

Best of June 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 June 2021. This information is being brought forward as the "Best of June 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 – Animal housing

We have been retained to provide a fire sprinkler system in an animal housing facility. The 2019 edition of NFPA 13 suggests in the annex that kennels and animal shelters are classified as light hazard occupancies. Are there any specific requirements for animal housing facilities?

Yes, Section 26.20 of NFPA 13 requires the use of quick response sprinklers in animal housing facilities. This requirement is extracted from NFPA 150 is the *Fire and Life Safety in Animal Housing Facilities Code*. It should be noted that as these facilities are typically classified as light hazard, quick response sprinklers are also required by the general sections of NFPA 13.

Section 9.2 of NFPA 150 outlines the sprinkler protection requirements for these facilities.

Aside from the quick response sprinkler requirement in NFPA 13, Section 26.20.1, NFPA 150 in Section 9.2.2 states that the sprinkler system must be in accordance with the requirements of NFPA 13.

Be sure to review all the sprinkler requirements in NFPA 150 as there are some requirements not found in NFPA 13. For example, while both NFPA 13 and NFPA 150 would require the sprinkler system to be supervised,

NFPA 150 in section 9.2.4.1 does require that the alarms be transmitted to an “approved, proprietary alarm-receiving facility, a remote station, a central station, or the fire department.” The next Section, 9.2.4.1, goes on to state that where a fire alarm is not required by other sections.

Question #2 – Sprinklers underneath round duct

Section 9.5.5.3.1.2 in the 2019 edition of NFPA 13 allows sprinklers that are installed under obstructions to be located adjacent to the obstruction and not more than 3 inches from the outside edge of the obstructions. The associated annex figure illustrates this allowance but shows a rectangle shaped obstruction.

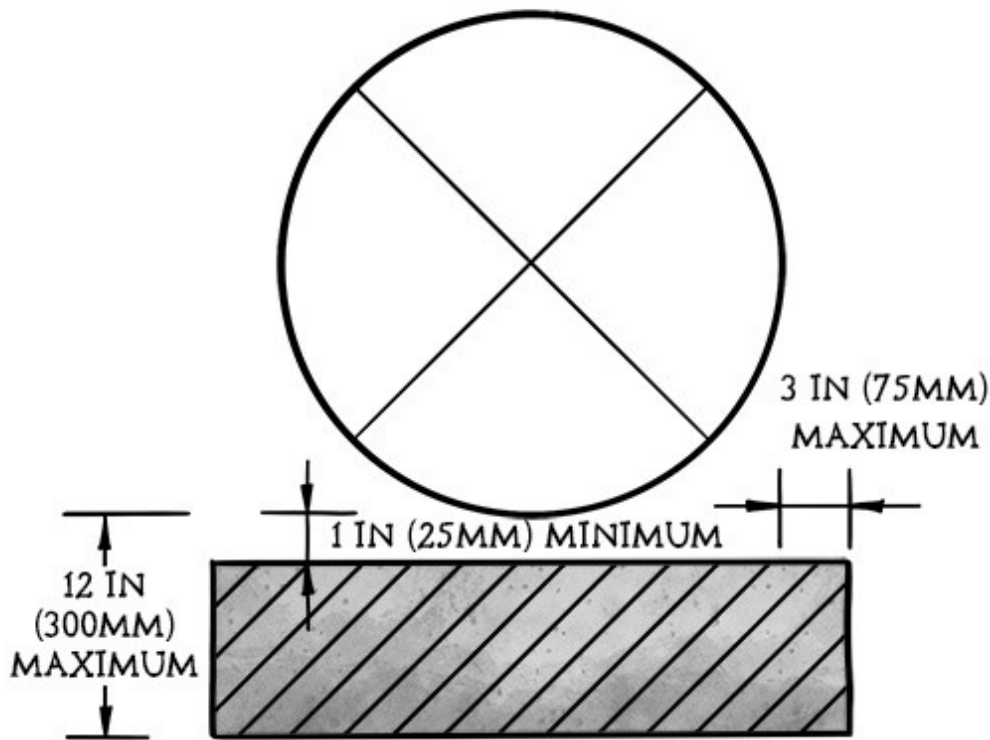
Can the sprinkler be installed 3 inches from the edge of a round duct?

