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

Editor - Roland Asp, CET **#469** **08/10/2021**

Best of July 2021

The following are a dozen questions answered by the NFSA's Codes, Standards, and Public Fire Protection staff as part of the Expert of the Day (EOD) member assistance program during the month of July 2021. This information is being brought forward as the "Best of July 2021." If you have a question for the NFSA EOD submit your question online through the "My EOD" portal.

It should be noted that the following are the opinions of the NFSA Engineering, Codes, and Standards staff, generated as members of the relevant NFPA and ICC 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 or ICC Council Policy #11 and should therefore not be considered, nor relied upon, as the official positions of the NFSA, NFPA, ICC, or its Committees. Unless otherwise noted the most recent published edition of the standard referenced was used.

Question #1 – Can the average ceiling height be used for storage?

A storage building has a differing ceiling height although the roof pitch does not exceed 2 in 12. The majority of the roof/ceiling is below 30 ft in height and a portion of the ceiling/roof height is over 30 ft. A sprinkler system is being installed in accordance with the 2016 edition of NFPA 13.

Can the ceiling height be taken as an average height for design of the sprinkler system?

No, the ceiling height cannot be taken as an average to determine the design criteria for the sprinkler system.

Section 12.1 provides the general requirements for storage and Section 12.1.3 is specific to the building and storage height. Section 12.1.3.1 indicates the maximum building height shall be measured to the underside of the roof deck or ceiling or in accordance with 12.1.3.1.1 through 12.1.3.1.3. Annex section A.12.1.3 indicates the fire protection system design should consider the maximum storage height. Section 12.1.3.1.4 indicates where the building height changes within a compartment, the sprinklers directly over the storage shall be capable of protecting storage

directly beneath.

Annex section A.12.1.3.1.4 provides additional information and explanatory material that references Figure A.12.1.3.1.4. This figure shows and example of a ceiling with a slope less than 2 in 12 where the maximum ceiling height shown is 30 ft. Sprinkler protection under the highest part of the ceiling must be designed for that height to a point at least 15 ft beyond where the ceiling height drops to 25 ft. Sprinkler protection beyond that point can be designed for a 25 ft ceiling.

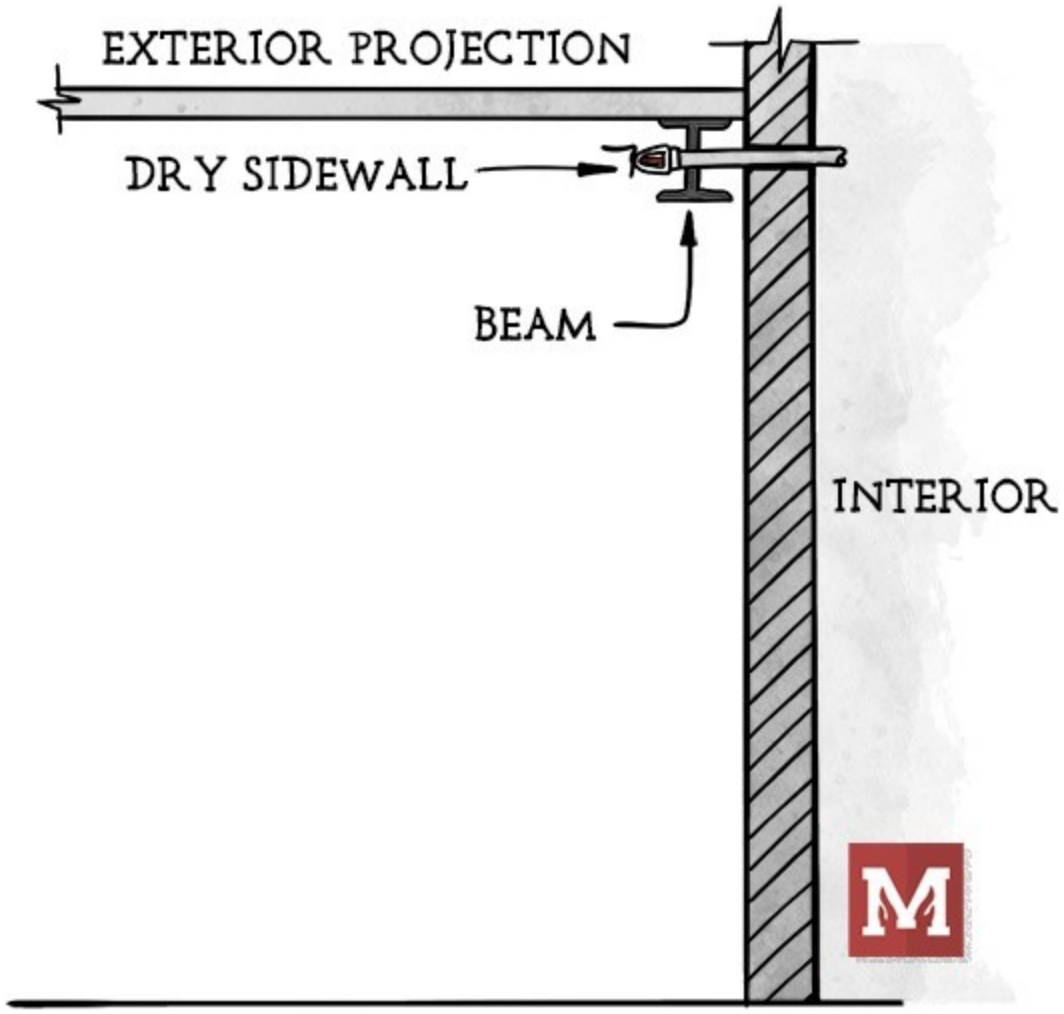
In the example given, sprinkler protection under the highest part of the ceiling (over 30 ft) must be designed for that height to a point at least 15 ft beyond where the ceiling height drops to 30 ft or less. Sprinkler protection beyond that point can be designed for a 30 ft ceiling.

