NFSA The Voice of the Fire Sprinkler Industry

# e-TechNotes

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Normally, e-TechNotes is distributed on Tuesdays when the NFSA is not broadcasting one of its Technical Tuesday on-line seminars. But since Christmas and New Years both landed on a Tuesday this year, we didn't send out an issue during the holidays. Here's the first issue of 2013 and a preview of what is planned for the first few issues of the year. As always, the editor reserves the right to change the topic if something important comes up, but the plan is to write about the following topics in the first four months of 2013:

- Jan. 15 – Issue 257: Best of December 2012 EOD's
- Jan. 29 – Issue 258: Changes to the NFPA 13 Installation, Hanging and Bracing Criteria in the 2013 edition
- Feb. 12 – Issue 259: Best of January 2013 EOD's
- Feb. 26 – Issue 260: Changes to the NFPA 13 Discharge Criteria in the 2013 edition
- Mar. 5 – Issue 261: Best of February 2013 EOD's
- Mar. 19 – Issue 262: Changes to NFPA 13R and NFPA 13D in the 2013 edition
- April 2 – Issue 263: Changes to NFPA 20 in the 2013 edition
- April 16 – Issue 264: Best of March 2013 EOD's
- April 30 – Issue 265: Changes to NFPA 14 in the 2013 edition

**Best of November 2012**

This month, we have selected the following "baker's dozen" (13) questions as the "Best of November 2012" answered by the engineering staff as part of the NFSA's EOD member assistance program. It should be noted that the following are the opinions of the NFSA Engineering Department staff, generated as members of the relevant NFPA technical committees and through our general experience in writing and interpreting codes and standards. These have not been processed as a formal interpretation in accordance with the NFPA Regulations Governing Committee Projects and should therefore not be considered, nor relied upon, as the official position of the NFPA or its Committees.

**Question 1 – Pitching of Pipe on Dry Systems**

How do the rules of pitching pipe (towards a drain) vary between dry systems in "refrigerated areas" and "nonrefrigerated areas"? Is all of the pipe in a dry system considered in a "refrigerated area" if it is ever going to be exposed to freezing temperatures?

**Answer:** A "refrigerated area" is a space that is artificially held in a cold state at all times of the year such as a food storage area or a sharp freezer. Dry system piping that will be exposed to freezing temperatures periodically due to weather is not considered in a "refrigerated area".

The rules for pitching branch lines are the same whether the piping is in a refrigerated area or not. The branch lines need to be pitched towards the drain ½ inch vertically for every 10 ft of horizontal pipe.

The difference in the rules is in the pitching of main piping. For mains in nonrefrigerated spaces, the piping only needs to be pitched ¼ inch vertically for every 10 ft horizontally. But for piping in refrigerated spaces, the pitch needs to be doubled for mains to ½ inch vertically for every 10 ft horizontally. See section 8.16.2.3 in the 2010 edition of NFPA 13 (similar sections in previous editions).

**Question 2 – Sizing Suction and Discharge Piping**

We have a client with an existing 6-inch underground fire service main feeding the sprinkler system in their building, with

no fire pump. We have been hired to install a 1500 gpm fire pump in the middle of this main. Can we use the existing 6-inch pipe for suction and discharge piping (assuming we do hydraulic calculations to prove that it will work with the friction loss for the sprinkler system demand) or do we have to tear it all up and replace it with 8-inch pipe?

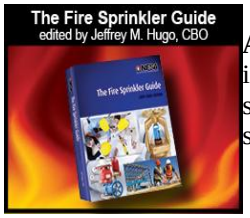
**Answer:** Some, or all, of the pipe will need to be 8-inch. The extent to which you need to change the piping system depends on the exact hydraulics of the situation. The beginning of the solution for this situation starts with Table 4.26(a) of NFPA 20-2010 (similar Table in previous editions). For a 1500 gpm pump, the table requires a minimum suction pipe size of 8-inch and a minimum discharge pipe size of 8-inch. However, a note to the table references the user back to section 4.14.3.4, which states that the 8-inch suction pipe is only required for a distance of 10 times the diameter of the pipe closest to the pump suction flange. This means that the user might be able to have a significant run of pipe underground that is 6-inch, then above ground, change to 8-inch pipe for a distance of 80 inches (a little under 7 ft) close to the pump. This requirement for a specific size of pipe at the suction side of the pump is to slow the water down so that it enters the pump suction flange closer to laminar flow than turbulent flow.