Yes, the requirements in 9.5.5.3.1.2 do not differentiate based on the cross-sectional profile of the obstruction; a round duct is treated the same as a rectangular duct. Sprinklers must be installed within 12-in below the lowest point of the obstruction either directly below any part of the obstruction as it appears in plain view or within 3-in horizontally outside the edge of the obstruction.

Research has shown that, as long as the sprinkler is placed under or close to the edge of an obstruction, sufficient heat from a fire directly below the obstruction will be channeled to the sprinkler to cause it to operate. Sprinklers may be located up to 3-in outside the perimeter of the obstruction or provided with an armover to any point below it. In either case, the deflector height must be within 12-in vertically below the level of the lowest part of the obstruction.

In fact the next edition of NFPA 13 will include an additional annex figure illustrating this concept with a round duct.

OBSTRUCTION (DUCT)



SPRINKLER DEFLECTOR UNDER OBSTRUCTION CAN BE LOCATED ANYWHERE IN SHADED AREA



Your Dependable Options for Dry Pipe Valves

Model DDX-LP Low-Pressure Mechanical Valve

Model FX Standard Pressure Differential Valve

Reliable

Question #3 – CPVC for underground use

The 2013 edition of NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, specifically referenced the use of CPVC pipe and fittings for underground installation, for example see Table 10.2.2.2. However, the newer editions of NFPA 24 have deleted this section and no longer references CPVC.

Does this mean that CPVC is no longer permitted to be installed underground?

No. CPVC is still permitted to be installed underground as long as it is listed for this use. Chapter 10 in the 2016 and the 2019 edition of NFPA 24 outline the requirements for underground pipe. Section 10.1.1 states that the piping used in private fire service mains must meet either Sections 10.1.1.1, 10.1.1.2 or 10.1.1.3.

Section 10.1.1.1 refers to Table 10.1.1.1 which lists acceptable manufacturing standards for underground pipe. CPVC is not referenced in this table, so this section does not apply.

Section 10.1.1.3 refers to steel pipe feeding fire department connections

and also does not apply to CPVC.

This leaves Section 10.1.1.2, which does apply. This section states that piping specifically listed for use in private fire service mains is permitted. Therefore, as long as the CPVC is listed for this use, it is permitted to be installed underground.

Question #4 – Density for an increased design area

On a project which consists of solid piled storage of a class IV commodity, a dry system is required. High temperature-rated sprinklers (control mode density/area) are to be used. In accordance with Figure 14.2.4.2 the starting density is 0.29 gpm/ft² over 2,000 sq. ft. With the 30% increase for the dry system, the new design area will be 2,600 sq. ft.

Can I use the density associated with 2,600 sq. ft. from the design curve? This would result in a density of 0.245 gpm/ft² over 2,600 sq. ft.

The answer is "no". When increasing the area of operation for a dry system (30%) the density is based upon the original or starting area of operation (in this case 2,000 sq. ft). This concept is found in Section 12.5 which says for dry pipe systems: *"the area of sprinkler operation shall be increased by 30 percent without revising the density."*



Question #5 – Valves on Underground lead-ins off fire loop

There is a complex where the sprinkler systems in multiple buildings are to be fed from an underground fire loop. Section 6.2.9 of the 2019 edition of NFPA 24 states that "All connections to private fire service mains" must be able to be isolated by one of seven options.

What exactly are "All connections to private fire service mains"? Does this section require a valve on the lead-in pipe off the fire loop? Or is this section really talking about aboveground connections to private service mains?

You have asked for clarification on the intent of Section 6.2.9 of the 2019 edition of NFPA 24 and specifically you have asked: What exactly are "All connections to private fire service mains"?

In the context of Section 6.2.9, a connection to a private fire service main is explained in annex Section A.6.6.1 which states the fire protection connections can include *sprinkler system lead-ins, hydrants, or other fire protection connections.*

In your example, this section would require a valve for the lead-in piping into the buildings feeding the sprinkler systems. Section 6.2.9 gives seven options for accomplishing this. The purpose of this section is to provide a means of isolating the lead-ins from the water supply.

It should be noted that Section 6.6 may also apply. This section would require sectional valves be provides so that there are no more than six connections on a section of private fire main. The purpose of a sectional control valve is to ensure the ability to isolate a segment of the underground main for maintenance or repair while impacting as few systems as possible. It should be noted that the 2022 edition of this standard will clarify that this section applies to fire loops only.



