NATIONAL FIRE SPRINKLER ASSOCIATION, INC.

Tuesday e-Tech Alert
April 11,2006

Best Questions of March 2006

We have selected the following questions as the "best of March 2006" answered by the NFSA Engineering staff:

Question 1 – Standpipes in 13R Occupancies

We have seen a number of low-rise residential occupancies that qualify for NFPA 13R sprinkler systems but require Class III standpipe systems per the International Building Code because the floor level of the highest story is more than 30 ft above the lowest level of fire department access (Section 905.3.1 of the 2003 edition). Can a 500 gpm fire pump be avoided? Can listed CPVC piping be used for the 13R system if a combined riser is installed? Are two separate fire department connections needed for the sprinkler and standpipe system?

Answer: The first exception to Section 905.3.1 within both the 2000 and 2003 editions of the IBC allows Class I standpipe systems instead of Class III standpipe systems if the building is equipped throughout with a sprinkler system installed in accordance with either NFPA 13 or NFPA 13R. This allows the use of a manual standpipe system in accordance with NFPA 14. With a manual standpipe system, the fire department essentially brings the pump to the fire in the form of the fire department pumper. Section 5.4.1 of the 2003 edition of NFPA 14 clarifies that the Class I standpipe can be manual for other than high-rise buildings. Except where the piping is subject to freezing the system must also be wet, and Section 5.2.5 defines the "Manual-Wet" standpipe system as a "wet standpipe system connected to a small water supply for the purpose of maintaining water within the system or sharing a water supply with an automatic sprinkler system but not having a water supply capable of delivering the system demand attached to the system". Although the 2003 edition of the IBC officially adopts the 2000 edition of NFPA 14, that edition contains the same intent – it was simply clarified in the 2003 edition. Through the use of a combined riser, the sprinkler system water supply maintains the wet condition of the standpipe system. CPVC can be used for the sprinkler system taken from the combined riser provided all normal precautions with regard to the pressure rating of components are observed. The fire department connection would be the normal Siamese connection appropriate for a Class I standpipe system. As an alternative the sprinkler and standpipe systems could be kept separate, with a checked supply from the sprinkler riser to the standpipe system. In this case, a separate single FDC would be needed for the sprinkler system, but there would be no need to consider the impact on the sprinkler system from higher pressures associated with use of the standpipe system by the fire department. One special precaution with regard to the use of the manual standpipe: Section 5.4.2 of NFPA 14 currently requires a sign at each hose connection to read: "Manual Standpipe for Fire Department Use Only."

Question 2 – Corrosion-Resistant Sprinklers in Steam Rooms

Does NFPA 13 - A6.2.6.1 (13) 2002 edition require that corrosion-resistant sprinklers be used in a small steam room (sauna)? Residential sprinklers are being used throughout a residential high-rise.

Answer: As an annex section, A.6.2.6.1 can contain no requirements. The base section within the standard, 6.2.6.1 requires listed corrosion-resistant sprinklers "in locations where chemicals, moisture, or other corrosive vapors sufficient to cause corrosion of such devices exist. The annex section provides examples of the intended application of the base paragraph, and includes "steam rooms of all descriptions" within that list. As such, it would appear clear that the intent is to use a corrosion-resistant sprinkler in that application.

This requirement, however, need not be considered difficult to satisfy. The teflon-coated and polyester-coated bulb-type sprinklers were originally listed as corrosion-resistant sprinklers to allow use of their white-coated and black-coated frames. Check with the manufacturers on residential versions.

Question 3 – Elevator Protection in 13D Applications

Is it the intent of NFPA 13D to require sprinkler protection in elevator shafts found in private homes?

