



## Number 69 November 14, 2006

### Best Questions of October 2006

We have selected the following questions as the “best of October 2006” answered by the engineering staff as part of the NFSA “Engineer of the Day” member assistance program:

#### Question 1 – Sprinklers Within Combustible Eave Spaces

Question 11 from the “Best of September” (eTechAlert 67) compilation dealt with the location of sprinklers in combustible attics but mentioned combustible eaves. Does the requirement for sprinklers below the eave space affect the need for sprinklers within the eave space?

**Answer:** No, they are two separate issues. The author of that interpretation threw in the 4 ft eave comment, but the last line was somewhat unrelated to the main question and was phrased improperly. NFPA 13 requires sprinkler protection *below* combustible eaves more than four feet wide. The requirement for sprinklers *within* the eave would depend on the construction in line with other requirements of NFPA 13. The eaves can be formed as part of the main truss space, meaning that the intersection point where the top and bottom chords is beyond the exterior building wall. In such case, the eave would be contiguous and sprinklered as part of the attic. Or, a truss could be used that keeps this intersection point within the outer walls but continues the top chord beyond the outer wall. In the latter case, the constructed space may require sprinklers if there is more than 6 inches between upper and lower chords, unless the space is filled with noncombustible insulation or meets one of the other exceptions.

#### Question 2 – Manual Wet Standpipes

A dry standpipe was specified for a three-story office building, but the local code official has insisted that it be a wet standpipe. Is there any way to avoid a fire pump?

**Answer:** NFPA 14 defines various types of standpipes. A “wet standpipe” is defined (Section 3.3.28 in the 2003 edition) as “a standpipe system having piping containing water at all times”, whereas a “dry standpipe” is defined (Section 3.3.5) as “a standpipe system designed to have piping contain water only when the system is being utilized.” System types are further defined within Section 5.2, where the concept of automatic vs. manual standpipes is introduced. Simply connecting a standpipe to available water supplies produces a “manual-wet” standpipe, which in Section 5.2.5 is recognized as a type of wet standpipe that can be served by fire department pumpers. The adequacy of the water supply must be proven through calculations if an “automatic-wet” standpipe system is desired in accordance with Section 5.2.2. NFPA 14 only allows manual standpipes for Class I service (no occupant use hose connections) and does not permit manual standpipes in high-rise buildings, defined in Section 3.3.9 as buildings more than

75 ft in height measured from the lowest level of fire department access to the floor of the highest story.

The code official may be attempting to match the standpipe requirement to that required by the adopted building code. Newer codes generally allow the use of manual wet standpipes in sprinklered buildings. For example, the 2003 edition of the International Building Code allows Class I standpipe service instead of Class III in fully sprinklered buildings, which in turn opens the door to the use of wet-manual standpipes maintained at the pressures needed by the sprinkler system. The NFPA 14 prohibition against the use of this concept in high-rise buildings would still apply.

### **Question 3 – Driver Requirements for Positive Displacement Pumps**

Section 8.6 of NFPA 20 references Chapters 10 and 12 for requirements for a positive displacement controller. Chapter 8 does not specifically reference Chapters 9, 11 or 13 for drivers. Is it the implied intent of NFPA 20 that the requirements of those chapters apply to drivers of positive displacement pumps? Also, does NFPA 20 require a positive displacement pump driver to be listed?

**Answer:** "Yes" to both questions. When the Committee on Fire Pumps expanded the scope of the document recently to include positive displacement pumps, it was with the intent that they meet all of the requirements of the document, not just the chapter on positive displacement pumps.

### **Question 4 – Dry System Rules for NFPA 13R Systems**

Our state fire marshal's office recently included the following comment in a plan review letter to us on an NFPA 13R project containing a dry pipe system: "The dry system must be installed in accordance with NFPA 13 requirement and not 13R that means the attic must be sprinklered. 1-6.22 1999, 5.3.3 2002." We note that Section 5.3.3 of NFPA 13R (2002 edition) states: "Where antifreeze systems, dry pipe systems, and pre-action systems are installed, they shall be installed in accordance with NFPA 13 - *Standard for the Installation of Sprinkler Systems*." The fire marshal's office explained that since we were not using a wet system, the building has to be sprinklered per NFPA 13. We respectfully disagreed, and argued the standard meant that if an anti-freeze system, dry system, or pre-action system were used to protect the building, then the subject system needed to comply with the specific section in NFPA 13, but not that we were now to use all of the guidelines set forth in NFPA 13.

