NFSA
The Voice of the Fire Sprinkler Industry

Tuesday e-Tech Alert

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# Best Questions of August 2010

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

**Question 1 – Minimum Spacing Between Sprinklers at Different Elevations**

One of last month's "Best Questions" referred to minimum spacing between a sidewall sprinkler and a pendent sprinkler. We have a question about different elevations. If a sprinkler has to be placed under a bulkhead, soffit or something else projecting out from the wall since the ones at the ceiling don't meet the obstruction criteria for throwing under it, does the 6 ft minimum need to be maintained between these sprinklers? Also, taking it one step further, if the sprinkler under the obstruction is standard coverage and the one at the ceiling is extended coverage does the minimum distance for the extended coverage sprinkler need to be maintained?

**Answer:** The problem is that the sprinkler at the higher elevation could get the sprinkler at the lower elevation wet, so the minimum distance may be appropriate. One way to decide the situation would be to draw a straight line from one sprinkler deflector to the other. If the line passes through the soffit, then the spray from the sprinkler at the higher elevation is blocked from getting to the sprinkler at the lower elevation, so the soffit could be treated as a baffle and no minimum distance is required. If the line goes below the soffit, then the sprinkler at the lower elevation could get direct sprinkler spray from the sprinkler above and the minimum distance should be maintained.

**Question 2 – Spacing Sprinklers below Cloud Ceilings**

We have an office area that has floating or cloud type ceilings. They have a gap or open area around them between the walls with a space of 17 inches between the edge of the ceiling and the walls. We have upright sprinklers above the ceilings (approximately 7 inches above the ceilings) and sprinklers below the ceilings. The upright sprinklers will cover the entire room in accordance with NFPA13. The question is: should the sprinklers below the ceilings be spaced to the edge of the ceilings or to the walls?

**Answer:** The problem is that the upright sprinklers are only 7 inches above the floating ceilings. This is not enough room for the sprinklers to establish their spray pattern. Because of this low clearance, the upright sprinklers can only protect the space above the floating ceilings (including the structure). The sprinklers below the ceiling will need to be used to protect the floor area of the room, which means that the sprinklers below the ceilings need to be located to properly protect all the way to the walls.

The answer would have been different if the floating ceilings were more than 18 inches below the upright sprinklers, allowing the spray patterns to develop so that the sprinklers above the floating ceiling could legitimately protect floor areas below the floating ceiling.

**Question 3 – C-Factor for a Dry Standpipe**

What C factor is required for a dry standpipe? I see that Table 8.3.2.3 of NFPA 14 requires a C-factor of 100 when calculating a dry pipe system unless the pipe is internally galvanized (in which case the C-factor is 120), but that table is very similar to Table 22.4.4.7 in NFPA 13. I mention that because both tables refer to "dry systems." I'm not convinced that a dry standpipe is a dry system. A dry system is constantly having fresh air pumped into it, thereby exposing the interior of the pipe to moist, rust-producing air. A dry standpipe is a closed system without exposure to moisture. Both tables use a C-factor of 120 for a deluge system. If an open deluge system can have a C-factor of 120, it seems to me that a dry standpipe would also have a C-factor of 120 since it would be even less susceptible to corrosion than an open system.

**Answer:** Dry-pipe and preaction sprinklers systems have a C-factor of 100 because they have supervisory air pumped into the sprinkler system piping after trip tests. When a dry-pipe or preaction system is drained after a trip test, you can never get all of the water out. Then, when you add supervisory air, even at a very low air pressure, you are putting more oxygen into a steel piping system that is still moist, creating more potential for corrosion. In addition, dry-pipe and preaction systems are closed systems. When moisture comes out of the supervisory air, it cannot evaporate because there is nowhere for the condensate to go.

A deluge sprinkler system does not have supervisory air. It is true that these systems have moisture in them after a trip test. But these systems tend to dry out over time because the air is free to circulate and condensate does not get trapped. Over time, the writers of NFPA 13 have noticed that deluge system piping does not corrode as badly as preaction or dry-pipe system piping, so the C-factor of 120 is allowed.

Automatic-dry and semi-automatic-dry standpipe systems are very similar to preaction and dry-pipe sprinkler systems. They are closed systems with supervisory air added and nowhere for condensate to go when it comes out of suspension in the air. Extra oxygen is combined with steel piping in a moist environment. A C-factor of 100 is appropriate for these systems.

