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

TechNotes

Editor - Roland Asp, CET | #461 | 04/13/2021

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Best of March 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 March 2021. This information is being brought forward as the "Best of March 2021." If you have a question for the NFSA EOD submit your question online through the "My EOD" portal.

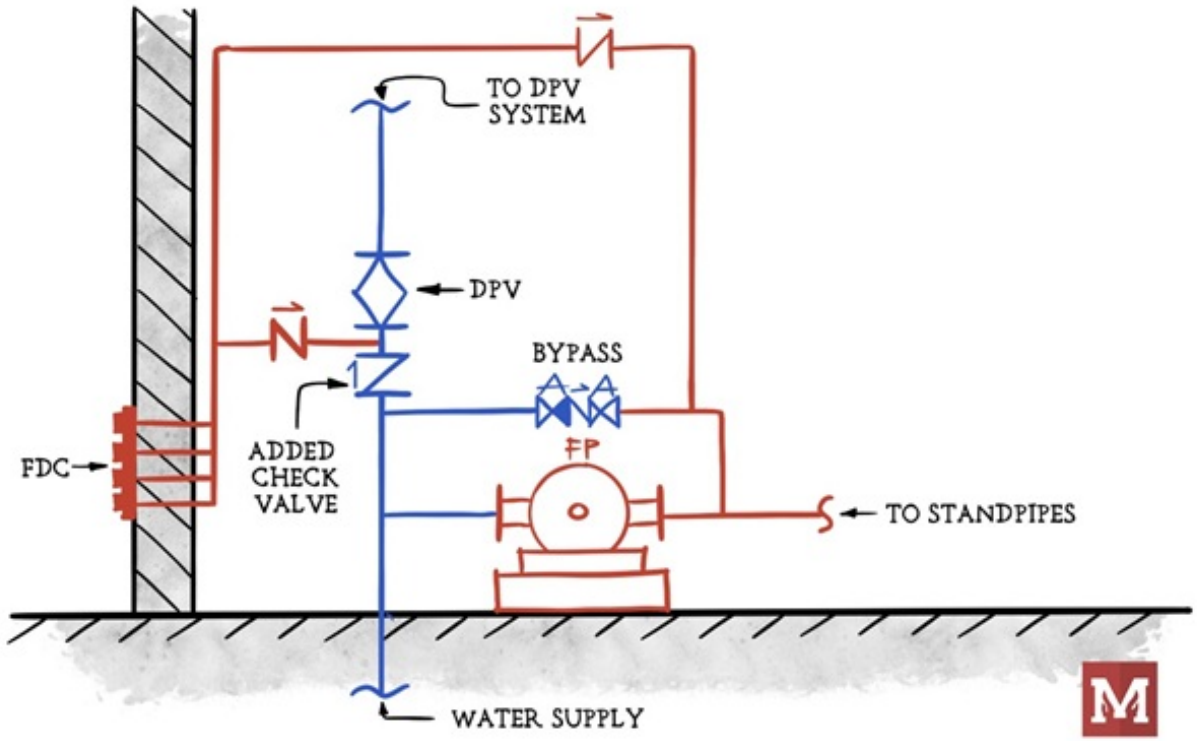
It should be noted that the following are the opinions of the NFSA Engineering, Codes, and Standards staff, generated as members of the relevant NFPA and ICC technical committees and through our general experience in writing and interpreting codes and standards. They have not been processed as formal 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 – Check Valve Separating FDC from Fire Pump Suction

A building includes automatic standpipes that are to be fed with a fire pump. The same structure also includes a dry sprinkler system in the garage level that do not require the pressure provided by the fire pump. It is desired to have a single fire department connection (FDC) serving both the dry system in the garage and the standpipes in the building and pressure reducing valves (PRV) are not desired for the garage sprinkler system. The FDC cannot be arranged to pressurize the pump inlet but if a check valve could be added to isolate this length of pipe, then the FDC could connect to two points in the system with separate check valves. See Figure below.

Can an FDC serve both dry valves upstream of a fire pump and the standpipe downstream of a fire pump as long as there is a check valve added to prevent the FDC from pressurizing the suction side of the fire pump?