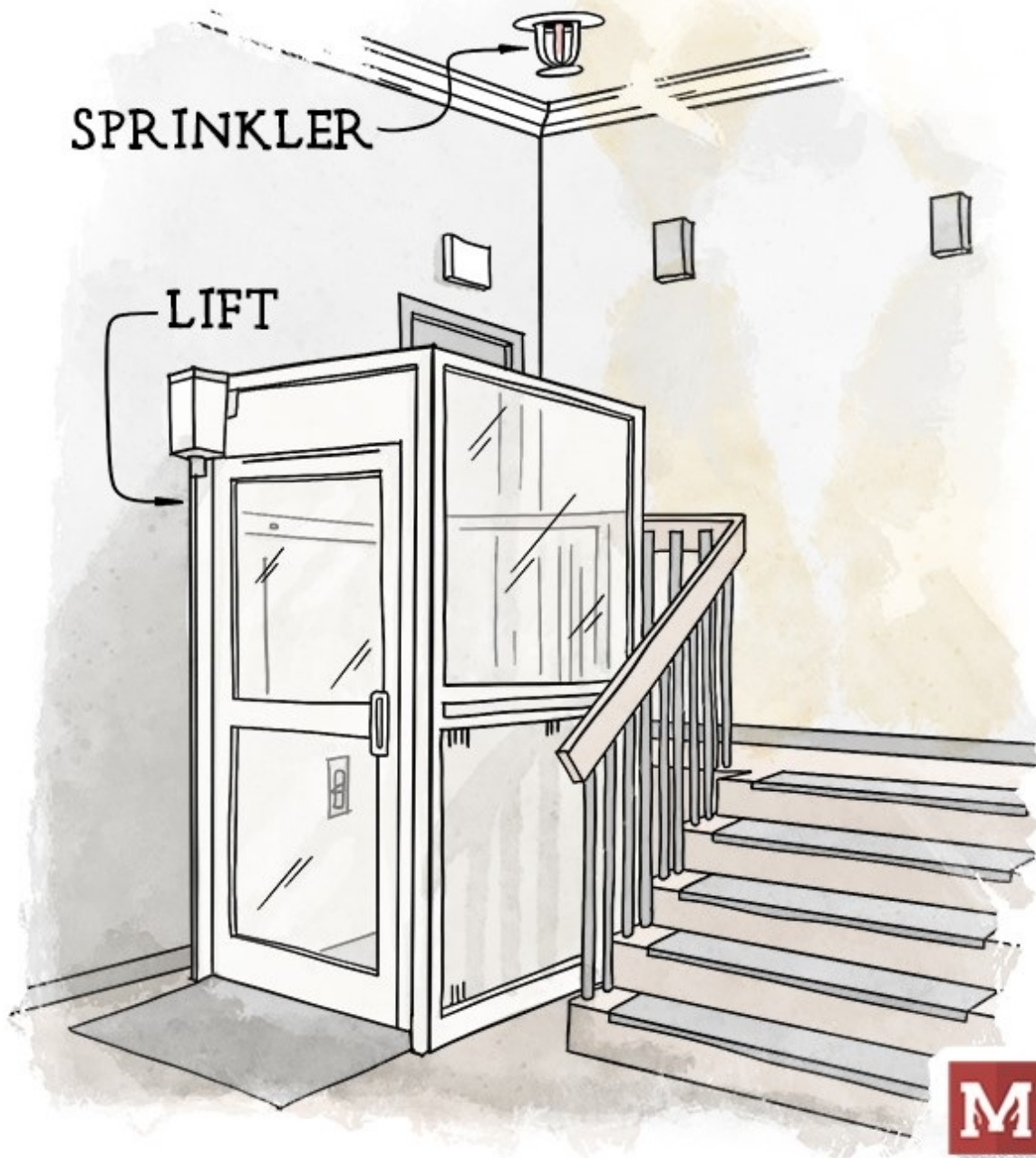
Question #6 – Elevator lift versus elevator shaft

There is an elevator or wheelchair lift in a building (see figure) that is not within an elevator shaft or separated by any barrier.