Answer: No. NFPA 13D would not require sprinkler protection in elevator shafts. This position was recently confirmed by the NFPA Committee on Residential Sprinkler Systems during preparation of the 2007 edition of the standard. It should also be noted that during 13R does not require sprinkler protection in the elevator shaft (Section 6.8.5 of the 2002 edition of NFPA 13R): "Sprinklers shall not be required in attics, penthouse equipment rooms, elevator machine rooms, concealed spaces dedicated exclusively to and containing only dwelling unit ventilation equipment, crawl spaces, floor/ceiling spaces, elevator shafts, and other concealed spaces that are not used or intended for living purposes or storage and do not contain fuel-fired equipment." However, in the event the elevator is used as the only means of egress then more importance should be placed on its protection.

Question 4 – Dry System Water Delivery Using Calculation Method

NFPA 13 item 7.2.3.3 states that piping volume shall be permitted to exceed the requirements of 7.2.3.1 where dry systems are calculated for water delivery in accordance with 11.2.3.9. Table 11.2.3.9.1- Dry System Water Delivery allows the system to tested by flowing two (2) remote sprinklers. Does this allow the use of two (2) inspectors test valves with two (2) reduced orifices or does it require one valve with an orifice equal to two (2) sprinklers? Also, does the actual trip time and water delivery time have to match that shown by the calculation program? Must the system delivery time be calculated prior to installation? If a system exceeds the 750 gallons allowed and has not had the delivery time calculated, but can or does meet the time requirement, by opening two remote test connections is the system acceptable?

Answer: If the listed computer program is used to prove the delivery time of Table 11.2.3.9.1, no special inspector's test connection is required. You are not required to prove the water delivery in

the specified time frame, so there is no need to build an inspector's test connection with additional openings. The situation is very much the same as hydraulic calculations performed by computer. The only time that a special inspector's test needs to be built is if the contractor wants to use the multiple openings instead of using the computer program. This is permitted by the "alternate arrangement" section of NFPA 13, and will be explicitly permitted in the 2007 edition. If the contractor is going to use this option, they need to build an inspector's test connection that simulates the same number of openings as Table 11.2.3.9.1.

Question 5 – Attic Sprinklers with Perpendicular Structural Members

NFPA 13 Section 8.6.2.2.1(a) (2002 edition) contains restricted sprinkler spacing and pressure requirements for unoccupied attics having combustible wood joists or wood truss construction with members less than 3 ft on center and slope of 4 in 12 or greater. I have a building with roof slope of 4 in 12 with wood trusses 8 ft apart, but they are parallel to the slope. Running perpendicular to the trusses are 2 x 4 wood purlins running 2 ft 6 in. on center up the slope of the roof. Are these purlins considered members per 8.6.2.2.1(a)?

Answer: Your question is interesting, in that the fire tests that performed to establish the special attic rules did not resemble in any way the configuration that you have described. Unfortunately, the rules in NFPA 13 are not explicitly limited to the configuration that was tested. The problem that was identified in the fire testing is that when the structural members run perpendicular to the ridge, heat races up the slope past sprinklers, creating a need for the sprinklers to be closer together. In your situation, the main structural members are running parallel to the ridge, so the need to squeeze sprinklers closer together is diminished. Although Table 8.6.2.2.1(a) appears to require specific spacing for your situation, there are some other sections of NFPA 13 that would allow different spacing based on fire tests. Section 8.1.1(5) allows sprinklers to be spaced in accordance with fire tests. Similarly, sections 1.5 and 1.6 allow alternate arrangements that have the same level of safety as what the standard requires. The Authority Having Jurisdiction may allow you to ignore the special attic rules and space the sprinklers in accordance with the regular rules for combustible obstructed construction if they are shown that the fire tests used to establish the special attic rules are different than the situation at hand.

Question 6 – NFPA 13R Areas Below Staircases

The area below the stairway in an NFPA 13R occupancy is used as a storage space. Is it necessary to have the area covered by the sprinkler system?

Answer: The requirement to include sprinklers in the type of space you have described can be found in Chapter 6.8.1 of NFPA 13R (2002 edition) where it states, "Sprinklers shall be installed in all areas except where omission is permitted by 6.8.2 through 6.8.6."

