NFSA NATIONAL FIRE SPRINKLER ASSOCIATION
The Voice of the Fire Sprinkler Industry

TechNotes

15
Editor - Mark Hopkins, P.E Issue # 369 March 15, 2017

TechNotes Issue # 369
March 15, 2017

Best of Month March 2017

Following are a dozen questions answered by the engineering staff as part of the NFSA's Expert of the Day (EOD) member assistance program being brought forward as the "Best of March 2017." If you have a question for the NFSA EOD (and you are an NFSA member), send your question to eod@nfsa.org and the EOD will get back to you.

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. They have not been processed as formal interpretations in accordance with the NFPA Regulations Governing Committee Projects and should therefore not be considered, nor relied upon, as the official positions of the NFPA or its Committees. Unless otherwise noted the most recent published edition of the standard referenced was used.

Question 1 - Use of Bulb and Link Sprinklers in the Same Compartment

Is it acceptable to replace a sprinkler having a glass bulb element with a sprinkler having a fusible link element?

Answer: The answer is "yes" it is acceptable to replace a sprinkler having a glass bulb element with a sprinkler having a fusible link element, as long as, the operating element has the same thermal sensitivity. Thermal sensitivity refers to the reaction time of the sprinkler in fire conditions of the element (quick response vs standard response). In other words, a quick response sprinkler with a soldered fusible link may replace a quick response sprinkler with a glass bulb and vice versa. Both types of quick response sprinklers will have similar thermal sensitivity.

NFPA 25-2017 identifies required characteristics for

replacement sprinklers in section 5.4.1.2, which reads as follows:

"**5.4.1.2*** Replacement sprinklers shall have the proper characteristics for the application intended, which include the following:

(1) Style
(2) Orifice size and K-factor
(3) Temperature rating
(4) Coating, if any
(5) Deflector type (e.g., upright, pendent, sidewall)
(6) Design requirements"

Note that these characteristics do not include the operating element type. However, NFPA 25, section 5.4.1.4 identifies that special and quick response sprinklers as defined by NFPA 13 shall be replaced with sprinklers of the same orifice size, temperature range, thermal response characteristics and K-factor. Definitions for quick response and special response sprinklers are found in NFPA 13-2016, sections 3.6.4.8 and 3.6.4.10, respectively.

Similarly, NFPA 13-2016, section 8.3.3.2 identifies that where quick response sprinklers are installed within a compartment al sprinklers shall be quick response unless permitted by section 8.3.3.3, 8.3.3.4 or 8.3.3.5. These exceptions apply when there are no quick response sprinklers in the temperature range required, when in-rack sprinklers are used, and for sprinklers having both quick response and standard response listings for different coverage areas.

Question 2 - Annual Testing of Foam Systems

Are foam systems required to have a full flow test conducted annually?

Answer: There is no requirement to flow foam continuously from the nozzles during the annual operational test required by NFPA 25-2017, section 11.3. Flow of water is sufficient to verify what is required by section 11.3, e.g. the valve(s) is(are) open, there are no obstructions, the nozzles are properly oriented (pointed correctly), operating pressure is sufficient, and so on. This was somewhat clarified by annex language that was added in the 2014 edition of NFPA 25 (see A.11.3(2)), which refers to a "water only flow test". It was further clarified by the addition of section 11.3.2.4 in the 2017 edition, which states "It shall be permissible to test the full flow discharge from foam-water deluge systems using water only in lieu of foam."
Testing of foam concentration is, as always, required.

Question 3 - Storage Tank Capacity Reduction

Register Here

Is it permitted to reduce the size (storage volume) of a ground storage tank supplying water to a fire pump below the fire protection demand for a warehouse if an automatic filling connection is used?

Answer: The answer to this question is "yes, this provision was clarified in the 2013 edition of NFPA 22." A tank sized at less than the system demand with a fire pump would be classified as a break tank per NFPA 22-2013, section 3.3.1. NFPA 22 defines a break tank as a tank providing suction to a fire pump whose capacity is less than the fire protection demand (flow rate times flow duration). Tanks are sized in accordance with either section 4.1.4 or section 4.1.5.