Yes, the intent of Section 6.4.3.1 of the 2019 edition of NFPA 14 is to avoid a situation where a pumper truck would increase the suction pressure of the fire pump potentially exceeding the pressure rating of the above ground piping. By adding the check valve, you prevent the FDC from pressurizing the fire pump suction. If the intent of the arrangement in the sketch is for the fire pump to only supply the standpipe system, the location of the fire department connection is acceptable.



Question #2 – Limited area sprinkler system and NFPA 25

Does NFPA 25 apply when inspecting a limited area sprinkler system with six or less sprinklers?

NFPA 25 does not directly address limited area systems allowed by NFPA 13. Depending on how the limited system is installed it may meet the definition of a sprinkler system found in Section 3.6.4 of NFPA 25. Changes to this definition were made in NFPA 25 in the 2014 edition, for prior editions just about any type of system would meet the definition if it had sprinklers, a control valve and automatic water supply. To meet the 2014 definition, it must have a water supply, control valve, drain, and alarm device. If it does not meet this definition then the authority having jurisdiction would have the final decision on what requirements for inspection, testing, and maintenance (ITM) would be needed. Even though these systems may not be directly addressed by NFPA 25, it is good practice to ensure that the components installed are properly maintained. NFPA 25 would be the document to determine the correct ITM requirements for each individual component for limited area sprinkler systems. Lastly, it is important to note that the International Fire Code states that sprinkler systems shall be tested and maintained in accordance with Section 901.

Question #3 – Velocity Limits

Are there advisory limits on flowing velocity for sprinkler systems?

No. NFPA 13, 2019 edition, Section 27.2.1.4 indicates, unless required by other NFPA standards, the velocity of water flow shall not be limited when hydraulic calculations are performed using the Hazen–Williams or Darcy-Weisbach formulas.

Section A.27.2.1.4 goes on to indicate that NFPA 13 does not provide a specific velocity limitation for the use of the Hazen-Williams formula. This is, in part, due to an expectation that excessive friction loss values will result in increasing pipe sizes, thereby serving as an inherent limit on velocity. However, the fact that NFPA 13 does not provide a specific limit should not be taken as an endorsement that the formula can be used for any velocity of water flow. The formula was empirically determined using "normal" conditions. When the velocity in the pipe exceeds that which was used to determine the formula, the formula might no longer be valid. There has been some research performed (Huggins 1996) in which results using the Hazen-Williams formula and the Darcy-Weisbach formula were compared, and the conclusion was that a specific velocity limit applied to all pipe sizes is not appropriate.

Factory Mutual (FM) Data Sheet 2-0 includes a maximum recommended velocity of 30 ft/second for use of the Hazen Williams formula. Many engineer's specifications include a maximum velocity requirement for hydraulic calculations as part of the contract documents. We have seen engineer's specifications with requirements for a maximum velocity of as low as 25 ft/second.

The September-October 2010 issue of SQ magazine includes a detailed article titled, "Does Velocity Matter?" This article can be viewed on our website **here**.

Question #4 – Exterior Canopy with Openings

An exterior canopy protected by a dry system. There are openings in roof that are open to the sky above.

Does the floor area below these openings need to be protected with sprinklers?

Yes, the building surrounds the opening in the ceiling. Assuming the building or fire area is required to be sprinklered throughout, the roof opening in the canopy would still be considered part of the building area. NFPA 13 does not have a specific exception or allowance to exempt this floor area from the protection area of the required sprinkler coverage.

Question #5 - Minimum Pipe Nipple Sizes in Seismic Designed Systems

There is a project that includes ¾" branch line outlets on an existing wet pipe system requiring new arm-overs for a remodel of the building. The 2010 edition of NFPA 13 states in Section 8.15.19.4.4 that ¾" pipe nipples cannot be used in a seismic zone. Can a 1"x ¾" street 90° be used in lieu of the pipe nipples?

Although this question is not directly answered in NFPA 13, the answer is likely no. The purpose of limiting pipe nipples less than 1 in. in areas subject to earthquakes is that these small diameter nipples may fail in an earthquake event, especially when feeding sprinklers below. This is why a minimum size of 1-inch for pipe nipples is required by Section 8.15.19.4.4.

