e-TechNotes

Editor-Kenneth E. Isman, P.E. *Issue No. 234* *Issued: March 13, 2012*

Best Questions of February 2012

We have selected the following questions as the "Best of February 2012" answered by the engineering staff as part of the NFSA's EOD member assistance program:

Question 1 – ESFR Sprinklers for 45 ft High Ceilings and Exposed Plastic Storage

We have an existing building with a ceiling 42 ft high that has a sprinkler system that is using a specific brand of ESFR sprinklers. The new tenant will have 16' high solid piled storage of exposed unexpanded plastic. The cut sheet for this particular manufacturer's sprinkler appears to allow protection for 45' high buildings with up to 40' of storage, but Table 15.4.1 of NFPA 13 only allows protection for a 40 ft high building for solid piled storage of exposed unexpanded plastics. Is there another area of NFPA 13 that addresses this situation, or do they need to drop a new ceiling in at 40 ft and lower the sprinkler system below that new ceiling, to comply with Table 15.4.1?

Answer: No, NFPA 13 does not have protection criteria for this situation elsewhere in the standard. Storage of plastics in a solid piled arrangement needs to be protected in accordance with Table 15.4.1. While the specific sprinkler that you mentioned can protect other commodities under ceilings up to 45 ft high (or potentially higher given a special listing), it cannot protect exposed plastics in a solid pile arrangement. As you mentioned, one solution would be to lower the ceiling height by using a drop ceiling. Then Table 15.4.1 of NFPA 13 could be used with the lower ceiling height.

Question 2 – Flexible Sprinkler Hose and Armover Rules

Where flexible sprinkler hose is being used as part of a sprinkler system, do the requirements for armovers (Section 9.2.3.5.2 in NFPA 13, 2010 Edition) apply to the flexible sprinkler hose.

Answer: The answer to your question is "no." Flexible sprinkler hose is a listed product that needs to be installed in accordance with the manufacturer's installation instructions. There is limited guidance in NFPA 13 on installing flexible sprinkler hose. The standard only notes that when it is more than 6 feet in length it needs to have a hanger installed on it (Section 9.2.1.3.3.3). Therefore, if the hose is 6 feet or less in length and the bracket/attachment and flexible sprinkler hose has been listed to handle the system pressure (even if it is over 100 psi) an additional hanger on the flexible hose would not be required.

Question 3: Pressure for Hydrostatic Test

NFPA 13 requires for a hydrostatic test that, "Portions of systems normally subjected to working pressures in excess of 150 psi shall be tested ..... at a pressure of 50 psi in excess of system working

pressure." What does the term “working pressure” refer to? Is it the system static pressure, the pump churn (if applicable), or some residual pressures?

Answer: The purpose of the hydrostatic pressure requirements is to make sure that the system is tested at 50 psi in excess of the maximum pressure that the system will ever be subjected to. For most systems, the fire department will pump in at 150 psi when connected to the fire department connection, so the test needs to be run at 200 psi. For systems that will experience a pressure greater than 150 psi due to the water supply situation, a test pressure higher than 200 psi will need to be calculated.

Since the concern is the maximum pressure, you can ignore any residual pressure situations when trying to find the “working pressure”. Residual pressure is always less than static pressure (water losses energy when it moves). The working pressure will be the maximum static pressure, and you need to analyze a system to determine what the maximum static pressure will be. In a system with a fire pump, the maximum static pressure in the sprinkler system (on the discharge side of the pump) will be the churn pressure of the fire pump plus the maximum static pressure from the water supply on the suction side of the pump. On a system connected only to a public water main, the working pressure will be the maximum static pressure from that main. On a system only connected to an elevated water tank, the working pressure will be calculated by multiplying the height of the water in the tank over the lowest point in the sprinkler system by 0.433. In a system only connected to a pressure tank, the working pressure will be the maximum pressure at which the pressure tank is held.

Question 4: Standpipe Outlets on Landings in Stairwells

Are Class I standpipe outlets in exit stairwells required to be installed on main floor landings or at intermediate landings?

Answer: The answer to this question has changed over the years. Prior to 1993, the requirement in NFPA 14 was to put the outlets at the main floor landing. In the 1993 edition, the outlets were moved to the intermediate landings (unless there were no intermediate landings) for two reasons. First, the building codes were changing to require areas of safe refuge at the main floor landings that there was a concern about congestion at the landing. Second, firefighters find that it is easier to get the hose through the door when starting at the intermediate landing rather than having to make sharp turns with heavy and inflexible hose right at the main landing.