**Answer:** You are correct that the intent of NFPA 13R is to reference NFPA 13 for the rules regarding how to arrange the dry-pipe system, not to bring in all of the rules of NFPA 13. The committee that writes NFPA 13R deliberately tries to keep things simple by referencing NFPA 13 where appropriate rather than copying all of the rules about sizing compressors, pitching pipe, using upright sprinklers, adding a 30% increase to the design area, using a C-factor of 100 for non-galvanized steel, holding the pressure at a maximum of 20 psi over the trip point of the differential dry valve, and other rules that apply to installing a dry-pipe system. But there was never an intent that by using NFPA 13 in part you had to follow all of the other rules such as sprinklering concealed spaces or adding hose stream demand. The basic rules of NFPA 13R still apply to the dry-pipe system used in an NFPA 13R occupancy, so you are permitted to leave concealed spaces unsprinklered and you are not required to add a hose stream demand to the sprinkler system. To apply NFPA 13R, however, the dwelling unit portions of the building

require the use of listed residential sprinklers, except as provided in Sections 6.6.7.1.3 and 6.6.7.1.4 (2002 edition) for small compartments and mechanical closets. Since there are no residential sprinklers listed for use in dry pipe systems at this time, a wet system must be provided where residential sprinklers are installed.

### **Question 5 – NFPA 13 Residential Unsprinklered Combustible Concealed Spaces**

A multi-story building has one level of parking, one level of retail space, and three levels of residential apartments. The parking and retail levels are built with post tension concrete floors, the residential levels are built with composite wood joists with ceilings attached directly to the bottom of the joists, with the joist channels firestopped into volumes not exceeding 160 cu. ft. but with no insulation. Per NFPA 13 (2002 edition) the design criteria is 0.15 gpm/sq.ft. over 1950 (dry system) for the parking level, 0.20 gpm/sq.ft. over 1500 sq. ft. for the retail level, and 0.10 gpm/sq.ft. for the four most demanding residential sprinklers on the residential floors. The question came up as to whether the design areas required a minimum of 3000 sq. ft. per the restrictions in section 11.2.3.1.8 (4) if the joist spaces were not filled with insulation? Also, does the same requirement apply to the parking or retail levels that are designed using the density/area method?

**Answer:** Since the unsprinklered combustible concealed spaces are only within the residential portion of the structure and the residential sprinkler design option is being used throughout the residential portion, there is no requirement to use a minimum 3000 sq ft design area. The 3000 sq ft minimum applies only to sprinklers calculated using the density/area method or the room design method. For residential sprinklers, neither design method is used, so the 3000 sq ft rule does not apply. The design area for residential sprinklers is four sprinklers, regardless of the existence of unsprinklered concealed spaces. This also applies regardless of how many sprinklers are in the rooms of the residential occupancy. Even if the most demanding room only has two sprinklers in it, NFPA 13 would require the most demanding four sprinklers to be calculated.

The four sprinkler design was adopted by NFPA 13 to encourage people to use residential sprinklers in residential occupancies since this sprinkler was the sprinkler specifically designed and tested against the residential fire scenario. The residential sprinkler intentionally has a smaller design area than standard spray sprinklers and extended coverage spray sprinklers in order to encourage their use. This is just one example of the decrease in design requirements to encourage their use.

### **Question 6 - Maximum Pressures on Underground**

A fire pump will be charging an underground loop including fire hydrants as well as the sprinkler systems. What is the highest pressure allowed on the underground? Are pressures of 173 psi to 195 psi acceptable?

**Answer:** Section 10.1.5 in NFPA 13 and NFPA 24 (2002 editions) provides guidance for manufacturers of underground pipe, and calls for minimum rated pressures of 150 psi. But in addition to this section, Section 6.1.3 requires all components in the system to be rated for the pressures they are going to experience.

### **Question 7 – Interior Ladders for Welded Steel Tanks**

How many interior ladders are needed on a steel aboveground water tank? NFPA 22 appears to require two hatches, but only one interior ladder.