Although we have not researched the relative strength of a ¾ x 1 inch street elbow in comparison to a 1-inch pipe nipple, this concept would still apply and the minimum pipe fitting size in a seismic area would also be 1-inch. This is supported by the Automatic Sprinkler Handbook which states that to prevent failures in seismic zones the minimum size of both fittings and piping is 1-inch.

Although not part of the standard, this commentary specifically calls out that both the pipe and the fitting must be a minimum of 1 inch. Again, this commentary is not part of the standard and if you can prove to the AHJ that the 3/4 x 1 inch street elbow has sufficient strength to prevent failure in an earthquake event, the AHJ may accept as an equivalency.

Question #6 - Wood Slat Ceiling

There is a project with a wood slat ceiling located more than a foot below the structural ceiling. This slatted ceiling is less than 70% open.

Are sprinklers required below the slatted ceiling, above the slatted ceiling or are they required both above and below?

Sprinklers will be required both above and below this slatted ceiling.

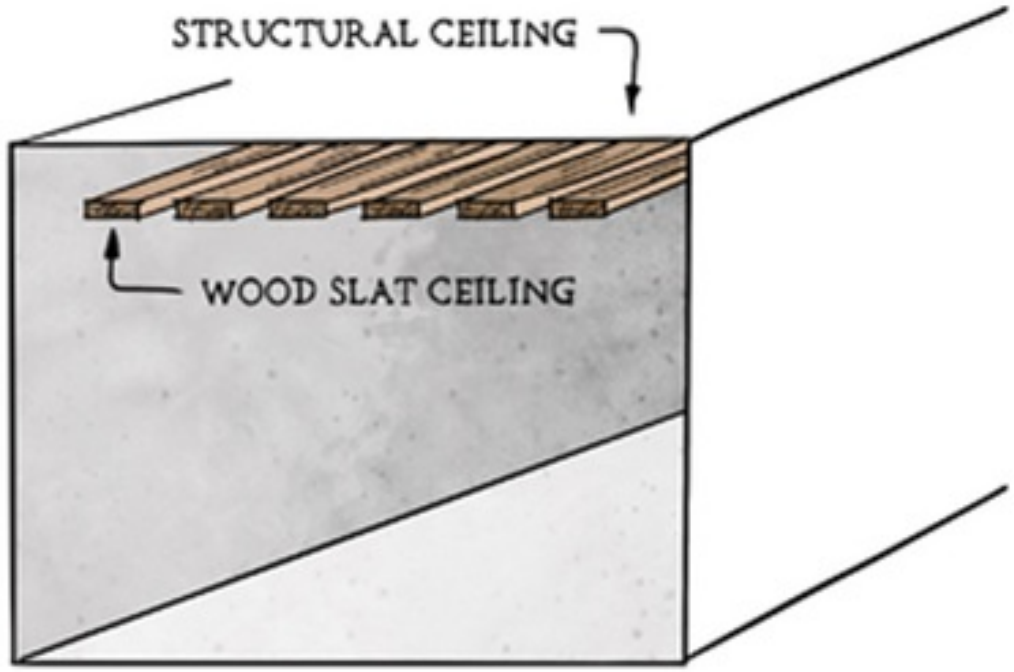
Sprinklers are required above the slatted ceiling because sprinklers need to be within 12-in of the top of the space in order to provide cooling for the structure.

Sprinklers are required below the slatted ceiling because the slats of wood create a significant obstruction to the spray from the sprinklers above the ceiling. Based on the information provided, the size of the slats and the opening dimensions provided, this slatted ceiling is less than 70% open, and this limited open area would certainly create a cumulative obstruction that would need to be considered.

NFPA 13 does not have language to deal with multiple small obstructions that are spaced close together. In this case it would be best to consider

NFPA 13 Section 8.1.1(3) (2010) which states that "Sprinklers shall be positioned and located so as to provide satisfactory performance with respect to activation time and distribution".

Section 8.15.13 of NFPA 13 (2010), Open-Grid Ceilings, can provide guidance for the situation described if the open area was 70% or more. This section does indicate that sprinklers would be permitted to be omitted below the lower ceiling if the openings constitute 70% or more of the total ceiling area. Another principal of the open grid ceiling rule that must be kept in mind is that the distance between the slats must be equal to or greater than the depth of the material.



