NFSA
The Voice of the Fire Sprinkler Industry

Tuesday e-Tech Alert

Editor-Russell P. Fleming P.E.

*Issue Number: 183*
*Issued: July 6, 2010*

# Best Questions of June 2010

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

**Question 1 – Antifreeze-Based Water Supplies**

Can antifreeze be used within a water supply? I recognize this is somewhat impractical for NFPA 13 or even NFPA 13R systems, but I have heard that stored water supplies containing antifreeze have been used with NFPA 13D systems.

**Answer:** All three standards contain the same definition of antifreeze systems, which is found as Section 3.3.9.1 in the current 2010 edition of NFPA 13D:

> *3.3.9.1 Antifreeze Sprinkler System. A wet pipe sprinkler system employing automatic sprinklers that are attached to a system that contains an antifreeze solution that are connected to a water supply. The antifreeze solution, followed by water, discharges immediately from sprinklers opened by a fire.*

Because this definition states that the antifreeze is followed by water, an antifreeze-treated water supply is not contemplated by the standards. While the NFPA standards have never included specific rules prohibiting the practice, the definition indicates such systems are not permitted.

**Question 2 – Filling vs. Fireblocking with Noncombustible Insulation**

Per NFPA 13 (2007 edition), Section 8.15.1.2.7, sprinklers are not required in spaces filled entirely with non-combustible insulation. Also, per Section 11.2.3.1.4.(4)(c), a space filled entirely with non-combustible insulation would also not require a 3,000 square foot design area. The IBC (2006) Section 717.2.1 states that loose-fill insulation shall not be used as a fireblocking material.

We have a situation where a combustible attic space is being entirely filled with non-combustible blown-in insulation and the AHJ is stating that since this blown-in insulation cannot be used as a fireblocking material, then it is not acceptable to be used for the exception in NFPA 13 for sprinkler protection. Please clarify that the exception in NFPA 13 is intended only to fill the space so that a combustible concealed space does not exist, and that it is not intended to be considered as a complete fireblock assembly per the IBC.

**Answer:** The concepts of "fireblocking" in the International Building Code (IBC) and insulation filling spaces in NFPA 13 are completely different. Section 717 of the IBC has nothing to do with the decision to sprinkler concealed spaces in NFPA 13.

The IBC refers to “fireblocking” in Section 717 as a relatively thin material that forms a barrier to prevent a fire in one space from sending the hot gasses to another adjacent space. The IBC makes it clear that loose fill insulation cannot be used to form this “fireblock”. But NFPA 13 is not worried about a “fireblock”. The purpose of Section 8.15.1.2.7 in NFPA 13 is to recognize that it would be a foolish waste of time to install sprinklers in a concealed space that was completely filled with insulation. In such a concealed space, there would be no room for the sprinklers, and even if the sprinklers were squeezed into the space and did open up in a fire, the insulation would block the spray pattern of the sprinklers. As far as NFPA 13 is concerned, the purpose of this type of insulation is NOT to stop the spread of hot gasses from one space to another, therefore, the insulation is not considered a “fireblock,” nor is a “fireblock” needed in order to use Section 8.15.1.2.7 of NFPA 13.

**Question 3 – Requirements for Floor Control Valves in NFPA 13R**

I have a 48,000 square foot, three story (16,000 / floor) apartment building. We have been instructed by the architect to install a sprinkler system per NFPA 13R with a dry attic system (since there will be no firestopping in the attic). Are zone control valves required for each floor?

**Answer:** You have not provided enough information for a simple “yes” or “no” answer. NFPA 13R does not require the installation of floor control valves. However, NFPA 14 does require separate floor control valves where a standpipe system serves as the water supply piping for a sprinkler system in the same building. If this building has a standpipe system, and if you are using a common riser to provide sprinkler protection, then you will need to install floor control valves in order to meet NFPA 14.

Also, there are many building codes that require floor annunciation of the fire alarm system. Since the waterflow switch on a sprinkler system serves as an initiating device for the fire alarm system, separate waterflow switches are required for each floor if the local code requires floor annunciation of the alarm system. You would need to check your local building code and fire code to determine whether or not floor annunciation is required. Technically, a flow switch can be installed without a floor control valve, but most contractors include the floor control valve once the waterflow switch is required.