Section 4.1.4 states, "A tank shall be sized so that the stored supply plus reliable automatic refill shall be sufficient to meet the demand placed upon it for the design duration." Section 4.1.5 states, a break tank shall be sized for a minimum duration of 15 minutes with the fire pump operating at 150 percent of rated capacity." For tanks having capacity of 30 minutes or less of supply additional requirement are imposed per section 14.5.3. Thus, the tank is permitted to be sized smaller than the volume required by multiplying the fire protection demand times the duration.

Question 4 - Loss of Fluid in Glass Bulb Sprinklers
What would cause the loss of fluid in glass bulb sprinklers?

Answer: There can be several causes for the loss of fluid in a glass bulb such as damage during shipment, handling and installation in the field. From a manufacturing standpoint, UL adopted a revision into its sprinkler standards in 2003 to require glass bulb integrity testing after the sprinkler has been fully assembled and subjected to the production leakage test. This requirement became effective September 26, 2004.
This was also addressed in NFPA 25-2017 under section 5.2.1.1.1(4), which states:

"**5.2.1.1.1** Any sprinkler that shows signs of any of the following shall be replaced:
(1) Leakage
(2) Corrosion detrimental to sprinkler performance
(3) Physical Damage
(4) Loss of fluid in the glass bulb responsive element
(5) Loading detrimental to sprinkler performance
(6) Paint other than that applied by the sprinkler manufacturer"

It is also advisable to contact the sprinkler manufacturer regarding such issues.

Did You Know??

The NFSA keeps a member of the Engineering Department staff on duty every business day to answer your technical questions live. We call this the Expert of the Day (EOD) program and it is available to our members by phone, fax or e-mail. Call us at (845) 878-4200 and press 2, or you can send a fax to (845) 878-4215, or you can e-mail us at eod@nfsa.org. Last year we answered more than 2600 requests for assistance.

Question 5 - Sprinkler Protection in Interstitial Spaces Containing Wood Trusses

Do interstitial spaces between floors of a residential building containing open web wood joists/trusses attached directly or within 1 in. to 6 in. of the ceiling need to be protected with sprinklers? If yes, can sprinklers be omitted per NFPA-2016, section 8.15.1.2.5?

Answer: This answer to the first question is "yes," these spaced are considered combustible concealed spaces. Sprinklers are required to be provided unless an exception is identified in section 8.15.1.2 based on the specific conditions. NFPA 13-2016, section 8.15.1.1 requires sprinklers in concealed spaces of exposed combustible construction (such as open web trusses) unless one of the conditions cited in sections 8.15.1.2.1 through 8.15.1.2.18 allow the omission of sprinklers. Sprinklers would be required since this concealed space does not meet one of these exceptions identified in sections 8.15.1.2.1 through 8.15.1.2.18.

The answer to the second question is "no." NFPA 13, section 8.15.1.2.5 would not apply to concealed spaces consisting of open wood trusses. Section 8.15.1.2.5 only applies to spaces formed by wood joists or other solid member construction. Nearly all the allowances to omit sprinklers in combustible concealed spaces require that the structural members be constructed of solid construction such as wood joists or composite wood joist for compartmentation purposes. Open wood trusses are not solid and these allowances to omit sprinklers do not apply. One notable exception is section 8.15.1.2.7 which allows sprinklers to be omitted from combustible concealed spaces where the entire space is filled with noncombustible insulation

Question 6 - Fire Flow and Sprinkler Demand

Would the fire flow and the sprinkler demand for a warehouse having an ESFR sprinkler system and private fire hydrants supplied by the same fire pump be required to be added together?
For this building, a fire flow of 1,937.5 gpm has been determined. The sprinkler system demand is estimated at 1,750 gpm using k=16.8 ESFR sprinklers with a 250 gpm hose allowance. In this case, would a total water demand of 3, 687.5 gpm (1,937.5 plus 1,750 = 3,687.5 gpm) be required?

Answer: The answer is "no". The 2015 IFC, Section B105.3 requires the greater of the sprinkler system with hose stream or the required fire flow. The 2015 NFPA 1 Fire

Code, Section 18.4.5.4, specifically states, "....the fire flow demand and the fire sprinkler system demand shall not be required to be added together. The water supply shall be capable of delivering the larger of the individual demands". As noted in the two national fire codes above, it is not the intent to add the sprinkler demand and fire flow demand together, only the greater of the two are used for building fire flow.