Manual-dry standpipe systems are a bit different. They have no supervisory air. But they are still closed systems. Moisture in the system left from a trip test or hydrostatic test cannot evaporate. The hose connections are kept closed. As such, we would say that these are still dry systems and should still use a C-factor of 100. If the owner wanted to institute some sort of drying procedure after any situation where water got into the piping, the AHJ might be persuaded to allow a calculation using a C-factor of 120, but that would be up to the AHJ.

**Question 4 – Indoor Display of Fireworks**

We have a situation where we are evaluating an arena in which on some occasions there may be some pyrotechnic displays such as in the case of a rock group, etc. I double-checked the standard, but could find no mention made of this type of occupancy. My gut is telling me it should be Extra Hazard Group I or II. Do you have any information you can forward me regarding such occupancies?

**Answer:** The NFPA publishes a standard 1126 - *Use of Pyrotechnics Before a Proximate Audience* that addresses indoor use of fireworks. But as long as that standard is followed, the types of fireworks don't affect the overall hazard classification of the space. The fireworks become just another potential ignition source. Since NFPA 13 does not take the probability of ignition into account in hazard classification (ignition is assumed), it should not affect the hazard classification. Obviously, in some cases the fire suppression system could be triggered by the type of pyrotechnic display. NFPA 1126 Section 8.1.6 allows portions of fire detection and life safety systems to be interrupted during the operation of temporarily installed pyrotechnic effects when approved by both the AHJ and the owner or owner's agent, and when an approved fire watch is in place to direct operation of all fire detection and life safety systems in the building.

**Question 5 – Wells as Raw Water Sources**

I have a question as to the meaning of "raw water source" as it relates to the need for return bends in NPFA 13. We are using a fiberglass underground water tank filled from a well to provide the water demand for a sprinkler system. Our question is, if the tank is filled from a well, does that mean it is a raw water source and then we are required to use return bends on all of our pendent heads?

**Answer:** A well is not necessarily a raw water source. The concern with raw water sources are small rocks, dirt and sediment that might get into the fire sprinkler system. A pump taking suction from a well may already have screens to protect the pump from small rocks and other obstructions. Tanks can be designed so that sediment settles at the bottom of the tank as long as the discharge flange of the tank is higher than the sediment level and as long as the tank is cleaned often enough for the sediment to remain below the discharge flange of the tank.

A fire sprinkler system is not required to have return bends if the pump and tank fed from a well have sufficient provisions to protect against the buildup of small obstructions, dirt and sediment on the interior of the sprinkler piping. Once every 5 years, NFPA 25 requires that the sprinkler piping be internally inspected for build-up of sediment or corrosion. This inspection can be used to verify that the pump and tank are not creating a problem.

**Question 6 – Increasing Pump Speed to Meet System Demand**

We have a couple of quick questions for you relating to the design of a fire pump.

1) Is it acceptable by NFPA to use anything other than the UL listed curve of a fire pump to design a system, such as the final field acceptance test?
2) Does NFPA 20 place a maximum limit on the rpm of a diesel driver, such as a percentage over the listed rpm?

Example: Say you design and submit an ESFR system with a fire pump rated for 100 psi at 1500 gpm. Once you get to the site, you find that the underground contractor mistakenly installed the fire line using 8-inch piping rather than installing 10-inch pipe as originally designed. In an effort to help the underground contractor, is it acceptable to install the fire pump, then perform a field acceptance test with the rpm of the driver slightly above the rated rpm in order to get a few additional psi out of the pump? Let's say that by doing so you prove the fire pump can deliver 110 psi at 1500 gpm. Once the field test is complete, can you update you calculations

showing the higher 110 psi rating on the pump that makes up for the additional psi loss through the smaller underground pipe, and use the updated calculations to resubmit to the AHJ?

I understand this all hinges on whatever the AHJ will accept, but we are looking for something out of the code that would support this effort as being acceptable to NFPA.

We're in a situation where we've come onto a project after original installation and approval and it appears that this is exactly what the prior contractor has done. We are formulating a response to our GC based upon calculation information that they've given us as well as original submittal calculation data from the city which, when compared to each other, show two different pump flow criteria. The original submittal shows the listed factory rating and the second, more recent one shows a 1750 rpm driver operating at 1860 rpm with the proportionate additional pressure used for proving the calculations work.

