NFSA
The Voice of the Fire Sprinkler Industry

Tuesday e-Tech Alert

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Best Questions of September 2010

We have selected the following questions as the "Best of September 2010" answered by the engineering staff as part of the NFSA's EOD member assistance program:

Question 1 – Lowest Expected Temperatures

We are located in Florida and don't get much in the way of freezing weather here, but I have a plan reviewer in the central Florida area asking for a dry system in an unheated attic space. He is basing it from the cold winter season we had this year where several wet systems failed due to the longer duration of freezing temperatures. I believe the AHJ has the right to ask for this but cannot find anything in NFPA 13 to verify. Can you point me in the right direction of where in NFPA the freeze areas are shown? I see a similar chart in regards to the protection against freezing underground pipe depth in Figure A.10.4.1 NFPA 13 (2002 edition), but that does not cover aboveground piping.

Answer: Section 8.15.3.1 in the 2002 edition (8.16.4.1 in the 2010 edition) of NFPA 13 addresses "Protection of Piping Against Freezing." Subsection 8.15.3.1.1 notes that if the temperature "cannot reliably be maintained at or above 40°F sprinklers shall be installed as a dry pipe or preaction system." Therefore, if the temperature is anticipated to fall below 40°F for a considerable length of time a dry system would be a solution. Figure A.10.5.1 in both the 2002 and 2010 editions consists of isothermal lines showing the lowest one-day mean temperature and provides some guidance in this area.

In addition, if the pipe is in the unused attic space but the attic is not required to have sprinklers of its own (i.e. the pipe is on the floor of the attic space), then it may be possible to use insulation over the piping in order to maintain the appropriate temperatures so that water does not freeze inside the piping.

Question 2 – Cleaning Sprinklers

I am a trustee at a church in Las Vegas. Some of our exterior sprinklers that are underneath a covered walkway and which have the glass tubes in them are cloudy from the dust and dirt here. Is it O.K. to clean them using water and a dry rag?

Answer: Applicable standards prohibit the cleaning of the sprinklers in that manner. Fire sprinkler systems are supposed to undergo annual inspections. An inspector would note if the accumulation of materials was substantial enough to require replacement or testing of the sprinklers. In the newest edition of NFPA 25, which is the document that covers the inspection, testing and maintenance of fire sprinkler systems, it has been noted that dust and dirt can be removed with compressed air (small cans are sold in most electronic stores) or by a vacuum hose, but the equipment is never supposed to touch the sprinkler, only the air.

Question 3 – ESFR Sprinklers in Plastic Molding Areas

There is an existing ESFR system protecting a warehouse area, but the owner wants to change the warehouse to production or molding areas. What would be the advantages or disadvantages if the owner decided to retain the ESFR system in the production or molding area? Does NFPA 13 address such cases? I know that it is technically not correct to retain the ESFR system, but the owner does not want to spend money to change it. I explained to him that in case of a fire in this area the ESFR system will demand a lot of water and pressure in one area that could lead to overtaxing the system elsewhere. Am I correct in my assumptions?

Answer: If the molding and production areas are classified as ordinary hazard, it is allowed to leave the ESFR sprinklers in place (see Section 12.6.7 of NFPA 13, which permits ESFR sprinklers to protect ordinary hazard). In this case, the ESFR sprinklers are more protection than is needed, but if the owner is okay with the extra water discharge, you don't have to change the sprinklers.

If the molding and production areas are classified as extra hazard, ESFR sprinklers should not be used. Some plastic molding processes burn and flow like a flammable liquid. It is possible that a flowing, flammable liquid fire would not be adequately protected with the ESFR sprinkler system.

Question 4 – QR Area Reduction for Miscellaneous Storage

We have a project that deals with rental type storage lockers and there is an issue with respect to the design criteria. The lockers are 10 feet high with the underside of the steel deck at 15 feet high. The system was designed for Ordinary Hazard Group 2, based on the 2002 edition of NFPA 13, but there is a little confusion with respect to the use of quick response sprinklers as well as the applicable area reduction. The 2007 edition of NFPA 13 appears to allow the area reduction for miscellaneous storage. What about the 2002 edition?