The space described generally qualifies as a closet. NFPA 13R specifically addresses closets and other spaces wherein sprinklers may be omitted. In Chapter 6.8.3 it states the conditions for omission, "Sprinklers shall not be required in clothes closets, linen closets, and pantries within the dwelling units that meet all of the following conditions:
(1) The area of the space does not exceed 24 ft^2 (2.2 m^2).
(2) The least dimension does not exceed 3 ft (0.91 m).

(3) The walls and ceilings are surfaced with noncombustible or limited-combustible materials as defined by NFPA 220, Standard on Types of Building Construction."

It should be noted that there should be no fuel fired equipment in this space (Section 6.8.5).

So, if the area is larger than 24 sq ft, sprinkler protection is needed. The standard goes on to say that a single sprinkler may suffice in that circumstance. 6.7.1.5.4 states*:* "In closets and storage areas with both a volume no larger than 300 ft^3 (8.93 m^3) and a ceiling height less than 5 ft (1.5 m) at the lowest ceiling, a single sprinkler located at the highest ceiling shall be permitted to protect that space."

Question 7 – Protecting Sprinklers During Remodeling

Are there protective covers/plates that one can be put in or around the sprinklers such that foreign objects like pipe or scaffolding will not make accidental contact with a sprinkler? Retrofitting jobs in existing work spaces make it imperative to seek a preventative solution.

Answer: One way to protect the sprinklers would be to use listed sprinkler guards.
It is important to note that the guards are listed specifically for individual models of sprinklers. The guard is a device that looks typically like a small cage and fits over the sprinkler. It offers some protection from contact but still allows the sprinkler to spray water in the event of a fire. We recommend that you contact the manufacturer of the sprinklers that are in an existing system to find out if guards are available for those particular sprinklers. The guards can be removed when the work is complete if aesthetics are important.

Question 8 – NFPA 14 Drain Risers

Section 7.12.1 of NFPA 14 (2003 edition) appears to require a 3-inch drain riser next to each standpipe containing pressure-regulating devices so as to facilitate testing of each device. Does this include both floor control pressure regulating valves and pressure restricting hose valves? Also, what is the intent of the Section 7.12.1.1 requirement for a 3 x 2-1/2 inch tee with internal threaded swivel fitting?

Answer: Yes. The term “pressure-regulating device” is the umbrella term that includes pressure reducing valves, pressure control valves and pressure-restricting devices. The 3-inch drain riser is intended to facilitate the testing of all such devices. The test connection on the drain riser must be a 2-1/2-inch swivel hose thread connection so that a fire hose may used to connect the pressure regulating device to the drain riser for the test.

Question 9 – Standpipe Systems and Fire Areas

Does a standpipe located in a parking garage need to be included in the system demand for the standpipe system located in an adjacent residential high-rise tower that it serves? The annex of NFPA 14 states: "A.7.10.1.1 If a water supply system supplies more than one building or more than one fire area, the total supply can be calculated based on the single building or fire area requiring the greatest number of standpipes." In my experience, a parking garage is always a separate fire area from dwelling units or other similar occupancies.

Answer: If the parking garage and residential tower are considered “separate buildings” then the parking garage standpipe would not need to be included in the system demand of the high-rise standpipe system. If the parking garage and residential tower are not “separate buildings” then the parking garage standpipe would need to be included in the residential tower standpipe system demand.

NFPA 14 generally defines a “standpipe system” as an arrangement of piping, valves, hose connections, and equipment installed in a building or structure. NFPA 14 (as well as other installation standards i.e. NFPA 13) typically relies on the building code to determine what constitutes a “separate building”. The International Building Code (IBC) defines a building area as an area included within surrounding exterior walls and fire walls exclusive of vent shafts and courts [IBC 502.1]. In this case the parking garage and the residential tower would be considered separate buildings if they are separated by an exterior wall or a fire wall. Table 705.4 of the 2003 edition of the IBC provides the minimum fire wall fire resistance rating for separating different occupancies.