For the 2010 edition of NFPA 14, the rules changed again back to the main floor landing unless the authority having jurisdiction (AHJ) mandates the installation at the intermediate landing. The reason that the committee agreed to move the outlet back to the main floor landing is that the problems with congestion that were feared in the 1990’s never materialized and sprinkler contractors were finding it extremely difficult to tap into a standpipe riser for the sprinkler system on each floor when the riser was at the intermediate landing. So now, the contractor has to check with the AHJ whenever planning a standpipe system to determine whether they require the installation of the outlets at the intermediate landing or not. If they do not, then the outlets need to be installed at the main floor landing.

Question 5: Intermediate Temperature Sprinklers

Can intermediate temperature sprinklers be used throughout light, ordinary or extra hazard occupancies?

Answer: NFPA 13 allows ordinary or intermediate temperature sprinklers to be used throughout all occupancies, unless a higher temperature sprinkler is required due to a heat source (see Section 8.3.2.1 in the 2010 edition, similar sections in previous editions).

Question 6: Bathtub as Part of the Area of a Bathroom

Is a bathtub considered part of the floor space of a bathroom?

Answer: Yes, unless the bathtub is separated from the rest of the bathroom in such a way as to be considered a separate compartment using the definition of a "compartment" in whichever standard (NFPA 13, NFPA 13D, or NFPA 13R) is applicable.

Question 7: Branchline Restraint

Is vertical restraint required on a branchline where the hanger rods are less than six inches long?

Answer: Yes, vertical restraint would be required. NFPA 13 only allows the omission of lateral restraint and end of branchline restraint as specified in Sections 9.3.6.1 through 9.3.6.5 (2010 edition section numbers referenced, similar sections in earlier editions).

Question 8: Bushings

Are bushings allowed to be used in an NFPA 13 system.

Answer: Prior to the 2002 edition, NFPA 13 discouraged the use of bushings. The concern was that bushings would be used to try and balance sprinkler systems by cutting down flow from sprinklers close to the water supply. But industry practice was to use bushings in certain situations where NFPA 13 was silent. For the 2002 edition (and each edition since) Section 6.4.6 was added to provide the situations where bushings can be used. They are allowed to be used in places where there is a change in pipe size and a standard fitting of the required size is not available. They are also allowed to be in accordance with Section 8.15.19.2 to attach sprinklers to a pipe with a different orifice size.

Question 9: Sprinklers in Bathrooms, NFPA 13

The 2010 NFPA 13 sprinkler handbook commentary following section 8.15.8.1 Bathrooms on page 350 states; "Over the years the storage of combustibles in bathrooms has become commonplace. Sprinklers are now required in all dwelling unit bathrooms, except those in hotels and motels, which maintain a minimal combustible loading due to the transient nature of the occupancy." This seems to conflict with NFPA 13-8.15.8.1.1 which allows bathrooms 55 sq ft or less in dwelling units to be without sprinklers, unless exceptions are met. Which is correct?

Answer: You are correct that the handbook commentary for this section of NFPA 13 contradicts the actual language in the standard. Unfortunately, this kind of conflict happens from time to time because the NFPA pushes handbook commentary authors to write their commentary before the language of the standard is finalized. The actual standard is correct, sprinklers are permitted to be omitted from bathrooms in all dwelling units meeting the criteria in 8.15.8.1.1.

In this particular case, the committee (early in the process) agreed to change the standard and require sprinklers in all bathrooms. The person writing the commentary responded to that and wrote an explanation as to why the change occurred. But late in the process, a motion was made to go back to the old rule of leaving sprinklers out of small bathrooms. That motion passed and the commentary was never updated.

This is one of the reasons that the user is warned at the beginning of the handbook that the commentary is just informative and that the actual rules of the standard (in a different color text) are the legally enforceable part of the book.

For the most part, handbook commentary authors do a great job in keeping up with the changes through the 100 week revision schedule of a document and revising the commentary as they need to as the document evolves. But every once in a while something slips through the cracks, like this example that you have found. We have notified the NFPA of this conflict and we hope that whoever is writing the commentary for Chapter 8 for the next edition will fix the conflict.

Question 10: Elbows for Vertical In-Line Pumps

NFPA 20 prohibits an elbow in the horizontal plane parallel to a horizontal split case pump's shaft within 10 times the pipe's diameter from the pump's suction flange. Does this rule apply to vertical in-line fire pumps?

Answer: The limit on elbows only applies to horizontal split case pumps. A vertical in-line pump is not a horizontal pump. In order to be a horizontal pump, the shaft has to be in the horizontal plane. There is no horizontal aspect to the shaft of a vertical in-line pump.

Question 11: Pipe Schedule Systems and Compartments

If a pipe schedule system is designed for a building with partitions separating the areas on a single floor, can the number of sprinklers on the pipe be increased because they are serving different areas? If the room walls were fire rated and created separate fire areas, would this be similar to floor separations so that only the sprinklers in an individual room would count for determining the specific pipe size?