Question #2 – Can a beam be considered a soffit for dry sidewalls?

A dry extended coverage sidewall sprinkler is to be used to protect an exterior canopy. This sidewall sprinkler will penetrate a 14-inch steel I-beam that is located 6 inches away from the exterior wall. Section 8.9.4.1.3.1 of the 2013 edition of NFPA 13, allows for sprinklers to be omitted from below the soffit when the soffit projects from the wall no greater than 8 inches.

Could the beam be considered similar enough to a soffit to exclude a sprinkler beneath the beam in accordance with this section?

No. As there is space between the beam and the wall, this beam cannot be considered the same as a soffit eliminating sprinklers under the beam. A soffit is typically enclosed which would restrict any heat or fire from entering behind in the void space. In the scenario provide by using a beam it could allow heat or flame to travel behind the beam and spread. The beam could be incased by drywall or in a similar manner then the sprinklers below could be eliminated.



Question #3 – Are melt away ceiling tiles allowed below fire sprinklers?

On a project where a sprinkler system is to be installed in accordance with the 2016 edition of NFPA 13, the architect is specifying the “melt away” ceiling tiles be installed below the sprinklers. These ceiling tiles will apparently melt at a temperature lower than that of the sprinkler and will not impede the activation or spray of the sprinkler above.

Are melt away ceiling tiles allowed to be installed below sprinklers?

Yes, “melt away” ceilings which are called drop-out ceilings are permitted by the 2016 edition of NFPA 13 in Section 8.15.15 under certain circumstances.

Drop-out ceilings and ceiling materials are permitted to be installed beneath sprinklers as long as the ceiling panels or ceiling materials are listed for this use and are installed in accordance with their listings. Section 8.15.15 does indicate that when using this type of ceiling material, the use of quick response sprinklers or the use of extended coverage sprinklers is not allowed unless allowed by the listing. This type of material is intended to “drop-out” at a relatively low temperature. Drop out ceilings are not considered to be traditional ceilings and piping run above is not considered to be concealed. As indicated by Section 8.15.15.5, it is important to note that it is not permitted to install sprinklers below these drop-out ceilings.

There are ceiling panels and ceiling materials that have been investigated as a ceiling material in accordance with UL Subject 723S, Outline of Investigation for Drop-Out Ceilings Installed Beneath Automatic Sprinklers, or as FM Class Number 4651, Plastic Suspended Ceiling Panels. Such ceiling panels and ceiling materials are designed such that the activation of the sprinkler and the ability of the sprinkler discharge to reach the hazard being protected are not adversely impacted.