Question #7 - Backflow Retrofit in a Pipe Schedule System

A backflow preventer is being retroactively installed in an existing pipe schedule sprinkler system. The adopted edition of NFPA 13 is the 2010 edition. Based upon Table 11.2.2.1, the following analysis was conducted:

Light Hazard = 15 psi (Table 11.2.2.1)
Elevation of Highest Sprinkler = 40'-0"
Elevation Loss = 17.32 psi (40 x 0.433)
Friction Loss DCVA @ 500 gpm = 8 psi
Required at base of riser = 40.32 psi @ 500 gpm

Is this example the correct method of analysis when retroactively installing a backflow assembly in a pipe schedule system, and additional fittings and horizontal runs need not be considered?

It appears that the example that you have included is the correct method of

analyzing the friction loss associated with a backflow prevention device that is retroactively installed in a pipe schedule system.

It should be noted that Section 8.17.4.6.2 states that when a backflow prevention device is added to an existing system a thorough hydraulic analysis shall be performed to account for the friction loss impact associated with this new device. However, the commentary associated with this section in the "Automatic Sprinkler Handbook (2013 edition)" does state that "Existing pipe schedule systems are not required to be recalculated in accordance with the hydraulic calculation methods of Chapter 11 when a backflow prevention device is retroactively installed.

However, pipe schedule systems are required to meet certain pressure and flow requirements in accordance with Chapter 11. As in the case of a hydraulically calculated sprinkler system, it must be verified that the water supply still meets the demand of the pipe schedule system after the installation of a backflow prevention device."

The method you have highlighted does follow the pipe schedule method found in Section 11.2.2 (including 11.2.2.6.2) to ensure that the water demand is met after the installation of the backflow prevention device.

This method does not have a requirement to consider "fittings and horizontal runs" however the annex to Section 22.5.1.4 titled Size of Risers should be considered. Section A.22.5.1.4 states that where there are unusually long runs of pipe or many angles in risers or mains, an increase in pipe size over the pipe schedules can be required to compensate for increased friction losses.

It also must be noted that the 500-gpm flow at the base of the riser that you have used is only appropriate where the water flow is electrically supervised and monitored. If the system only includes a local alarm, then the higher flow (750 gpm) must be used. See Section 11.2.2.5. Also, to use the lower flow (500 gpm) the building needs to be of noncombustible construction or there are no open areas that exceed 3000 sq. ft as noted in Section 11.2.2.7.

Question #8 – Hanging and Bracing of Standpipes

A multistory building has floors that are 13 foot apart and there is a riser clamp on each floor to support the riser. The 2010 edition of NFPA 14 is being enforced.

Are restraints below each floor also required? The current install has them on every other floor using riser clamps on the underside of the slab.

Are additional restraints required when pressure exceeds 300 psi?

NFPA 14 does not specifically address the hanging and bracing of risers in multi-story building. The requirements for riser pipe support are found in NFPA 13- 2010 Standard for the Installation of Sprinkler Systems. NFPA 14, Section 6.5 Support of Pipe, refers the user back to NFPA 13 for those

requirements.

The requirements for the support of riser pipe are found in Chapter 9 Installation Requirements for Hanging and Support of System Piping. Section 9.2.5.1 allows risers to be supported by riser clamps or hangers on horizontal connections within 24 in. of the centerline of the riser. Section 9.2.5 has the additional requirements for the support of risers and Section 9.2.5.4 Multistory Buildings, which has 5 requirements (9.2.5.4.1-9.2.5.4.4 & 9.2.5.5):

1. Support provided at the lowest level, each alternative level above and below offsets and at the top of the riser.
2. Supports above the lowest level shall restrain pipe movement upward where flex fittings are used.
3. Where support is from the ground it shall constitute the first level of support.
4. Where risers are offset or do not extend from the ground, the ceiling level above the offset shall constitute the first level of support.
5. Maximum distance between support cannot exceed 25 feet.

