NATIONAL FIRE SPRINKLER ASSOCIATION, INC.

Tuesday e-Tech Alert
June 6, 2006

Best Questions of May 2006

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

Question 1 – Positioning Levels of In-Rack Sprinklers: Storage vs. Rack Height

When positioning in-rack sprinklers within racks, NFPA 13 sometimes specifies placing them at the 1/3 and 2/3 levels, but does this relate to the height of the racks or the height of the storage?

Answer:

When working with NFPA 13 and in-rack sprinklers, the concern is with height of storage. The issue is the amount of combustibles that are above the highest level of in-rack sprinklers because this is the fire that the ceiling sprinklers will have to fight by themselves. It really does not matter where the physical rack itself ends. Most of the time this does not make a difference in the placement. The placement of the in-rack sprinklers is rounded up to meet the rule in Section 7-4.2.1.1.2 (NFPA 13 2002 edition), which requires the sprinkler to be located 6 inches above the load in the tier. For example, for 25 ft high storage on double row racks where two levels of in-rack sprinklers are being installed, the highest level of in-rack sprinklers needs to be at or above 16'-8" above the floor (two-thirds of 25 ft). But if the storage levels are 5 ft each (5 ft between rack levels with 4 ft high loads on each rack level), this would put the sprinkler in the middle of the fourth load and would violate section 7-4.2.1.1.2. Instead, the sprinkler needs to be moved up to approximately 19'-6" to be above the top of the load. This is what section 7-4.2.1.1.4 means when it refers to the "first tier level at or above one-third and two-thirds".

Question 2 – Sloped Ceilings for Storage

NFPA 13 (2002 edition) Section 12.1.7, "Ceiling Slope", states that the sprinkler system criteria specified in Chapter 12 is intended to apply to buildings with ceiling slopes not exceeding 2 in 12. The standard does not appear to contain anything that would adjust the criteria for roof slopes greater than 2 in 12. Does the code address protection of high piled storage in buildings with a roof pitch greater than 2 in 12, or is it just not allowed?

Answer:

The intent of Section 12.1.7 is that the criteria found in Chapter 12 are only applicable to flat, horizontal ceilings. You are also correct that the standard does not have criteria that address protection of storage under a sloped ceiling. This would be considered outside the scope of the requirements.

There are a couple of options. One would be to construct a flat, horizontal ceiling below the sloped roof. Another would be to reach agreement with the Authority Having Jurisdiction as to what special criteria will apply, perhaps by bringing in a fire protection engineer to develop sprinkler protection criteria or some other protection scheme that meets the owner's goals and provides an appropriate level of safety.

Question 3 – Alternatives to Return Bends for ESFR Sprinklers

Is it the intent of NFPA13 (2002 edition), Section 8.14.18.1 to require a return bend on ESFR pendent sprinkler installation fed from a raw water source when no drops are used and the sprinkler is screwed into the welded outlet at the bottom of the pipe? If the answer is yes, are there alternate ways to achieve the same purpose as a return bend, such as installing a strainer or strainers in the system?

Answer:

Yes, return bends are required for pendent ESFR sprinklers taking water from raw sources such as ponds. It makes no difference whether the sprinkler is intended to be installed on a drop or not. The concern is that sediment will build up on the sprinkler seat and prevent the sprinkler from opening during a fire. Since the sediment is finer than could be caught by most screens, the option of using strainers has not been permitted by NFPA 13. Several cycles ago, NFSA submitted a proposal to the NFPA 13 Committee to exempt ESFR sprinklers from this provision based on the fact that the orifice is large enough to avoid plugging by an obstruction. The Committee rejected the proposal due to concerns for sediment build-up over time. Some Committee members had anecdotal experience with problems, even with sprinklers having orifice sizes greater than K-8.0.

Question 4 – NFPA 13D Bathroom Exemption for Vanity Areas

In an NFPA 13D system, bathrooms under 55 sq. ft do not require sprinklers. Does this apply to a vanity area under the same square footage that is its own compartment?

Answer:

No. While separate bathrooms can be treated separately, the definition of a bathroom is not met simply by the presence of a lavatory or sink. A room with just a sink in it is not a bathroom and needs to be sprinklered. In order to be a bathroom the room needs to include a toilet, bathtub or shower.