Answer: You have asked if the 2002 edition of NFPA 13 will allow an area reduction for quick response sprinklers when applied to miscellaneous storage. The answer is no, you can not apply the quick response reduction for miscellaneous storage, but this prohibition was applicable only to the 2002 edition. The Technical Committee reversed their intent for the 2007 edition and specifically allowed remote area modification for miscellaneous storage. Often the Authority Having Jurisdiction will recognize the allowances in more current editions of installation standards on a case-by-case basis, so may want to pursue this further.

Question 5 – Use of Epoxy Coated Steel Pipe

A fire department AHJ is dealing with a large industrial client in their jurisdiction that is trying to use epoxy coated steel pipe for underground fire main use. I referenced NFPA 13 Section 10.1.2, which specifically excludes its use. However, they have come back with galvanized pipe citing ASTM A53 as an acceptable material because it is referenced in AWWA C200 - *Steel Water Pipe 6 in. and Larger*, which is referenced in Table 10.1.1 of NFPA 13 (2010 edition). Is this a legitimate interpretation?

Answer: There are only two reasons why steel pipe is included in Table 10.1.1. The first is to provide acceptable types of steel pipe that can be used in accordance with Section 10.1.3 where steel is used for the supply to a fire department connection underground. The second is to provide guidance to manufacturers that wish to pursue a special listing of steel pipe for general underground use in accordance with Section 10.1.2. To the best of our knowledge, no manufacturer has yet pursued a listing of steel pipe for underground use. Since there is no listed underground steel pipe, the only acceptable use of steel pipe from Table 10.1.1 is for underground service to a fire department connection.

Question 6 – Protection of Plastic Storage

Could you help me with a question that I have about rack storage of Group A plastics? The commodity consists of rolls of plastic wrapping that would be used to package cheese. These rolls are approximately 16 inches tall and 12 inches around. They are stacked 3 high on a wooden pallet. The owner wants to stack them in double row racks. The racks will have 4 load rails including the topmost level. The load rails are spaced 60 inches vertically apart with the first one at 60 inches above the floor. The owner wants to stack above 20 feet high. The plastic rolls are exposed, non-encapsulated.

When looking at the decision tree in Figure 17.1.21 of NFPA 13 (2010 edition) for Group A plastics, I do not know if it leads me to use exposed, expanded or to the other direction which is cartoned, etc. etc. When I go further into Chapter 17, to 17.2.1.2, this section describes the ceiling water demand for "Group A plastic commodities in cartons"…. which we do not have. This is why I wonder if the decision tree leads us outside the scope of chapter 17.

If we are outside the scope of Chapter 17, where do we go for the design criteria for exposed group A plastic?

Answer: It would be inappropriate for us to comment on whether or not your particular arrangement of exposed plastics can be treated as the same basic hazard as the more traditional exposed plastic scenario. Questions regarding hazard classification are difficult except in those circumstances where some NFPA occupancy committee has specifically addressed the issue. This is especially true because hazard classification is considered in many states to be the most important aspect of fire protection system design, and an obligation of the responsible design professional. One reason many states require involvement of a responsible design professional is to ensure that the site-specific attributes of the project are recognized and properly addressed, which cannot be accomplished in a generic manner.

The particular commodity that you have described, with multiple layers of plastic, might allow the fire to burrow into the plastic and form a deep-seated fire, much like roll paper, that is extremely difficult to control or suppress. Roll paper storage is much more difficult to control or suppress with fire sprinklers than storage of exposed paper cups, even though they are made of the same material.

Assuming that the responsible design professional has determined that the commodity that you have described can be protected as a generic exposed unexpanded plastic, the first thing that you need to do is ignore the plastics decision tree because it does not provide useful information. The decision tree tells you that it is possible to protect exposed unexpanded plastics, but does not say how. Unfortunately, the decision tree has not kept pace with the ability of sprinklers to protect exposed plastics. This is an item that we are hoping to fix in the 2013 edition of NFPA 13.

In order to protect exposed unexpanded plastics, you need to go through Chapter 17 and figure out which protection schemes work for that commodity. There are several potential solutions:

1. CMSA sprinklers can be used in accordance with Table 17.2.2.1 to protect exposed unexpanded plastics stored up to 25 ft in height.
2. ESFR sprinklers can be used in accordance with Table 17.2.3.1 to protect exposed unexpanded plastics stored up to 25 ft in height.
3. A combination of spray sprinklers at the ceiling and in-rack sprinklers arranged in accordance with Figures 17.3.4.1.3(a) through 17.3.4.1.3(f) can protect any storage height of exposed unexpanded plastics. *(Note: Select an arrangement of in-rack sprinklers from one of the figures, don't try to follow them all at the same time)*

4. A combination of spray sprinklers at the ceiling and in-rack sprinklers arranged in accordance with Figure 17.3.4.1.4 can protect any storage height of exposed unexpanded plastics on double-row racks.
5. ESFR sprinklers can be used in accordance with Table 17.3.3.1 to protect exposed unexpanded plastics stored up to 40 ft in height.