Question 10 – Deluge System Below Cloud Ceiling

Is it possible to use a separate deluge system below a "cloud" ceiling? An auditorium to be sprinklered has ceiling heights that vary with the sloping floor from 15 to 25 feet over fixed seating. The "clouds" are acoustical baffles that hang from the main ceiling at various angles, most 8 ft x 8 ft but some 5 ft x 5 ft in area. The clouds essentially overlap but are generally one to two feet apart in the vertical plane. The ceiling above the clouds is protected with a wet pipe sprinkler system with upright sprinklers on exposed piping. The proposed system below the clouds consists of 22 individual deluge systems serving exposed branch lines, activated by a series of heat and beam detectors.

Answer: Although the motivation for the system in terms of improved performance is obviously commendable, the arrangement would be highly unusual and could have some drawbacks that must be balanced against any advantages over more traditional protection.

Traditional protection would involve an extension of the wet pipe system such that sprinklers are placed within the individual "clouds" to provide protection below these obstructions. In this manner the aesthetics would be improved, since ceiling sprinklers could be used and no pipe would be visible below the clouds. Use could be made of listed flexible drops if the angles of connection are a concern.

The fire load of an auditorium with fixed seating is generally limited, in that the seating itself is likely to be the source of the fire as opposed to a display or some object higher from the floor. This means that a fire plume rising from the seating will entrain air as it moves toward the ceiling, increasing in diameter. Fire plumes tend to increase in width at an angle from the vertical of approximately 15 percent. As such, the plume will be too wide at the ceiling to bypass the clouds and reach the ceiling without heating sprinklers below. (The most common question we get with regard to cloud ceilings is whether a complement of sprinklers is needed at the upper ceiling level).

Aside from the adverse aesthetics, consideration should be given to whether piping below the clouds will adversely affect acoustics. An acoustical expert once told me that he allows only concealed dry pipe systems to protect his auditoriums.

Most importantly, however, it should be recognized that the success of fire sprinkler protection is largely due to the simplicity of the systems. Wet pipe systems have a recognized higher reliability than dry pipe systems, and dry pipe are considered more reliable than preaction and deluge systems. The more actuating devices involved, the more opportunity for system failure.

We would suggest that consideration be given to a simple wet pipe system. If there is concern that the slope of the acoustical panels will prevent proper sprinkler response, consideration could be given to placement of the sprinklers in the upper parts of the panels while observing sprinkler spacing rules. This will allow the heat flow to be directed past the sprinkler operating mechanisms and allow proper operation from the rising plume.

Question 11 – Ceiling Heat Diffusers

How is Table 8.3.2.5(a) of NFPA 13 (2002 edition) intended to be applied to a 135^{o}F quick response extended coverage sprinkler located near a ceiling heat duct diffuser in a suspended ceiling that nominally discharges downward, but for which the discharge is directed horizontally over 360 degrees? Is the minimum distance from the diffuser edge to the centerline of the sprinkler to be more than 1'-0" as indicated by Table 8.3.2.5(a)? Should the location comply with item (1)(b) for ordinary degree rated sprinklers?

Answer: The applicable part of the Table 8.3.2.5(a) is condition 1(c) for diffusers rather than 1(b), which addresses ducts. Table 8.3.2.5(a) prohibits ordinary temperature rated sprinklers within a 12-inch cylinder of diffusers that discharge downward, but prohibits them within a 30-inch semi-cylinder of diffusers that discharge horizontally. The 360-degree distribution you describe tends to better distribute and dilute the heat compared to a uni-directional horizontal discharge, and for this reason the cylinder approach to ordinary temperature rated sprinkler avoidance would appear more appropriate than the semi cylinder. However, the 135-degree F temperature rating of the sprinkler warrants some additional caution. For this reason we would recommend compliance with the 24 inch minimum specified in Table 8.3.2.5(c), which was developed for fast-response residential sprinklers, for "side of ceiling- or wall-mounted hot air diffusers".

Question 12 - Sectional Control Valves within Dry Pipe Systems

Can control / isolation valves be used downstream of a dry pipe valve? Logical applications would be drops to in-rack sprinklers in freezers (under 20 sprinklers), paint booths, and combined dry pipe and standpipe systems.