NFPA 13R, however, allows a vanity in a separate room to be considered its own bathroom for purposes of the sprinkler exception. Section 3.3.1 states “Within a dwelling unit, any room or compartment containing a lavatory dedicated to personal hygiene, or a water closet, or bathing capability such as a shower or tub, or any combination of facilities thereof.”

Question 5 – Requirements for Listed Concealed Space Sprinklers

Does Section 8.14.1.6 of the 2002 edition of NFPA 13 always require the use of special listed combustible interstitial space sprinklers for protection of open web wood truss construction that is less than 36 inches from deck to deck?

Answer:

No. Section 8.14.1.6 states that the concealed space must "channel heat and be less than 36 inches deck to deck." The corresponding annex section (A.8.14.1.6) goes on to explain "surfaces should be considered to channel heat when the surface or supporting members are greater than 2 inches in depth." With open web wood truss construction this would mean the top chord of the truss would be 2 inches deep or greater to classify as channeling heat.

Also, in some applications insulation covers the top chord of the truss. If the insulation is installed in such a fashion that the smoke and hot gasses would not be channeled then the above section

would not apply. In other words, standard spray sprinklers could be used in the space if it does not channel heat or if it is more than 36 inches from deck to deck in the concealed space.

Question 6 – Residential Sprinklers Under Soffits

Is it the intent of NFPA-13 (2002 edition) to require a sprinkler under a soffit exceeding 8 inches in width in a residential dwelling unit? If so, would Section 8.9.4.1.3.2 apply relative to the placement of a residential pendent sprinkler under the soffit? Does the requirement in Section 8.10.3.3, calling for a minimum distance between sprinklers in a compartment to be 8 feet unless the listing of the sprinkler requires a greater distance, apply to the distance between residential sidewall sprinklers in soffits and residential pendent sprinklers under the same soffits?

Answer:

For sidewall spray sprinklers and for sidewall extended coverage sprinklers, Sections 8.7.4.1.3.2 and 8.9.4.1.3.2 require pendent sprinklers under soffits that are more than 8 inches in width. For residential sprinklers, the rules of 8.7 and 8.9 do not apply and there is no corresponding section in 8.10. Obviously, however, the 8-inch maximum applied for these other sidewall sprinklers can be considered good guidance and a reasonable limit.

When sidewall residential sprinklers are installed on a soffit and pendent residential sprinklers are installed under the soffit, the 8 ft minimum rule of 8.10.3.3 is not important. The soffit represents a significant enough separation between the sprinklers. The pendent sprinkler is only needed for a fire directly under the soffit. If that sprinkler opens, water should not get up to the sidewall sprinkler above and on another face of the soffit. If a fire starts out in front of the sidewall sprinkler, the sidewall sprinkler should open first and spray from this sprinkler should not wrap around and spray directly on the pendent sprinkler below the soffit. If water could get below the soffit in that manner, the pendent sprinkler wouldn't be necessary.

Question 7 – Minimum Size of Private Fire Service Mains

Section 15.1.3.1 of NFPA 13 (2002 edition) states that no pipe smaller than 6 inches in diameter shall be installed as a private service main. We are working on a project where the general contractor brought in a 4-inch water service into the riser room from a connection to the city water main (approximately 130 feet of underground), which is defined as a private service main in 3.8.1 and would appear to be a direct violation of Section 15.1.3.1. The general contractor is arguing it is allowed in accordance with Section 15.1.3.2 because the hydraulic calculations work and there are no hydrants off of the 4-inch water service (its sole purpose is to supply the fire protection and the domestic water). Does Section 15.1.3.2 apply even though this is a private service main?

Answer:

Yes. Section 15.1.3.2 is intended as a direct exception to Section 15.1.3.1. The NFPA reformatted the document in 2002, deleting each “exception” but recreating each one as a new section directly below the section to which it related. This has caused some confusion because the statements are often not mutually exclusive. In this case, the intent of the standard is to allow any size pipe that works from a hydraulic standpoint for a private fire service main so long as the main does not serve fire hydrants. This intent is clearer in the 1999 edition of the standard, where the concept appeared as Section 9-1.3 with an exception. Both sections 15.1.3.1 and 15.1.3.2 relate to private fire service mains.

Question 8 – Distance of Water Storage Tanks from Buildings

Are there criteria for placing a water storage tank for fire protection use, such as a minimum distance from the building?

