NFSA The Voice of the Fire Sprinkler Industry

e-TechNotes

Editor-Kenneth E. Isman, P.E. *Issue No. 253*
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Best of October 2012

This month, we have selected the following dozen questions as the "Best of October 2012" 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 – When Standpipes at Horizontal Exits are the most Remote

We are putting a Class I standpipe system into a building. We recognize that NFPA 14 requires hydraulic calculation of the most remote two outlets on the most remote standpipe in order to account for fire fighters connecting in a stairwell and connecting to the outlet below the fire floor as well as the outlet at the fire floor so that they can have two hoses from the stairwell advancing to fight the fire simultaneously. But what if the most remote standpipe riser is in the middle of a floor, nowhere near a stairwell, at a horizontal exit? Do we still need to calculate two outlets on this standpipe riser when there is no ability to have fire fighters connect to a second outlet in this location?

Answer: Standpipe risers on both sides of a horizontal exit are treated just like risers in stairwells, which means that the most remote will need to be calculated for 500 gpm. There is no exception for risers that are not near stairwells. Typically, horizontal exits are in the middle of buildings, so they are not the most remote.

The standard needs to be written in such a manner that it is easily understood and uniformly interpreted and enforced. Sometimes this results in unusual cases being penalized because they don't match the situations that were contemplated when the rules were written. This is one of those unusual cases that were not contemplated when the rules were written. There is no way that a code or standard can be written to anticipate every layout of every situation.

Most communities have a variance procedure where some relief from the strict rules of a standard can be granted based on the unusual situation in a specific building. This is one of those times when such a variance might be appropriate. The Authority Having Jurisdiction is permitted to consider such a variance under section 1.4 of NFPA 14.

Question 2 – Standpipe Systems in Buildings Protected with NFPA 13R Systems

In a building protected with an NFPA 13R system, would a standpipe system also be required?

The requirements for standpipe systems are found in the building codes and fire codes and are independent of the installation of any kind of sprinkler system. The International Building Code typically requires standpipes in all buildings (aside from Group R-3) in which the floor level of the highest story is 30 feet or higher above

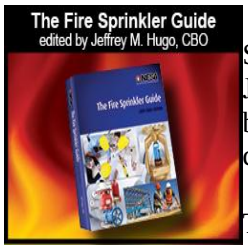
the lowest level of fire department access.

Question 3 – Seismic Braces and Changes in Direction of Mains

When Seismic Bracing is required on a main, is a brace required at every change in direction?

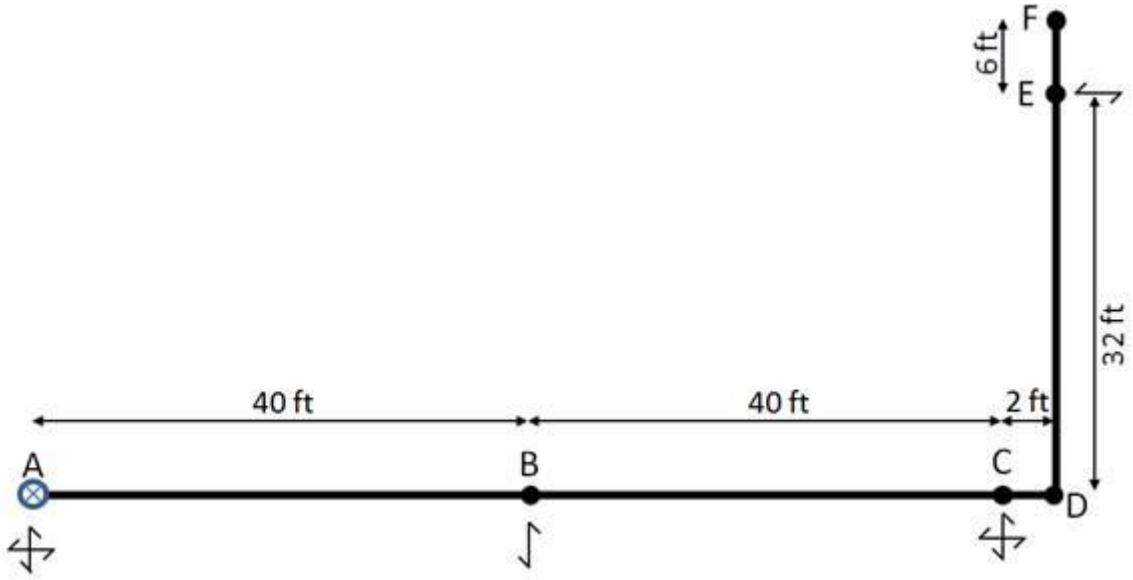
Answer: You are not necessarily required to have a brace at every change in direction, but in order to meet the rules of NFPA 13, you will probably have braces at almost all changes in direction (at least until the 2013 edition of NFPA 13 gets printed and comes into widespread use). Another way to answer this question is that it is very difficult to properly protect mains with changes in direction unless you put braces in when the changes occur, but it is not impossible.

