NFSA The Voice of the Fire Sprinkler Industry

TechNotes

Editor-Kenneth E. Isman, P.E. **Issue# 270** **July 2, 2013**

Best of June 2013

This month, we have selected the following dozen questions as the "Best of June 2013" answered by the engineering staff as part of the NFSA's EOD member assistance program.

It should be noted that the following are the opinions of the NFSA Engineering Department staff, generated as members of the relevant NFPA technical committees and through our general experience in writing and interpreting codes and standards. These have not been processed as a formal interpretation in accordance with the NFPA Regulations Governing Committee Projects and should therefore not be considered, nor relied upon, as the official position of the NFPA or its Committees.

Question 1 – Acceptance Test for Dry Pilot Line

Are dry pilot lines required to be hydrostatically tested? If not, what acceptance test criteria should be performed?

Answer: Dry pilot lines are not required to be hydrostatically tested. Dry pilot lines are part of a detection system, not sprinkler piping. Hydrostatic testing in accordance with section 25.2.1.1 of NFPA 13 (this is the section number for the 2013 edition, similar sections are in previous editions) is for the sprinkler system piping and attached appurtenances which are subjected to system working pressure. The pilot line is not subjected to working pressure since the pilot lines are typically "protected" from high pressures from the dry pilot actuator. When the system is tripped, water flows up to the dry pilot actuator and is drained through the bottom of this device. The dry pilot system is spared from whatever pressure is in the sprinkler system by the devices' (actuator) drain.

NFPA 13 doesn't specifically point out acceptance criteria for the dry pilot lines since they are technically under the umbrella of NFPA 72 as a part of the detection system. NFPA 72 requires that these detection lines be tested according to the manufacturer's instructions. In lieu of specific manufacturer requirements, you could perform an air test requirement as described in NFPA 13, Section 25.2.2.1 for 40 psi at 24 hours, which is similar to NFPA 25 Section 13.4.3.2.6. This would insure the integrity of the piping for the dry pilot line, which is the critical issue with making sure that the line will operate properly.

Question 2 – Protecting Electrostatic Spray Application Equipment

Section 22.4.1.6 of NFPA 13 requires additional protection (an open head deluge system designed for a minimum density of 0.6 gpm per sq ft) for electrostatic spray application equipment that is not listed. Isn't all equipment supposed to be listed?

Answer: Not according to NFPA 33. This section in NFPA 13 is extracted from NFPA 33, Standard for Spray Application Using Flammable or Combustible Materials. NFPA 33 does not require automated liquid electrostatic spray application equipment to be listed. However, there is a

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penalty to the owner for choosing to use unlisted equipment in that extra fire protection is required. Sprinkler contractors that are protecting spray equipment should make sure that they know whether the automated liquid electrostatic spray equipment is listed or not so that they do not get caught needing this extra deluge system designed to discharge a significant amount of water.

Question 3 – Fire Pumps and Hose Stream Demands

We have a fire pump that is taking suction from a public main (that includes fire hydrants) and is only supplying fire sprinkler systems. There are no hydrants or inside hose stations being fed by the fire pump. Do we add the hose stream demand flow at the discharge of the pump, or at some other location?

Answer: Since you have no inside hose demand, the total inside and outside hose demand is equal to the outside hose demand. Section 11.1.6.2 of NFPA 13 says that the outside hose demand is added to the sprinkler demand at the connection to the city main since there are no private hydrants in your situation.

You are certainly allowed to add the outside hose demand at the discharge of the pump, but this would be a more conservative way of looking at the situation. It would assume that the flow for the hose stream demand is coming from the water supply through the pump, which over-predicts the friction loss (and forces you to oversize the pump). There is nothing wrong with over-predicting the friction loss because it will build in an extra safety margin to the calculations. But in a system where there isn't much difference between the demand pressure and the available supply, you may need that extra pressure.

If you to run the calculation back to the water main through the pump and then add the hose demand there instead, you will save the extra friction loss of the hose stream demand through the suction piping. This takes a bit more to calculate, but it is sometimes worth it to show that a system will work with a marginal supply and is completely legitimate since the hose stream demand is not actually going to go through the pump.

Question 4 – Ferrous Hangers

Why are pipe hangers required to be ferrous?

Answer: The general requirement for hangers to be constructed of ferrous material (sections 9.1.1.2(4) and 9.1.1.6.1) is based on the environment that sprinkler systems have to endure. Not only are the hangers required to support the system during every day situations, which could include a certain amount of corrosion resistance, but they also need to endure fire scenarios. This means that the strength and durability of the hanger material needs to work at elevated temperatures. Most non-ferrous materials can't perform well under such rigorous demands.