If the piping arrangement discussed above is attempted by the user (some 6-inch pipe and then some 8-inch pipe), hydraulic calculations will need to be performed to prove that the water will arrive at the pump suction flange at a positive gage pressure when the maximum flow (2250 gpm) is coming through the suction pipe (see section 4.14.3.1 in NFPA 20-2010, similar section in previous editions). Note that the maximum flow is defined as 150% of the rated flow of the pump, not the system flow demand of the sprinkler system. There are provisions in NFPA 20 for lower maximum flow conditions if the water supply is not capable of handling 150% of the rated flow of the pump, but that is beyond this question. If the residual pressure of the water supply at maximum flow is not sufficient to overcome the friction loss and elevation change between the water supply and the pump, then some of the underground pipe may need to be changed to 8-inch in order to allow the water to be delivered to the pump at a positive gage pressure.

For the discharge pipe, Table 4.26(a) also requires 8-inch pipe for the discharge pipe, and there is no provision for using smaller pipe, even with hydraulic calculations. However, section 4.15.1 of NFPA 20-2010 (similar section in previous editions) says that the discharge pipe is the, "pipe, valves and fittings extending from the pump discharge flange to the system side of the discharge valve." So, you do not need to dig up the 6-inch underground on the discharge side of the pump as long as the hydraulic demand of the system can be met with the 6-inch pipe. You just need to provide 8-inch pipe in the pump house or pump room from the discharge flange of the pump to the discharge control valve.

**Question 3 – Foam System Duration**

We have a situation where a system is being installed in accordance with both NFPA 16 and NFPA 30. Section 16.5.1.12 of NFPA 30 specifies one duration, while Section 6.2.3.1 of NFPA 16 specifies another. Which duration is appropriate?




**Answer:** Section 6.2.3.1 of NFPA 16 specifically says "unless otherwise specified in the occupancy standards". NFPA 16 is the general standard for installation of foam-water sprinkler and foam-water spray systems. NFPA 30 is the specific standard for occupancies with flammable and combustible liquids. This being the case, NFPA 30 will be the applicable standard in this situation.

**Question 4 – Overhanging Beam on Balcony**

We are installing an NFPA 13R sprinkler system in an apartment building with sidewall sprinklers protecting the balcony in accordance with section 903.3.1.2.1 of the International Building Code. Are the beams considered obstructions for the purposes of Table 6.4.6.3.5.2(a) of NFPA 13R? In other words, do we need to make sure that the beams are at least 8 ft away from the sprinkler?

Answer: No. Section 903.3.1.2.1 of the International Building Code (IBC) specifically states that sidewall sprinklers can be used to protect outside balconies under decks with exposed structural members (beams). As long as the rules of the IBC are met, with the sprinklers 1 to 6 inches below the structural members and no more than 14 inches down from the deck, these rules override any provisions of NFPA 13R. See section 102.4 of the IBC, which states, "Where differences occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply."

**Question 5 – Threads on 17/32 inch Sprinklers**

We have a situation where an existing sprinkler system with ½ inch (k-5.6) sprinklers needs to be converted to 17/32 inch (k-8.0) sprinklers. Can a 17/32 inch orifice (k-8.0) sprinkler have a 1/2 inch thread? This would really save us from having to replace all of the fittings.

**Answer:** Yes. NFPA 13, 2010 Edition, Table 6.2.3.1 (similar tables in previous editions) says that sprinklers up to a size of K-11.2 can have 1/2 inch thread types. There are manufacturers that make such sprinklers.

**Question 6 – Antifreeze TIA's**

We note that the NFPA has processed TIA's to the most recent editions of the sprinkler standards (2010 and 2013), but can we still continue to use antifreeze however we want if the local jurisdiction is still legally enforcing an older edition of the standards?

**Answer:** The antifreeze TIA's only applied to the most recent editions of the standards. But in the NFPA's mind, these are the only editions that exist, so they don't generally do TIA's to previous editions. In other words, their standards are the current recommendations as the right way to do things. Anyone who ignores those recommendations may end up in a difficult liability situation.