Section 9.3.5.3.1 requires all cross mains and feed mains to be protected with lateral braces. When a change of direction occurs, the lateral braces on the pipe before the turn can't count as lateral braces for the portion of the pipe after the turn because they are holding the pipe in a different direction. So, most of the time, additional lateral braces are needed after the turn. The only exception is that section 9.3.5.4.2 allows longitudinal braces to serve as lateral braces for pipe after a turn if the longitudinal brace is installed within 24 inches of the turn.



Similarly, section 9.3.5.4.1 requires all cross mains and feed mains to be protected with longitudinal braces. Just like the discussion above, longitudinal braces before a change in direction can't count as longitudinal braces after the change in direction, but if there is a lateral brace within 24 inches of the change in direction, it can count as a longitudinal brace after the change.

These concepts are easier to see in a drawing than they are to explain in words. Consider the following drawing with a main that starts at a riser (Node A) goes east for 82 ft and then makes a 90 degree turn (at Node D) to the north and then goes another 38 ft. There is a 4-way brace at Node A (the top of the riser), a lateral brace at Node B, a lateral and longitudinal brace at Node C, which is 2 ft from the change in direction, and a lateral brace at Node E.



Note that after the turn at Node D, a longitudinal brace is not needed because the lateral brace at Node C is acting as the longitudinal brace for the pipe between Nodes D and F. This brace is within 40 ft of the end of the pipe (as measured along the length of the pipe) so it complies with the rules for longitudinal bracing. Also note that most of the pipe from Node D to Node F does not need a lateral brace either (because the longitudinal brace at Node C counts as the lateral brace for the pipe from D to F), but a lateral brace is required at Node E because a lateral brace needs to be within 6 ft of the end of the pipe. So the lateral brace at Node E has nothing

to do with the change in direction. It would be needed even if the pipe did not change direction at Node D.

The reason that I mentioned the 2013 edition of NFPA 13 up above is that they tried to make this situation a bit easier. There are new sections in the 2013 edition of NFPA 13 that will allow changes in direction that do not exceed 12 ft (total run of pipe measured about the bends) without any special bracing. This will make it easier to get a main around a column or obstruction without any special braces.

Question 4 – Braces on Pipe Strapped to Trusses

On a system with CPVC pipe supported with two-hole straps across the top of the bottom chord of a wood truss, are sway braces still required?

Answer: First, we need to separate the answer for lateral and longitudinal sway braces. Lateral sway braces should be exempt under Section 9.3.5.3.9 in NFPA 13, 2010 Edition (similar sections in previous editions), even though this type of hanger does not have a "rod" component. The pipe is tight to the structure and will move with the structure during an earthquake event. The concept of Section 9.3.5.3.9 is to limit the possible movement of the pipe, which is accomplished with the strap-type hangers.

Longitudinal sway braces will still be necessary. The strap-type hanger does not offer any resistance to the longitudinal direction of the piping. Therefore, the longitudinal sway braces will still have to be installed.

Question 5 – Concealed Spaces that Require Sprinklers

We have a concealed space consisting of 18" deep open wood floor trusses spaced 24" inches on center with insulation only affixed to the deck between the top chord of the floor truss (not filling the entire space). The ceiling will be attached to the bottom chord forming a concealed space. Do sections 8.15.1.2.5 and 8.15.1.2.6 allow sprinklers to be omitted?

Answer: Sprinklers are required in the concealed space consisting of the open wood trusses that you have described. Section 8.15.1.2.5 only applies to spaces formed by wood joists. You have wood trusses, not wood joists, so this section is not applicable to your situation. Section 8.15.1.2.6 only applies to spaces formed by composite wood joists. You have wood trusses, not composite wood joists, so this section is not applicable to your situation.

Question 6 – Concrete Anchors

Where hangers for a sprinkler system in a seismic zone are being connected to concrete, are the anchors required to be prequalified for seismic and where do we find this requirement.