**Question 4 – Obstructions to Large Drop Sprinklers**

I am working on a large drop sprinkler system and am wondering how far away from a girder I need to be. The bottom cord of the girder is a 13-inch obstruction (made up of angle iron) and is within 36 in. vertically of the sprinkler deflector. NFPA 13 (2002 edition) addresses obstructions less than 8 in. wide by using the “three times rule.” I cannot find where it addresses obstructions between 8 and 24 inches wide.

**Answer:** You only have two choices with obstructions over 8 inches wide. The first is to meet the beam rule of Table 8.11.5.1.2 and get far enough away from the girder to spray under it. The other option is to use Section 8.11.5.1.3 and put another sprinkler on the other side of the girder. If neither of these rules works, then you may not be able to use large drop sprinklers with this type of ceiling construction. Sometimes, in these situations, building owners install drop ceilings below the structural members and put the large drop sprinklers under the drop ceilings to eliminate the obstructions concerns.

**Question 5 – Calcs for Compartmented Occupancies w/o Room Design Method**

I currently have a project that I am working on (a nursing home). The specifications state that "room design" method is not permitted and that the system shall be hydraulically calculated. The specifications also state that the residential sprinklers in the resident rooms require a remote area of four sprinklers per NFPA. It seems I have two (2) separate calculations I need to do, one for the light hazard area hallways and corridors (using K-5.6 QR sprinklers) and one for the resident bedrooms (using K-4.2 residential sprinklers).

For the light hazard area the largest fire area (room) is 1385 sq. ft. Per NFPA 13 and the density/area method, I am required to address 1500 sq. ft. of floor space (A=SxL). So, in this situation I would be required to provide water to sprinklers in other adjacent rooms to achieve the 1500 sq. ft. Am I correct with that assumption?

There are no resident rooms that include more than two (2) sprinklers for coverage. There is a sprinkler in each bathroom but the rooms themselves have one (1) and sometimes two (2) sprinklers. Per NFPA 13 am I required to include water for the sprinkler in the bathroom plus one sprinkler from another room to achieve the four (4) sprinklers that are required?

**Answer:** The answer to both of your questions is to conduct the hydraulic calculations by ignoring the walls. Don't worry about compartments or rooms. For the quick response sprinklers, calculate the 1500 sq ft of floor area protected by quick response sprinklers that creates the greatest water supply demand, ignoring the walls and following the branch lines. For the residential sprinklers, calculate the four sprinklers (next to each other) that create the greatest demand, ignoring the walls and following the branch lines. Figure A.11.3.1.3 of NFPA 13 shows this calculation for a variety of different room/corridor configurations.

**Question 6 – Obstructions to Sprinklers from Lighting Fixtures and HVAC**

We were conducting a system inspection and found a number of situations in which lighting fixtures and HVAC vents appear to violate the sprinkler obstruction rules of NFPA 13. Would they be considered violations of NFPA 25? It appears the light fixtures and vents may have been added during a room rehab.

**Answer:** First, NFPA 25 does not require analysis of sprinklers and all potential obstructions. The analysis of sprinklers and potential obstructions is an issue that the owner needs to deal with on a separate basis beyond NFPA 25. When NFPA 25 asks about obstructions to a sprinkler, it really just means that the sprinkler has sufficient clearance to any storage below it, meaning at least 18 inches except for some special sprinklers that require 36 inches clearance.

Under the provisions of NFPA 25, changes in the building are required to trigger a hazard evaluation to determine if the protection is still suitable for the occupancy (Section 4-1.5 in the 2008 edition of NFPA 25). Separate from the system inspection report, you should send a letter to the owner indicating that, while not part of the normal system inspection, your personnel discovered that changes may have been made to the building that warrant such an evaluation. It would be advisable to provide a cost proposal to complete such an evaluation, or make a recommendation for a third party that would be able to perform the evaluation.

However, it should also be noted that, since the 2002 edition of NFPA 13, non-structural members are exempt from the "three-times" obstruction rule (see Section 8.6.5.2.1.4 in the 2010 edition) in light and ordinary hazard occupancies. Assuming that the sprinklers are standard coverage sprinklers and not extended coverage sprinklers, you don't have to worry about light fixtures or HVAC equipment as long as the sprinkler can legitimately spray to both sides of the obstruction.