Should someone want to use a nonferrous material, NFPA 13 permits that in Section 9.1.1.6.2 (2013 Edition, previous editions contain similar language), which indicates it would have to be subjected to fire tests adequate for the hazard in which the product will be installed and be listed. If the product was proven by fire tests and then certified by a registered professional engineer with the other items in Section 9.1.1.2, it should be acceptable to the intent of NFPA 13. Due to the cost of fire testing, it is usually more economical to use products that are ferrous or products that are listed for the service.

Question 5 – Multiple-Row Rack Storage Depth

Is there a maximum allowable depth to a multiple-row rack?

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Answer: No. Multiple-row racks are defined as those greater than 12 feet in depth. There is no cap on the width. In some situations, NFPA 13 requires greater protection for multiple row racks greater than 16 ft in depth (see Table 16.2.1.3.3.2). Other multiple-row rack arrangements require in-rack sprinkler protection and depending on the width of the rack(s) the pattern of in-rack sprinklers will be repeated until the entire depth of the rack is protected, making the depth a variable that is not significant enough to worry about.

Question 6 – Separate Risers for Sprinklers in Trash Chutes

Are sprinklers in a trash chute required to have a separate riser?

Answer: No. However, section 11.2.3.4.1 contains specific discharge criteria when the sprinklers in the chute have their own riser. If you install the sprinklers in the trash chute from the sprinklers on adjacent floors, then the hydraulic calculations get more complicated because you can't use section 11.2.3.4.1. Most people use the separate riser so they know how to do the calculations.

Question 7 – Counting on Refill When Sizing Tanks

Are we allowed to count on the refill rate of water from a water supply filling our tank during a fire to meet our duration demand? We note that this is what a break tank does, but we note that rules for break tanks have only recently been introduced into NFPA 20 and NFPA 22. Does this mean that break tanks were not allowed before these rules went into these standards?

Answer: All editions of all NFPA documents permit the refills rates from water supplies to meet part of the duration demand. This is the very definition of using break tanks.

Water-based codes and standard just have a requirement for water flow to last for a certain period of time (duration). These documents do not specifically say how to make that happen. Any combination of water supply tanks, pumps, mains, reservoirs, penstocks, flumes, rivers, lakes, or ponds are permitted to be used as long as the water supply duration requirements are met.

In the 2007 edition of NFPA 20, the committee realized that there was no control on the refill mechanisms being used for break tanks or the minimum sizing of break tanks. So, the committee wrote some rules on this subject that appeared in Chapter 5. Since then, the rules have been copied into NFPA 22, since this is actually a better place in the NFPA system for break tank rules. Prior to the 2007 edition of NFPA 20, you could use break tanks in conjunction with a fire pump, but there were no rules for minimum sizes or how to arrange the refill mechanism.

Question 8 – Sprinkler Location in Small Bathroom With Obstructions

We have a 42 sq ft bathroom (357 cubic feet) in a hospital patient room. Our plan is to put one sprinkler in the room, however, an obstruction tight to the ceiling does not allow the sprinkler to meet section 8.6.5.1.2 and spray under the obstruction. There is no location in the room where a sprinkler can be located to meet the obstruction rule. Do we need to put multiple sprinklers in this tiny compartment?

Answer: No. To address this situation, you first have to start with the realization that NFPA 13 does not require that water be delivered directly to every square foot of floor area. There are many sections in NFPA 13 that allow dry spaces behind a variety of obstructions.

Small compartments are always a challenge. It was never the intent of the

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committee to require lots of sprinklers in small compartments just because of the obstructions at the ceiling. In older editions of the standard, the committee hoped that people would just be reasonable and that it should not need to specifically spell out exactly how to handle these situations. The fact is, in a small compartment, a sprinkler will open if there is a fire anywhere in the compartment and the sprinkler will prevent the fire from getting beyond the compartment. From a water distribution standpoint, if the sprinkler is a standard orifice (k-5.6) sprinkler, at its minimum pressure of 7 psi, it would deliver 14.8 gpm. In a room that is 42 sq ft in area, that's a density of 0.35 gpm per sq ft, which is 3.5 times the amount of water that would be required for light hazard space like a bathroom. This significant amount of over-discharge helps to better control a fire in such a small space. Even if water can't get directly under the obstruction, there is so much water in the space, bouncing off of the walls and getting entrained into the air going to the fire, it is hard to imagine a fire failing to be controlled.

