



*Issue Number: 193*

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## **Best Questions of October 2010**

We have selected the following questions as the “Best of October 2010” answered by the engineering staff as part of the NFSA’s EOD member assistance program:

### **Question 1 – Listed for Fire Protection or Other Use**

For an antifreeze loop attached to a wet pipe system, is the expansion tank (expansion chamber) required to be Listed "for fire protection use"? Section 7.6.3.3 states "Where the connection between the antifreeze system and the wet pipe system incorporates a backflow prevention device, and the conditions of 7.6.3.5 are not met, a listed expansion chamber shall be provided to compensate for thermal expansion of the antifreeze solution as illustrated in Figure 7.6.3.3." The definition of "Listed" in Section 3.2.3 does not specifically state that a product is required to be Listed "for fire protection use." Is it therefore acceptable to use equipment listed for some uses - but not necessarily for fire protection use - to be used on fire protection systems?

**Answer:** When NFPA 13 uses the term “listed” it means listed for fire protection use. Yes, expansion chambers have to be listed for fire protection use in order to be used in accordance with NFPA 13.

### **Question 2 – Hydraulic Calculations for Fire Hose Serving a Dry Standpipe**

We have two questions. We are being asked to hydraulically prove a manual dry standpipe in an unsprinklered standalone five-story parking garage. We don’t see anything in NFPA 14 that omits the required 100 psi @ 500 gpm requirement at the top level, which in turn gives the AHJ the right to ask us to prove it hydraulically. Are we missing something? We have been given pumper truck documentation by the fire department, and water supply information by the water department. Where can we find an official source to provide friction loss through a fire hose connected from a pumper truck to a fire department connection? It’s a 4 x 2-1/2 x 2-1/2 FDC, so we need friction loss for 750 gpm (two standpipes) split through two hoses.

**Answer:** First you asked if you are required to hydraulically calculate a manual standpipe system. The answer is yes. However, because your water supply is a fire truck, the important thing is to determine whether or not the pressure requirement for your system will be greater than 150 psi at the FDC. If it will you must provide a hydraulic placard stating the required system pressure. Fire trucks have a standard procedure of providing a pressure of 150 psi to the FDC, so if more pressure is required they must know so they can provide it.

In your second question you asked where you can find information on pressure loss across an FDC. The answer to this question is you only need to find the pressure loss to the FDC so that the fire department knows whether or not they need to provide more than 150 psi to the FDC.

### **Question 3- Elevations of Pump and Tank**

I have a design project for a 13R system that will require a pump and storage tank. It has been proposed that the pump be located just below the top of the water line when the tank is full. I understood that the tank needs to be above the pump at the bottom water level. Who is correct?

**Answer:** You are correct that the pump needs to be level with the bottom of the tank. NFPA 20 (which is referenced by NFPA 13R) requires that the water needs to be delivered to the pump suction flange at a positive gage pressure. This cannot be done when the pump is above the water line of a tank. The pump needs to be operational throughout the fire. If the pump was installed level with the water at the top of the tank, the pump would violate NFPA 20 after the first few seconds of water discharge and for the rest of the 30-minute duration of the fire.

### **Question 4 – Sprinkler Locations in Transverse Flues**

We are providing an in-rack system using Figure 6.8.6.2.1 (b) of NFPA 30 (2003 edition). My question is whether the in-rack sprinklers have to be perfectly centered in the transverse flue and at the rack uprights as shown or whether they can be offset from center as long as we maintain the required 4 ft – 5 ft on center spacing between sprinklers? If so, is there a maximum dimension we can be off center with the sprinkler?

**Answer:** Yes, in-rack sprinklers installed in accordance with NFPA 30, 2003 edition, Figure 6.8.6.2.1(b) need to be installed in the transverse flue. The figure specifically says the sprinklers need to be installed in the transverse flue. There are two important reasons to place sprinklers in this location. First, this is the path along which the hot gases from a fire will travel. In order for these sprinklers to activate quickly and be most useful in putting out the fire they need to be placed directly in the path of the fire. Second, placing the sprinklers here allows their spray to reach the maximum amount of material when they are activated.

### **Question 5 – ESFR Sprinklers in Light Hazard**

I have an existing ESFR warehouse that a light hazard tenant is moving into. The K-14 ESFR cut sheet says that the sprinkler is FM approved as a quick response non-storage sprinkler. Can the ESFR sprinklers remain in this light hazard occupancy or do they have to be changed out?