Through this process the subject of "affinity laws" came up. Do you know if there's ever a time where the affinity laws can be applied to a listed fire pump rating to show that the increased available pressure from the pump (mechanically possible and in mathematically calculable) is acceptable for design purposes by NFPA or the IFC?

One final follow-up question. This is a PLD diesel fire pump. Does that have any bearing on the answers?

**Answer:** No, the affinity laws cannot be used to prove a higher pressure at a higher speed. The speed is not allowed to be increased beyond the rated speed of the pump just to produce more pressure unless the AHJ wants to grant a specific variance from the NFPA standards.

To specifically answer your two questions:

1) It is difficult to answer this question because the question itself is flawed. According to NFPA 20, in order for the pump to pass the acceptance test, the field acceptance test needs to match the listed performance curve of the pump exactly (within the accuracy of the test measuring equipment). So there can never be a condition where the field acceptance test is different from the listed performance curve of the pump if the installation complies with NFPA 20.

2) Yes, there is a limit to the speed at which a diesel pump can turn. NFPA 20 requires that the pump turn at rated speed at maximum flow (150% of rated flow). There is no allowable extra speed at this performance point. The pump is allowed to turn as much as 10% faster at lower load conditions (which will happen naturally when a lesser flow is going through the pump).

In short, NFPA 20 does not allow what you have suggested. The pump is rated to turn at a specific speed and you are suggesting having the pump run at a speed for which it has not been designed. This would violate the UL listing of the pump and is not permitted by NFPA 20. If the AHJ wants to allow this as variance from NFPA 20, that would be the prerogative of the AHJ. If you were to do such a thing, you would need to place permanent signs in the pump room warning people of the special requirements so that they don't slow the pump down in the future.

Finally, we're assuming that the term "PLD" is referring to is a variable speed device that slows the pump down in order to limit the pressure produced on the discharge side of the pump. That does not

change the above answers. The variable speed pumps are only permitted by NFPA 20 to slow down the pump, not to speed it up. The purpose of the variable speed driver is to help the pump to produce less pressure so that the system components are protected. Even under these conditions, the pump is still required to be tested at its regular speed and compared to the original pump curve. The variable speed driver is not permitted to turn faster to create more pressure.

**Question 7 – Shared Water Motor Gongs**

I have an inspector who posed the question of "how many risers are allowed to be tied in to one water motor gong?" I could not find any restrictions in NFPA 13 or 25. Could you provide a code reference that applies? One manufacturer's data sheets state that up to three separate fire systems can share one gong as long as each ¾-inch line contains a check valve and strainer.

**Answer:** According to NFPA 13, there is not a specific limit on the number of systems that can be tied to a water motor gong. However, there is a practical limit in the field due to the physical arrangements of the systems and their connections. In addition, Section A.8.17.1.5 recommends that water motor gongs be located near the system valve and the length of pipe to the alarm device should not exceed 75 feet.

You had also noted that there was manufacturer information on the number of systems that could be connected to a single water motor gong. If this is the case, then the manufacturer's guidelines should be followed.

**Question 8 – Sprinklers under Car Storage Canopies**

A car dealership has large canopies off the sides of the building. They are of noncombustible construction and finishes. One is 30 ft by 60 ft; the other is 30 ft by 10 ft. There will be cars below them, and the display will change from time to time. Are these canopies required to have sprinkler protection?

**Answer:** Yes. Although Section 8.15.7.3 of NFPA 13 (2010 edition) indicates that sprinklers are not required below canopies, roofs, porte-cocheres, balconies, decks and similar projections of noncombustible or limited combustible construction, Section 8.15.7.4 requires sprinklers under roofs, canopies, porte-cocheres, balconies, decks and similar projections greater than 2 ft wide over areas where combustibles are stored. Annex section A.8.15.7.2 provides guidance indicating that temporarily parked vehicles are not considered storage as with drive-in bank windows or porte-cocheres. While the canopies on the car dealership may give the appearance of a porte-cochere, there is no traveled way that serves the function of ensuring only temporary parking. Since the building feature is independent of its current use for automobile storage, it must be recognized that the space could easily be used for some other type of storage as well, and that sprinklers are therefore needed.