**Question 7 – Installing PRVs Immediately Downstream of Pumps**

Is it permissible to install a pressure reducing valve immediately after a fire pump? If so, should the pump by-pass be connected before or after the pressure reducing device?

**Answer:** The answer to your question depends on what kind of system is downstream of the fire pump because the piping downstream of the fire pump is governed by the rules of the standard for that system. If the only system downstream of the fire pump is a sprinkler system, then a pressure reducing valve is allowed in the piping after the discharge control valve because a pressure reducing valve is permitted by NFPA 13.

If the piping downstream of the fire pump feeds a standpipe system, then a single pressure reducing valve is not permitted because NFPA 14 prohibits a single pressure reducing valve from feeding more than 2 outlets. NFPA 14 would permit a master pressure reducing assembly, which consists of two pressure reducing valves in series so that if one fails open, the other will take over and reduce the pressure. So, this master assembly could be installed in the piping after the discharge valve for the pump.

As to whether the pressure reducing valve is before or after the bypass depends on the pressure of the water coming from the water supply through the bypass. If the pressure of the water in the water supply through the bypass needs reduction, then the pressure reducing valve needs to be after the bypass connection. But if the pressure from the water supply through the bypass is not exceeding the rating of the system piping, then the pressure reducing valve should be before the bypass connection.

**Question 8 – Installing Wet Drops on a Dry Pipe System**

I have a job to renovate a floor in an existing building with a dry system throughout. The work is on the first floor and the piping is above the ceiling in a heated area with heated floors above. In other words there is no chance of this piping freezing. The problem is that sprinklers are above and below the ceiling and the pendant drops now look down. I believe in order to comply with NFPA13 to install wet drops on a dry system I have to come off of the top of the branch. Are there any exceptions to this rule? There is no room to rotate the line up in order to install a nipple and elbow on the top of the pipe and below the floor above. I may be able to rotate the lines out to the side and square break the drops.

**Answer:** NFPA 13 provides two alternatives you your situation:

1. Use listed dry-pendent sprinklers.
2. Use copper tube instead of steel pipe so that you don't have to worry about pipe scale settling on the pendent sprinklers.

If you can't meet either of these options, you need to install the sprinklers in return bends that come up out of the piping and then go over and down to the pendent sprinkler. See Section 7.2.2 for more information.

**Question 9 – Pneumatic vs. Hydrostatic Testing for Dry Systems**

Are both a hydrostatic test and a pneumatic test required or is just a hydrostatic test acceptable when testing a dry pipe system?

**Answer:** All systems must be hydrostatically tested at 200 psi for 2 hours. There are some exceptions listed in 24.2.1, but specific to your question, the only acceptable test is the hydrostatic test. There are occasions, especially in colder climates, when freezing temperatures will not permit the hydrostatic test at the time of installation. In these occasions, an air test is acceptable until the weather is above freezing, at which time the hydrostatic test is required to be performed.

For dry-pipe systems, the air test is required in addition to the hydrostatic test. This is why section 24.2.2.1 starts with the statement, "In addition to the standard hydrostatic test, an air pressure leakage test at 40 psi (2.8 bar) shall be conducted." The purpose of the extra air pressure test is to make sure that the dry-pipe system will not trip accidentally due to loss of air. Even when a system passes the hydrostatic test, there is the possibility that there will be unacceptable air leakage. The basic problem is that air can more easily escape from tiny openings than water.

**Question 10 – Clearance to Shelf Storage Along Sides of Sprinklered Aisles**

I have a fire official indicating that 18 inches of clearance must be maintained from the sprinkler deflectors to the top of the shelf storage, even though the sprinklers are under a solid walkway between shelves, and the bottom shelf at the platform is essentially at the same elevation as the platform. Shoe boxes are loaded in the shelves on both sides of the aisle, with sprinklers centered in the aisles and spaced at a maximum 8 ft on center.

Our contention is that the clearance is not required per Section 8.6.6 since storage is not directly below the sprinklers and the sprinklers are spaced to the center of the shelves. This storage configuration is similar to that shown in Section 8.15.9 for library stack areas and medical records storage; specifically Figure 8.15.9(b), except we are not taking advantage of the lack of vertical dividers by only placing sprinklers in alternate aisles.