**Answer:** NFPA 13 (2010 edition) Section 8.3.3.1 lists the types of sprinklers that can be used in a light hazard occupancy and ESFR sprinklers are not among them. However, this does not mean you have to take out the ESFR sprinklers. Rather than convert to a light hazard occupancy it may be possible to classify the building as an ordinary hazard group 1 occupancy. You would be providing a higher level of protection and ESFR sprinklers are acceptable for use in ordinary hazards occupancies. If there is a life safety concern it can be noted that ESFR sprinklers are fast response sprinklers.

### **Question 6 – Contradictory Supply Pressures for Flow and Pump Tests**

I have a fire pump question. Does pulling the water through an underground main to feed a fire pump affect the supply pressure at the street and at the pump differently than flowing the same amount of water through the same piping using city pressure (pushing it)? We are trying to figure out why we can't get enough water to the pump for the 150% test.

There appears to be plenty of pressure and flow from the street to the pump. We can flow 2,400 gpm around the 8-inch pump bypass through a site hydrant on the high pressure water main (after the fire pump) that feeds the plant risers and hydrants. The residual during this test at the street was 52 psi and the pressure at the pump suction flange was 30 psi. (Fire pump off). But when flowing 1900 gpm through the pump test header, the suction pressure is 10 psi, and the residual at the street is 26 psi. The same inspection company has been doing the test the whole time and has checked and rechecked all gauges and calculations for flows and pressures. Over the last 10 years the suction pressure at the pump during the 150% test has fallen from 36 psi to 10 psi and the last two tests were only able to produce 143% and 132%.

Why, when pumping water through the pump, does the pressure at the street and the suction pressure at the pump drop off so far when there seems to be plenty of supply?

Why can we get the flow and pressure through the bypass but not through the pump? (The 26 psi residual pressure discrepancy at the street is very puzzling) The only difference in piping from the bypass flow and the pump flow is that when we flow water through the pump, it has to go through a suction 8-inch OS&Y, the pump and six ft of 8-inch test header versus 20 ft of bypass piping, 150 ft of 10-inch PVC, and the hydrant.

**Answer:** Based on what you have said, it would appear that one of two possibilities is causing your problem. The first possibility is that there is some sort of blockage in the suction line between the bypass line and the pump suction flange. There could be a large amount of pressure loss through a small area of pipe if there was a large item in it. This would also explain the continued degradation of water pressure available at the suction flange as more and more material became caught in this area.

Another possible reason for this problem could be the way that the water supply is set up. You mentioned that the water supply had become stronger over the last ten years. Part of the way that this may have been accomplished is through adding more pumps to the city system. In order to save energy some of these pumps may not turn on unless there is a very high flow rate going through them. Flowing 1900 gpm through the pump may not have been enough to trigger the secondary pumps, where flowing 2400 gpm through the hydrant may have been enough.

### **Question 7 – Sprinklers in Electrical Rooms**

Sometimes it is difficult to determine the voltage of electrical rooms. The AHJ's have varied requirements. We typically make one penetration into these rooms over the door to sprinkler them. With this approach we can easily remove the pipe and cap the system outside the room late in the game for the AHJ. Are there any written rules that prevent sprinkler pipe from passing thru electrical rooms?

**Answer:** The following are the requirements that cover sprinkler protection in electrical equipment rooms. In general, sprinkler protection is required in the electrical equipment space, although there are specific situations which will allow the omission of sprinklers from the space.

IBC - The International Building Code does require sprinkler protection in electrical equipment rooms. Section 903.3.1.1.1 mentions that sprinklers shall not be omitted from any room merely because it contains electrical equipment. The IBC does allow the omission of sprinklers from any room or space where sprinklers are considered undesirable because of the nature of the contents, when approved by the building official, and from generator and transformer rooms separated from the remainder of the building by walls and floor/ceiling or roof/ceiling assemblies having a fire-resistance rating of not less than 2 hours (from Section 903.3.1.1.1 exceptions 2 and 3).