Does this “lift” need to be protected in accordance with the rules for elevator hoistways (Section 9.3.6 of the 2019 edition of NFPA 13)?

No. This situation does not fall under the elevator hoistways rules of Section 9.3.6. In this case, there is no shaft or hoistway to protect. As this lift is a part of the overall room structure and is open, sprinklers at the ceiling level can protect this equipment. The entire floor area of the room would need to be covered by sprinklers.

One question that may need addressed is: if this lift is over 4 ft wide is it an obstruction that needs sprinklers? NFPA 13 does not specifically answer this question but based on the photo there does not appear to be a practical way to install sprinkler underneath the lift. NFSA would suggest contacting the authority having jurisdiction for additional input.



Question #7 - Booster pump in small NFPA 13 system

A small apartment complex will be getting a full NFPA 13 sprinkler system and a small booster pump is to be installed to support the sprinkler system.

Does the booster pump need to be listed as a fire pump?

Yes, booster pumps installed for fire sprinkler systems are fire pumps. The NFPA 13 sprinkler system is being installed for property protection and if it needs the additional demand pressure, the pump unit must provide it reliably. It is important to note, the International Building Code (IBC) and the International Fire Code (IFC) provide many material or economic tradeups, tradeoffs, and exceptions for NFPA 13 systems. The reliability of a listed fire pump is critical for these benefits.

Non-listed booster pumps are not permitted on the system as they do not

need to meet the same rigorous fire protection listing standards as fire pumps do.

The IBC and the IFC through Section 913.1, states when pumps are installed for fire sprinkler systems, they must meet the fire protection listing requirements in NFPA 20, the *Standard for the Installation of Stationary Pumps for Fire Protection*, through Section 4.7. Furthermore, when the IBC or IFC require the installation of automatic sprinkler systems through Section 903.3.1, it is to be in according to NFPA 13 and NFPA 13R. Both installation standards (NFPA 13: Section 5.2.1 and NFPA 13R: Section 9.5) require fire pumps to be listed and installed according to NFPA 20.

Question #8 – Branchline restraints

For a sprinkler system in a seismic zone, what is the minimum length of a branch line (less than 2.5 in. and hangers greater than 6 in.) that would require restraint?

Section 9.3.6.3 of the 2013 edition of NFPA 13 requires that the end sprinkler on a branchline be restrained. Therefore, all branchlines regardless of length are required to be restrained.

Section 9.3.6.4 goes on to states that branch lines shall be laterally restrained at intervals not exceeding those specified in Table 9.3.6.4(a) or Table 9.3.6.4(b) based on branch line diameter and the value of C_p . The minimum length between restraints would be subject to the material and the C_p of the branch line pipe.

For example: For 1" steel pipe with a C_p value of .60, then the minimum interval between restraints would be 36 feet. If this branch line is less than 36 feet, the end sprinkler needs to be restrained but no additional restraints are required.

Question #9 – Minimum capacity for water storage tank for an ESFR system

In accordance with the 2013 edition of NFPA 22, what would the minimum capacity of a water tank be if the commodity is group A plastic palletized storage protected by an ESFR system?

Not enough information was given to specifically determine the required capacity of a tank serving an ESFR system as the capacity would be determined based upon the sprinkler demand of the system installed. In general, NFPA 22 (2013) states that the capacity of the tank would be based upon the system that it is supplying (in this example the capacity would be based upon the sprinkler demand multiplied by required duration as calculated per NFPA 13 requirements. (In the 2013 edition - see Annex Section A.4.1.1.

Information in NFPA 13 can be found in Chapter 11. Section 11.1.4.1 states

that the water demand requirements is determined by the design approaches found in the storage chapters. Section 12.8 goes on to say that that if applicable, the required hose stream must be added to the water demand for the sprinkler. Section 12.8.1 indicates that if the tanks only serve the sprinkler system and not any hose stations, hydrants etc. than the tank can be sized to provide the duration and demand of the sprinkler system only ignoring the hose stream demand.

Table 12.8.6.1 will indicate the required hose stream (if applicable) and the required duration of the water supply.

Based upon the info given and subsequent phone conversations, it was indicated that the commodity is to be palletized storage of Group A plastics stored 30 feet in height. As this commodity is to be protected with ESFR sprinklers, the appropriate criteria would be found in Table 15.4.1 considering the storage arrangement, commodity classification, storage height, ceiling height, and k-factor. Table 15.4.1 would give you the minimum operating pressure.

