NFSA
The Voice of the Fire Sprinkler Industry

# Tuesday e-Tech Alert

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## Best Questions of September 2009

We have selected the following questions as the "Best of September 2009" answered by the engineering staff as part of the NFSA's EOD member assistance program:

**Question 1 – Avoiding Sprinklers Under Soffits Wider than Four Feet**

Section 8.6.5.1.2 of NFPA 13 (2002 edition) allows sprinklers on opposite sides of obstructions up to 4 ft in width. I have two separate ceiling heights (9 ft and 10 ft), separated by a soffit that is 5 ft wide. The soffit height is 8 ft above the floor. Can I space my sprinklers far enough away from the soffit to spray under it (per Section 8.6.5.1.2) or do I need to have sprinklers directly below the soffit because it is over 4 ft wide?
I suppose the soffit could be considered a beam obstruction, but Table 8.6.5.1.2 only goes up to an 18-inch maximum dimension below the bottom of the obstruction, while I have a 24-inch depth on one side of the soffit.

**Answer:** You are not required to put sprinklers under the soffit as long as the sprinklers on either side comply with Table 8.6.5.1.2. If you meet these requirements the sprinklers will be able to spray under the soffit without being obstructed, regardless of how wide the obstruction. Section 8.6.5.1.2 provides the user with three options on how to avoid obstruction problems. If you select option 1 (Table 8.6.5.1.2 and Figure 8.6.5.1.2(a)), then there is no concern over the width of the object as long as you can spray past the corners (per Table 8.6.5.1.2) and as long as the maximum distance between sprinklers complies with the rules of Section 8.6.

With regard to the maximum distance, this is the reason Table 8.6.5.1.2 was expanded in the 2007 edition to include depths as much as 35 inches below the deflector.

**Question 2 – Defining Corrosion Resistant Pipe**

We have a question regarding NFPA 13 Section 8.3.4.3 and the use of K-4.2 orifice sprinklers in a dry system. Are CPVC, galvanized, and copper the only pipe types that comply with Section 8.3.4.3's requirement for corrosion resistant or internally galvanized piping? Does steel piping with an anti-microbial coating qualify?

**Answer:** When the Committee refers to corrosion resistant pipe, they typically mean copper, plastic, or stainless steel. Internally galvanized pipe is not considered "corrosion resistant" as it is used throughout the standard, which is why it was referenced separately from corrosion resistant pipe in this paragraph. We should caution you that plastic and copper tube have limitations on their uses when installed in a dry system, so they may or may not be acceptable for use depending on the specific scenario, even though they would be corrosion resistant. Steel pipe that has been coated with an antimicrobial material is not "corrosion resistant." The coating is designed to resist microbes and limit their growth and impact on the piping. However, Section 8.3.4.3 is intended to address standard corrosion of the pipe that is expected through its lifetime. The main concern is the small orifice on the sprinkler and its ability to still achieve the intended flow and spray pattern. Typical system corrosion needs to be minimized to ensure good performance.

**Question 3 – Securing Trapeze Hangers to the Building Structure**

A 6-inch main is suspended from the bottom chord of two bar joists by a piece of 2½-inch pipe. The support pipe has a rod welded to the bottom to prevent it from rotating and then a C-type clamp is attached to prevent it from dislodging from the web of the truss. Does this comply with the requirements of NFPA 13 (2007 edition) Chapter 9?

**Answer:** First, it needs to be determined if the trapeze is proposed to be a trapeze hanger per NFPA 13 or if it is to be considered an extension of the building structure, which would fall under structural jurisdiction. The sprinkler system pipe would simply be hung from this structural member in accordance with NFPA 13.

If it is intended that the trapeze comply with NFPA 13, then the minimum size must be met by the trapeze member in accordance with Tables 9.1.1.6.1 (a) and (b). We have assumed that the 6-inch pipe is Schedule 10. If the trapeze member is Schedule 40, then the maximum span would be 8 feet based on the information you provided. Likewise, if Schedule 10 is used for the trapeze member then 5 feet is the maximum span to support the load. Next, Section 9.1.1.6.4 notes that the trapeze member needs to be supported to avoid "slippage". This is often done with C-clamps as you note were installed in this case. The piece that is missing is the "hanger" for the trapeze member.