Another option is to us the Factory Mutual standards, which have different criteria than the NFPA standards. Some AHJ's will accept the FM designs as alternate methods that have the same intent as NFPA 13. If you are going to go down that road, we would suggest that you follow the FM standards completely and not just pick up the discharge criteria from their standard. Their discharge criteria are based on the assumption that you are following the rest of their standards. Also, you would be wise to get the AHJ to agree to this approach up front so that significant work is not put into the approach before approvals are made.

If none of these options will work for you, then you always have the option of hiring a fire protection engineer to work out a unique design solution for this particular client. Such a solution could take into account the burning characteristics of the commodity discussed previously and would be considered an alternate arrangement that may be acceptable to the AHJ in accordance with Sections 1.5 and 1.6 of NFPA 13.

Question 7 – Distance from an Air Diffuser

I have ordinary temperature rated sprinklers in a nursing home, including some that are located about 8 to 10 inches away from downward-discharging air diffusers. Am I correct that this is no problem per Table 8.3.25(a) provided that the forced air coming through the diffuser will not exceed 100^{o}F and therefore the maximum ambient ceiling temperature is not expected to exceed 100^{o}F, or is the minimum 12 inches required?

Answer: The table asks that ordinary temperature sprinklers be more than 12 inches away from the diffuser, regardless of the temperature of the air that is discharged from the diffuser. The reason for this is that we do not control the heating system and it is possible that the heating system will discharge air that is warmer than 100 degrees.
If you can be assured that the heating system will not discharge air at greater than 100 degrees, then the ordinary temperature sprinklers being closer to the diffusers can be accepted by the Authority Having Jurisdiction as an alternative that meets the intent of the standard.

Question 8 – Protection of Loading Docks

Do covered, non-combustible, exterior loading docks that are not used for storage and do not have an occupied space above them require sprinkler protection? NFPA 13 (2010 edition) Section 8.15.7.2 states that sprinklers shall be permitted to be omitted where exterior canopies, roofs, porte-cocheres, balconies, decks, or other similar projections are constructed of non-combustible, limited combustible, or fire retardant-treated wood. It states in Section 8.15.7.5 that sprinklers shall be installed under roofs, canopies, porte-cocheres, balconies, decks, or similar projections greater than 2 ft. wide where combustibles are stored. But A.8.15.7.5 states that short-term transient storage, such as for delivered packages ... should not be considered storage or handling of combustibles.

Answer: There is a difference between an overhang at an office building where a package might occasionally be left and a loading dock, where the express purpose is the loading, unloading and temporary storage of materials. Section A.5.3.2 specifically says that loading docks that are only used for

loading and unloading of ordinary combustibles need to be protected in accordance with Ordinary Hazard Group 2. Sprinklers would be necessary for such protection.

Question 9 – Different Ceiling Heights for QR Area Reduction

When quick response sprinklers are used in a building, what consideration should be given to differing room ceiling heights? Consider the following:

1) If all rooms in an area have ceiling heights of 9 ft except for a 2-story enclosed (with fire-rated construction) stair which has a ceiling height of 23 ft from the ground floor to the 2nd floor ceiling, can a reduced design area be used in the area adjacent to the stair?

2) If all rooms in an area have ceiling heights of 9 ft except for a single 3 ft x 4 ft video closet containing video equipment which is exposed to the structure with a ceiling height of 16 ft, should the reduced design area be calculated according to a 9 ft ceiling height or should the 16 ft ceiling height be used?

Answer: You have two options. The first is to take the highest ceiling as the worst case and run the calculations with that ceiling height. The other option is to perform multiple calculations for each of the different areas with different ceiling heights.

Question 10 – Floor Protection from Atrium Glass Sprinklers

We have a glass atrium with a light hazard area surrounding it. The atrium glass requires sprinklers on 6 ft centers. It is our understanding that when providing pendent sprinklers (installed per NFPA 13) spaced 6 ft on center for the water curtain, that these standard spray sprinklers can also serve the purpose of protecting the floor space per the spacing limitations of NFPA 13. Is this a correct interpretation?