Section 15.4.3 indicates that the design area would be 12 sprinklers (four sprinklers on three branch lines).

Based upon the above, the required size of the tank can be estimated based upon the needed sprinkler demand and the required duration from Table 12.8.6.1.

Question #10 – Change of occupancy

An old furniture store has gone out of business and the building is to become a storage facility for a chemical company. No hazardous materials are to be stored in this facility. The building is approximately 38,732 square feet in size.

How do we determine if sprinklers need to be provided based upon this change of occupancy?

Using the International Building Code (IBC), this is a change of occupancy from a mercantile (M) to a moderate hazard storage (S-1). From the fire sprinkler perspective and building area size, both the M and the S-1 are over the thresholds in Chapter 9 of the IBC. Meaning, if it was built new as a M or S-1, 38,000+ sq. ft. it is required to be sprinklered. Technically, the IBC, per Section 102 requires the new occupancy to comply as if built new.

The 2021 International Existing Building Code (IEBC) may provide guidance. It is not a code that the fire marshals are using much, so reach out to the building department or investigate it on your own. Chapter 10 is for change of occupancy. It provides all of the fire protection, egress, and life safety upgrades for a change and specifically Section 1011.2.1 is written for installing fire sprinklers in an existing building with occupancy or use changes. This should be helpful for getting the sprinklers in, but maybe

only to a partial degree. Maybe the remaining portion could be staged for full protection in a few years.

An article that supplements this answer and could be helpful getting compliant can be found in the [March/April 2021](#) issue of NFS Magazine in Codes Corner.

Question #11 – 5-year internal pipe systems

Our customer has a 5-story building with a floor control valve assembly control valve, water flow switch and test/drain on each floor.

There are essentially five wet systems as opposed to one wet system that feeds everywhere, correct? In regard to 5-year internal pipe inspections on wet systems, half of those systems, meaning three of the five systems need to be inspected?

Yes. The definition of a sprinkler system changed in the 2014 edition of NFPA 25 adding that a sprinkler system shall have a water supply, control valve, drain and waterflow alarm. Based on the scenario provided, three systems that would require a 5-year internal assessment in accordance with Chapter 14. The remaining two systems would need to be assessed during the next inspection frequency.

Question #12 – Privacy curtains

Two questions were asked regarding privacy curtains and the 2013 edition of NFPA 13.

Question 12-1: When Section 8.10.7.2.2 along with corresponding Sections in 8.6, 8.7, 8.8, 8.9, and 8.10.6.2.2 (Suspended or Floor Mounted Vertical Obstructions) refers to "privacy curtains" are they referring to curtains hung on thin wire, cords, or similar items that would clearly not represent an obstruction to sprinkler discharge?

Yes, privacy curtain is a generic term that could include those suspended from the ceiling with thin wire, cords, or similar items that would not represent an obstruction to sprinkler discharge or be able to comply with one of the other obstruction rules to sprinkler discharge pattern development rules in the standard. The concern is when the privacy curtains are suspended with fabric mesh that could present an obstruction if the mesh does not meet the requirements of NFPA 13, 2013 edition, Section 8.6.5.2.2.1 as being at least 70% open on the top 22 inches.