**Answer:** We would agree that NFPA 22 (2003 edition) requires only a single interior ladder for welded steel tanks. It should be noted that annex Figure B.1(1) shows a welded steel suction tank that clearly shows a tank with two roof hatches and a single interior ladder, supporting the wording of the standard. Note that the figure contains the caption “shell manway (two required)”. If there was any intent to provide two interior ladders it can be assumed a similar note would have been attached to the figure for that purpose.

### **Question 8 - Mixing Quick Response In-Rack Sprinklers**

Does NFPA 13 (1999 edition) specify the use of standard or quick response in-rack sprinklers for double row racks, 30 ft high storage for a class I, II, III, IV commodity in Table 7-4.3.1.5.1? Also, if the existing rack next to this new one we are doing has standard response sprinklers, would we be mixing sprinklers if we used QR type?

**Answer:** The in-rack sprinklers required by the table are not required to be quick response sprinklers, but there is no prohibition against the use of quick response sprinklers. The section that governs this in the 1999 edition is Section 5-12.2. The base paragraph specifies standard response, but an exception permits quick response. This holds to the present day, with Section 8.13.2.1 of the new 2007 edition of NFPA 13 allowing the use of either standard or quick response sprinklers.

The allowance for quick response sprinklers in racks is independent of whether ceiling sprinklers are quick response. As such, the new restriction on mixing of sprinklers at the ceiling (Section 8.3.3.2 in the 2007 edition states that all sprinklers within a compartment be quick response when quick response sprinklers are used) is not intended to apply. In-rack sprinklers activate only in response to fires in their immediate vicinity, so the use of standard response sprinklers in one rack and quick response sprinklers in an adjacent rack would not be expected to present a problem.

### **Question 9 – What is “Fully Sprinklered”?**

Is a building still “fully sprinklered” per NFPA if a wet pipe system is provided throughout with the exception of a control room protected with an FM 200 clean agent system. (1 shot – no reserve)?

**Answer:** In general, a “fully sprinklered” building is one in which sprinklers are provided in accordance with NFPA 13. However, the applicable building code takes precedence. Most building codes contain a clause allowing substitution of another type of automatic fire extinguishing system in place of sprinklers where appropriate for the hazard. As an example, Section 903.1.1 of the 2003 edition of the International Building Code allows alternative systems complying with Section 904 of the Code “where recognized by the applicable standard and approved by the Building Official”. Section 904 is entitled “Alternative Automatic Fire-Extinguishing Systems” and addresses these other systems but contains a statement in Section 904.2 that these systems “shall be not be considered alternatives for the purposes of exceptions or reductions permitted by other requirements of the Code.” In other words, a building equipped throughout with one of these systems would not automatically be granted the area or height increases or other “trade-ups” permitted for fire sprinkler protection. With regard to “fully sprinklered” or the code language “equipped throughout with an automatic sprinkler system”,

Section 903.1.1.1 clarifies that sprinklers are to be installed throughout except for specific locations, including “2. Any room or space where sprinklers are considered undesirable because of the nature of the contents, when approved by the building official.” Provided the building official is convinced of the appropriate use of the alternative system, and the alternative system is installed in accordance with applicable NFPA standards, the official should therefore also continue to consider the building as “fully sprinklered” for other purposes of the code.

### **Question 10 - “Fully Sprinklered” for Standpipe Sizing in NFPA 13R Occupancies**

NFPA 14 (2003 edition) sections 7.6.2 and 7.6.3 state that the minimum size for standpipes in combined systems shall be 6-inch but can be 4-inch for a combined system within a “fully sprinklered building” that is hydraulically calculated. Would a building be considered “fully sprinklered” if there are unprotected combustible concealed spaces as allowed in NFPA 13 and NFPA 13R? Are there any situations in buildings completely covered by a sprinkler system installed per NFPA 13 or NFPA 13R that would deem the building not fully sprinklered? What if the system were being installed per NFPA 13?

**Answer:** NFPA 13 does not define the term, but it has become the industry standard that a building with sprinklers provided in accordance with NFPA 13 is considered a “fully sprinklered building”. NFPA 13D and 13R, by contrast, do not provide complete sprinkler protection as part of their focus on life safety and economical sprinkler system installation. As such, a building with nonsprinklered combustible concealed spaces in accordance with the allowances of NFPA 13 is still considered to be fully sprinklered.