Answer: Yes, sprinklers that are installed on 6 ft spacing to protect a glass wall can also protect the floor area near the wall as long as they are installed with their deflectors within 12 inches of the ceiling.

Question 11 – Preaction Riser within an Electrical Room

Can a pre-action assembly be located inside of an electric room as long as we meet the NEC distance requirements? The pre-action system is for a data center outside of this room.

Answer: No. NFPA 70, 2008 Edition, Section 110.34(F) states that all piping that is foreign to the electrical installation shall not be located in the vicinity of the service equipment. Sprinkler piping is considered foreign unless it is for fire protection of the electrical installation. As this piping would be for the data center next door, it would be considered foreign piping and not be allowed in this area.

Question 12 – Seismic Values

We are in a dilemma about what values to use in our seismic calculations for ap and Rp, when doing seismically-braced sprinkler design projects that are to be designed under NFPA 13(2002 edition). We used 1.0 and 3.5 until the 2007 edition of NFPA 13 was issued, the appendix of which lists values of 2.5 and 4.5 instead. When I look in the 2005 edition of ASCE 7, it indicates values, in Table 13.6-1, of 2.5 and 4.5, for: “Piping and tubing not in accordance with ASME B31, including in-line components, constructed of high- or limited-deformability materials, with joints made by threading, bonding, compression couplings, or grooved couplings”, and the table is not indicated (by vertical bar in the margin) as being changed from the previous edition of ASCE 7. In fact, the value of Rp = 3.5 is not found anywhere in the table, so I am really wondering why the TIA shows it as such. You would help us

out a lot if you could let us know where the values of Ap = 1.0 and Rp = 3.5 come from. We really need to go back to the values of 1.0 and 3.5, but we need to know the code basis for the use of those values.

Answer: To begin with, there is nothing magic about those numbers, and they haven't stayed the same over the years. They have varied in different editions of the National Earthquake Hazard Reductions Program (NEHRP) Recommended Seismic Provisions. Those provisions, developed through the National Institute of Building Sciences with Federal funding, form the basis of the requirements within standard ASCE/SEI 7, which in turn is adopted by the International Building Code. This was addressed in the commentary within the 2010 edition of the NFPA's *Automatic Sprinkler Systems Handbook* (page 456). The "component response factor" Rp went from 3.5 for steel piping in the 2002 edition of ASCE/SEI 7 to 4.5 in the 2005 edition. The value of ap, the "component amplification factor" went from 1.0 to 2.5. Since one is in the numerator and the other in the denominator of the force factor equation for mechanical equipment, the ratio is significant. The ratio went from 0.29 in the 2002 edition to 0.55 in the 2005 edition, significantly increasing the forces.

To what do they supposedly relate? The Commentary published with the NEHRP Provisions indicates the component response factor Rp represents the "energy absorption capability of a component and its attachments," which depend on "both overstrength and deformability." By way of contrast, an all-welded steel piping system is assigned an Rp of 9. The Commentary cautions that "At present these potentially separate considerations are combined in a single factor. The tabulated values are based on the collective judgment of the responsible committee."

Continuing with the Commentary, the component amplification factor "represents the dynamic amplification of component responses as a function of the fundamental periods of the structure and component…Tabulated ap values are based on component behavior that is assumed to be either rigid or flexible."

So, there is a lot of judgment involved, but the source for the 2002 edition of NFPA 13 was the ASCE/SEI 7-02, as contained in the TIA 02-1 issued on the 2002 edition of NFPA 13 with an effective date of August 6, 2003.

Upcoming NFSA "Technical Tuesday" Seminar – October 12th

Topic: Dry Systems and Residential Occupancies
Instructor: Kenneth E. Isman, P.E., NFSA Vice President of Engineering
Date: October 12, 2010

The use of dry pipe systems in residential occupancies has been evolving. NFPA 13 originally allowed the user to protect residential occupancies like any other type of light hazard occupancy when it comes to dry pipe systems. But recent changes have been enacted to make the rules much more stringent. This program will review the evolution in requirements through recent editions of the standard and touch on how NFPA 13R and NFPA 13D handle the subject as well.