New to the 2013 edition of NFPA 13 is a section that directly addresses this concept. This new section (8.5.5.4) specifically allows sprinklers to be installed in any small compartment under 400 cubic feet by completely ignoring the potential obstructions. While the heading of section 8.5.5.4 is "Closets", the language of the section expands the application of the section to all compartments, including bathrooms. While this section is new to the 2013 edition of the standard, it should be considered as an interpretation of the committee's intent from previous editions.

Question 9 – Clearance Around FDC

Is a fire department connection (FDC) required to be a minimum distance from gas lines/meters or electrical transformers?

Answer: There is no specific requirement in NFPA 13 to keep the FDC away from other equipment, but there are requirements in other places that need to be considered. Some fire codes have minimum clearance requirements around FDC's. For example, the International Fire Code (IFC) requires 36 inches clear to the sides and front of an FDC mounted on a wall and 36 inches all the way around a free-standing FDC (see section 912.3.2).

In addition, the National Electrical Code (NFPA 70) requires clearance around certain electrical equipment. For example, a high voltage (over 600 volt) transformer on the outside of the building would be required to have a fence surrounding it. Table 110.31 of NFPA 70 shows minimum clearance requirements from the transformer to the fence parts depending on the voltage of the transformer. The FDC would not be allowed to be within these clearances so that the FDC could be installed outside of the fenced enclosure around the transformer.

Question 10 – Bathroom Sprinklers and Corrosion Resistance

We have had an engineer (representing an owner) state that a blanket reference to NFPA 13 in specifications would require us to install corrosion resistant sprinklers in bathrooms. Are sprinklers in bathrooms required to be corrosion resistant?

Answer: No. Section 6.2.6.1.1 specifically says, "Listed corrosion-resistant sprinklers shall be installed in locations where chemicals, moisture, or other corrosive vapors sufficient to cause corrosion of such devices exist." A bathroom does not have chemicals or corrosive vapors. It also does not have moisture sufficient to cause corrosion. Bathrooms are not a space where corrosion resistant sprinklers are required by NFPA 13.

The ordinary business practices of the fire sprinkler industry establish the fact that moisture in a bathroom is insufficient to cause corrosion on typical sprinklers. Since NFPA 13 specifically requires the space to have moisture

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"sufficient to cause corrosion" in order to require corrosion resistant sprinklers, such sprinklers are therefore not required by NFPA 13 in bathrooms.

If the engineer of record (representing the concerns of the building owner) wants corrosion resistant sprinklers in bathrooms, they are welcome to specify them in the document specifications. Lacking any specific requirement in the specifications, a sprinkler contractor is not required to install corrosion resistant sprinklers in bathrooms as far as NFPA 13 is concerned.

Question 11 – Quick Response Area Reduction in Concealed Space

We are installing quick response spray sprinklers in an attic (concealed space) following the rules of light hazard occupancies in accordance with 8.15.1.3. The concealed space is made up of combustible roof trusses with a slope of 4 in 12. The system will be a wet pipe system (we are not in an area subject to freezing). Can we take the reduction in design area for quick response sprinklers per section 11.2.3.2.3.1?

Answer: Yes, as long as the distance from the bottom of the space to the peak does not exceed 20 ft and as long as there are no unsprinklered pockets (like dormers) within the concealed space. The reduction would be based on the height from the bottom of the space to the peak. The reduction would be compounded with the 30% increase for ceiling height required by section 11.2.3.2.4.

For example, if the height of the concealed space at the peak was 7 ft, the minimum design area would be 1170 sq ft after starting with 1500 sq ft and taking a 40% reduction for quick response sprinklers and a 30% increase for the sloped ceiling.

Question 12 – Number of Jockey Pumps

Can a single jockey pump be used to maintain the pressure in a system with multiple fire pumps feeding the fire protection system(s)?

Answer: Yes. NFPA 20 does not require a jockey pump in any installation. Section 4.25.6 requires a method for maintaining pressure in the system that is not the fire pump. This is a performance-based requirement. Most people use a jockey pump to meet this requirement (although you are not required to). As long as the jockey pump performs the job (maintaining system pressure under normal conditions and preventing all of the fire pumps from running unless there is a fire), it can be used as the mechanism for meeting the performance-based requirement.

There is no reason to require multiple jockey pumps as long as the single jockey pump is capable of keeping up with any leakage or changes in pressure on the system(s) being fed by the multiple fire pumps.