Answer:

NFPA 22 requires that a tank be protected from exposure fires. Specifically, NFPA 22 requires that the tank be located at least 20 ft from any combustible structures, or that a tank within 20 ft of a combustible structure be fireproofed (sprayed with a protective coating) or protected with an exposure protection system.

There is no specific statement about keeping the tank any distance from non-combustible structures, nor is there any special recognition for fully sprinklered structures.

Question 9 – Strainers for Preaction Systems

If a water supply for a preaction system is non-potable, does NFPA 13 require that a strainer be installed?

Answer:

No. NFPA 13 only requires strainers in certain open water supplies. A captive water supply characterized as 'non-potable' would not require a strainer. Section 15.2.5 (NFPA 13 2002 edition) states, "Penstocks or Flumes, Rivers, or Lakes. Water supply connections from penstocks, flumes, rivers, lakes, or reservoirs shall be arranged to avoid mud and sediment and shall be provided with approved double removable screens or approved strainers installed in an approved manner." This requirement applies to all types of sprinkler systems.

Question 10 – Earthquake Protection for Existing Buildings

If a school that was built in the 1960's is being retrofitted with a sprinkler system, does the need to provide bracing and other earthquake protection features depend on whether the building was originally constructed to resist earthquakes?

Answer:

No. Every building has some degree of inherent resistance to seismic loads. If the Building Code would require earthquake protection for the sprinkler system if the building were built new today in that location, then the sprinkler system should be installed with earthquake protection.

Question 11 – Definition of "Limited Combustible"

In NFPA 13, 2002 edition, is the use of the words "limited combustible", as referenced in Sections 8.14.1.2.1 and 8.14.1.2.2, intended as that defined by Section 3.3.14 as Limited-Combustible Material, or is the term "limited combustible" referencing a portion of a space that is combustible? If it is a portion of the space, how do we determine what is too much?

Answer:

Where NFPA 13 uses the term "limited combustible" it is referencing the Section 3.3.14 definition, and what is most commonly gypsum wallboard. The definition of "limited combustible" in section 3.3.14 identifies the material properties of gypsum wallboard and then allows any other material that you can build a wall or ceiling out of to be called the same thing, if it meets the same criteria. As used in sections 8.14.1.2.1 and 8.14.1.2.2, the term "limited combustible" applies to the construction material forming the concealed space. The intent of sections 8.14.1.2.1 and 8.14.1.2.2 are to state that it is the structural elements that count in the determination of "limited combustible" not the other items that might be in the space. For example, telephone wiring might

not be limited combustible, but the presence of such wiring does not automatically mean that sprinklers are required in the space.

The situation was clearer in the 1999 and prior editions of NFPA 13 where the requirement for sprinklers was for "concealed spaces enclosed wholly or partly by exposed combustible construction" (see 5-13.1.1 in the 1999 edition, similar sections in previous editions). By referencing the construction forming the space, rather than the materials that might be in the space for other reasons, the committee tried to make it clear that it was the construction material surrounding the space that made the difference. Unfortunately, when cleaning this section up in the 2002 edition and trying to be more specific about where sprinklers can be omitted, the committee referred to "limited combustible concealed spaces". There was no intent in the rewording to expand the consideration from the construction forming the space; it was just a shorthand way to refer to a concealed space formed by noncombustible or limited combustible material.

Elements of the wiring industry have been pushing this issue hard. They attempt to use NFPA 13 as justification for making owners purchase more expensive "limited combustible" cable. The NFPA Standards Council has ruled in the development of both NFPA 70 and NFPA 90A that the term "limited combustible" is only appropriate for materials used to construct walls and ceilings. The use of the term "limited combustible" for materials like cables or pipe is inappropriate.

During the rewrite of NFPA 13 for the 2007 edition, the Committee directly addressed this issue, putting the language back to the way it was in the 1999 edition relative to the material forming the space being the basis of whether or not sprinklers should be installed, not what other materials might be in the space. The committee did insert an annex note saying that there is some threshold of combustible material in a concealed space that should require sprinklers, but that threshold is unknown and undefined at this time due to a lack of fire test information that shows what the threshold should be and due to a lack of experience with fires propagating through concealed spaces where the materials forming the space are noncombustible or limited combustible.