It might be best to treat the issue like a recall. The 1983 edition of NFPA 13 would allow you to install a Central Omega sprinkler today if it was still being legally enforced, but would you do it? The same concepts apply to antifreeze. For owners that insist on keeping high concentration antifreeze because they want to take advantage of the strict letter of the law, you may wish to have your lawyers draft very strong language absolving your company of any responsibility and make the owner sign it.

**Question 7 – Water Delivery Requirements for Dry Systems in Dwelling Units**

Is it the intent of NFPA 13 (2010 Edition) to require that all sprinklers in dwelling units (regardless of whether they are quick response or residential) that are protected with dry systems have water to them within 15 seconds of operation.

**Answer:** Yes. The committee felt that it was not acceptable to have a fire burning without water flowing in dwelling units for any longer than 15 seconds after a sprinkler activates. It is a difficult requirement to meet, but it is the intent of the standard. Note that this was a change in the 2010 edition. The 2007 edition required water delivery within 60 seconds to remote portions of dwelling units and the 2002 and previous editions had different rules based on system volume.

**Question 8 – Unit Heaters and ESFR Sprinklers**

We have unit heaters in a building being protected with ESFR sprinklers. If the sprinklers are on a 10 ft x 10 ft spacing and Figure 8.3.2.5 of NFPA 13 says that ordinary temperature sprinklers need to be at least 7 ft from the heater, how can we protect the building? There does not seem to be any acceptable location for the heaters.

Answer: The 7 ft measurement in Figure 8.3.2.5 is from the center of the heater. If the heater is placed exactly in the middle of four sprinklers on a 10 ft by 10 ft spacing, the distance from the heater to the sprinkler will be exactly 7.07 ft, which exceeds 7 ft, permitting the use of an ordinary temperature sprinkler, assuming that the heater is not pointed to blow at one of the sprinklers. If the heater is pointed to blow at one of the sprinklers, the sprinkler in question can be changed to intermediate temperature, with the rest of the sprinklers remaining as ordinary temperature. There are manufacturers that make intermediate temperature ESFR sprinklers.

**Question 9 – Multiple Sprinkler Pipes from the Same Trapeze**

Can multiple sprinkler system pipes can be hung from a single trapeze hanger by adding the section moduli together?

**Answer:** Yes. You can support multiple pipes from the same trapeze hanger by adding their section moduli together and then choosing a hanger that has a section modulus greater than the combined total of the pipes being supported.


**Question 10 – Confusing Design Area Terminology**

We are reviewing a set of plans for a light hazard occupancy with a 13'-6" ceiling that is protected with quick response sprinklers. In the submittal paperwork, the contractor identified the design area as 979 sq ft, but on the plans, they show the design area as 7 sprinklers and 1076 sq ft. We are confused by the inconsistency and feel we should reject the plans since the design area is not 1500 sq ft. Are we correct? Why did the contractor present different numbers and why are

they below 1500 sq ft?

**Answer:** Please don't reject the plans on this basis. The sprinkler system design area is permitted by section 11.2.3.2.3.1 of NFPA 13-2010 (similar section in previous editions) to go below 1500 sq ft for light and ordinary hazard occupancies where quick response sprinklers are being used at the ceiling as long as the ceiling height is 20 ft or less. The exact reduction depends on the ceiling height.

For your situation, with a ceiling height of 13.5 ft, a reduction of 34.75% is permitted for the design area (see the equation in Figure 11.2.3.2.3.1 to calculate this percentage). A 34.75% reduction from 1500 sq ft is the same as taking 65.25% of 1500 sq ft, which sets the design area at 979 sq ft (0.6525 x 1500 = 979). This is why the paperwork says that the minimum design area is 979 sq ft.

When the contractor laid out the system, they initially looked at 6 sprinklers as the potential design area. However, in looking at the sketch you included, these 6 sprinklers only covered a floor area of 920 sq ft. This is not enough to satisfy the minimum of 979 sq ft, so the contractor added an additional (seventh) sprinkler. This 7$^{th}$ sprinkler covers about 156 sq ft, which brings the total floor area covered by the 7 sprinklers to 1076 sq ft (920 + 156 = 1076).

Since the 7 sprinklers cover an area in excess of the minimum required by NFPA 13 (979 sq ft), this system is acceptable, which is why you should not reject the plans on this basis. The difference in terminology is that in one place, the contractor is informing you of how they went through the process of determining the minimum acceptable design area (979 sq ft). On the plans, they are showing you how they exceeded that minimum with a design area of 1076 sq ft. For this situation, the 7 sprinklers covering 1076 sq ft become the design area because any smaller design area would not meet NFPA 13.