Question #4 – Can ESFR sprinklers be installed closer than 8 feet?

Can ESFR sprinklers be spaced closer than 8-feet when they are placed inside concrete tees that are 6-feet on-center?

The NFSA’s standard response to this question based upon the 2019 and earlier editions of NFPA 13 was “no”. In accordance with the requirements of the standard, ESFR sprinklers need to be spaced greater than 8 ft apart. One possible way to meet this requirement in situations such as the concrete tee construction is to stagger the ESFR sprinklers. However, it must be noted that it is likely that the 2022 edition of NFPA 13 will add allowances that permit ESFR sprinklers to be closer than 8-feet apart where they are separated by a structural member or by baffles. This new allowance was highlighted in the Technical Speaking column of the July-August 2021 issue National Fire Sprinkler Magazine which can be viewed in the members-only section of the NFSA website. This article which is titled includes 20 Potential Changes in the 2022 Edition of NFPA 13 includes this which relates to this topic:

ESFR Sprinklers Closer than 8 ft (14.2.4.3, 14.2.9.4.1 and 14.2.9.4.2). Past edition of NFPA 13 required ESFR sprinklers to be spaced at least 8 ft apart in all cases. The 2022 edition will add allowances which will allow ESFR sprinklers to be closer than eight feet apart where they are separated by a structural member or by baffles.

Question #5 – Does NFPA 101 require fire sprinkler systems in schools?

The 2015 edition of NFPA 101 requires an educational occupancy exceeding 12,000 sq. ft. to have a fire sprinkler system, however the 2018 edition appears to require an educational occupancy not exceeding 1,000 sq.ft. to have a fire sprinkler system.

Referencing the 2018 edition of NFPA 101, if an educational occupancy/permanent building is 9,800 sq. ft., is a fire sprinkler system is required?

Yes, the educational occupancy would require a sprinkler system. The new requirements for educational occupancies can be found in Section 14.3.5.2 of NFPA 101. The 2018 edition change removed the 12,000 sq. ft. threshold for sprinkler protection. All non-relocatable educational occupancies greater than 1,000 sq. ft. is required to have a sprinkler system.

Based on the information that provided; the permanent educational occupancy of 9,800 sq. ft. would be required to be protected by a sprinkler system.

Question #6 – Does a wood ceiling qualify as decorative trim?

In a single-family home to be protected with a NFPA 13D sprinkler system, there are various ceiling pockets. The sides of the ceiling pockets have a drywall finish; however, the upper portion of the pockets have a tongue and groove wood finish that will be painted or stained.

Does a tongue and groove ceiling qualify as "decorative trim" per the requirement of Section 8.3.7(3) of the 2016 edition of NFPA 13D?

No, the tongue and groove ceiling is not considered decorative trim. The annex to section 3.7.3 (3) states that decorative trim would be considered crown molding and other similar trims. The tongue and groove wood ceiling would be considered a combustible finish and would not meet the

requirements of Section 8.3.7(3).

Question #7 Does the height of the structural member determine obstructed construction?

It was noted that in NFPA 13, for the definition of obstructed construction, there is nothing mentioned about the height of the structural members, so it may be interpreted that if the distance between members (with no opening in the cross-section) be up to 7.5 ft, it has to be considered obstructed regardless of their height.

For example, a ceiling area may have wood structural members that are 1-inch in height. Would this be considered to be obstructed construction?

No. It is correct that the definition of obstructed and unobstructive construction do not include a prescriptive dimension for the structural members, instead, obstructed construction is simply defined as a type of construction that impedes either the heat flow or the spray from the sprinkler (or both). Conversely, unobstructed construction would not impede either the heat flow of the spray pattern.

While a definitive dimension is not included in the definitions, the annex example does include some guidance. For example, Annex Section A.3.3.41.1 (in the 2019 edition of NFPA 13) in subsection (1) states that beam and girder construction is a type of obstructed construction where the roof is supported by wood beams of 4-in. or greater. Based upon this, if the joists are less than 4 inches, they would be likely considered to be unobstructed construction.

