

Best of June 2022

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 2022. This information is being brought forward as the "Best of June 2022." 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 recently published edition of the standard referenced was used.

Question #1 – Sprinkler Protection for 22 inch Joists at 24" on Center

A project consists of exposed 22 inch deep beams spaced 2 feet on center. As this is considered obstructed construction, the 2019 edition of NFPA 13 states that the sprinkler needs to be located 1- 6 inches below the beam and a maximum of 22 inches below deck.

It is not possible to meet this requirement and it is not desired to install sprinklers in every beam pocket. Does NFPA have an exception to this requirement?

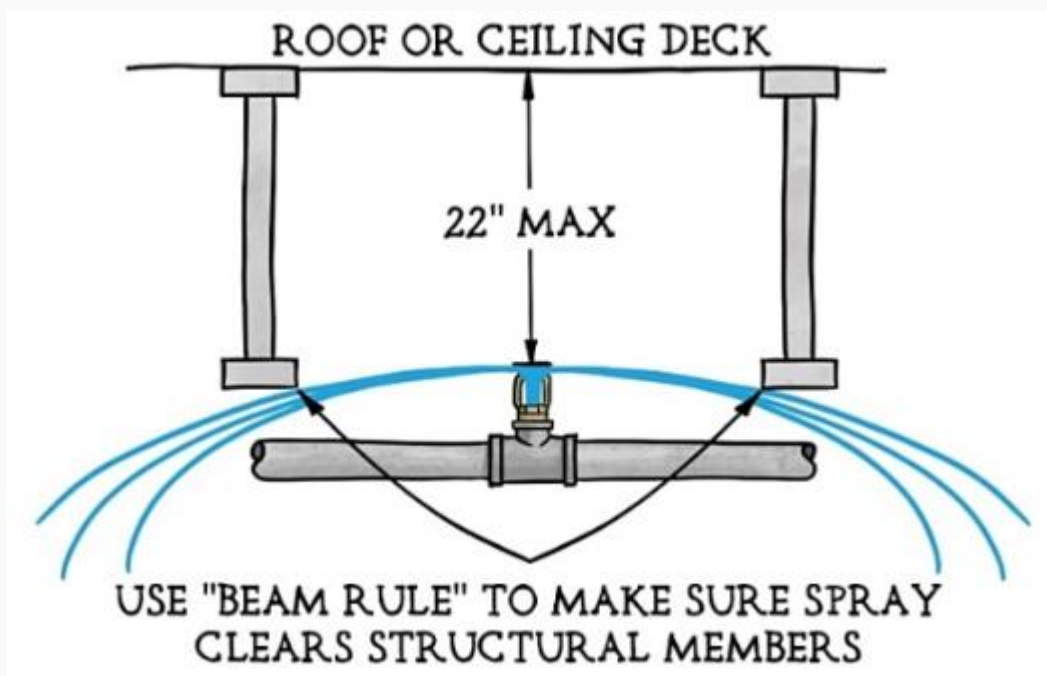
Yes. Section 10.2.6.1.2 (1) of the 2019 edition of NFPA 13 does indicate that the sprinkler deflector needs to be installed within 1 inch to 6 inches below the beams and no more than 22 inches below the roof deck. However, the charging statement of Section 10.2.6.1.2 states that under obstructed construction, the sprinkler deflector must be located in accordance with one of the five arrangements of this section.

While it would not be possible to meet the requirements of 10.2.6.1.2 (1), it does appear that you can meet the requirements of subsection (2) of this section.

Section 10.2.6.1.2 (2) states that the sprinkler deflector may be located at or above the bottom of the joists and no more than 22 inches below the deck if section 10.2.7.1.2 (beam rule) is met. Table 10.2.7.1.2 indicates that where the sprinkler is located less than 1 foot from the edge of the obstruction (in this case the 22 inch beam, then the sprinkler deflector is permitted to be located even with the bottom of the joist.)