When pipe is located above structural members a traditional "hanger" is not appropriate. The structure will still carry the load and the points of support still have to comply with the maximum distances provided in Table 9.2.2.1, as demonstrated in Section 9.1.1.5.3 where pipe is run through structural members. Therefore, the remaining concern would be somehow securing it in place horizontally. As the standard is currently silent on this topic, it would be up to the AHJ to approve the arrangement.

**Question 4 – Protecting 15 ft of Stored Plastics with Low Clearance**

Reference is made to Section 17.2.1.2(b) of the 2007 edition of NFPA 13. I have a building with a ceiling height of 17 ft 2 in. in which the owner has plans to store up to 15 ft of Group A plastics on single and double row racks. Can this be protected using the 0.45 gpm over 2000 sq ft density/area criteria based on a minimum clearance from sprinkler deflector to storage of 18 inches? If not, where would I look for protection criteria for plastics stored to this height with such limited clearance? Is the wording of "minimum clearance of 5 ft" actually supposed to be maximum? For every other storage height (from 5 ft to 25 ft) there is a specific chart that deals with clearance less than 5 ft from product to ceiling. I do not see anything that talks about 15 ft of storage with less than 5 ft of clearance from product to ceiling. In other sections of Chapter 17, as the storage gets closer to the sprinklers, the density goes down. Such is the case with Figures 17.2.1.2(a).

**Answer:** No, you cannot protect 15 ft high storage of Group A plastics with a 0.45 density using ceiling-only sprinklers in a building with a 17 ft high ceiling. The problem is that the fire is too close to the structural steel at the ceiling and the density is not sufficient to absorb the heat from the fire and prevent the steel from getting close to failure.

For the 17 ft high building, we believe you have three options:

1. Keep the storage at 15 ft and use the 0.6 gpm per sq ft density option with no in-rack sprinklers. Note that this will be very difficult to do since the sprinklers will generally be 6 to 8 inches below the ceiling, making it difficult to maintain the 18 in clearance.

2. Keep the storage at 15 ft and use the 0.3 gpm per sq ft density option with one row of in-rack sprinklers. Note that this will be very difficult to do since the ceiling sprinklers will generally be 6 to 8 inches below the ceiling, making it difficult to maintain the 18 in clearance.

3. Move the storage down to 10 ft so that the minimum 7 ft clearance is maintained and then use the 0.45 gpm/sq ft density for the ceiling sprinklers with no in-rack sprinklers.

**Question 5 – Sprinklers in Church Organs**

I have a question about sprinklers in church organs. The church is completely sprinklered, with the large organ built along one wall. It has access behind with several levels and ladders for servicing the combustible inners of the organ. The architect believes it is a piece of furniture and doesn't require sprinklers in it. I can't really find anything in NFPA 13 to address a similar type of condition. Any help or experience with this type of situation that you could recommend?

**Answer:** The 2007 Edition of NFPA 13 Section 8.1.1 (7) states: *Furniture, such as portable wardrobe units, cabinets, trophy cases, and similar features not intended for occupancy, does not require sprinklers to be installed in them. This type of feature shall be permitted to be attached to the finished structure.*

The interior workings of an organ can involve several levels and ladders, and take up a tremendous amount of space. Like wardrobe units, trophy cases, and cabinets, organs can be considered furniture so long as their interior construction is not contiguous with the interior structure of the building. The sprinkler protection should be sufficiently complete such that all floor areas would be covered if the organ were removed.

That being said, a strong case could be made to churches that it would be in their best interest to extend their sprinkler systems into the combustible interior of large organs. They can be valuable and historic pieces of property, and prompt sprinkler operation can help minimize fire impact.

**Question 6 – FM Global Approach to Balancing In-Rack Sprinklers**

In the next release of FM data sheet 8-9, I have heard they will be removing the hydraulic requirement of balancing the in-rack sprinkler system demand with the overhead demand. Is this also being changed in NFPA 13? Your thoughts?

**Answer:** We are aware of many significant changes being made by FM in their data sheets. You have to remember that, as the property insurer, FM is willing to write a check to cover the building owner's losses if something happens that they did not anticipate, and can make unilateral decisions on that basis. The NFPA standards have a different basis, one of consensus of many different parties and interests. The NFPA committees are aware that there have been many fires in which both ceiling and in-rack sprinklers opened during a fire, and the committee believes the water supply needs to be capable of handling both sets of sprinklers simultaneously. An exception appears in NFPA 30B, where the three levels of in-rack sprinklers are under horizontal barriers and full-scale fire tests have never shown in-rack sprinklers and ceiling sprinklers to open at the same time. As such, NFPA 30B allows the demands to be calculated separately, but not added together.