Question 7 - Retroactive Backflow Preventer Requirements

Would a backflow prevention assembly be required to be added to existing systems when old alarm valves or dry pipe valves are replaced?

Answer: The answer to your question is "it depends." NFPA 13 does not require the installation of backflow assemblies; however, the backflow preventer may be required by the building code, plumbing code, health code, water purveyor, or other document." If a new backflow prevention assembly is to be installed in an existing system, it must follow the installation requirements of NFPA 13-2016 including 8.17.4.5.2, which states the following for retroactive installations.

"When backflow prevention devices are to be retroactively installed on existing systems, a thorough hydraulic analysis, including revised hydraulic calculations, new fire flow data, and all necessary system modifications to accommodate the additional friction loss, shall be completed as a part of the installation."

Question 8 - Sprinkler Protection in Elevator Machine Rooms

Do current editions of NFPA 13 allow facilities to omit sprinkler protection in elevator machine rooms? If so, what are the appropriate code and section references?

Answer: The answer is "yes". Beginning in the 2013 edition of NFPA 13, language was added to allow sprinklers to be omitted from such spaces if the machine room meets certain conditions. In both the 2016 and 2013 editions of NFPA 13, the requirement allowing sprinklers to be omitted from elevator machine rooms is found in section 8.15.5.3. This section states that sprinklers are not required in elevator machine rooms installed in accordance with NFPA 101 or applicable building code where the following conditions are met:

1) the machine room is dedicated to elevator equipment only,
2) the machine room is equipped with smoke detectors in

accordance with NFPA 72,
3) the machine room has a fire resistance rating as specified by building code,
4) the machine room is not used for storage, and
5) the elevator machinery is not of hydraulic type.

Question 9 - Protection of Balconies and Projections

Would a balcony that is within the footprint of the overall roof line of a structure and is enclosed on three sides be considered a "projection" in accordance with NFPA 13-2010, section 8.15.7?

Answer: The answer to this questions is "yes". The requirements of NFPA 13-2010, section 8.15.7 apply to exterior roofs, overhangs, balconies and eaves constructed of combustible materials or having combustible storage and of sufficient size to allow heat accumulation. Section 8.15.7.1 requires sprinklers to be installed under "exterior roofs, canopies, porte-cocheres, balconies, decks or similar obstructions exceeding 4 feet in width" unless specifically omitted by sections 8.15.7.2, 8.15.7.3 or 8.15.7.4.

Section 8.15.7.2 and 8.15.7.3 allow sprinklers to be omitted if either the projection is constructed of noncombustible, limited-combustible construction or fire retardant-treated wood as defined by NFPA 703 or in the scenario where it is of combustible construction provided the exposed finish is noncombustible, limited-combustible or fire retardant-treated wood as defined by NFPA 703.

Section 8.15.7.4 allows for exterior exit corridors to omit sprinklers provided the walls are at least 50% open when the corridor is entirely noncombustible.
Therefore, sprinkler protection would be required for the arrangement described if the overhead projection is over 4 feet in width and constructed of combustible construction with combustible finishes section 8.15.7.2 or 8.15.7.3.

Question 10 - Class I and III Hose Valves on Intermediate or Primary Landings

Would hose valves be required on intermediate or primary floor landings in accordance with NFPA 14-2013 edition?

Answer: NFPA 14-2013, section 7.3.2 identifies that 2 1/2 in. hose valves are required on the primary floor landings. However, section 7.3.2.1 permits these hose valves to be located on the highest intermediate landings if approved by the AHJ. This allows for consistency with the IBC-2012 requirements, which are specified in the reverse order. IBC, section 905.4 requires 2 1/2 in. hose valves on the intermediate landing unless approved by the AHJ. If IBC-

2012 is applicable, then the base requirement would be to locate the hose valves on the intermediate landing since the Building Code requirement would supersede the NFPA 14 requirements. However, it is advised to discuss the requirements and preferences with the AHJ since the requirement could be reasonably argued based on either set of requirements and the valves should be located where the fire department prefers them.