Based on this section, a sprinkler installed with the deflector positioned 22 inches below the deck would be located even with the bottom of the 22 inch beam. This meets the provisions of section 10.2.6.1.2 (2) and section 10.2.7.1.2 (beam rule) and could be considered an exception to the base requirement to have the sprinkler installed 1 inch to 6 inches below the bottom of the beam.

If for some reason the above cannot be met (for instance if the beam is deeper than 22 inches, then another option may be to install a false deck (such as with installation that would effective lower the plane of the roof deck) as allowed by section 9.5.4.1.3.



Question #2 – Minimum Area of Coverage for CMDA Sprinklers

The 2016 edition of NFPA 13 states that the minimum area of coverage is 64 square feet for Early Suppression Fast Response (ESFR) sprinklers and is 80 square feet for Control Mode Specific Application (CMSA) sprinklers.

Is there a minimum area of coverage for Control Mode Density Area (CMDA) sprinklers?

No. There is no minimum protection area of coverage requirement for standard spray sprinklers, therefore their minimum area of coverage is only limited by the minimum distance between sprinklers. Standard spray sprinklers are required to be a minimum of 6 feet apart.

CMDA design criteria is based on the use of standard spray sprinklers. NFPA 13, 2016 edition, Section 8.6, unlike Sections 8.11.2.3 for CSMA and 8.12.2.3 for ESFR, does not provide a minimum protection area of coverage. Section 8.6.3.4.1 for standard spray sprinklers indicates unless the requirements of 8.6.3.4.2, 8.6.3.4.3, or 8.6.3.4.4 are met, sprinklers shall be spaced not less than 6 feet on center.

Question #3 – Fire Department Connection in Rural Areas

A sprinkler system is being supplied by a water storage tank. The building is in a rural area with no public water supplies or fire hydrants.

Is a fire department connection (FDC) required and if so, should a means for the fire department to access the water in the tank be provided?

Yes, if the building is accessible for fire department support, a FDC is required by the standard even if there is no usable public water supply. The intent is if a building is accessible to fire department vehicles, a fire department connection be provided.

The tank should be arranged to be utilized by the fire department and the hose allowance included in the size of the tank, or another water supply sources such as a natural body of water, separate tank, or a reservoir should be utilized.

NFPA 13, 2016 edition Section 8.17.2 for FDCs indicates that unless the requirements of 8.17.2.2 are met, a fire department connection shall be provided as described in 8.17.2

Section 8.17.2.2 indicates the following systems shall not require a fire department connection:

1. Buildings located in remote areas that are inaccessible for fire department support.
2. Large-capacity deluge systems exceeding the pumping capacity of the fire department.
3. Single-story buildings not exceeding 2000 square feet in area.

Section A.8.17.2.1 goes on to explain that where a hydrant is not available, other water supply sources such as a natural body of water, a tank, or a reservoir should be utilized.

Simply being in a remote area does not satisfy the requirements of Section 8.17.2.2 (1) to omit a fire department connection. The standard only allows fire department connections to be omitted if the building is located in a remote area that is also inaccessible for fire department support.

The International Fire Code (IFC, 2021 edition) Section 507 requires an approved water supply and fire flow. This can also be found in more detail in NFPA 1, 2021 edition, Sections 18.3 and 18.4.



Question #4 – Clearance to Storage ESFR

An ESFR sprinkler located under an obstruction is less than 36 inches above the top of low piled storage (8 feet storage height).

Is there an exception that would allow this ESFR sprinkler to be closer than 36 inches to the top of this storage?

No. As stated in section 14.2.12 in the 2022 edition of NFPA 13, the clearance from the deflector of an ESFR sprinkler to the top of storage must be at least 36 inches.

It should be noted that in the case described (protecting low piled storage), it is possible that the design criteria would be Ordinary or Extra Hazard (depending on commodity, storage height and storage arrangement) based upon Table 4.3.1.7.1.1 (see section 4.3.1.7.2) however, this does not impact the required clearance from storage. This is based upon the type of sprinkler which as stated above is 36 inches for ESFR sprinklers.