Also, do not assume that on the basis of this one relaxation that the requirements in FM data sheets are less stringent than those of the NFPA standards.

**Question 7 – ASME Requirements for Well Tanks in NFPA 13D and 13R Systems**

Is a well tank considered a pressure tank and thus required to be designed to ASME standards to be used as an NFPA 13D system water supply? If not, does removing the bladder and piping discharge from a bottle of nitrogen make it a pressure tank? I have a small country church being converted to 10 small apartments under NFPA 13R, and the compartmentation allows a 2-sprinkler design area. The domestic water supply comes off a well, with no city water. The water supply I propose is a series of well tanks without the diaphragm or bladder, and adding an air supply such as nitrogen or compressed air in a (ASME) cylinder, with a regulator set at 40 psi to push the water into the system. I've discussed this with a manufacturer, and they make a series with 100 psi test pressure, 75 psi working pressure. This particular site has a demand of 30 gpm at 35 psi. I'd like to ask whether there have been any discussions on the requirement in 13D that "pressure tanks" be designed to ASME standards, and how critical this is to the reliability of the water supply. Basically I think it's reliable and I do know it's affordable in comparison to alternatives in 13R. Unlike pumps that are an allowed option in both 13D and 13R, this provides protection in a power outage. It also avoids the "13R pumps" from entering the discussion because frankly, an unlisted pump with a listed controller doesn't meet NFPA 20. If

this is being found acceptable for NFPA 13R systems (as evidenced by the ads I see for them) in some jurisdictions, then some AHJs are being misguided. I believe compliance may come down to determining whether a well tank without the bladder is a pressure tank. I understand a reliable well system of sufficient flow, pressure and duration is acceptable for 13D and 13R supplies. I believe it is acceptable to come off an adequately sized well pump to a series of well tanks of sufficient capacity to hold the system's water supply. I assume a residential-type well tank is an assumed component of a well system. I assume the committee is aware that 99% of the residential well tanks sold are not ASME vessels. So, if a non-ASME well tank is an acceptable component of the water supply, does that change when the rubber is removed and the oomph to drive the water out changes from a well pump to a nitrogen cylinder with regulator?

**Answer:** The bladder tank in a well system as a part of the NFPA 13D system is not subjected to the ASME pressure vessel requirement because it is part of the domestic water supply. Philosophically, we accept whatever is allowed for the domestic water supply for NFPA 13D systems. We also do not reference NFPA 22 for any tanks as a part of the NFPA 13D system.

But the NFPA Residential Committee feels differently about NFPA 13R systems. NFPA 22 is referenced for NFPA 13R systems. So, a tank that is a part of the water supply for an NFPA 13R system needs to meet Section 7.1.7.1 of NFPA 22 and comply with the ASME pressure vessel code. Otherwise, the other chapters of NFPA 22 require a vacuum vent that would prevent the tank from allowing pressure to build up in the tank.

Certainly, an AHJ is permitted to accept what you have proposed as an alternate, and there is certainly some merit in what you have proposed. But the base rules of NFPA 13R would say that those tanks are pressure tanks.

We agree with you that the so-called "13R pumps" are inappropriate if they do not meet the requirements of NFPA 20.

**Question 8 – Paint Spray Booths**

Is there a contradiction between the acceptable use of intermediate- and high-temperature sprinklers found in Section 8.3.2.3 of NFPA 13 (2002 edition) and the annex language for sprinklers inside paint spray booths in Section A.13.4.2.1? What criteria need to be followed for the required duct sprinklers for the spray paint booth?

**Answer:** No, there is no contradiction. Section 8.3.2.3 states that it is acceptable to use intermediate- and high-temperature sprinklers in ordinary and extra hazard spaces "as allowed in this standard and other NFPA codes and standards." This means that in general it is acceptable to use them, but there may be instances specified where they may not be the best choice. The annex language is extracted from NFPA 33 and recommends (recall that annex language is not enforceable) that sprinklers should be "of the lowest practical temperature rating." The goal is for the sprinklers to operate as rapidly as possible. If there is a high-temperature rating, the fire will have to be larger to operate the sprinkler(s) versus an ordinary temperature rating. The Committee just wants the user to pick the lowest practical temperature rating for the space to ensure the sprinklers' rapid operation.