NEC - The 2008 edition of NFPA 70, the National Electrical Code, has fire protection requirements in Article 110 (Requirements for Electrical Installations). Section II has information for less than 600 volts and Section III has requirements over 600 volts. For less than 600 volts, Section 110.26 (Spaces About Electrical Equipment) allows sprinkler protection (see 110.26 (F)(1)(c)): "Sprinkler protection shall be permitted for the dedicated space where the piping complies with this section." For 600 volts or more Section 110.34 (Work Space and Guarding) also allows sprinkler protection (see 110.34(F)): "Piping and other facilities shall not be considered foreign if provided for fire protection of the electrical installation." Neither of these sections specifically require sprinkler protection but they do allow the sprinkler piping in the space.

NFPA 13 - Section 8.15.10.1 of the 2007 edition of NFPA 13 requires sprinkler protection in electrical equipment rooms, although Section 8.15.10.3 does allow sprinklers to be omitted from electrical equipment rooms where all of the following conditions are met:

- (1) The room is dedicated to electrical equipment only.
- (2) Only dry-type electrical equipment is used.
- (3) Equipment is installed in a 2-hour fire-rated enclosure including protection for penetrations.
- (4) No combustible storage is permitted to be stored in the room.

### **Question 8 – Bi-fold Doors as Sprinkler Obstructions**

I'm working on an NFPA 13R design and some of the apartments have bi-fold doors on the closets. The local AHJ asked if the doors should be considered as obstructions to horizontal sidewall sprinklers. I told them I would look into it but could not find anything in NFPA 13 or 13R that addresses doors as obstructions. I need some advice as to how to respond.

**Answer:** The bi-fold door is no more of an obstruction than a standard door that would swing out into the room. In general, the sprinkler would be above the plane of the top of the door so that it would be able to spray over the door. It is always a good idea to minimize the effect of an obstruction when possible, but a moveable obstruction such as a door is not specifically addressed in the criteria of NFPA 13 or NFPA 13R.

The only other location criteria might exist is in the listing/cut sheet information for the sprinkler being used. However, we are not aware of any sprinkler manufacturers addressing a door of any style as an obstruction in their product literature.

### **Question 9 –Solid Wood Joists in lieu of Composite Wood Joists**

In reference to Section 8.14.1.2.6 of NFPA 13, we have a situation that matches Section 8.14.1.2.6 perfectly but with wood joists in lieu of composite wood joists. Would this meet the intent of this section? In other words, can the omission of sprinklers from the concealed space still be used when the wood construction is solid wood instead of composite wood joists?

**Answer:** In general, the answer is "yes." Solid wood has more favorable burn characteristics for fire protection than composite wood members do. This is because of the glue and adhesives used in making the composite material. The solid wood will burn more slowly than the composite, which would make this a better scenario than the one in the standard that permits the omission. We do also need to point out that the composite wood joists have a solid web to them, which helps contain the smoke and heat if there is a fire. Therefore, the solid wood arrangement would also have to have a solid web to the members. This is less common to see with solid wood construction, so we just want to make sure that the cases really are parallel.

### **Question 10 – Group A Plastics on Shelves**

Can Group A plastics stored on shelves 7 ft tall be protected as solid pile storage under Table 15.4.1 of NFPA 13 (2010 edition) with ESFR sprinklers? This is a toy retail store, with shelving between 18 in. and 60 in. wide, mostly 18-inch back-to-back with 5 ft aisles. Upon inspection of the retail store it appears that the larger shelves in the store are open grates. The majority of the shelving in the store is less than 30 in. or 60 in. back-to-back. This dimension would fall into the definition of NFPA 13 for shelf storage (Section 3.9.2.6 in the 2010 edition).

**Answer:** Group A plastics being protected in accordance with the ESFR sprinkler requirements of Chapter 15 cannot be on solid shelves. The first column of Table 15.4.1 specifically states that no solid shelves are permitted.

There are some people that have successfully made the argument that miscellaneous storage in accordance with Chapter 13 can be protected with ESFR sprinklers even with solid shelves as long as the commodity is not considered anything more than ordinary hazard. We can see this position because ordinary hazard occupancies are permitted to be protected with ESFR sprinklers by Chapter 12. In your case, however, you are beyond the protection of miscellaneous storage and are utilizing Chapter 15, therefore we would not think that ESFR sprinklers are appropriate for use in trying to protect the solid shelves.

We should also point out that recent fire testing with Group A plastics on back-to-back shelves similar to what you have described with standard spray sprinklers showed that the fires were more intense than anticipated with standard 30-inch wide shelves. Due to this concern, new protection criteria were added to the standard to protect back-to-back shelves with spray sprinklers. Since tests have not been conducted with ESFR sprinklers, the use of such sprinklers with the commodity that we know to be more demanding would probably be a subject of concern.