It should also be noted that in the 2022 edition of NFPA 13, a new section was added that states for ESFR sprinklers protecting a light or ordinary hazard space, the spacing requirements and the obstruction rules for standard spray sprinklers is permitted to be used (see section 14.2.7.1.). This does not however allow the 18 inch clearance to storage for standard spray sprinklers to be applied to ESFR sprinklers.

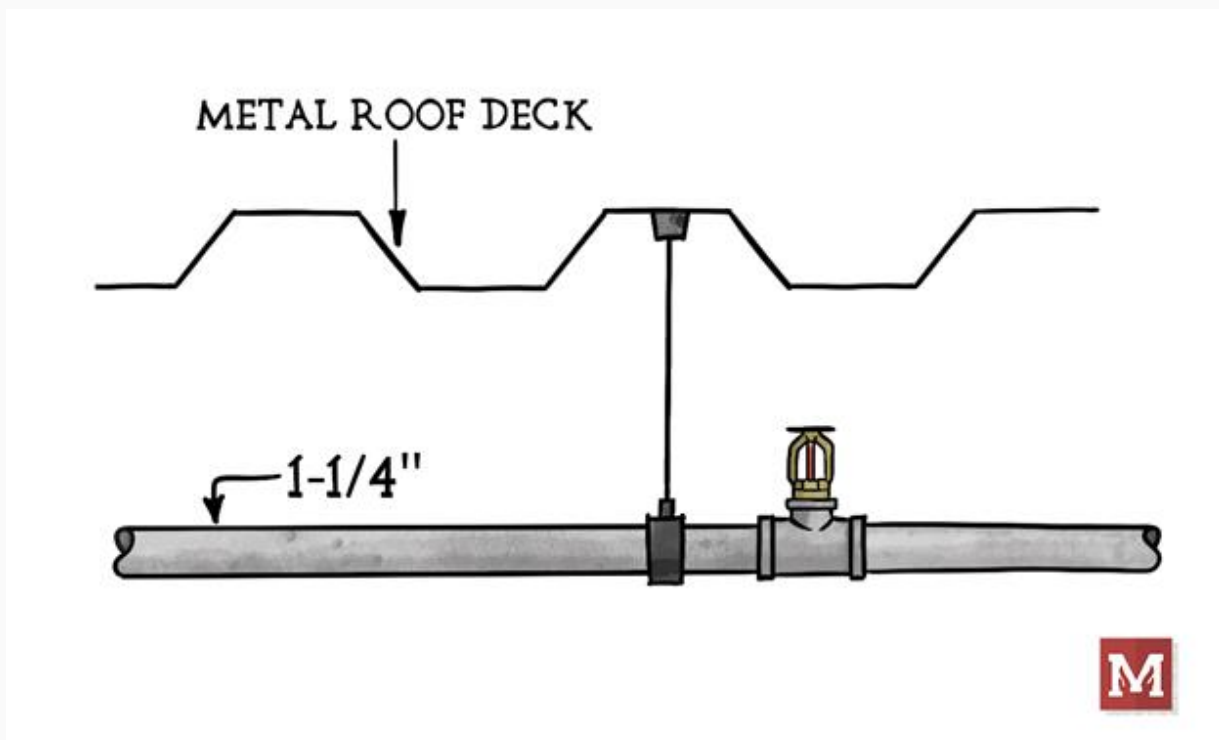
Question #5 Hanging from Metal Decking

Section 9.2.1.4.1 in the 2016 edition of NFPA 13 states that branch piping 1 inch or less is permitted to be hung from a metal deck.

Can 1 ¼ inch sprinkler piping be hung from metal deck when a specific hanger has been designed and approved by a structural engineer?

Yes, if certified by a registered professional engineer, sprinkler piping greater than 1 inch is permitted to be supported from a metal deck if the method of attachment and ability of the deck to support the necessary loads (see section 9.2.1.3.1) are approved by a registered professional engineer.

This was clarified in the annex to this section in the 2019 edition of NFPA 13. See annex section A.17.4.1.4.1. It is understood your question is specific to the 2016 edition, but since the annex language provides explanatory material (or intent) behind a specific section, it could be used as guidance for your situation.