In some cases the building codes refer to the installation of “buildings equipped throughout” with sprinklers in accordance with either NFPA 13 or NFPA 13R. Such is the case in the International Building Code allowance for allowable building height increases, the use of Class I standpipes in lieu of Class III standpipes, and other design alternatives. In these cases, sprinklers would be provided as normally required for an NFPA 13R occupancy and the building could still be considered sprinklered throughout in accordance with NFPA 13R, but it would generally not be considered a fully sprinklered building. The reference to the standard essentially defines what “sprinklered throughout” means in those cases. An insurance company might conceivably give credit for a dwelling “equipped throughout” with sprinklers in accordance with NFPA 13D.”

NFPA 13 contains wording (Section 8.1.1(a) in the 2002 edition) that states a basic principle of “sprinklers shall be installed throughout the premises.” Exceptions are then made on the basis of practicality and consideration of fire load. The other standards, however, do not include this statement, and allow omission of sprinklers on the basis of economics as well as the other considerations.

The reason four stories was selected as the cutoff for application of NFPA 13R is that building codes generally require standpipe systems in higher buildings, bringing with them water supplies that make the addition of sprinkler protection less costly. NFPA 14 (Section 7.10.1.3 in the 2003 edition) refers to combining standpipe demands with sprinklers installed in accordance with NFPA 13, but does not specifically make an allowance for NFPA 13R. NFPA 13R is not even among the referenced publications of NFPA 14 in Section 2.2. As such, it would be difficult to conclude that NFPA 14 intends to credit an NFPA 13R sprinkler system within the definition of “fully sprinklered” for purposes of Section 7.6.3. Since an NFPA 13 system can always be used in lieu of an NFPA 13R system, the option exists to use an NFPA 13 system when standpipes are required.

## **Question 11 – Pressure Gauges Upstream of Pressure Reducing Hose Valves**

Are pressure gauges required at the upstream side of pressure reducing hose valves?

**Answer:** Section 5.7.3 (2003 edition) of NFPA 14 states that “a valved outlet for a pressure gauge shall be installed on the upstream side of every pressure regulating device”. A pressure reducing valve is defined as a type of pressure regulating device (Section 3.3.17). However, NFPA 14 does not contain any requirements for the pressure gauges themselves, only these outlets to which they can be connected for testing purposes. It should be noted that this is different from the NFPA 13 for sprinkler systems, which (Section 8.15.1.2.2 in the 2002 edition) specifically requires pressure gauges on both the upstream and downstream side of each pressure reducing valve. NFPA 14 does specify (in Section 5.6.1) some other locations for which it does require pressure gauges.

## **Question 12 - Mixing Extended and Standard Coverage Sprinklers**

A small addition is being put on a fairly new school, and the bid specification calls for matching existing sprinklers. The original sprinkler contractor installed extended coverage sprinklers and standard coverage sprinklers together in the corridors. The standard sprinklers cover the areas near the exits and the extended are in the middle. Is this installation legal?

**Answer:** NFPA 13 (Section 8.3.3.2 in the 2002 edition) requires that where quick response sprinklers are installed, all sprinklers within a compartment shall be of the quick response type. However, extended coverage sprinklers are not necessarily quick response sprinklers. There is no prohibition against mixing extended coverage and standard coverage sprinklers within a compartment. Section 14.4.4.6.3 even allows extended coverage sprinklers as an exception to the prohibition against mixing orifice sizes: “Extended coverage sprinklers with a different orifice size shall be acceptable for part of the protection where installed in accordance with their listing.”

## **Upcoming NFSA “Business Thursday” Online Seminar**

**Topic: Water Charges – Impact and Standby Fees**

**Instructor: Dominick Kass, NFSA Northeast Regional Manager**

**Date: November 16, 2006**

Public water supplies are critically important to the economical installation and successful operation of a fire sprinkler system. Many political jurisdictions have added impact fees and standby water fees that are excessively high and having an adverse impact on fire sprinkler ordinance adoption. This presentation investigates these fees and charges in the perspective of the cost/benefit to government; addresses installation requirements such as excessive backflow protection requirements, retrofit of cross-connection devices on existing systems by those other than fire sprinkler contractors; excessive taps for the apparent reason to charge standby water fees, and the many other actions by water purveyors that cause extra costs and liability to the contractor. This presentation will also address legislative efforts to help control water supply costs.