With regard to criteria, the 2007 edition of NFPA 13 added a section specifically on duct protection: Section 8.15.12. The Committee recognized that guidance was needed on where the sprinklers belonged in the ductwork. In the 2002 edition, there are some guidelines for ductwork similar to what was added in the 2007 edition, but it applied only to kitchen duct systems and was found in Section 7.9.3.

You should also be aware that the 2007 edition of NFPA 33 included some new material specific to sprinkler installation in ducts and stacks involved in spray applications. See Section 9.4.6 of NFPA 33. This language will be picked up and included in the 2010 edition of NFPA 13 when it comes out later this year.

**Question 9 – Pump Room Temperature Limits**

I have a plan reviewer requesting me to put a note on my plans that says per NFPA-20 and NFPA-70 there is a requirement to have the fire pump room cooled down at a certain temperature which is determined by one of these codes. This is an electric fire

pump and their concern is for the controllers. Is there anything in NFPA-20 or NFPA-70 that requires an electric fire pump room to be maintained at a certain temperature for the controller's purposes?

**Answer:** The answer to your question is "no." We have reviewed NFPA 20 and NFPA 70. There are requirements in NFPA 20 for cooling of the pump room when a diesel engine is used in order to keep the combustion process of the diesel engine as it is intended. However, there are no requirements for cooling the space when an electric fire pump is used. There are general rules to provide ventilation in Section 5.12.5 of NFPA 20, but no specific amount of ventilation or temperature that needs to be maintained in the pump room for electric motor driven fire pumps. NFPA 70, Article 695, contains many requirements for the electrical parts of a fire pump, but again there are no pump room cooling requirements there. The pump manufacturer may have specific temperature limits for its pump.

**Question 10 – Inspecting NFPA 13D Water Tanks**

Are the requirements of NFPA 25 Chapter 9 also applicable for residential NFPA 13D type water storage tanks? We have several group home NFPA13D type systems with water storage tanks. My impression in reading Chapter 9 is that the standard is more applicable to underground water storage tanks and not small 300 gallon tanks installed inside buildings. For example, a 5-year internal inspection to check for leakage can be done externally on the tanks I have in mind.

**Answer:** No. Section 1.1.3 of NFPA 25 (2008 edition), states: "This standard shall not apply to sprinkler systems designed and installed in accordance with NFPA 13D." Therefore, if the system was installed in accordance with NFPA 13D, the requirements for maintenance would not be in NFPA 25.

NFPA 13D notes in Section 4.2 (2007 edition) that instructions should be provided to the owner for maintaining the system properly. Also, Section A.4.2.1 in the annex notes some of the items that would be a good idea as part of the maintenance program.

**Question 11 – Applying the Minimum 3,000 Sq Ft Rule**

I have a project where I believe that I am required to calculate an area of 3,000 sq ft in a light hazard area based on the fact that there is an unsprinklered combustible concealed joist space which is draft-stopped into volumes less than 160 cubic feet. NFPA 13 (2002 edition) is the standard enforced for this project. If the ceiling of the space I am protecting located directly below the concealed joist space is sloped at 4 in12, do I need to increase the area by 30 percent, resulting in a design area of 3,900 sq ft? Can I reduce the 3,000 sq ft area per Figure 11.2.3.2.3.1 (NFPA 13 2002 edition) if I am using quick response sprinklers with ceilings lower than 20 feet? Also, if there is no increase due to slope, can I end up calculating a remote area less than 3,000 sq ft in this instance? In another area of the building the same type of unsprinklered joist space exists acting as floor framing for the 2nd floor. Would the 3,000 sq ft remote area requirement extend to the 2nd floor as well as 1st floor remote areas? The 2nd floor is a light hazard office occupancy, wood framing & sheetrock walls with an attic with wood truss spaces above protected with a dry pipe system.