Question #6 - Warehouse Standpipe System

A single-story warehouse project requires a Class I standpipe in accordance with the 2016 edition of NFPA 14. The standpipe system must be separate and not connected to the sprinkler system unless permitted in NFPA 13.

Is it permitted for the standpipe system to be fed from a common water supply and fire pump but separate from the sprinkler risers?

Yes, the configuration described is compliant with NFPA 14 *Standard for the Installation of Standpipe and Hose Systems*. Systems are allowed to be combined or independently supplied directly from the feed main. Feed mains are used to supply water to one or more standpipes or sprinkler systems.

Combined systems are only allowed when the building is partially or fully protected with sprinklers and must be sized in accordance with NFPA 14 Section 7.6. Combined systems are allowed to share the water supplying both the standpipe and sprinkler systems with the standpipe supplying the sprinkler system.

NFPA 13 *Standard for the Installation of Sprinkler Systems* does allow hose connections on a sprinkler system but where a standpipe is required to meet NFPA 14, it would not be allowed to be supplied directly from the sprinkler system.



Question #7 – Pipes Less than 1 inch in Sprinkler Systems

A sprinkler system is being installed in accordance with the 2013 edition of the NFPA 13. The system piping is to be black steel and there is a very strong water supply, and it is suggested that the branch line piping be reduced to 3/4 inch.

Where does it say steel pipe is permitted to be less than 1 inch on a sprinkler system?

The 2013 edition of NFPA 13 (and all recent editions) do not allow steel pipe less than 1 inch in diameter to be installed. For hydraulically calculated systems, this is noted in Section 23.4.1.2. For pipe schedule systems this is noted in the pipe schedule tables (tables 23.5.2.2.1 and 23.5.3.4.)

There is one limited exception. Section 8.15.20.4, *Revamping of Pipe Schedule Systems* and Section 8.15.20.5, *Revamping of Hydraulic Design Systems* both allow a pipe nipple that is no longer than 4 inches to be less than 1 inch in diameter. This allows an existing upright sprinkler (with a 1/2 inch thread) to be removed and a short 1/2 of 3/4 inch nipple to be piped to a 1 inch drop to a new pendent sprinkler.

Note that this nipple is limited to 4 inches in length and that the use of pipe nipples less than 1 inch is not permitted in seismic zones. (See 8.15.20.5.4)

It should be noted that the 2016 edition of NFPA 13 added an allowance for the use of extension fittings which are smaller than 1 inch in diameter. Extension fittings are now defined in section 3.5.6 and section 6.4.8 of the 2016 edition of NFPA 13 contains allowances for these fittings.

It should also be noted that NFPA 13 did allow the use of 3/4 inch pipe in the past. It appears that 3/4 inch pipe was removed from the pipe schedule tables of NFPA 13 in 1940. Although access to the 1940 edition of NFPA 13 is not available, the twelfth edition (1962) of the Fire Protection Handbook addresses this topic.

This book states that the 1905 pipe schedule (known as the 12-3 schedule based upon the number of sprinklers allowed on the 3/4 inch, 1 inch, and 1 1/4 inch pipe sizes, respectively) was changed in the 1940 edition of the standard. For the 1940 edition, the Fire Protection Handbook states "In that year the Sprinkler Standard made a radical departure in eliminating 3/4 inch pipe for branch lines in order to improve water discharge at end sprinklers and to reduce the danger of clogging".

Question #8 – Riser Room Located under Stairs

Can a sprinkler riser room be located under stairs in an apartment complex in accordance with the IBC?

The IBC does not specifically regulate where the riser can/cannot be in a building. However, it does provide guidance and criteria for ensuring there is adequate access and working space to install the equipment and perform maintenance later. These considerations must be kept in mind when determining where the riser assembly should be located.