During the development of the next edition (2022 of NFPA 13), a revised definition of smooth ceilings (a type of unobstructed construction) was accepted which also supports the concept of the 4 in. dimension. This new definition will be found in Section 3.3.28.4 will define a smooth ceiling as a ceiling without irregularities greater than 4-inches in depth.

3.3.28.4 Smooth Ceiling.

A continuous ceiling free from significant irregularities, lumps, or indentations greater than 4 in. in depth. (AUT-SSI)

The committee statement for this revision (Second Revision No. 1015) reads:

The standard needs to better define its intent for smooth ceiling as written, there is no guidance for what a significant irregularity is. The 4 in. (100 mm) revision aligns with obstructed construction criteria.

As the determination of the ceiling construction type is so important in ensuring that sprinklers will activate in a timely manner and that spray will control a fire, the committee responsible for NFPA 13 chose not to include specific measurements in the definitions for obstructed and for unobstructed construction. Each ceiling type must be evaluated to determine of it will impede the activation or spray pattern of a sprinkler. As there are many different types of ceiling construction, it would not be feasible to include more specific guidance in the definition.

Question #8 – Does a vertical standpipe need a fire rating?

The 2010 edition of NFPA 14 in Section 6.1.2.2 requires standpipes to be protected by a fire resistance equal to that of the exit stairway, however 6.1.2.2.1 indicates "feed mains" are not required to be protected in a sprinklered building.

Is it the intent of this section to require the vertical pipe (the standpipe) supplying Class 1 hose connections to remain within the stair shaft or be located within a protected enclosure? Or is the intent to have the actual hose connection itself located within a protected enclosure for fire department staging purposes?

The intent is to provide risers and laterals of Class I standpipes with an appropriate level of fire protection. Above ground pipe is required to be enclosed in fire-rated construction equal to that of the enclosed fire rated exit stairway, Section 6.1.2.2.1.

There are exceptions for horizontal standpipes, horizontal portions of a standpipe or “feed mains” found in Table 6.1.2.2 but that would not apply to vertical standpipe. A feed main simply refers to a horizontal supply for one or more standpipes.

The technical committee has several first draft proposals in the next edition of NFPA 14 looking to clarify Table 6.1.2.2. This includes the redefining of feed mains and express mains, along with clarification of require levels of protection for each.

Where stairways are not required to be enclosed in fire-rated protection the standpipe is not required to be protected, Section 6.1.2.2.2.

The International Building Code (IBC), Section [F]905.4.1 also requires all risers and laterals of Class I standpipes, not located within the internal exit stairwell, to be protected by a degree of fire resistance equal to the requirement for the vertical encloses found in the building. This IBC requirement has an exception for buildings fully protected throughout with automatic fire sprinklers, which allows laterals outside of that fire-resistance-rated area.

The requirement provides a reasonable level of protection for the standpipe system and a protected area for the fire department to deploy hose lines. The exception for lateral pipes is allowed, as they typically supply additional hose connections required for other reasons like travel distance or horizontal exits.

Question #9 – Are air or nitrogen supply lines subject to hanger requirements?

When supplying dry pipe or pre-action systems with compressed air or nitrogen from a

remote source, would the hanger attachments be subject to the five-times the weight of the water filled pipe plus 250 lbs. and the requirements of Section 9.1.1.3 if the supply line is supported by a shared support system?

Yes, compressed air or nitrogen lines can be shared by the same supports. Section 9.1.1.3 addresses this exact topic. NFPA 13 calls this situation, "other distribution systems." It realizes that other systems may need to share the same supports that are being utilized by the sprinkler piping.

Section 9.1.1.3 is the charging language for the remaining of section. The shared supports systems are required to be certified by a registered professional engineer in addition to the design criteria found in Sections 9.1.1.3.1.1 and 9.1.1.3.1.2. They can be designed to either section. There are the two options regarding the design criteria, however either option must be coupled with Section 9.1.1.3. Additionally, whatever other systems are being shared with the supports must be compatible with the sprinkler piping per the requirements of Section 9.1.1.3.1.5.

Question #10 – Are oil filled transformers required to be protected?