**Answer:** Section A.8.6.6 clarifies that the 18 inch clearance is not required for storage against walls. This position is taken by NFPA 13 because the 18-inch clearance is only important where you are trying to spray beyond an object. In the case where the object is mounted on a wall, you are not trying to spray past it, so the 18-inch clearance is not important. Your situation is very similar. The shelves in this case are acting as walls. There is no intent to spray past the shelves and there is a sprinkler on the other side to handle a fire on the other side, so there is no need to enforce the 18-inch clearance rule.

**Question 8 – Maximum Room Size for Flammable Liquid Storage**

Is there maximum room area for inside storage of flammable and combustible liquids per NFPA 30 or other NFPA?

**Answer:** You have asked about a maximum room area. There is no such thing. However, there is a maximum quantity of flammable and combustible liquids that is allowed to be stored in a unit area in some situations. If the quantity of these controlled materials exceeds the allowable area, then the area may need to be increased (along with the protection in the area) in order to store the quantity of materials required.

But as long as the protection is correct, and as long as the density of materials is not exceeded, there is no maximum size of a room or space housing flammable or combustible liquids that I am aware of.

Question 9 – Qualifications of Pump Maintenance Personnel

This question was asked by a fire marshal:

1. Is a diesel mechanic permitted to perform preventative maintenance on the engine of a diesel driven fire pump in the presence of and working for (hired by) a licensed fire sprinkler contractor?
2. Is there anything in NFPA that would not allow for this?

**Answer:** Yes. NFPA 25 is the governing document for maintenance. Although, NFPA 25 instructs the user to follow the manufacturer's guidelines for appropriate maintenance and provides information should the manufacturer's guidelines not be available. There is also a generic statement that anyone who works on the equipment (all types) be trained and knowledgeable about the equipment. For the case of a diesel engine, a diesel mechanic should be knowledgeable as the engine itself would be similar to other diesel engines used in completely different applications. However, it is important to note that the mechanic should have enough familiarity with the fire protection equipment to ensure proper shutdown for the maintenance to occur and proper reinstatement for the system to be back online.

## Question 10 – Supporting a Seismic Separation Assembly

Can hangers be installed to support piping installed for seismic separations or will hangers prevent the desired planned flexibility of the assembly? Clearly, seismic bracing is not permitted to be attached to the assembly according to section 9.3.3.4. However, this 9.3.3.4 and 9.3.7 appear to be silent.

The seismic separation is on a high pressure fire loop located within a power plant. Our field personnel is have issues with the seismic separation assemblies sagging due to the flexible couplings as shown in NFPA 13. We would like any suggestions on how to properly install the seismic separations to eliminate or reduce this issue in the field

**Answer:** There is no one specific method recommended by NFPA 13 on supporting a seismic separation assembly. The performance goal of the arrangement would be to help resist the gravitational forces on the assembly while still allowing motion should the assembly need to move due to an earthquake. One of the simplest ways to accomplish this would be to use a wire connection to help resist the weight of the assembly. This is also the type of support typically used with the U-shape specially listed devices for their support.

## Question 11 – Lintel Separating Sink and Toilet Rooms

We have a situation in which we have a sink room, and a tub and toilet room adjacent to each other. The entry way does not contain a door, but does have a header at the opening. Each room individually is under 55 SQFT.

The obvious question is can we consider these two separate rooms?

**Answer:** It is possible to have two adjacent rooms, each meeting the definition of a bathroom, and each under 55 sq ft (thereby eliminating the requirement for sprinklers if they are in a dwelling unit). The issue comes down to the question of whether or not each individual room meets the definition of a "compartment" (which is why the definition of a bathroom starts out by saying that it is a compartment).

Compartments are allowed to have openings to other compartments without doors as long as they meet one of the two criteria below:

1. An opening up to 8 ft wide is allowed if there is a lintel at least 8 inches deep over the opening.
2. An opening up to 36 inches wide is allowed without any lintel.

If the opening between your compartments meets either of the two criteria above, you can consider them as separate compartments and leave sprinklers out of both spaces.

In the 2007 edition of NFPA 13, the definitions of "bathroom" and "compartment" are in sections 3.3.2 and 3.3.5. In the 2010 edition, the definitions are essentially the same and are in sections 3.3.2 and 3.3.6. In previous editions of the standard, the definitions are similar, but the 36 inch opening between the compartments with no lintel was not recognized.