### **Question 11 – Distance to Pump Diesel Engine Muffler Discharge**

What is the maximum distance permitted by NFPA 20 to discharge the muffler (diesel fire pump) outside the building or pump room? For example, when you have a diesel fire pump in a basement.

**Answer:** Section 11.5 of NFPA 20 provides guidance on engine exhausts. It mentions that the exhaust has to be piped to a safe point outside the pump room and arranged to exclude water and that the exhaust gases cannot discharge where they will affect persons or endanger buildings.

### **Question 12 – Galvanized Pipe for Preaction Systems**

I am designing a pre-action fire sprinkler system. Is it required to have the piping galvanized or can I just use black pipe? Section 8.4.7.2 appears to require the use of galvanized:

8.4.7.2\* Galvanized Pipe.

8.4.7.2.1 Where steel pipe is used in preaction and dry pipe systems, piping materials shall be limited to internally galvanized steel.

8.4.7.2.2 Black steel pipe shall be permitted when the system is installed in freezers where the air temperature is below 32°F (0°C) and the air supply is either nitrogen or a listed regenerative air dryer.

8.4.7.2.3 Nongalvanized fittings shall be permitted.

**Answer:** A preaction system does not need to be galvanized. Black steel pipe is acceptable for use. Section 8.4.7.2 only applies to preaction/dry systems using large drop sprinklers. This originated from a requirement originally developed by Factory Mutual when that organization first approved large drop sprinklers.

### **Upcoming NFSA "Technical Tuesday" Seminar – November 9<sup>th</sup>**

*Topic: Clearance to Storage*

*Instructor: Victoria B. Valentine, P.E., Director of Product Standards*

*Date: November 9, 2010*

Storage can cause a high challenge fire. The amount of clearance between the sprinklers and the top of storage can alter the protection needed in the space. Variations in the sprinkler densities, calculation areas or other protection requirements due to the distance from the top of storage to the sprinklers will be discussed. This seminar will also review recent changes in NFPA 13 to handle scenarios where there is a large clearance between the storage and the sprinklers, including the spacing of in-rack sprinklers.

### **Upcoming NFSA "SAM Friday" Seminar – November 12<sup>th</sup>**

*Topic: Flexible Drops: Uses and Limitations*

*Instructor: Mike Dooley, Flexhead*

*Date: November 12, 2010*

"Flexible sprinkler hose fittings" were first allowed by NFPA 13 in the 2007 edition of the standard, but have specific rules and limitations attached to their use. This seminar will address those rules, but also note the degree to which these devices have been accepted for use as part of earthquake protection features and as simple labor-saving design features.

### **Upcoming NFSA/FSI "Best Practices Thursday" Seminar – Nov. 18<sup>th</sup>**

*Topic: Effective Sales Proposals*

*Instructor: Paul Johnson & Brian Cullen & Top Myers*

*Date: November 18, 2010*

Would you like to explore the best possible techniques for delivering compelling sales presentations? Join us for this 45-minute presentation where we will cover the latest in persuasive proposal writing techniques that help you demonstrate your competitive advantage and take the focus off of price. One-on-one follow-up is available after the call 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](mailto:seminars@nfsa.org)

### **Advanced Technician Training Class**

*November 16-18/Fishkill, NY*

*Holiday Inn Hotel and Conference Center*

*542 Route 9*

*For reservations, call (845) 896-6281 and 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:

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	Las Vegas, NV	Standpipe Systems (1/2 day a.m.)
Nov 10	Las Vegas, NV	Commissioning & Acceptance Testing (1/2 day p.m.)
Nov 30	Pembroke, MA	Sprinkler Protection for General Storage
Dec 1	Pembroke, MA	Sprinkler Protection for Rack Storage
Dec 2	Pembroke, MA	Sprinkler Protection for Special Storage
Dec 14	Marana, AZ	Sprinkler Protection for Rack Storage
Dec 15	Marana, AZ	Sprinkler Protection for Special Storage
Dec 16	Marana, AZ	Standpipe Systems (1/2 day a.m.)
Dec 16	Marana, AZ	Underground Piping (1/2 day p.m.)

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](mailto: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](http://www.nfsa.org).*

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