (Section 20.3 in the 2007 edition), testing has not been performed for shelves over 15 ft high, which is why the standard is so very stringent on this matter. Advise the owner to take one level of storage from their shelves if they wish to protect the shelf storage in accordance with NFPA 13. In-rack sprinklers are generally not used with shelf storage (which is defined as shelves up to 30 inches in depth per Section 3.9.2.6) but are required for solid shelves in rack storage when the shelves exceed 20 sq. ft. in area (Section 16.1.6.1 of NFPA 13 – 2007 edition).

Question 12 – Jockey Pump Power Requirememts

NFPA 20 (2003 edition) states the following:

10.3.4.6 A fire pump controller shall not be used as a junction box to supply other equipment. 10.3.4.7 Electrical supply conductors for pressure maintenance (jockey or make-up) pump(s) shall not be connected to the fire pump controller.

NFPA 20 is not clear as to where the power supply for the jockey pump may be taken from, only that it "shall not be connected to the fire pump controller". Is there a section I'm not seeing in NFPA 20 that would clarify where the power supply for a jockey pump and its controller shall, or may be taken from?

Answer: There are no requirements whatsoever for the power to a jockey pump. The jockey pump is not really a fire protection device. It is a piece of equipment that protects the fire pump from excessive use, but serves no purpose during a fire. If the jockey pump is out of service, the fire protection system will work fine without it, so there are no requirements in any standard for the pump to have any special power arrangement. Many times, the jockey pump will be served by the same power source as the main fire pump for convenience. Since the power is brought into the pump room for the fire pump, it only makes sense that the jockey pump also uses this power. NFPA 20 allows the jockey pump to use the same service as the main fire pump. This is shown in Figure A.9.3.2 in the 2003 edition of NFPA 20 (similar figures in other editions). In both Arrangement A and Arrangement B, the power prior to the fire pump controlled is permitted to be tapped for "fire pump auxiliary loads". These auxiliary loads include the jockey pump. Note that the tap for fire pump auxiliary loads is considered optional. This is not a requirement of NFPA 20, but an allowance. If you do not want to provide power to the jockey pump in this manner, you are welcome to use any power supply that gets the correct current and voltage to the jockey pump.

Upcoming NFSA "Technical Tuesday" Seminar – October 9th

Topic: Special Considerations for Dry Systems
Instructor: Cecil Bilbo, Jr., NFSA Director of Technical Services
Date: October 9, 2007

This seminar will discuss the special requirements that are often overlooked on dry systems. The discussion will include the calculation of water delivery times and the new manifolds for testing systems in this manner, as well as the new requirements for signs and information on a dry sprinkler system. Also, find out if the small room rule and the largest room method can be used on dry systems. More importantly, the TIA recently issued for dry systems and its affect on the development of the 2007 edition of NFPA 13 will be discussed. In addition, this seminar will take a look at the history of the requirements for water delivery in NFPA 13 over the last hundred years.

Information and registration for this seminar is available at www.nfsa.org or by calling Dawn Fitzmaurice at 845-878-4200 ext. 133 or email: dawn@nfsa.org.

Upcoming NFSA "Business Thursday" Seminar – October 18th

Topic: Recruiting and Retaining Employees
Instructor: Buddy Dewar, NFSA Director of Regional Operations
(Former Florida State Fire Marshal)
Date: October 18, 2007

Gaining market advantage cannot be accomplished without a viable and effective workforce. As our industry grows the labor force must also grow. But at what rate and how can we effectively train and motivate our employees to maximize their productivity? This On-Line is a follow up presentation containing comments and ideas shared during a Workshop Session at the June 2007 NFSA Annual Seminar and Exhibition in Las Vegas.

Information and registration for this seminar is available at www.nfsa.org or by calling Dawn Fitzmaurice at 845-878-4200 ext. 133 or email: dawn@nfsa.org.

NFSA Technician Training Classes

Two-Week Technician Training Seminar

November 5-16, 2007	Newburgh, NY
February 4-15, 2008	Centennial, CO

NICET Inspector Certification Review Class

November 6-8, 2007	Providence, RI

For more information on any of these classes, contact Nicole Sprague at 845-878-4200 ext. 149 or email: Sprague@nfsa.org.

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 between now and the end of the year:

Oct 23	Introduction to Sprinkler Systems (1/2 day)(AM)////Woodland, CA
Oct 23	Underground Piping (1/2 day)(PM)////Woodland, CA
Oct 24	Inspection, Testing & Maintenance////Woodland, CA
Oct 25	Basic Seismic Protection (1/2 day)(AM)////Woodland, CA

Oct 25 Advanced Seismic Protection (1/2 day)(PM)////Woodland, CA
Oct 29-30 Two-day NFPA 13 Overview & Intro to Plan Review////Riverside, CA
Oct 30-31 Two-day NFPA 13 Overview & Intro to Plan Review////Spokane, WA
Nov 1 Sprinkler Protection for Special Storage////Spokane, WA
Nov 1 Hydraulics for Fire Protection////Riverside, CA
Nov 6-7 Two-day NFPA 13 Overview & Intro to Plan Review////Durango, CO
Nov 8 Sprinklers for Dwellings////Durango, CO
Dec 11 Pumps for Fire Protection////Tucson, AZ
Dec 12 Fire Pump Layout & Sizing (1/2 Day) (A.M.)////Tucson, AZ
Dec 12 Standpipe Systems (1/2 Day) (P.M.)////Tucson, AZ
Dec 13 Inspection, Testing & Maintenance////Tucson, AZ

For more information on these seminars, or to register, please visit *www.nfsa.org* or call Michael Repko at 845-878-4207.

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.