**Question 11 – Standpipe Demand for Building Protected by NFPA 13R**

In a 4-story residential building with an NFPA 13R sprinkler system and 4 standpipes (one in each of the 4 exit stairs) would the flow demand required by NFPA 14 be 1000 gpm or 1250 gpm?

**Answer:** The 2010 edition of NFPA 14 requires a maximum flow rate of 1250 gpm for a building with a NFPA 13R sprinkler system installed. If the sprinkler system was an NFPA 13 system the flow rate could be reduced to 1000 gpm in accordance with section 7.10.1.1.5 of the 2010 edition of NFPA 14. Note that this is a change in the 2010 edition of NFPA 14, and has been upheld in the next edition.

A little history of this rule would probably be helpful. The 2007 edition of NFPA 14 (Section 7.10.1.1.3) allowed the reduced flow of 1000 gpm when the building was "sprinklered throughout." The 2007 language could allow a building sprinklered throughout in accordance with NFPA 13R to take advantage of the reduced maximum flow rate of 1000 gpm if the Authority Having Jurisdiction (AHJ) agreed that an NFPA 13R system met the rule of being "sprinklered throughout". Most AHJ's did agree that NFPA 13R systems met the rule of being "sprinklered throughout" since this is the terminology used in the building code where it references NFPA 13R.

While preparing the 2010 edition of NFPA 14, the committee changed this requirement to only allow the 1000 gpm maximum flow to apply to buildings sprinklered throughout in accordance with NFPA 13 (see the Report on Proposals 14-67 Log#10 which initiated this change).

The NFPA 14 Technical Committee, in writing the 2013 edition of NFPA 14, initially accepted a proposal to also allow NFPA 13R sprinkler systems to be allowed to take advantage of the 1000 gpm maximum flow rate. But this proposal was then rejected during the comment stage of development, which resulted in the 2013 edition of NFPA 14 reiterating that the 1000 gpm reduced maximum flow rate only applies to NFPA 13 sprinkler systems. Although the 2013 edition of NFPA 14 is not released yet, it appears that this will be the final language that will appear in the document. (See the Report on Proposals 14-61 Log#11 and the Report on Comments 14-32 Log#8 showing the proposed language for the 2013 edition of NFPA 14).

**Question 12 – The Three-Times Obstruction Rule in Light and Ordinary Hazard**

Is a 2 ft wide cable tray or light fixture directly under sprinklers in an ordinary hazard occupancy with less than 18 inches vertically between the sprinklers and the cable tray or light fixture a problem?

**Answer:** No, as long as the sprinklers are not extended coverage. In this case, the proper obstruction rule to follow is the "three-times rule" since water can get to two sides of the cable tray or light fixture from the sprinklers. Section 8.6.5.2.1.4

specifically eliminates any specific distance when using the three-times rule for objects that are not structural members in ordinary hazard occupancies. Since a cable tray or light fixture is not a structural member, you don't have to worry about the distance from the sprinkler to the cable tray or light fixture as long as you can legitimately say that the water will go to two sides of the object (which you can in this case).

Section 8.6.5.2.1.4 only applies to standard spray sprinklers, not extended coverage sprinklers. So, if extended coverage sprinklers are being used, section 8.8.5.2.1.3 would require the cable tray or light fixture to be moved so that it is not directly under the sprinkler and so that it was at least 36 inches away as measured in a direct line as shown in Figure 8.8.5.2.1.3.

**Question 13 – Protection Criteria for Palletized and Solid Pile Storage**

We are reviewing a set of plans for a sprinkler system to protect palletized storage of Group A plastics (in cartons, not expanded, stable piles) up to 20 ft high in a 25 ft high building. If you work through the Decision Tree (Figure 15.2.2) in NFPA 13, you find that the protection needs to be in accordance with Column C of Table 15.2.6(a), which would require a density of 0.6 gpm per sq ft over 2500 sq ft. But the contractor is insisting that he can protect the commodity with a density of 0.6 gpm per sq ft over 2000 sq ft because that is all that is required for rack storage. Which is correct?