Answer: The answer to this question will vary depending on which building code and fire code is being enforced in your community, but generally, the answer is "yes." The requirement will be found in the building code, not in NFPA 13 until the 2013 edition. In the IBC, section 1912.1 requires all mechanical systems that are anchored to concrete (not just sprinkler systems, but including sprinkler systems) to use prequalified anchors. Unless your local community modified section 1912.1 when they adopted the IBC, this will apply to your sprinkler system.

Unfortunately, there are times when rules from the building codes override or apply in addition to those in NFPA 13 and this is one of those times. Building codes are primary legal documents and standards, like NFPA 13 are meant to supplement these building codes, not replace them. Therefore, when there is something specific in the building code that is not addressed in the NFPA standard, or different from what is in the NFPA standard, then the building code prevails.

In this case, many contractors were missing this requirement and so it has been added to the 2013 edition of

NFPA 13 so that everyone knows that they need to use prequalified anchors.

Question 7 – Sizing "Knee Braces"

I'm wondering how to properly size an angle iron knee brace/knee bracket. Do you know of a formula or chart to help determine the correct size of angle and bolts/lag bolts? I tried searching for "knee" on the NFSA website and didn't retrieve any results…same thing in the members only area. Can you help?

Answer: The terms "knee brace" or "knee bracket" are not standard industry terms, and we have never been asked about them, so we're not surprised that your search of our records turned up empty. We assume that you are talking about some sort of product that forms a right angle where the vertical portion will be attached to a vertical surface (like a wall or the side of a structural member) and the horizontal surface will be used to support or brace the sprinkler pipe. We don't know whether you're proposing to use this device for hanging or bracing of the pipe. The answers are different for each situation, so they need to be discussed separately.

If you are proposing to use the device as a hanger, you have to be very careful about the ability of the wall to hold the load. Section 9.2.1.3.1 requires the sprinkler piping to be "substantially supported from the building structure" and that the structure needs to be capable of supporting the load of the water-filled pipe plus 250 lbs. If the bracket is going to be connected to a non-load bearing partition or wall, you need to make sure that this partition or wall can withstand the load. The portion of the bracket being attached to the wall still needs to be listed under section 9.1.1.4.1 and the sizing of the device would need to be covered in the listing. Likewise, the way to mount the device should be covered in the listing. If not, the sizing in Table 9.1.5.3.1 would be a good guide because the stresses involved would be similar to the stresses in attaching to the side of a beam. As always with NFPA 13, the listing requirements for hangers are waived if a Professional Engineer designs the hanger components and shows that the loads can be handled by the brace and the structure.

If you are proposing to use the device as an earthquake brace, you may not be able to do this. The basic philosophy of NFPA 13 is to have the sprinkler system move with the floor/ceiling/roof assembly. Walls and floor/ceiling/roof assemblies move in different directions during an earthquake. Attaching a brace to a wall in one part of the system and braces to the ceiling in another part of the system would pull the sprinkler system in two different directions during an earthquake, which could create a significant amount of damage. In general, bracing mains to walls is not a good idea.

Certainly, a Professional Engineer could come up with an earthquake protection scheme that would have you bracing to the walls, but that would come up under the portion of NFPA 13 that allows an engineer to specify their own criteria and then the engineer would need to be involved in sizing the brace components.

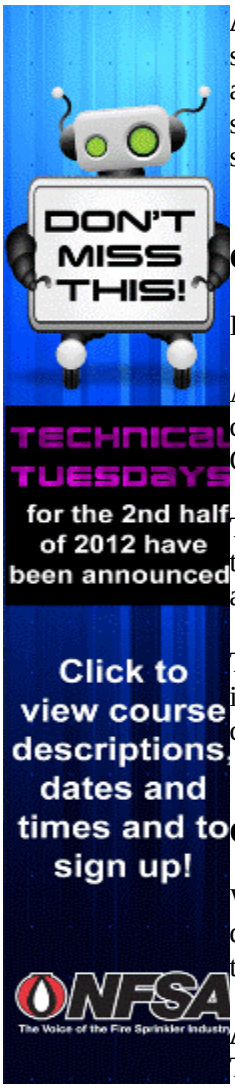
Question 8 – Trapeze Hangers of Wood

Can a trapeze hanger be made from a 2 x 4 piece of wood?

