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Best Questions of July 2009

We have selected the following questions as the “Best of July 2009” answered by the engineering staff as part of the NFSA’s EOD member assistance program:

Question 1 – Surge Clips for Restraint

Referencing the 2002 edition of NFPA 13, Section 9.3.6.3 states “The end sprinkler on a line shall be restrained against excessive vertical and lateral movements”. This has always been a source of discussion as to what is required. Generally we have interpreted this as adding a “surge clip” to the last hanger on the line to guard against vertical movement. Is additional restraint beyond a surge clip required?

Answer: Additional restraint beyond a surge clip can be necessary, since NFPA 13 requires restraint against both lateral and vertical movement. The surge clip by itself prevents only vertical movement. However, a surge clip in combination with sprinkler penetration of a ceiling has generally been considered to satisfy the full requirement, since the ceiling prevents the horizontal movement as the surge clip holds the sprinkler line in place vertically. Because restraint devices are only required to be approved rather than listed, it would be up to the Authority Having Jurisdiction to determine whether the ceiling is sufficiently robust to provide the horizontal restraint in combination with the surge clip. Section 9.3.6.1 lists other mechanisms used for restraint, the most common being the wraparound U-hook and the splayed wire. Both of these devices help prevent motion in all 360 degrees around the pipe.

Question 2 – Wet Pipe System Overage with High Expansion Foam

We are working on an Air Force hangar with an existing ceiling level sprinkler system and with a new high expansion foam system. Our hydraulic calculations, based on the pipe configuration “as is”, show that the water supply exceeds the system demand with a “safety factor” of 32.8 psi. The reviewer has noted the wet pipe sprinkler system is “overflowing 44.3% (1443gpm – 1000gpm = 443 gpm). This is an unrealistic design for a hangar project. Please explore methods to minimize this overage. Please make corrections.”

I know that in designing of AFFF foam-water systems we try to balance the system with water supply to better use the stored foam concentrate, but I thought “balancing” wet pipe systems to water supply was not good engineering practice. Your thoughts?

Answer: You are correct that throttling down the piping system to avoid an overage in the water application density for a wet pipe sprinkler system is not considered good practice. There would need to be an overriding design concern, such as the limited quantity of an additive such as foam, the need to capture and store discharged water, or a drainage restriction, in order to justify such a measure. All too often, water supply pressures deteriorate over time. As such, excess pressure availability is considered a safety factor for a sprinkler system rather than a disadvantage.

It should be noted that the expected rate of sprinkler discharge does play a role in the design of the high-expansion foam system due to expected foam breakdown and a required compensation factor. You may want to refer to Section 6.12.8.2 of NFPA 11 (2005 edition).

Question 3 – Spacing of Sprinklers Based on Construction Above/Below Ceiling

With regard to protection areas of standard upright and pendent sprinklers, is it the intent of NFPA 13 (2007 edition) Table 8.6.2.2.1(a) to be applicable to standard spray pendent sprinklers located below non-combustible ceilings, in accordance with the construction type above such ceiling? For example, if the construction type is “combustible obstructed” with members less than 3 ft on center, with an acoustical tile ceiling below the members, are the sprinklers above the ceiling required to be spaced 130 sq ft, and the pendent sprinklers at or below the ceiling also required to be spaced at 130 sq ft?

Answer: No. The area above the ceiling is separate from that below the ceiling and each should be sprinklered as required by NFPA 13. The sprinkler below the ceiling follows the rules for sprinklers below a flat, smooth ceiling, including Table 8.6.2.2.1(a). If sprinklers are installed above the ceiling, then the construction around those sprinklers would be used to determine the maximum allowable protection areas for those sprinklers.

Question 4 – Protecting a Concealed Space above a Paint Spray Booth

I have a standard paint booth with a mixing room and two paint booths. There are two different opinions that I have run into about the protection of the interstitial space above the filters, about 10 inches or so of noncombustible construction. I looked through the new NFPA 33 and I did not come up with anything conclusive. Does this space require sprinklers?