In looking at where NFPA allows an increase in the number of sprinklers for a specific size pipe in above and below a ceiling applications with no fire rating and their justification that a fire either above or below the ceiling would be contained in the area by the operating sprinklers, it would appear similar that if spaces are divided by walls (fire rated or not) that the rooms would be considered on their own.

Answer: The answer to your question is "no." NFPA 13 does not provide any credit for walls. While we understand the argument that you are making, the intent of the standard was to have a single set of simple rules that everyone could follow without having to worry about openings in walls, ratings of walls, tenants moving walls, etc.

Given how easy it is to hydraulically calculate a system these days, it would be better to just calculate the system if there is any question about the pipe size and needing to prove that a certain size pipe will work in a given configuration. If it does not work when it is calculated, making it a pipe schedule system does not improve the situation.

Question 12: Space Above Rubber Tire Storage

We have a client that wants to store rubber tires to 20 ft in a 40 ft warehouse using NFPA 13 Table 18.4(b) with high temperature sprinklers. They then want to store lesser commodities on top because the rack is higher than 20 ft. It looks like it is possible to store up to a class III commodity up to 25 ft without in-rack sprinklers with a 0.65 gpm/sq ft density.

The question is, are they allowed to use the storage space above the rubber tire storage? If so, and they want to store up to 35 ft, will in-rack sprinklers be required in the rubber tire storage or begin where the commodity begins?

Answer: No, you can't use the space above the tires to store other items, even if the other items are allowed to be stacked that high. There are two problems with using the space above rubber tires to store lesser commodities:

1. The sprinkler discharge criteria for lesser commodities (let's say Class III just for the sake of discussion) are based on the burning characteristics and the heat release when that commodity (Class III) is burning underneath. The discharge from the sprinkler needs to be sufficient to absorb the heat being released by the fire. The density/area curves are designed to provide that level of fire protection, but not more. The problem is that with a greater commodity (like tires) below the Class III heating up the Class III commodity on top, the Class III commodity is going to pyrolize faster and burn with a hotter heat release than if the fire underneath it was Class III. The sprinkler system discharge may not be capable of dealing with this hotter burning Class III commodity.

2. Enforcing the ban on tires above a certain height when there is storage of something else above that height would be a nightmare. Everyone understands the words, "don't store above this level." You can build the racks so that nothing can be stored above a certain level. It is much harder to explain to a person that does not have a fire protection background why some objects can go up to certain points while others can't. If I were an AHJ, I would worry about the to really enforce such a provision, even if it would work from a fire protection perspective.

Question 13: Missing Cover Plates

When conducting an NFPA 25 inspection, are missing cover plates and escutcheons required to be reported?

Answer: It is possible that missing cover plates need to be replaced. NFPA 25 calls for the annual inspection of all sprinklers and if any part of the sprinkler is missing, the sprinkler needs to be replaced. Sections 6.2.7.2 and 6.2.7.3 of NFPA 13 specifically say that the cover plates and escutcheons are a part of the listed sprinkler assembly. Therefore, in order for the sprinkler to be properly inspected and for it to pass the inspection, the cover plates would need to be present.

Delving deeper into the subject, there is one condition under which it would be okay to leave a cover plate off of a sprinkler. In order to do that, you have to know when it is important to have the cover plate. There are two situations under which cover plates are absolutely mandatory (for the purposes of this discussion, we are including escutcheons along with cover plates and treating them as similar objects for recessed flush and concealed sprinklers):

1. All models of sprinklers need to go through some sort of response test where the listing laboratory makes sure that the sprinkler is capable of sensing the heat from a fire in a reasonable

time. Some recessed flush and concealed sprinklers cannot be tested in the typical test apparatus used to conduct this sensitivity test (called a plunge oven), so they have to be tested in a life-sized room with a real fire in the room. These sprinklers are installed with their escutcheon or cover plate in place, and in many cases, these escutcheons and cover plates help direct the hot gasses from the fire to the activating link and help the sprinkler respond in a reasonable time. Without the escutcheon or cover plate, the sprinkler would not pass the test and would not respond in time to a real fire.

2. In some situations, building codes require the floor/ceiling assembly in which a pendent sprinkler is installed, or the wall on which a sidewall sprinkler is installed, to have a specific fire resistance rating. The fire resistance rating of the ceiling material is determined without the sprinkler in place. When the contractor drills a hole in the wall or ceiling to put the sprinkler through, they create a penetration of a fire rated assembly. Such penetrations are generally considered "membrane penetrations" since they only go through one layer of the wall or ceiling and do not completely penetrate from one side of the assembly to the other. Most building codes allow a membrane penetration to be covered by a metal cover plate or escutcheon without any additional sealant to protect the rating of the assembly. See Exception 5 to section 713.3.2 of the International Building Code for an example of a code allowing a metal cover plate to satisfy a membrane penetration in a rated assembly when the penetrating item is a sprinkler.