Answer: It depends on the materials that form the structural members of the building. If the building is noncombustible construction, then the answer is "no". If the building structure uses 2 x 4 lumber to form trusses or joists and the trapeze will be connected to these members, then the answer would be "yes". The trapeze member is considered an extension of the building structure, so items consistent with the building structure can be used as trapeze hangers.

Question 9 – Shallow Concealed Spaces and Special Sprinklers

We have a combustible concealed space that is flat (not sloped) and only 28 inches deep that needs to be protected with sprinklers. Are we required to use any special sprinklers? If we are, what are their spacing requirements?



Answer: Yes, if the concealed space has wood truss or wood joist construction. In this case, sprinklers that are specially listed for concealed spaces need to be used. These sprinklers have broader, flatter spray patterns and are better for this type of construction. See section 8.15.1.6 in NFPA 13. The spacing requirements for the sprinkler will depend on the listing of the sprinkler. Check with the manufacturer of the specially listed sprinkler for spacing requirements.

Question 10 – Access to Sprinklers in Concealed Spaces

If sprinklers are installed in concealed spaces, are access hatches required to get into the space?

Answer: There is no requirement in NFPA 13 for all sprinklers and piping to be accessible. In fact, it is quite common to run sprinkler pipe in spaces that have no accessibility. Section 1209 of the International Building Code requires access openings to certain crawl spaces and attic spaces, but not all concealed spaces.

There is certainly a risk to a building owner if a sprinkler opens in a concealed space with no access. It will take some effort to get into the space and replace the sprinkler. But there is no direct requirement to provide access. If a building owner wants this access, they need to specify that up front.

There is also no requirement in NFPA 25 to get into concealed spaces and inspect sprinklers. The assumption in NFPA 13 is that you are inspecting the sprinklers that you can see from the floor level. Sprinklers in concealed spaces are specifically exempt from annual inspection.

Question 11 – Using Sprinklers of Correct Temperature Classification

We are confused by Table 8.3.2.5(a), especially for downward discharging diffusers where it says, "Any distance except as shown under Intermediate-Temperature Rating column". Can you help explain how to use the table?

Answer: The easiest way to deal with Table 8.3.2.5(a) is to start with the Intermediate Temperature column. This column tells you where you need to use intermediate temperature sprinklers. In the case of downward discharging diffusers, you need to use intermediate temperature sprinklers up to 1 ft away from the edge of the diffuser when the sprinklers are within 1 ft vertically from the ceiling.

The Ordinary Temperature column then says that anywhere outside of this ring, you can use ordinary temperature sprinklers. So, in order for you to use an ordinary temperature sprinkler next to a downward discharging diffuser, you need to be more than 1 ft away from the edge.

Question 12 – Discharge and Test Header Pipe Sizing

Table 5.25(a) of NFPA 20 states the minimum size for discharge piping and test header piping for various size fire pumps. Are we allowed to reduce the size of both discharge pipe and test header piping if we hydraulically prove the pump works with the smaller size?

Answer: You cannot reduce the size of the discharge pipe. The concern is that smaller pipe sizes cause back pressure on the pump and forces the driver to work harder to produce the pressure. The driver has not been sized for this kind of backpressure.

The pipe going to the test header can be any size you want as long as hydraulic calculations prove that you can make it work so that the maximum flow (150% of the rated flow of the pump) can be achieved at the test header. See the Technically Speaking article in the Fall 2003 edition of Sprinkler Quarterly (available in the Members Only section of our website) for procedures on performing this calculation.

Upcoming NFSA "Technical Tuesday" Seminar – November 20

Topic: Hydraulic Calculations of In-Rack Sprinklers
Instructors: Kenneth E. Isman, P.E.
Date: Tuesday, November 20, 2012- 10:30 am EST

The hydraulic calculation procedures for in-rack sprinklers are very different from the procedures for ceiling sprinklers. Determination of the number of sprinklers that might open if there is a fire as well as the location of the most demanding sprinklers can be a challenge. Next, the user needs to determine if the in-rack sprinkler demand needs to be added to (and balanced with) the ceiling sprinkler demand. Procedures will be provided for all of these steps in the calculation process as well as a discussion of decisions that can be made (sprinkler selection, pipe sizing and pipe location) to make the system as efficient as possible.

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

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:

Nov 29	Liverpool, NY	Inspection, Testing & Maintenance for the AHJ
Dec 11-13	Atlanta, GA	3-Day Inspection & Testing for the Sprinkler Industry
Jan 8-10	Westbury, NY	3-Day Inspection & Testing for the Sprinkler Industry

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.