Answer: If you have chosen to use an automatic water sprinkler system as defined by NFPA 33 Section 9.1.1(1), the answer to your question depends on whether or not this space meets the definition of a concealed space not requiring sprinkler protection as defined by NFPA 13 Section 8.15.1.2. If this space does not meet those requirements, then sprinkler protection needs to be installed. Since the space is non-combustible, and appears to be concealed, it does not sound like it requires sprinkler protection.

Question 5 – Are Jockey Pumps Necessary?

An above ground tank feeds a closed-head foam system with a vertical in-line pump. Is a jockey pump required? Also, should the tank size be based on the foam duration of 10 minutes or does it have to be based on 60 minutes per Section 6.2.3.1 of NFPA 16?

Answer: NFPA 20 does not require that you install a jockey pump. However, Section 5.24.6 of NFPA 20 requires that the fire pump not be used as a pressure maintenance pump. This means that there must be some mechanism for keeping pressure in the system that does not involve turning on the main fire pump. Some people do this with connections to domestic systems that have decent pressure. It is also possible that you could

convince an AHJ that a small sprinkler system is tight and that there will be no pressure loss in the system, so a jockey pump is not needed. It would be up to the AHJ to decide if a small tight system met the intent of Section 5.24.6.

Yes, the water supply tank needs to be sized for a 60-minute demand. Even though the foam is only designed for 10 minutes of discharge, the water needs to continue to flow after the foam runs out to keep the area cool. If your tank is not large enough to supply the 60-minute demand, you are all allowed to treat the tank like a break tank and refill it as long as the refill rate maintains the 60-minute duration.

Question 6 – Meeting Building Code Requirements for Sprinklers on Decks

The International Building Code (Section 903.3.1.2.1 in the 2006 edition) requires sidewall sprinklers to protect decks in NFPA 13R occupancies. The code states that the sprinklers can be placed from 1 to 6 inches below from the bottom of the joists, but no more than 14 inches below the deck. Most extended coverage sidewall sprinklers are only listed for use beneath unobstructed construction with flat smooth ceilings, so the code is allowing the sprinkler to be used beyond its listing. If there is a fire, and the sprinkler fails to operate, are we going to be challenged for installing the sprinkler as directed?

Answer: All sidewall sprinklers are listed for use as described in sections 8.4.2 and 8.7 of NFPA 13, which does not allow their use under obstructed construction. However, we are advised by the sprinkler manufacturers that have studied this issue that neither the manufacturers nor contractors would generally be held responsible so long as the product is being installed in accordance with the building code. In this instance, the writers of the building code have expressed the desire to have a specific level of protection and have knowingly allowed a product to be used beyond its listing limitations.

Question 7 – Sprinkler Protection of Openings through Fire Barriers

We are installing sprinklers in a prison, and there is a 1-hour fire rated wall between several dining halls and the adjoining kitchen. There will be two pass-throughs for trays in each separation wall measuring 8 in. high by 36 in. long. Would sprinklers centered on both sides of each pass-through serve as a water curtain and provide adequate protection?

Answer: There is no specific section of NFPA 13 that allows sprinklers to substitute for protection across an opening in a fire rated wall or partition. Some building codes contain specific allowances for this type of arrangement. Many AHJs will also accept this as an alternative, but each situation must be evaluated on a case-by-case basis. If the decision is made to provide such a water curtain, NFPA 13 criteria can be used in the absence of other design specifications.

Question 8 – Domestic and Hose Allowance with NFPA 13 Criteria in NFPA 13R

When dealing with areas outside the dwelling unit (such as in the case of an assisted living facility with a large dining area) NFPA 13R Section 6.8.2.1 stipulates that the area is to be designed in accordance with NFPA 13. Does the domestic water demand have to be included with a hose stream allowance?