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

## **Next NFSA “Technical Tuesday” Online Seminar**

**Topic: Protective Coatings for Piping**

**Instructor: Cecil Bilbo, Jr., Director of Technical Services**

**Date: November 21, 2006**

Pipe must be protected from harmful environments. One way to protect the pipe is to use a coating. Coatings could be as simple as painting the pipe or using a pipe that is specially listed with a coating already applied to it. In addition, various options are available with regard to galvanizing pipe. Whatever method is followed it is important to remember that the pipe must be able to endure the environment that it is installed. This seminar will review available options for coating pipe and the installation requirements that accompany it. Also, common problems that arise with protective coatings will be discussed.

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

## **Next NFSA Two-Week Technician Training Program – Denver Location**

A number of registrants were turned away from the recent two-week technician training program in Philadelphia due to limits on class size, so register early for the next available class:

**Dates – January 8-19, 2007**

**Location – South Metro Fire Rescue, 9125 E. Mineral Ave., Centennial, CO**

**Hotel – Drury Inn & Suites, 9445 East Dry Creek Road, Centennial, CO 80112**

**(Call 303-694-3400 by 12/14/06 for NFSA \$69 per night room rate)**

For more information, contact Nicole Sprague using [Sprague@nfsa.org](mailto:Sprague@nfsa.org) or by calling 845-878-4200 ext. 149.

## **NFSA Announces Spring 2007 Technical Tuesdays on 2007 Standards**

During the first half of 2007, NFSA will be devoting its “Technical Tuesday” online seminar series to an in-depth review of changes to the new 2007 editions of NFPA 13, 13D, 13R, 14 and 20. This is your chance to learn from the experts who represent the fire sprinkler industry on the technical committees that write the sprinkler rules. See the changes in the 2007 edition that can clarify older rules and make the installation of fire sprinkler systems more cost effective.

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| <b>Jan 16</b> | <b>Changes to Definitions and System/Component Requirements<br/>Russell P. Fleming, P.E.</b> |
| <b>Jan 30</b> | <b>Changes to the Installation Rules<br/>Cecil Bilbo, Jr.</b>                                |
| <b>Feb 13</b> | <b>Changes to the Hanging Requirements</b>   |

**Victoria B. Valentine, P.E.**

- Mar 6**            **Changes to Underground Piping and Water Supplies**  
                      **Kevin J. Kelly, P.E.**
- Mar 20**           **Changes to Design Approaches and Calculations**  
                      **Cecil Bilbo, Jr.**
- Apr 3**             **Changes to the Seismic Protection Rules**  
                      **Victoria B. Valentine, P.E.**
- Apr 17**           **Changes to Storage Protection Requirements**  
                      **Russell P. Fleming, P.E.**
- May 8**            **Changes to the Residential Sprinkler Standards**  
                      **Kenneth E. Isman, P.E.**
- May 22**          **Changes to the Standpipe Rules**  
                      **Kevin J. Kelly, P.E.**
- Jun 12**           **Changes to the Pump Requirements**  
                      **Kenneth E. Isman, P.E.**

The level of all seminar topics is considered intermediate. Because these seminars are being offered as a complete program on NFPA 13, a 30% discount is available when signing up for all ten seminars in the series.

Information and registration for this seminar series is available at [www.nfsa.org](http://www.nfsa.org) or by calling Dawn Fitzmaurice at 845-878-4200 ext. 133 or email [dawn@nfsa.org](mailto:dawn@nfsa.org).

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*In the promotion of the fire sprinkler concept, the National Fire Sprinkler Association represents all fire sprinkler industry interests including fire sprinkler contractors, manufacturers and suppliers of fire sprinklers and related equipment and fire protection professionals. Established in 1905, the National Fire Sprinkler Association provides publications, nationally accredited seminars, representation in codes and standards-making, market development, labor relations and other services to its membership. Headquartered in Patterson, New York, the National Fire Sprinkler Association has regional operations offices throughout the country.*