## Question 12 – Loads on Post-Installed Anchors in Concrete

When investigating the allowable loads for a listed post-installed anchor, is it a requirement that these loads comply with the notion of carrying five times the weight of the water-filled pipe plus 250 lbs? Or, since the anchor is listed,

can it be used at a spacing where the anchor will support a load not exceeding its listed load capacity, and does not exceed the allowable spacing? As an example, a post-installed anchor has a listed capacity of 640 lbs. If that load must comply with the "five times plus 250 lb" rule, then a piece of 4-inch schedule 40 pipe must have anchors spaced approximately 4.3 ft apart as opposed to the allowable spacing of 10 ft for vertically installed anchors.

**Answer:** Hanger products that have been listed per UL 203, *Pipe Hanger Equipment for Fire Protection Service*, incorporate the loads needed for fire sprinkler systems. In other words, for the hanger components listed per UL 203, the manufacturer's load value should be used, since the safety factors have already been incorporated. FM Global also has a comparable standard that approves hanger components. The "five times the weight" noted in Section 9.1.1.2 is a performance requirement with appropriate safety factors intended to apply when hangers or arrangements are used that are not listed per UL 203.

## NFSA "Technical Tuesday" Seminar – July 20th

**Topic: Calculating Sprinklers Under Obstructions**
**Instructor: Cecil Bilbo, Jr., CET**
**Date: July 20, 2010**

Design technicians frequently ask about the hydraulic calculation procedures for calculating sprinkler systems where additional sprinklers are added under obstructions. The 2010 Edition of NFPA 13 has clarified the rules for when to include sprinklers below obstructions in the sprinkler system demand. The proper hydraulic calculation procedures will vary based on the kind of sprinkler being used at the ceiling, such as spray sprinklers, control mode specific application sprinklers, and ESFR sprinklers. This seminar will discuss the different procedures that need to be followed for each type of ceiling sprinkler when additional sprinklers are added under obstructions.

## New "Best Practices Thursday" to Debut Later This Month

In conjunction with Fire Sprinkler Industry – Best Practices, the NFSA is pleased to announce that its "Business Thursday" online seminar series will become "Best Practices Thursday" starting in just over two more weeks. The following dates and topics have been selected:

July 22 – Managing Job Costs
August 19 – Information Technology Update
September 16 – Budgeting for Success
October 21 – The Insurance Market
November 18 – Effective Sales Proposals
December 16 – Contracting 101

The faculty will be from the Best Practices program. Each seminar will carry a registration fee of $125 but will be free to companies participating in the Best Practices program. Look for additional information on the NFSA website at www.nfsa.org or on the Best Practices website www.fsi-bp.org .

Additional training opportunities through the NFSA Engineering Department include the following…

## 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**

## Layout Technician Training Course (2-week course)

**Champaign, IL – August 2-13, 2010**

Academy of Fire Sprinkler Technology, Inc.
1617 Interstate Dr., Champaign, IL 61822

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 seminars scheduled for 2010:

| | | |
|---|---|---|
| July 7 | West Des Moines, IA | Pumps for Fire Protection |
| July 7 | Denver, CO | Sprinkler Protection for Rack Storage |
| July 7 | Denver, CO | Sprinkler Protection for Special Storage |
| July 8 | West Des Moines, IA | Sprinklers for Dwellings |
| July 20 | Bettendorf, IA | Residential Homes to High-Rise |
| July 21 | Bettendorf, IA | Sprinklers for Dwellings |
| July 22 | Bettendorf, IA | Hydraulics for Fire Protection |
| Aug 24 | Menasha, WI | NFPA 13 Update 2007 |
| Aug 25 | Menasha, WI | Sprinkler Protection for General Storage |
| Aug 26 | Menasha, WI | Foam Water Systems (1/2 day) |
| Aug 26 | Menasha, WI | Commissioning & Acceptance Testing (1/2 day) |
| Aug 31 | Rochester Hills, MI | NFPA 13 Update 2007 |
| Sept 1 | Rochester Hills, MI | Plan Review Policies & Procedures |
| Sept 2 | Rochester Hills, MI | Commissioning & Acceptance Testing (1/2 day) |
| Sept 2 | Rochester Hills, MI | Introduction to Sprinklers (1/2 day) |
| 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.*