NFPA 13 – 2010 does not have any additional requirements for riser support for systems exceeding 300 psi. NFPA 14 – 2010, Section 7.2.1 does not allow system pressures at any point to exceed 350 psi. The 2019 edition has increased that maximum pressure to 400 psi.

Question #9 – Inertia Base for Fire Pump

The acoustics consultant on a project has recommended an inertia base for a new fire pump installation on the ground floor.

Does this conflict with NFPA 20 which emphasizes rigid foundations and support for fire pumps?

Yes, the use of an inertia base on a centrifugal fire pump is in conflict with the prescriptive requirements of NFPA 20, 2016 edition.

Section 6.4.4 requires the foundation be sufficiently substantial to form a permanent and rigid support for the base plate.

The NFPA 20 committee previously rejected proposals to permit the use of an inertia base and indicated with a committee statement, “Committee feels inertia bases should not be used for a fire pump.”

Question #10 – Vertical Distance Clearances from Heat Sources

Table 8.3.2.5(c) of the 2016 edition of NFPA 13 states that in a residential area, an ordinary temperature sprinkler cannot be less than 60 inches from the front of a recessed fire place.

Does this minimum distance extend all the way to the ceiling?

Yes, unlike Table 8.3.2.5(a), Table 8.3.2.5(c) *Temperature Ratings of Sprinklers in Specified Residential Areas* does not include vertical distances. The minimum distance from the edge of the source of heat to the sprinkler (either ordinary-temperature or high-temperature) specified in this table extends from the floor to the ceiling.

This concept has been clarified and illustrated in the 2019 edition of NFPA 13. Annex Figures A.9.4.2.5 (a - d) show the distances of this table extending from floor to ceiling.

Question #11 – Hydrostatic Test of Underground Piping

Section 10.10.2.2.1 of NFPA 24 requires that all piping and attached appurtenances subject to system working pressure must be hydrostatically tested. This project will consist of cutting in a tee in the distribution main to provide service to a new sprinkler system. There will be a new curb box valve (approved by AHJ) near the tie-in point. The plan is to perform a hydrostatic test on all of the new piping up the newly installed valve at the tie-in point and to perform a visual test at water supply pressure of the newly installed tee to the newly installed valve.

There does not seem to be a section of NFPA 24 that allows for the visual testing of the tee up to the new valve. There is a concern of pressurizing the existing water supply system to 200 psi when the working pressure is only 90 psi.

Are you required to hydrostatically test a newly installed tee in the distribution that provides water to a new sprinkler system?

Assuming that the distribution main that is being tapped into is owned by a separate entity then the owner of the private service main, the answer to this question is that NFPA 24 does not require a hydrostatic test be performed on the tee of a distribution main that feeds a private water service main supplying a sprinkler system. The scope of NFPA 24 is limited to private fire service mains only and does not include the water distribution system (especially if the street mains are owned by another entity such as a water utility). It is not clear from your question if the distribution main is part of a water utility or is an onsite private main.

In support of this concept is the definition of private fire service mains which is found in Section 3.3.13. The definition states that a private fire service main is the pipe and its appurtenances on private property that is between a source of water and the base of the system riser… The keyword in this section “on private property”. The tap into the distribution system (street main) is not typically within the scope of NFPA 24. The private service main and the requirements of NFPA 24 would end at the property line. See figure A.3.3.13 which clearly indicates that the end of the private fire service main is at the property line. Based upon this, the hydrostatic test would be performed on the underground private main from the new curb box valve at the property line to the system riser.

The scope of NFPA 24 and the definition of private fire service main has implications for acceptance testing. The portion on private land is owned by the building owner and is subject to all the acceptance testing requirements of NFPA 24. Past the property line is the public main which is owned and operated by others. Public mains and accessories are tested to a different standard and are not subject to the requirements of NFPA 24.

It is suggested that you speak with the water purveyor for any required acceptance testing requirements for the tap to the distribution main to the curb box.