Answer: When NFPA 13R sends you to NFPA 13 to determine certain discharge criteria, the system in the building remains an NFPA 13R system. The committee sends you to NFPA 13 to determine how much water is required to flow from the sprinklers and how far apart the sprinklers can be (read section A.6.8.2 for more in this subject). But the system is still an NFPA 13R system, so you do need to include domestic demand if the supply

pipes carry both sprinkler and domestic flow and if there is no way to shut down the domestic flow automatically in case of fire. You need to do this because the rule is in NFPA 13R, Section 6.6.5. You do not need to include hose stream demands because NFPA 13R has no requirement for hose stream demands.

Question 9 – Pump Sizing for Aircraft Hangar

We are estimating a combination foam-water system for a hangar and a wet pipe sprinkler system for adjacent office and servicing areas. NFPA 409 makes it clear that the water supply shall be capable of supplying all systems including hose stream allowance.

The wet pipe sprinkler system is specified for 0.17 gpm/sq ft over 5000 sq ft with 500 gpm hose allowance. There will be up to 4 fueled helicopters in for service at one time, which totals approximately 2000 gallons of Class A jet fuel. Is a duration of 60 minutes correct for the wet pipe sprinkler system if there is fuel in the helicopters?

When determining the booster pump required, do we need to balance the two systems together for our total demand or do we just size the pump based upon the greatest demand of the two systems?

Answer: You have not provided sufficient information to answer your questions. First, you need to decide whether the hangar is a Group I, Group II or Group III hangar. Then you need to go to the chapter that outlines the fire protection for that group.

For example, if the hangar is a Group II hangar, then you go to Chapter 7 for your fire protection system criteria. Section 7.8 has the water supply requirements, which start at 30 minutes for fueled aircraft, but go up potentially due to the foam system durations. When sizing the water supply (including the fire pump), you need to account for all of the systems that would activate at the same time during a single fire. Also, watch out for Section 7.8.8, which requires a back-up fire pump and additional tanks or reservoirs. This is unique to NFPA 409 and some contractors miss it.

Question 10 – Restraint for Branch Lines with Upright Sprinklers

We have a conditional approval at a high-rise project where we are being asked by the fire inspector to add line restraints for the branch lines in a parking garage. It is our understanding that under NFPA 13, 2002 edition, branch line restraints are not required for an exposed branch line with upright sprinklers approximately 6 inches away from the structure. We currently have installed surge clips on all hangers to prevent any upward movement. Our question is in regards to NFPA 13, 2002 edition. Does our current installation meet the rules with regard to branch line restraint requirements?

Answer: In addition to the requirement for restraint on the ends of branch lines in seismic areas found in Section 9.3.6.3, Section 9.3.6.4 of the 2002 edition required restraint at 30 ft intervals “Where upward or lateral movement of the system piping would result in damage to the sprinkler(s) through impact against the building structure, equipment or finish materials.” Enforcement of this provision would require a reasonable prediction of the movement of branch lines when subject to lateral earthquake forces and, in high risk seismic areas, vertical earthquake forces as well. In general, unless used with a type of hanger restricting lateral movement, branch lines would be expected to swing in the arc permitted by the length of branch line hangers. The point at which the piping would contact the structure should be examined to determine if impact forces would be applied directly to the sprinklers themselves. In general, forces applied to the piping holding the sprinklers are not expected to damage the sprinklers. For that reason, upright sprinklers on branch lines are considered better protected than pendent sprinklers against injury from fork lifts and other sources of damage within typical industrial occupancies.

Ultimately, however, the AHJ must determine if the sprinklers are likely to be damaged by impact, necessitating the additional restraint.

Because of the degree of subjectivity involved in making this type of determination, the NFPA Committee on Hanging and Bracing began to require restraint for all branch lines in seismic areas in the 2007 edition of the standard, with the spacing based on the expected earthquake severity. Also in the 2007 edition, however, the NFPA committee clarified that the intent of restraint could be accomplished through the use of hanger rods less than 6 inches in length, measured between the top of the pipe and the point of attachment to the structure. Piping held on short hangers is not expected to develop the momentum that would lead to sprinkler damage, and does not require either end-of-line or intermediate restraints.