Question 12 – Transfer Switch Requirements in NFPA 20

A fire pump controller manufacturer representative recently advised that there are new requirements in the 2003 Edition of NFPA 20 – *Fire Pumps* concerning the "second utility" type transfer switch requirements when the auxiliary power generator capacity is in excess of 225 % of the fire pump motor's rated full-load current (Section 10.8.2.1.5). What is the history behind this section of NFPA? If this edition is not yet officially adopted should it nevertheless be applied due to service life issues with the fire pump and controller? Are there safety issues associated with the old portion of the Code that initiated this change?

Answer:

Section 10.8.2.1.5 does not require a second utility transfer switch, but rather an additional isolation switch when the transfer switch is incorporated into the controller cabinet.

In order to understand the development of section 10.8.2.1.5 in the 2003 edition of NFPA 20, we have to go back to the 1999 edition of the standard. In that edition Section 7-8.2 allowed two different methods for providing transfer switches for situations where there was more than one source of power to the controller. A transfer switch has to be installed whenever there are two different sources of power, but Section 7-8.2 allowed the transfer switch to be incorporated into the same box as the controller (in a separate compartment) or it allowed the transfer switch to be a totally separate device (in its own cabinet). The two different options are called Arrangement I and Arrangement II and are illustrated in the 1999 edition in Figure A-7-8. In the Figure, Arrangement A (corresponding to Arrangement I in the body of the standard) illustrates the situation where the transfer switch is inside the controller cabinet, while Arrangement B

(corresponding to Arrangement II in the body of the standard) illustrates the transfer switch in a separate cabinet somewhere ahead of the controller. Either arrangement is acceptable to NFPA 20.

If you look at the rules in the 1999 edition for transfer switches when they are installed in their own cabinets (ahead of the controller) you'll see Section 7-8.2.2(b), which requires an isolation switch "ahead of the normal input terminals of the transfer switch." By putting the term "terminals" in plural, this means both the normal power terminals as well as the emergency power terminals. So, for the situation where the transfer switch is ahead of the controller, there is an isolation switch on both the normal power source and the emergency power source.

But the same level of protection does not exist in the 1999 edition for the situation where the transfer switch is built into the controller and the emergency source of power is a generator. For the situation where the transfer switch is inside the controller and the emergency power source is another utility, Section 7-8.2.1.3 requires the extra isolation switch. But there is no corresponding requirement for the isolation switch to shut down the emergency power source where that power source is a generator. Typically, the isolation switch for the controller cuts power to the normal power source in this arrangement, not the emergency source. The thinking of the Committee at the time was presumably that the generator could be shut down at the source and so an additional isolation switch was not necessary.

The purpose of an isolation switch is to allow service on the parts of the controller or transfer switch without having electricity in the device. The isolation switch is then a safety device necessary for replacement or repair of parts within the controller or transfer switch. In writing the 2003 edition of NFPA 20, the committee noticed that there were two different levels of safety between the two different Arrangements allowed by the standard. In the case of the separate transfer switch, there was an extra isolation switch that permitted the transfer switch to be worked on with the power turned off. But in the case of the transfer switch being built into the controller, the isolation switch was not required to be installed when the power source was a generator.

In order to address these two different levels of safety with the two arrangements, the Committee decided to add a requirement for an additional isolation switch when the power source was a generator. However, the Committee did not want to add this extra requirement for all situations with a generator because small generators that are just there for the fire pump can be shut down manually before working on the controller/transfer switch, so the additional isolation switch is not necessary. However, when a large generator is installed in a building for multiple purposes (the fire pump being just one) there is a chance that you will need the generator running when someone needs to work on the transfer switch. In this case, an isolation switch would be needed to safely work on the transfer switch while the generator was still running.

The Committee decided to draw the line at small generators just for fire pumps and big generators handling multiple loads by examining the current demands on the generator. If the generator is just going to be used for the pump, then it will have a load capacity similar to the demand for the fire pump. But if the generator is going to be used for multiple devices, then it will have a load demand much greater than the load needed for the fire pump. After debating between 300% and 225%, the committee ended up settling on kicking the requirement for the extra isolation switch in at 225% of the fire pump's rated full-load current. While this number is somewhat arbitrary, it is consistent with other similar requirements in the National Electrical Code (NFPA 70). Once a generator of this size is used with a fire pump, there is an assumption that the generator will be used for other loads other than the pump and there needs to be some method of isolating the pump from the generator so that the transfer switch for the pump and be safely worked on while the generator is allowed to run.