So, if you research the situation and find that the sprinkler is one that does not need the cover plate to pass the sprinkler response test at the laboratory in order for the sprinkler to be listed, and if you research the building code and make sure that the ceiling or wall that the sprinkler is penetrating is not required to have a fire resistance rating, then you would be allowed to have a sprinkler remain without a cover plate or escutcheon. In most cases, a building owner does not want to pay for this research and it is cheaper to just replace the cover plate or escutcheon.

Question 14: Concealed Spaces and Fire Retardant Coatings

In a combustible concealed space normally required to be sprinklered, can the use of an applied fire retardant coating eliminate the need for sprinklers in the concealed space?

Answer: NFPA 13 does not provide the same recognition of coated products as it does treated products (see section 8.15.1.2.11, which only addresses treated wood and its annex note that discusses coated products) for at least the following three concerns about coated materials:

1. All coatings don't penetrate into the wood. A nick or scratch on the product could expose the wood underneath. Not only would this cause concerns during construction, but after installation, the potential still exists for the coating to be abraded.

2. If coatings are applied after the wood installed in the attic, it is difficult to get the coating on all of the surfaces due to the limited space in an attic, yet a fire has no problem burning into tight spaces.

3. Long-term viability. We need to make sure that the coating survives over time in a variety of environments.

Sprinklers are not required where all of the exposed combustible construction of a space is fire retardant treated wood because over time, we have learned that these three issues are not a concern with treated products. The treatment penetrates the entire wood product, which means that we don't have to worry

about nicks and scrapes. The treatment occurs before the wood is installed, so we don't have to worry about the tight spaces in the attic. And we have knowledge of how the product reacts in a variety of environments over long-term periods of time.

The sprinkler committee in developing the 2010 edition of the standard was asked to address fire retardant coatings on a generic basis. This means that they could not take the performance of any specific product into account when rendering their decision. If they had said "yes" to the use of coated products, they would have been allowing all coated products to be used to replace sprinklers in combustible concealed spaces, regardless of how poorly they handled the three concerns above. That was not a position they were ready to take, and it is doubtful that the subject would ever be addressed in a generic manner since all coating products are not alike. If a coating product can show equivalency to a treated product while taking into account the three issues discussed above, it can be used under NFPA 13 and the equivalency clause. It is also possible that a standard could be created, or that changes to NFPA 703 could be developed, so that NFPA 13 could reference a specific coating product that meets certain tests. Until such time as this type of step is taken, we have done the best we can to address the situation.

Question 15: Main Drain Valve Listing

Are main drain valves required to be supervised? Must the valve be locked or chained shut?

Answer: Main drain valves are not required to be supervised. In fact, the main drain valve is not required to be listed (see 6.1.1.5). Therefore, you could use any kind of valve you want for a main drain and for many of these valves, there is no way to even get any kind of supervision device attached to the valve.

Upcoming NFSA "Technical Tuesday" Seminar – March 20th

Topic: NFPA 20 and NFPA 14 for High-Rise Buildings
Instructors: James D. Lake
Date: Tuesday, March 20, 2012- 10:30 am EST

NFPA 20 and NFPA 14 each have different requirements for how to provide water supplies for standpipe systems in high-rise buildings. This seminar will show how the requirements of each of these standards can be put together to form a comprehensive standpipe system that meets both NFPA 20 and NFPA 14.

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

Layout Technician Training Course (2-week course)

Fishkill, NY – October 8-19, 2012

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

Upcoming In-Class Training Seminars

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

Apr 3-4	Hillsboro, OR	NFPA 13 Overview
Apr 5	Hillsboro, OR	Sprinkler Protection for General Storage
Apr 10 *(SPECIAL RATE!!)*	Hayward, CA	Inspection, Testing & Maintenance for the AHJ
Apr 10-12 Industry	Libertyville, IL	3-Day Inspection & Testing for the Sprinkler
April 10-11	Willoughby, OH	Two-Day NFPA 13 Overview
April 12	Willoughby, OH	Inspection, Testing & Maintenance
Apr 12 *(SPECIAL RATE!!)*	Roseville, CA	Inspection, Testing & Maintenance for the AHJ
Apr 17	Denver, CO	Inspection, Testing & Maintenance for the AHJ
Apr 18	Denver, CO	Pumps for Fire Protection
Apr 19 Piping	Denver, CO	Commissioning & Acceptance Testing/Underground

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

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

About the National Fire Sprinkler Association
Established in 1905, the National Fire Sprinkler Association (NFSA) is the voice of the fire sprinkler industry. NFSA leads the drive to get life-saving and property protecting fire sprinklers into all buildings; provides support and resources for its members – fire sprinkler contractors, manufacturers and suppliers; and educates authorities having jurisdiction on fire protection issues. Headquartered in Patterson, N.Y., NFSA has regional operations offices throughout the country. www.nfsa.org.