Answer: We are not aware of any specific provisions of NFPA 13 that prohibit the use of sectional control valves within a dry pipe system. It should be kept in mind that Section 8.15.2.3 of NFPA 13 requires that all pipe in a dry pipe system be pitched to drain, and that Section 8.15.2.4.3 requires drainage provisions for portions of systems that can be isolated by sectional control valves. It has been the traditional wisdom within the fire sprinkler industry that the use of sectional control valves be minimized as much as possible to help eliminate the problem of valves inadvertently left in the closed position. Of the potential applications mentioned, it should be recognized that floor control valves used in combined sprinkler and standpipe systems are not

usually considered sectional valves, although they would essentially fall into this category when evaluating total system volume.

Upcoming NFSA Technical Tuesday Online Seminar

Topic: Special Sprinklers
Instructor: – Cecil Bilbo, Jr., Director of Technical Services
Date: April 18, 2006

This seminar will discuss the requirements for the proper design and installation of Special Sprinklers used in Automatic Fire Sprinkler Systems. The seminar will focus on the requirements from NFPA 13 and from the various manufacturers' literature on these types of sprinklers. This will include sprinklers used in attics, concealed spaces, prefabricated steel structures, and many other applications. Items including location and positioning, special design considerations and understanding cost benefits will also be discussed.

Information and registration for this seminar is available at www.nfsa.org.

2006 Basic and Advanced Technician Training, NICET Inspection Seminars

The NFSA is the only organization that offers two-week basic technician training seminars, 3-day advanced technician training seminars, and NICET-oriented inspection and testing review seminars at various locations across the United States. The 2006 schedule has been set for the following dates and locations:

2-week Basic Technician Training

August 14-25, 2006 – Seattle, WA
October 16-27, 2006 – Philadelphia, PA

3-day Advanced Technician Training

April 18-20, 2006 – Chicago, IL
October 3-5, 2006 – Minneapolis, MN

3-day NICET Inspection and Testing Certification Review

June 27-29, 2006 – Sugarland, TX
July 11-13, 2006 – Edwards, CO
September 6-8, 2006 – Dallas, TX
November 14-16, 2006 – Anchorage, AK

For more information, contact Nicole Sprague using Sprague@nfsa.org

NFSA In-Class Training Opportunities

NFSA also offers in-class training on a variety of subjects at locations across the country. Here are some upcoming seminars:

May 2	Cockeysville, MD	Inspection, Testing & Maintenance
May 3	Cockeysville, MD	Sprinkler Protection for Rack Storage
May 4	Cockeysville, MD	Standpipe Systems
May 4	Cockeysville, MD	Underground Piping
May 9	Colorado Springs, CO	Pumps for Fire Protection
May 10	Colorado Springs, CO	Sprinkler Protection for General Storage
May 11	Colorado Springs, CO	Sprinkler Protection for Rack Storage
May 9-10	Nags Head, NC	Plan Review & Inspection
May 11	Nags Head, NC	Hydraulics for Fire Protection
May 16	Winston Salem, NC	Inspection, Testing & Maintenance
May 17	Winston Salem, NC	Pumps for Fire Protection
May 18	Winston Salem, NC	Underground Piping
May 16-17	Richmond, CA	Plan Review & Inspection
May 18	Richmond, CA	Underground Piping
May 18	Richmond, CA	Seismic Protection
May 23-24	Freeland, MI	Plan Review & Inspection
May 25	Freeland, MI	Residential: Homes to High-Rise
May 23-24	Murray, UT	Plan Review & Inspection
May 25	Murray, UT	Hydraulics for Fire Protection
May 23	Spokane, WA	Sprinkler Protection for General Storage
May 24	Spokane, WA	Sprinkler Protection for Rack Storage
May 25	Spokane, WA	Hydraulics for Fire Protection

For more information or to register, visit www.nfsa.org or call 845-878-4207.

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