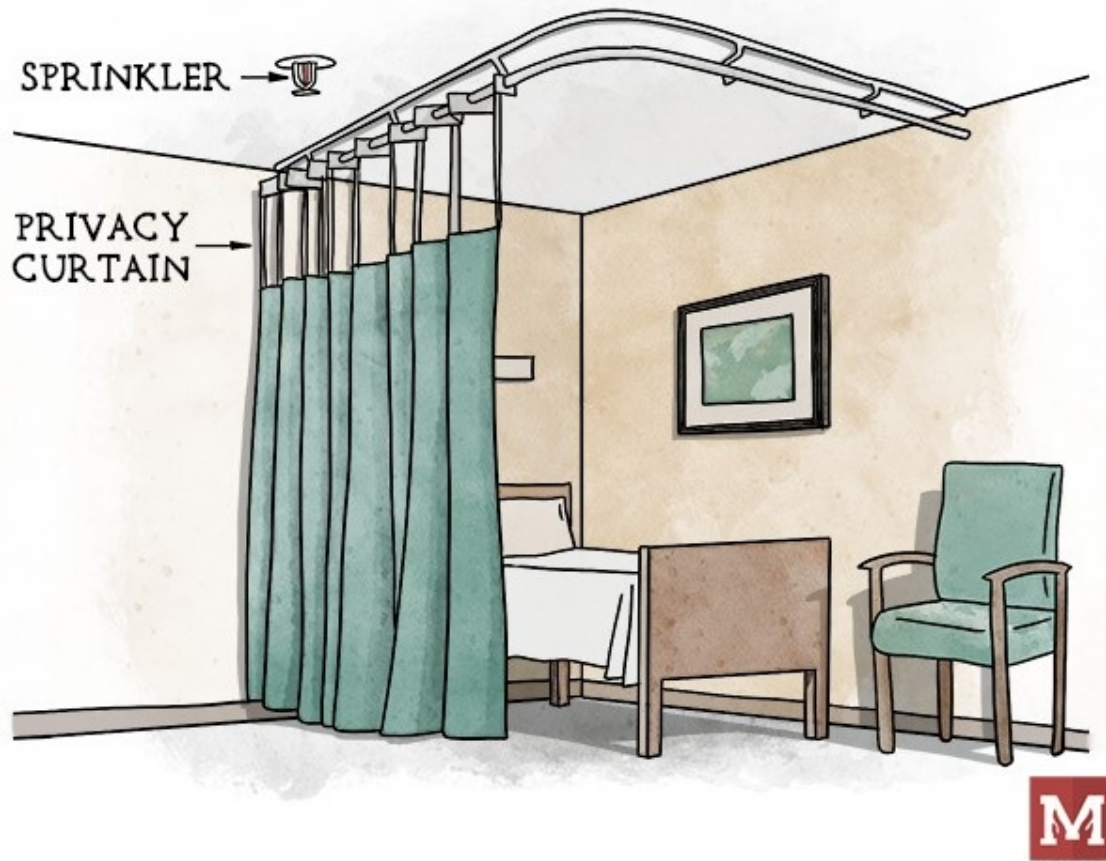
Question 12-2: The spray sprinkler Sections (8.6, 8.7, 8.8, 8.9) have an allowance for privacy curtains hung with fabric mesh that is at least 70% open and extends from the ceiling down 22 inches. This allowance is not included in the corresponding residential sprinkler Sections 8.10.6.2.2 and 8.10.7.2.2. Is this allowance not permitted to be used with residential sprinklers?

Yes, there is no allowance in the standard for fabric mesh on suspended vertical obstructions when using residential sprinklers. Sections 8.10.6.2.2 and 8.10.7.2.2 for residential sprinklers do not provide the exception for fabric mesh as permitted by the standard for spray and extended coverage sprinklers.

Work was done on vertical curtains and sidewall sprinklers for some health care situations. The test report was titled, "The Effect of Privacy Curtains on Sprinkler Spray" by Jason Averill at the National Institute of Standards and Technology - US Dept. of Commerce. The work was published in July 2004. This report was used by the committee for the 2007 edition of NFPA 13 relative to privacy curtains.

Residential sprinklers are held to a higher performance standard than standard spray sprinklers including life safety criteria. Section 3.6.4.8 defines a residential sprinkler as a type of fast-response sprinkler having a thermal element with an RTI of 50 (meter-seconds)^{1/2} or less, that has been specifically investigated for its ability to enhance survivability in the room of fire origin, and that is listed for use in the protection of dwelling units.

It appears the intent of the standard is to not allow the fabric mesh on suspended vertical obstructions when using residential sprinklers due to the enhance survivability requirements and potentially due to a lack of test data relative to the performance of residential sprinklers and fabric mesh obstructions.





Layout Technician Training Class

The Layout Technician Training class is designed to take a person with basic knowledge of math, physical science and drafting skills and teach them to be productive basic sprinkler layout and detailing technicians. All of the work elements necessary for NICET Level II Certification will be covered by the course.

Layout Technician Training
August 10 - Sept 2, 2021

Blended Layout Practicum
August 25 - Sept 2, 2021



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](#).

National Fire Sprinkler Association

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