Question 11 - K=4.2 Sprinklers and Corrosion Resistant Pipe

Does piping with a certain corrosion resistance ratio (CRR) qualify as corrosion resistant pipe allowing K=4.2 sprinklers to installed on dry pipe system in a light hazard occupancy as described in NFPA 13-2016 section 8.3.4.4?

Answer: The answer to your question is "no," the intent of section 8.3.4.4 is to require an inherently corrosion resistant piping material or internally galvanized steel". The CRR provides a relative index based entirely on the pipe wall thickness at the first exposed thread compared to the thickness of the first exposed thread for Schedule 40 steel pipe. It does not relate to any inherent corrosion resistance in the material nor does it reflect the effectiveness of applied coatings. In this case, it was the committee's intent to require sprinkler piping that is inherently resistant to common corrosion to reduce the possibility of oxidation and scale that could potentially interfere with the operation of a small orifice sprinkler.

A related question dealing with coated pipe was addressed in NFSA e-TechNotes, #249, September 12, 2012:

TN #249, Question 3 - Small Orifice Sprinklers and Corrosion Resistant Pipe

Section 8.3.4.3 of NFPA 13 allows K-4.2 sprinklers to be used in dry systems protecting light hazard occupancies when the piping is corrosion resistant or internally galvanized. Specifically, you have asked if pipe with MIC treatments or coatings meet this requirement.
Answer. No. MIC treatments or coatings protect the pipe from a specific type of corrosion, but concerns about pipe scale due to other forms of corrosion, namely oxidation, still exist with these pipes. In order to use the small orifice sprinklers, the committee intends the pipe to be copper, brass, nickel, stainless steel, galvanized steel or some other product that is corrosion resistant. The committee would also accept CPVC if it was used in accordance with a listing that allowed dry system use. By using the term "corrosion resistant", the committee is trying to keep the options open for contractors to balance cost issues with

availability. The committee did not want to create a list of acceptable pipes because there is always the possibility that they miss a product that would be acceptable. This type of "performance based" language is a direction that codes and standards are headed in and will be more prevalent in the future.

Question 12 - ESFR Sprinkler Shift Along a Branchline

Would NFPA 13-2016, section 8.12.2.2.3 permitting an ESFR sprinkler to be moved up to 12 inches along a branch line apply when an ESFR sprinkler installed too close to a 2-inch angle iron structural truss brace? The same condition applies at the adjacent branch line on the opposite side of the truss, which has a similar conflict with another brace. The adjacent branch lines located near the middle of the bays do not encounter similar obstructions due to these structural braces. Do adjacent branch lines need to be changed to conform with 8.12.2.2.3(2)?

Answer: The answer to the first question is "yes, if the three conditions of NFPA 13-2016, section 8.12.2.2.3 are met." The sprinkler is permitted to be moved up to 12 inches and the coverage area of the moved sprinkler is permitted to be 110 square feet, if the average "actual" coverage area per sprinkler is less than the maximum (100 sq ft) and the spacing between sprinklers does not exceed 12 feet. The third condition allowing the relocation of the sprinkler is addressed by the second question.

As described, the situation involves three consecutive sprinklers along a branch line between truss bays. The two sprinklers located near the trusses are obstructed by braces while the sprinkler at the center of the bay is not obstructed. The sprinklers near the trusses would be permitted to shift due to the obstructions created by the braces. However, the spacing of sprinklers would need to be within the minimum and maximum permitted spacing per sprinkler and the "actual" average protection area per sprinkler must be less than or equal to 100 sq ft. The spacing per sprinkler is permitted to increase from 10 ft to 11 ft (or 11 ft to 12 ft, etc.) resulting in a protection area of coverage of 110 sq ft. For this shift to be permitted, the spacing of the sprinkler near the center of the bay will need to be reduced such that the coverage area is less 100 sq ft and the actual average is less than or equal to 100 sq ft.

The answer to the second question regarding adjacent bran lines is yes. Refer to the examples in Figure A.8.12.2.2.3. The shift will ensure uniform spacing near structural members and consistency in the coverage.