This is one of those situations where the new edition of a standard has addressed a safety issue that wasn't previously identified. There is no rule in the NFPA standards that causes you to use the new edition until it is legally adopted. However, it does create notice that this safety situation

has been identified. The minimal cost of an additional isolation switch avoids potential liability related to ignoring a known safety concern.

Upcoming NFSA Technical Tuesday Online Seminar

Topic: Water Mist Nozzles
Instructor: Victoria B. Valentine, P.E., NFSA Manager of Product Standards
Date: June 13, 2006

Water mist nozzles have many similarities to fire sprinklers. However, they are listed and installed under completely separate standards. This seminar will highlight the installation criteria and detail the listing criteria for water mist nozzles. The applicable spaces that water mist nozzles can be used 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

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:

June 13	**Oak Ridge, TN**	**Pumps for Fire Protection**
June 14	**Oak Ridge, TN**	**Hydraulics for Fire Protection**
June 15	**Oak Ridge, TN**	**Inspection, Testing & Maintenance**
June 13	**Lake Jackson, TX**	**Inspection, Testing & Maintenance**
June 14	**Lake Jackson, TX**	**Pumps for Fire Protection**
June 15	**Lake Jackson, TX**	**Sprinklers for Dwellings**
June 20-21	**Bozeman, MT**	**NFPA 13 Overview & Plan Review**
June 22	**Bozeman, MT**	**Hydraulics for Fire Protection**
June 20	**Dallas/Fort Worth, TX**	**Sprinkler Protection for General Storage**
June 21	**Dallas/Fort Worth, TX**	**Sprinkler Protection for Rack Storage**

June 22	**Dallas/Fort Worth, TX**	**Sprinkler Protection for Special Storage**
June 27	**Oak Creek, WI**	**Introduction to Sprinkler Systems (1/2 day)**
June 28	**Menomonee Falls, WI**	**Inspection, Testing & Maintenance**
June 29	**Oak Creek, WI**	**Residential: Homes to High-Rise**
June 28	**Wilmington, DE**	**Pumps for Fire Protection**
June 29	**Wilmington, DE**	**Standpipe Systems (1/2 day)**
June 29	**Wilmington, DE**	**Seismic Protection (1/2 day)**
June 30	**Wilmington, DE**	**Inspection, Testing & Maintenance**
July 11-12	**Providence, RI**	**NFPA 13 Overview & Intro to Plan Review**
July 13	**Providence, RI**	**Hydraulics for Fire Protection**
July 18-19	**Prescott Valley, AZ**	**NFPA 13 Overview & Intro to Plan Review**
July 20	**Prescott Valley, AZ**	**Inspection, Testing & Maintenance**
July 18	**Albuquerque, NM**	**Hydraulics for Fire Protection**
July 19	**Albuquerque, NM**	**Pumps for Fire Protection**
July 20	**Albuquerque, NM**	**Sprinkler Protection for General Storage**

For more information or to register, visit www.nfsa.org or contact Michael Repko at 845-878-4207.

NFSA to Launch "Business Thursday" Online Seminars

Building on the success of the "Technical Tuesday" online seminars that the NFSA has been conducting for many years, the NFSA will be presenting a series of ten "Business Thursday" online seminars for the second half of 2006. Aimed at the contractor or project manager rather than the technician, these seminars will follow the same format, staring at 10:30 am Eastern time and continuing for 1 to 1-1/2 hours. The schedule of dates and topics is as follows:

July 6	**Safety and Risk Management**
July 20	**Contract Language Pitfalls**
August 10	**Change Orders**
August 24	**Insurance "Wrap-up" Programs: OCIPs and CCIPs**
September 14	**Pre-Job Planning**
September 28	**Mold Remediation**
October 19	**Project Scheduling**
November 2	**Prompt Pay and Retainage**
November 16	**Water Charges: Impact and Standby Fees**
December 7	**AHJ Relationships**

Information and registration for this seminar series is available at www.nfsa.org. A 30 percent discount is available when signing up for all ten seminars in the series.

services to its membership. Headquartered in Patterson, New York, the National Fire Sprinkler Association has regional operations offices throughout the country.