A new electrical vault is being installed in a new building to house transformers. These transformers do not meet the provisions of the 2016 edition of NFPA 13, section 8.15.11.2 (2), they are oil filled transformers. The building owner is adamant to not install sprinklers stating it will be a hazard.

Are sprinklers required in accordance with the 2019 edition of NFPA 13?

Yes, oil filled transformers do pose a fire hazard and would require sprinkler protection per Section 8.15.11.2 of NFPA 13-2016. Water spray protection of transformers is common practice of outdoor oil filled transformers close to buildings or structures, indoor oil filled transformers pose a greater hazard.

It should also be noted that Section 903.1.1.1 of the model building code does allow for the omission of sprinklers for equipment rooms containing transformers when smoke detection is provided and the room is separated by a 2-hour barrier, it does not reference dry, or oil filled transformers. The California Building Code has removed this section and simply states alternative protection methods require approval from the authority having jurisdiction (AHJ).

There are a few factors to consider when evaluating the fire protection requirements of an indoor oil filled transformer. One of which is the oil type, there are oil filled transformers available with "less than flammable liquid" which is an insulating oil that has a higher flash point than the standard mineral oil used for transformers, which will reduce the fire risk. It should be noted the 2019 edition of NFPA 13 added transformers with listed K-class fluid to this exception.

If the concern is the water from the sprinkler system creating an electrocution hazard it is also

possible to de-energize the transformer with the activation of heat detection or water flow.

Question #11 – Can more than four quick response sprinklers be inside a dwelling unit?

In accordance with the 2013 edition of NFPA 13R, quick response sprinklers are permitted to be used instead of residential sprinklers where no more than four sprinklers are located within the dwelling unit.

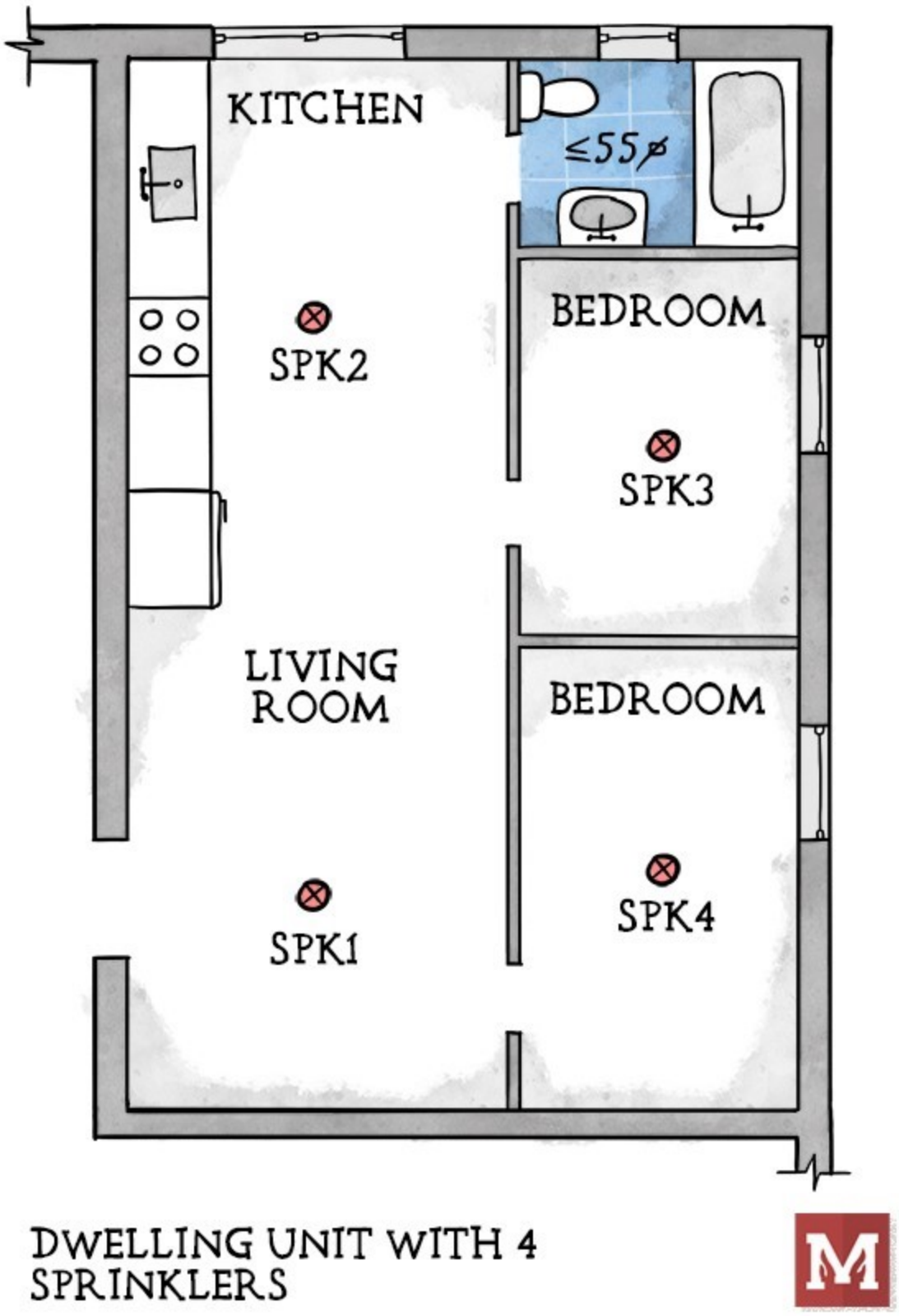
Specifically, Section 6.2.1.3 states that quick response sprinklers can be used in dwelling units that meet the definition of a compartment as long as four sprinklers or less are located within the dwelling unit.