**Question 9 – Hazard Classification of Wax Figures**

I am the engineer of record for a project at a local theme park for a building that is being renovated. The building is essentially an entrance to the park and will have people walking through looking at scenes made of wax figures and then exiting the building. I do not have any information on the wax figures as far as the exact material goes. The wax figures are over 50 years old, are life-sized and will be

placed on the floor. Nothing in the building is being sold or stored. The ceiling height is 24 ft. In my opinion this would be analogous to a wax museum. My question is: what is the occupancy hazard classification of this building? I do not think light hazard is appropriate and the miscellaneous storage section of NFPA 13 does not appear to directly apply in that the wax will not be stored on racks or shelves. Any assistance you can provide will be appreciated.

**Answer:** 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. In this case, since we are not aware of any relevant decisions by other NFPA technical committees, and since you are the responsible design professional, we would recommend that you investigate the degree of correlation to museum properties, which often contain similar figures. Most museums, where the fuel load is low and the heat release from a potential fire is expected to be low, are treated as light hazard occupancies. It is worth noting, however, that NFPA 13 annex Table A.5.6.3 includes "cartoned paraffin/petroleum wax blocks" as equivalent to storage of Group A plastics. The same table suggests that cartoned candles be treated as expanded Group A plastic. As with almost all fuels, however, the quantity of combustibles, more specifically the quantity per unit floor area, should play a major role in the determination of an adequate sprinkler system hazard classification.

## Question 10 – Size of Pipe Sleeves in Earthquake Areas

What is your interpretation of Section 9.3.4.3 in the 2002 edition of NFPA 13 regarding pipe sleeves? Does a 1¼-inch piece of pipe require a 3-inch pipe sleeve or a 3¼-inch pipe sleeve? Does a 1½-inch piece of pipe require a 3-inch pipe sleeve or a 3½-inch pipe sleeve? Does a 2½-inch piece of pipe require a 4-inch pipe sleeve or a 4½-inch pipe sleeve?

**Answer:** If a pipe is 1¼-inch pipe is used for the sprinkler system, the pipe sleeve for required clearance purposes would be 3¼-inch. The paragraph indicates that any pipe from 1-inch through and including 3½-inch utilizing a pipe sleeve must use a nominal sleeve sized 2 inches larger than the pipe. Therefore, with 1¼-inch pipe a sleeve needs to be nominal 3¼ -inch, with 1½-inch pipe the sleeve needs to be nominal 3½ -inch, or with 2½-inch pipe the nominal sleeve size would be 4½-inch. Obviously, since pipe is not produced to all these dimensions, the next highest nominal size must be used. It should also be noted that the clearance is not required when flexible couplings are used within 1 ft of both sides per Section 9.3.4.5.

### Question 11 – Chemical Hood Protection

I am designing a job where they do chemical testing. The fire marshal asked me if the chemical hoods need to have fire sprinklers in them, they are 6-0 x 4-0 and have a glass front that comes down 24 inches. I told him I do not know. He then told me that if they are required by code then put them in. I said OK. Can you please let me know where I would find such information?

**Answer:** The intended use and construction of the chemical hood will determine if a fire suppression system is required or not. NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals*, provides information on fire protection for chemical hoods.

Specifically, Section 8.10.1 of NFPA 45 states: *"Automatic fire protection systems shall not be required in chemical fume hoods or exhaust systems except in the following cases:*
*(1) Existing hoods having interiors with a flame spread index greater than 25 in which flammable liquids are handled.*
*(2) If a hazard assessment shows that an automatic extinguishing system is required for the chemical fume hood, then the applicable automatic fire protection system standard shall be followed."*

If a suppression system is required then Sections 6.2.1.1 and 8.10.2.1 of NFPA 45 will provide information on installing the appropriate system:

*"6.2.1.1 Automatic sprinkler system protection shall be required for all new laboratories in accordance with the following:*
*(1) Automatic sprinkler system protection for Class A and Class B laboratories shall be in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, for ordinary hazard (Group 2) occupancies.*
*(2) Automatic sprinkler system protection for Class C and Class D laboratories shall be in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, for ordinary hazard (Group 1) occupancies."*

*"8.10.2.1 The fire extinguishing system shall be suitable to extinguish fires within the chemical fume hood under the anticipated conditions of use."*