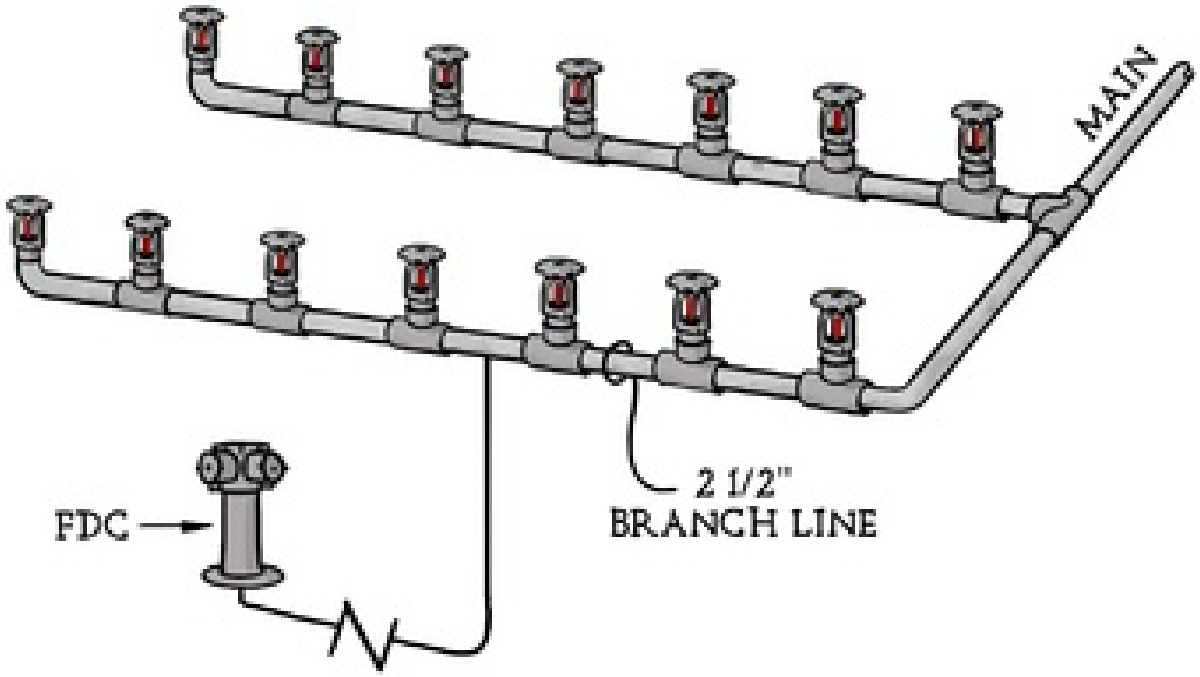
If, however, the distribution mains are not under the jurisdiction of a public utility and the entire water distribution system is considered a private fire service main, the acceptance criteria of NFPA 24 would apply. The one exception would be if this system meets the criteria of Section 1.1.3 (2) which states that “Mains providing fire protection and/or domestic water that are privately owned but are operated as a water utility” are not within the scope of NFPA 24.

Regardless, performing a hydrostatic test on an existing distribution main seems problematic and may not be successful in holding the required pressure. Again, it is suggested that you have a conversation with whomever is the appropriate AHJ to determine if a visual inspection from the new tee to the curb box would be acceptable.

If it is determined that a hydrostatic test of the new cut-in tee is required, this new section should be isolated for the hydrostatic test. Isolation or blind flanges may be needed at the tee to isolate the new section from the existing. This concept is highlighted in A.10.10.2.2.6 of NFPA 24 which states that blind flanges are recommended over metal seated valves as valves may leak more than 1 fl oz/in. of valve diameter per hour.

Question #12 – FDC Tie-In to Large Branch Line

No, this would meet the definition of a branch line. A branch line is defined in section 3.5.4 as the pipes supplying sprinklers directly or through sprigs, drops, return bends or arm-overs. A main is defined in section 3.5.6 as the pipe supply cross mains either directly or through risers. These definitions are not based on sizing but are defined by their role in the sprinkler piping network. Section 8.17.2.4.1.1 states "The fire department connection shall not be attached to branch line piping." Based upon this, you cannot tie the FDC into a branch line as described.



Layout Technician Training

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.

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
April 20 - May 20, 2021
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August 10 - Sept 2, 2021

Layout Technician Training
Nov 2 - Dec 2, 2021

Blended Layout Practicum	Blended Layout Practicum	Blended Layout Practicum
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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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