Question 11 – Residential Sprinklers in Hospital Patient Rooms

We just recently have had a debate in our office as to whether residential sprinklers can be used in hospital patient rooms. It would be my contention that they cannot be as I believe the occupancy of a patient room would differ from that of a nursing home sleeping room as called out in NFPA 13, Section 3.3.7. If it was the intention of the NFPA 13 committee to permit residential sprinklers to be permitted to be used in hospital patient rooms, would they not have been very specific in permitting them to be used in such occupancies?

Answer: You are correct that hospital patient rooms are typically not considered similar enough to dwelling units to allow the use of residential sprinklers. But nursing home guest rooms are considered dwelling units and do allow the use of residential sprinklers.

Question 12 – Bracing for Drain Piping

Does NFPA 13 (2007 edition) require bracing for a 3-inch drain riser?

Answer: It has never been the intent of the Committee and Hanging and Bracing to brace piping that is not essential to sprinkler system operation. Other components of the system drainage system are treated similarly. For example, drain valves are simply required to be approved, not listed, in accordance with Section 6.7.3. The wording of Section 9.3.5.3.2, however, calls for lateral sway bracing on “all branch lines and other piping with a diameter of 2-1/2 inches and larger,” which could be considered to apply to drain piping as well. The NFSA will be submitting a proposed change for the next amendment cycle of NFPA 13 to clarify the situation.

Upcoming “Business Thursday” Online Seminar – August 20th

Topic: *Impairment Procedures*

Instructor: *Karl Wiegand, NFSA Manager of Installation Standards*

Date: *August 20, 2009*

NFPA 25 spells out specific duties and responsibilities of impairment coordinators to minimize the length of impairments to fire protection systems and get the systems back up and running. The duties and responsibilities apply to both emergency and preplanned impairments. This seminar will explain the duties and responsibilities required of an impairment coordinator and offer cautions to fire sprinkler contractors that might want to fill this roll for the building owner. (Great study guide for NICET Work Element 43008)

Upcoming "Technical Tuesday" Online Seminar – August 25th

Topic: Field Identification of Sprinklers

Instructor: Russell P. Fleming, P.E., NFSA Executive Vice President

Date: August 25, 2009

Various product recall and replacement programs have made it important to be able to identify particular types and brands of sprinklers, but field identification goes beyond this. Attributes such as temperature rating, orifice size, response sensitivity and orientation determine sprinkler system performance characteristics, and the need to properly replace sprinklers requires a complete understanding of all variations. (Great study guide for NICET Work Element 41017)

To register or for more information, contact Dawn Fitzmaurice at (845) 878-4207.

Additional training opportunities available through the NFSA engineering department include...

Two-Week Layout Technician Training

September 14-25, 2009

Baltimore, MD

October 12-23, 2009

Phoenix, AZ

Inspection and Testing for the Sprinkler Industry

August 18-20, 2009

Wilmington, DE

For more information on the above classes, contact Nicole Sprague using Sprague@nfsa.org or by calling 845-878-4200 ext. 149.

In-Class Training Seminars

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

Residential Sprinklers: Homes to High Rise	Rogers, AR	Aug 11
Sprinklers for Dwellings	Rogers, AR	Aug 12
Sprinkler Prot. for Flam. & Comb. Liquid Storage (1/2 Day)	Rogers, AR	Aug 13
CPVC Piping (1/2 Day)	Rogers, AR	Aug 13
NFPA 13 Overview	Kahului, HI	Aug 12-13
Inspection, Testing & Maintenance	Kahului, HI	Aug 14
NFPA 13 Overview	Brighton, MI	Aug 19-20
Sprinklers for Dwellings	Brighton, MI	Aug 21
NFPA 13 Update 2007	Aurora, IL	Aug 26
NFPA 13 Overview	Aurora, IL	Aug 27-28
NFPA 13 2007 Update	Boardman, OR	Sept 1
Hydraulics for Fire Protection	Boardman, OR	Sept 2
Inspection, Testing & Maintenance	Boardman, OR	Sept 3
Introduction to Sprinkler Systems (1/2 Day AM)	Alexandria, MN	Sept 8