Upcoming NFSA "SAM Friday" Seminar – October 15th

Topic: CPVC Failure Analysis for Sprinkler Contractors
Instructor: Michelle Knight, Lubrizol
Date: October 15, 2010

Leaks in CPVC fire sprinkler systems can occur for a variety of reasons, including chemical incompatibility issues, mechanical damage to the pipe or fitting, and installation errors. This presentation will focus on recognizing the signs of various types of problems and steps that can be taken to avoid them. Michelle Knight has worked in research and development in the CPVC department at Lubrizol for 20 years, and specializes in failure analysis and material testing.

Upcoming NFSA/FSI "Best Practices Thursday" Seminar – Oct. 21st

Topic: The Insurance Market
Instructor: Brian Cullen & Top Myers
Date: October 21, 2010

Do you REALLY understand what drives your hazard insurances premiums? How can you save money when purchasing something you can't do without? This 45-minute presentation will overview the hazard lines insurance markets and provide participants with a solid step-by-step plan for negotiating best possible rates. One-on-one follow-up is available after the seminar at no additional charge.

To register or for more information on any of the above seminars, contact Michael Repko at (845) 878-4207 or e-mail to seminars@nfsa.org

Additional in-class training opportunities include:

3-Day Inspection and Testing for the Sprinkler Industry

October 19-21/Troy, NY
Hilton Garden Inn Troy
235 Hoosick Street
Room rate $99/night until Oct. 10
For reservations, call (877) 782-9444 and mention code: NFSC

To register or for information, contact Nicole Sprague at (845) 878-4200 x149 or Diana Romano at x132.

Advanced Technician Training Class

November 16-18/Fishkill, NY
Holiday Inn Hotel and Conference Center
542 Route 9
Room Rate $89/night until Oct. 17
For reservations, call (845) 896-6281and mention code: NFS

To register or for information, contact Nicole Sprague at (845) 878-4200 x149 or Diana Romano at x132.

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:

Oct 6	Pembroke, MA	Sprinklers for Dwellings
Oct 6	Palm Springs, CA	NFPA 13 Update 2007/2010
Oct 7	Pembroke, MA	Inspection, Testing & Maintenance
Oct 7	Palm Springs, CA	Sprinklers for Dwellings
Oct 13	Hillsboro, OR	Plan Review Policies & Procedures
Oct 14	Hillsboro, OR	CPVC Piping (1/2 day a.m.)
Oct 14	Hillsboro, OR	Commissioning & Acceptance Testing (1/2 day p.m.)
Oct 15	Hillsboro, OR	Inspection, Testing & Maintenance
Oct 25	Fairbanks, AK	Plan Review Policies & Procedures
Oct 26	Fairbanks, AK	Hydraulics for Fire Protection
Oct 27	Fairbanks, AK	Sprinklers for Dwellings
Oct 28	Fairbanks, AK	Inspection, Testing & Maintenance
Oct 29	Fairbanks, AK	Commissioning & Acceptance Testing (1/2 day a.m.)
Nov 1	Anchorage, AK	NFPA 13 Update 2007
Nov 2	Anchorage, AK	Commissioning & Acceptance Testing (1/2 day a.m.)
Nov 2	Anchorage, AK	Basic Seismic Protection (1/2 day p.m.)
Nov 3	Anchorage, AK	Inspection, Testing & Maintenance
Nov 3	Teutopolis, IL	Introduction to Sprinklers (1/2 day a.m.)
Nov 3	Teutopolis, IL	CPVC Piping (1/2 day p.m.)
Nov 4	Teutopolis, IL	Plan Review Policies & Procedures
Nov 9	Wichita, KS	Standpipe Systems (1/2 day a.m.)
Nov 9	Wichita, KS	Introduction to Sprinklers (1/2 day p.m.)
Nov 9	Las Vegas, NV	Underground Piping (1/2 day a.m.)
Nov 9	Las Vegas, NV	Basic Seismic (1/2 day p.m.)
Nov 10	Wichita, KS	Sprinklers for Dwellings
Nov 10	Las Vegas, NV	Standpipe Systems (1/2 day a.m.)
Nov 10	Las Vegas, NV	Commissioning & Acceptance Testing (1/2 day p.m.)
Nov 11	Wichita, KS	Pumps for Fire Protection

These seminars qualify for continuing education as required by NICET, and meet mandatory Continuing Education Requirements for Businesses and Authorities Having Jurisdiction.

To register or for more information, contact Michael Repko at (845) 878-4207 or e-mail to seminars@nfsa.org

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.