**Question 12 – Restraint of Branch Lines without Bracing**

We have a schools agency here in California that said we cannot eliminate the need for lateral restraint on branch lines hung with rods less than 6 inches long because the 2002 edition of NFPA 13 does not allow it. I tried explaining that if the limited hanger lengths allow the omission of lateral braces for mains then, since restraints on branch lines are considered less important, you shouldn't need them. They acknowledge that it now says that in the 2007 edition of NFPA 13 but not the 2002 edition. Can you confirm that although it doesn't specifically say that branch lines restraint can be omitted in the 2002 edition that it was nevertheless the general intent to allow that exception to be used?

**Answer:** Yes. The Committee made the clarification with additional language in Section 9.3.6.5 of the 2007 edition of NFPA 13, indicating that restraint is not required on the branch lines under the same criteria that allow omission of the lateral sway braces in accordance with the 6-inch hanger rod rule of Section 9.3.5.3.8. This was discussed by the Committee as a clarification rather than a change, and it was agreed that the intent needed to be spelled out clearly. Restraint is a lesser degree of resistance from horizontal forces than bracing, and if it is permitted to omit the lateral sway braces, then the restraint can also be omitted.

## Upcoming NFSA "Technical Tuesday" Seminar – September 14th

**Topic: Alarm System Interface**
**Instructor: Russell P. Fleming, P.E., Executive Vice President**
**Date: September 14, 2010**

For buildings with fire alarm systems, NFPA 13 defers to NFPA 72 – the *National Fire Alarm Code.* NFPA 72 in turn has specific requirements relating to sprinkler flow alarms and supervisory signals. This seminar will provide correlation between these two important installation standards, and differentiate between requirements and options.

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

## Upcoming NFSA/FSI "Best Practices Thursday" Seminar – Sept 16th

**Topic: Budgeting for Success**
**Instructor: Paul Johnson**
**Date: September 16, 2010**

Would you like to improve your team's ability to accurately forecast new sales? Are you anxious to get a better handle on budgeting operating and capital expenses? Join us for this 45-minute discussion on collaborative budgeting and prepare to improve your sales and expenses forecasting efforts! One-on-one follow-up is available after the call at no additional charge.

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

## Sign Up for NFSA's New "SAM Friday" Online Series

**Like his distant cousin Joe Friday of "Dragnet" fame, SAM Friday is all about the facts, not sales pitches. This fall, NFSA is launching a pilot series of four online series featuring experts from among the Supplier and Manufacturer (SAM) members of NFSA. These seminars will be held at the usual time, starting at 10:30 am Eastern, but as the name suggests will be held on Friday mornings. Because this is a pilot series, the NFSA is charging only $39 per seminar, or all four seminars for $99. The schedule is as follows:**

**Friday, September 24th**
Topic **– Flow, Pressure, and Tamper Switches**
Instructor – Mike Henke, Potter Electric Signal

**Friday, October 15th**
Topic – **CPVC Compatibility Update**
Instructor – Michelle Knight, Lubrizol
**Friday, November 12th**
Topic – **Flexible Drops: Uses and Limitations**
Instructor – Norm MacDonald, Flexhead

**Friday, December 10th**

Topic – **Steel Pipe Types and Specifications**
Instructor – Drew Siddons, Allied Tube

**Join these experts and allow them to answer your product questions.** To register or for more information, contact Michael Repko at (845) 878-4207 or e-mail to seminars@nfsa.org

## Inspection & Testing for the Sprinkler Industry (3-day course)

**New Castle, DE – September 28-30, 2010**
**Delaware State Fire School's Regional Center**
**2311 McArthur Drive, New Castle, DE 19720**

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

## Additional 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:

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| Sept 14 | Dayton, OH | Plan Review Policies & Procedures |
| Sept 15 | Dayton, OH | Inspection, Testing & Maintenance |
| Sept 16 | Dayton, OH | Basic Seismic Protection (1/2 day a.m.) |
| Sept 16 | Dayton, OH | Standpipe Systems (1/2 day p.m.) |
| Sept 16 | Concord, NH | Sprinkler Protection for General Storage |
| Sept 17 | Concord, NH | Sprinkler Protection for Rack Storage |
| Sept 18 | Concord, NH | Plan Review Policies & Procedures |

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.*