Does this mean that quick response sprinklers can be used if a single compartment within the dwelling unit does not contain more than four sprinklers even if the entire dwelling unit does contain more than four sprinklers?

No, a maximum of four quick response sprinklers are permitted to be installed within the entire dwelling unit.

Section 6.2.1.3 (through 6.2.1.1) allows up to four quick response sprinklers in a dwelling unit. A dwelling unit has (defined in Section 3.3.4) cooking, living, sanitary, and sleeping areas. A compartment (defined in Section 3.3.2) consists of walls and ceiling with limited number of openings. This section (6.2.1.3) is specific to make sure the dwelling unit meets the definition of a compartment, mainly the openings are limited. A dwelling unit can have multiple compartments, but this section only allows four sprinklers throughout the entire dwelling unit, regardless of the number of compartments.

Section 6.2.1.3.1. increases the design density to 0.1 gpm/sf. Note, quick response sprinklers are not residential sprinklers. One of the main differences of residential sprinklers is their listing and capability to meet the wall wetting requirements. Quick response sprinklers do not need to wet the walls, so, this section is increasing the density, i.e., more flow, to compensate for this difference. The four quick response sprinkler maximums in a dwelling unit with the increased density is intended for small dwelling units, such as hotel rooms or efficiency apartments.



DWELLING UNIT WITH 4
SPRINKLERS

Question #12 – Do copper fire sprinkler systems need five-year

inspections?

There is a facility that has a sprinkler system that is done in copper piping. The owner claims that copper sprinkler systems do not need to have the NFPA 25 five-year inspection because copper does not rust, and it is impossible to open because the joints are soldered. Section 14.2.1.5 of the 2014 edition of NFPA 25 does state that nonmetallic pipe is not required to comply with the requirement to perform the five-year inspection.

Are copper sprinkler systems exempt from five-year internal inspection?

No, copper systems are not exempt from internal assessments. In accordance with Section 14.2.1.5 of NFPA 25 only non-metallic systems such as CPVC are exempt from internal assessments. Copper is not considered to be nonmetallic piping.

Layout Technician Training

Blended Layout Tech Practicum

This class is the second part of the Layout Tech Blended program. The class focuses on the application of the course materials through layout, design and calculation of multiple types of sprinkler systems. This portion also includes information on NFPA updates, Project Management, Stock-listing and Estimating.

Layout Technician Training
Nov 2 - Dec 2, 2021

Blended Layout Practicum
Nov 17 - Dec 2, 2021

Register Here

New EOD Process

Starting on July 15, 2020, the NFSA has a new EOD process where members can submit questions, track the progress, and view their EOD cases. The step by step process is detailed in

TechNotes #442.

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