NFPA 13 2002 Update (1/2 Day PM)	Alexandria, MN	Sept 8
Plan Review Policies & Procedures	Alexandria, MN	Sept 9
Inspection, Testing & Maintenance	Alexandria, MN	Sept 10
Commissioning & Acceptance Testing (1/2 Day)	Seattle, WA	Sept 15
CPVC Piping (1/2 Day)	Seattle, WA	Sept 15
Hydraulics for Fire Protection	Seattle, WA	Sept 16
Standpipe Systems for Fire Protection (1/2 Day)	Seattle, WA	Sept 17
Fire Pump Layout & Sizing (1/2 Day)	Seattle, WA	Sept 17
NFPA 13 2007 Update	Dayton, OH	Sept 16
Sprinklers for Dwellings	Dayton, OH	Sept 17
CPVC Piping Installation Requirements (1/2 Day)	Dayton, OH	Sept 18
Commissioning and Acceptance Testing (1/2 Day)	Dayton, OH	Sept 18
NFPA 13, 13R, 13D 2007 Update	Anaheim, CA	Sept 22
Hydraulics for Fire Protection	Anaheim, CA	Sept 23
Underground Piping (1/2 Day)	Anaheim, CA	Sept 24
Basic Seismic (1/2 Day)	Anaheim, CA	Sept 24
Plan Review Policies & Procedures	Berlin, VT	Sept 22
Sprinkler Protection for Rack Storage	Berlin, VT	Sept 23
CPVC Piping (1/2 Day)	Berlin, VT	Sept 24
Basic Seismic Protection (1/2 Day)	Berlin, VT	Sept 24
NFPA 13 Overview	Menasha, WI	Sept 30-Oct 1
Hydraulics for Fire Protection	Menasha, WI	Oct 2
Inspection, Testing & Maintenance	Concord, NH	Oct 13
Residential Sprinklers: Homes to High Rise	Concord, NH	Oct 14
Sprinklers for Dwellings	Concord, NH	Oct 15
Underground Piping (1/2 Day)	Woodland, CA	Oct 20
Commissioning & Acceptance Testing (1/2 Day)	Woodland, CA	Oct 20
Sprinkler Protection for General Storage	Woodland, CA	Oct 21
Sprinkler Protection for Special Storage	Woodland, CA	Oct. 22
Pumps for Fire Protection	Edwardsville, IL	Oct 27
Sprinkler Protection for General Storage	Edwardsville, IL	Oct 28
Sprinkler Protection for Rack Storage	Edwardsville, IL	Oct 29
NFPA 13 Overview	Pembroke, MA	Oct 27-28
Plan Review Policies & Procedures	Pembroke, MA	Oct 29
Inspection, Testing & Maintenance	Irving, TX	Oct 27
Hydraulics for Fire Protection	Irving, TX	Oct 28
NFPA 13, 13R, 13D 2007 Update	Irving, TX	Oct 29
NFPA 13, 13R, 13D 2007 Update	Effingham, IL	Nov 10
Plan Review Policies & Procedures	Effingham, IL	Nov 11
Hydraulics for Fire Protection	Effingham, IL	Nov 12
Sprinkler Protection for Rack Storage	Marana, AZ	Dec 8
Sprinkler Protection for General Storage	Marana, AZ	Dec 9
Basic Seismic Protection (1/2 Day)	Marana, AZ	Dec 10
Advanced Seismic Protection (1/2 Day)	Marana, AZ	Dec 10

These seminars qualify for continuing education as required by NICET.

To register or for more information, contact Dawn Fitzmaurice at (845) 878-4207 or send an e-mail to seminars@nfsa.org

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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.

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