**Answer:** The contractor is correct in this case. Section 15.2.7 of NFPA 13 allows protection criteria from the rack storage rules (where the sprinkler system is "ceiling only" protection) to be used for palletized and solid piled storage. The theory is that rack storage is much more difficult to protect than solid piled or palletized storage due to the stability of the racks holding the combustible commodity in place while it burns and allowing better oxygen flow to the burning surface of the fuel. By comparison, solid piled and palletized storage tends to collapse during a fire and remove much of the combustibles from the oxygen flow.

The reason that the rack storage rules are less stringent than the palletized and solid pile rules (even though the rack storage fire is more demanding for the sprinkler system) is that the fire tests done for (what is now) Chapter 15 of NFPA 13 were conducted mostly in the 1970's (or earlier) with (mostly) k-8 generic spray sprinklers. These tests provided density/area criteria for NFPA 231, which was eventually incorporated into NFPA 13 as Chapter 15. At that time, the k-8 sprinkler was the biggest orifice sprinkler that existed. These sprinklers were not specifically designed for storage. Instead, they were designed to protect everything from hospitals and elementary schools to warehouses.

The "ceiling only" protection in Figures 17.2.1.2.1(a) through (f) came (mostly) from some fire tests conducted in the 1990's with k-11.2 sprinklers (and larger) specifically designed for storage. These sprinklers performed much better than the k-8 sprinklers of the past and helped to justify lower discharge criteria for protecting rack storage with ceiling only sprinklers.

While writing the 2007 edition of NFPA 13, the Sprinkler System Discharge Criteria Committee reviewed the protection rules in Chapter 15 to those that are in Chapter 17. Since rack storage is a greater challenge than solid piled and palletized storage, they wanted to clarify that when you use the better sprinklers (k-11.2 and larger that are listed for storage) you could use the lower criteria if you wanted, but it was too hard to incorporate the lower criteria into the Tables in Chapter 15 because the Tables in Chapter 15 apply to four types of storage (palletized, solid pile, bin-box and shelf), but the allowance to use the rack storage criteria is only for solid pile and palletized storage. So, instead of writing all new Tables and criteria, they just slipped a section into Chapter 15 that says that you can use the rules of Chapter 17 instead of Chapter 15 if you want to for solid pile and palletized storage.

Once you go to Chapter 17 for the protection criteria, you use all of the criteria from Chapter 17, nothing from Chapter 15. Therefore, you use the 2000 sq ft design area from Chapter 17 because that is part of the criteria for "ceiling only" protection.

This is one of the little-known sections in NFPA 13 that can really make sprinkler systems more efficient while providing better fire protection using newer technology products.

## Upcoming NFSA "Technical Tuesday" Seminar – January 8

***Topic: Rules Governing Fire Sprinkler Installation***
***Instructors: Jeff Hugo, CBO***
***Date: Tuesday, January 8, 2013- 10:30 am EST***

NFPA 13 is the primary document to use for installing fire sprinkler systems. However, there are several other codes and

standards involved when designing, installing, testing and inspecting sprinkler systems. Layout technicians, contractors, designers, suppliers, and AHJ's will all have a different responsibility, but all are using the same documents. This course will detail how these codes and standards are arranged, how they work together (and what to do when they don't), along with how chapters and sections are organized.

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

## Upcoming In-Class Training Seminars

The NFSA training department also offers in-class training on a variety of subjects at locations across the country, and in recognition of the current recession has adopted a new reduced fee structure. Here are some upcoming seminars:

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| Jan 8-10 | Westbury, NY | 3-Day Inspection & Testing for the Sprinkler Industry |
| Jan 15 | Brea, CA | Commissioning & Acceptance Testing/Basic Seismic |
| Jan 16-17 | Brea, CA | 2-Day Protection of Storage |
| Jan 17 | Meridian, ID | Fire Sprinkler Design Options in the IBC |
| Jan 19 | Meridian, ID | Introduction to Fire Sprinklers, Standards & Codes |
| Jan 22-24 | Wausau, WI | 3-Day Inspection & Testing for the Sprinkler Industry |
| Jan 25 | Wausau, WI | Inspection, Testing & Maintenance for the AHJ |

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

**To register for these in-class seminars, click HERE. Or contact Michael Repko at (845) 878-4207 or e-mail to seminars@nfsa.org for more information.**



***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.*