**Answer:** You are required to start with the areas in Figure 11.2.3.1.1. From there, you would increase or decrease as called for in the rest NFPA 13. When you are finished, if your remote area is not at least 3000 sq ft, you must use 3000 sq ft as your remote area. You do not start at 3000 sq ft and then increase. You may consider reductions but as explained in my answer to question 1, the 3000 sq ft consideration is for comparison to your final remote area assumption. You may not reduce the remote area below 3000 sq ft. Finally, NFPA 13 says that areas adjacent to the concealed space must be at least 3000 sq ft. The first floor and the second floor would be "adjacent" to this interstitial combustible concealed space. Therefore, you should use the 3000 sq ft minimum for both floors.

As examples, consider the following three options:

One option would be to pick 0.1 over 1500 from the light hazard curve. In this case you would increase the design area to 1950 because of the sloped ceiling over the sprinklers. Since this is not at least 3000 sq ft, you would need to increase the design area to 3000 sq ft, ending up with 0.1 over 3000 as your design density/area.

A second option would be to pick 0.085 over 2300 sq ft from the light hazard curve. Increasing the design area by 30% for the sloped ceiling takes you to 2990 sq ft. Since this is not at least 3000 sq ft, you need to increase the area to 3000 sq ft, making your design density/area 0.085 over 3000.

A third option would be to pick 0.07 over 3000 sq ft from the light hazard curve. You still need to increase the design area 30% for the sloped ceiling. So, your final design density/area would be 0.07 over 3900 sq ft.

All three options are acceptable. Option 2 is probably the most efficient. The choice is up to the designer.

**Question 12 – Sprinklers Below Irregular Concrete Tees**

We have a project with concrete tees spaced 4 ft 6 in. on center, flanked by shorter tees spaced at 2 ft 2 in. on center. Would this type of construction be considered obstructed, allowing sprinkler deflectors to be located at maximum 22 inches below the deck? Or would this be considered unobstructed in accordance with Section 8.6.4.1.2(5) of NFPA 13 (2007 edition), with sprinklers located a maximum of 12 inches below the deck?

**Answer:** This should be treated as obstructed construction. The tees are certainly going to be impediments to both sprinkler spray and heat flow. Since some of the tee stems are less than 3 ft on center, you can't use Section 8.6.4.1.2(5) to locate the sprinkler below the tees. Instead, Section 8.6.4.1.2(2) would require the sprinkler deflectors to be located 21 or 22 inches below the deck in the center of the 4 ft 6 in. section. This should provide the 2 ft clearance to each side of the sprinkler required by Section 8.6.5.1.2. Under this rule, the 2 ft 2 in. channels can be without a sprinkler. As long as the pattern repeats, the sprinklers will be 6 ft 8 in. apart in that dimension and can be up to 15 ft apart in the other dimension and still maintain an acceptable spacing for ordinary hazard.

## Upcoming "Technical Tuesday" Online Seminar – October 13th

***Topic: Inspection and Testing of Backflow Devices***
***Instructor: Karl Wiegand, NFSA Manager of Installation Standards***
***Date: October 13, 2009***

Participants will be able to identify different backflow devices and ensure that compliance with state and local health requirements are followed. The six classes of fire protection systems will be discussed as they relate to the American Water Works Association (AWWA) Manual M-14, *Recommended Practice for Backflow Prevention and Cross-Connection Control*. The forward flow and reverse flow testing requirements of NFPA 25 will also be covered. (Great study guide for NICET Work Element 46003)

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

## Upcoming "Business Thursday" Online Seminar – October 29th

***Topic: Inspection Contracts***
***Instructor: Michael J. Friedman, P.E., NFSA Consultant***
***Date: October 29, 2009***

This seminar focuses on Inspection Contract language and Form of Agreements. Large dollar settlements and court decisions may depend on the language that is used in an agreement between an owner and an inspecting contractor. For certain, there is

concern on the part of the inspecting company as to what kind and how much liability will be incurred should a loss occur after inspections take place. The seminar will include examination of a model agreement and include a few case studies and suggested language for identifying deficiencies.

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

Additional training opportunities available include…

## Two-Week Layout Technician Training

***October 12-23, 2009*** ***Phoenix, AZ***

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

## In-Class Training Seminars

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| 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 |
| NFPA 13, 13R, 13D 2007 Update | Des Moines, IA | Dec 1 |
| Hydraulics for Fire Protection | Des Moines, IA | Dec 2 |
| Sprinkler Protection for General Storage | Des Moines, IA | Dec 3 |
| 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

***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.*