To specifically address the question, there is no prohibition to placing a riser room under a set of stairs in an apartment building. The IBC does require clearances around equipment to elements of permanent construction, including other installed equipment and appliances, must be sufficient to allow for inspection, service, repair, or replacement without removing such elements of permanent construction or disabling the function of a required fire resistance rated assembly. It goes on to say that riser rooms must also be provided with doors and unobstructed passageways large enough to allow removal of the largest piece of equipment. Furthermore, the room must be maintained at a minimum temperature of 40°F, any heating units must be permanently installed (no portable space heaters), and permanent lighting must be installed/provided.

While not specifically a sprinkler issue, the building code in section 1011.7.3 also requires walls and soffits within enclosed usable spaces (or rooms) under stairs to be protected with 1-hour fire resistive rated construction or the fire resistance rating of the stairway enclosure (which may be 2-hour depending on the number of floors served), whichever is greater. There is an exception that if the stair only serves one dwelling unit, the enclosure can be protected with 1/2 inch gypsum board as an alternative to a 1-hour rated enclosure. Separate requirements will apply if this stair is considered an exterior exit stairway (see IBC section 1011.7.4).

If not already, the architect should be made aware that the space under the stair will be used as a “usable space” to verify compliance with this section.

Question #9 – Antifreeze System Test Connections

Section 8.6.3.6 of the 2022 edition of NFPA 13 requires antifreeze systems to have a drain/test connection at the remote section of the system.

Is this test connection required to have an orifice equal to one sprinkler (like requirements of 16.14.1.1) so that it can be used for flow-testing of water flow alarms, or is the purpose of this connection simply to allow samples to be taken for testing of the antifreeze solution?

The intent of the drain/test connection in accordance with section 8.6.3.6 is to test (or take samples of) the antifreeze solution in accordance with section 5.3.4.1 in the 2020 edition of NFPA 25. There is no requirement that the orifice size match what is outlined in section 16.14.1.1 of NFPA 13.

This requirement was added in the 2007 edition of NFPA 13. At the time, it was specific to systems larger than 40 gallons. The annex section associated with this requirement (section A.7.6.3.5 in the 2007 edition) indicates that it's required because NFPA 25 mandates evaluation of the concentration levels at the supply inlet to the antifreeze system AND at a remote point of the system. There is no mention in the annex when this section was originally added that the orifice size needed to comply with the requirements for wet pipe systems in section 16.14.1.1.



Question #10 – Air Compressor for Pressure Tanks

The 2018 edition of NFPA 22 states in section 7.2.10 that air compressors must be capable of delivering not less than 16 cfm for tanks of 7,500 gallons total capacity. For a particular project, the total volume of the pressure tank is only 2,925 gallons.

Is there any allowance for a compressor of a lesser cfm rating for smaller tanks?

No, there is no allowance for a compressor with a lesser cfm rating for pressure tanks less than 7,500 gallons. A 2,925 gallon pressure tank would require the minimum compressor delivering not less than 16 ft³/min of free air. The standard does not say for tanks less than 7,500 gallons, but that appears to be the intent.

Section 7.2.10 indicates an air compressor capable of delivering not less than 16 ft³/min (0.45 m³/min) of free air for tanks of 7,500 gal (28.39 m³) total capacity, and not less than 20 ft³/min (0.57 m³/min) for larger sizes, shall be provided.

Question #11 – ESFR Speculative Warehouse Zoning

A project is being designed for a speculative warehouse with multiple tenants.

Is there any code or standard written that has ESFR systems in speculative warehouses being designed for potential tenants rather than maximum square footage allowed? Is Zoning per tenant space required?

No. Codes and standards do not get down to the level of speculative building system zoning. An owner could arrange systems to accommodate future tenants, but that comes from a contract, not codes.

The building code (IBC, Subchapter 402) does require tenant spaces in covered malls to have separate control valves, but that requirement does not apply for speculative warehouses. Some jurisdictions, such as Phoenix, AZ, will address speculative buildings, such as a minimum density through an ordinance.

The purpose of area limitations for systems is based upon the maximum floor area protected by a single system that may be out of service. This is based upon the judgement that it would be better to limit the maximum area to 40,000 sq ft (for storage) that might be unprotected due to a system being impaired.

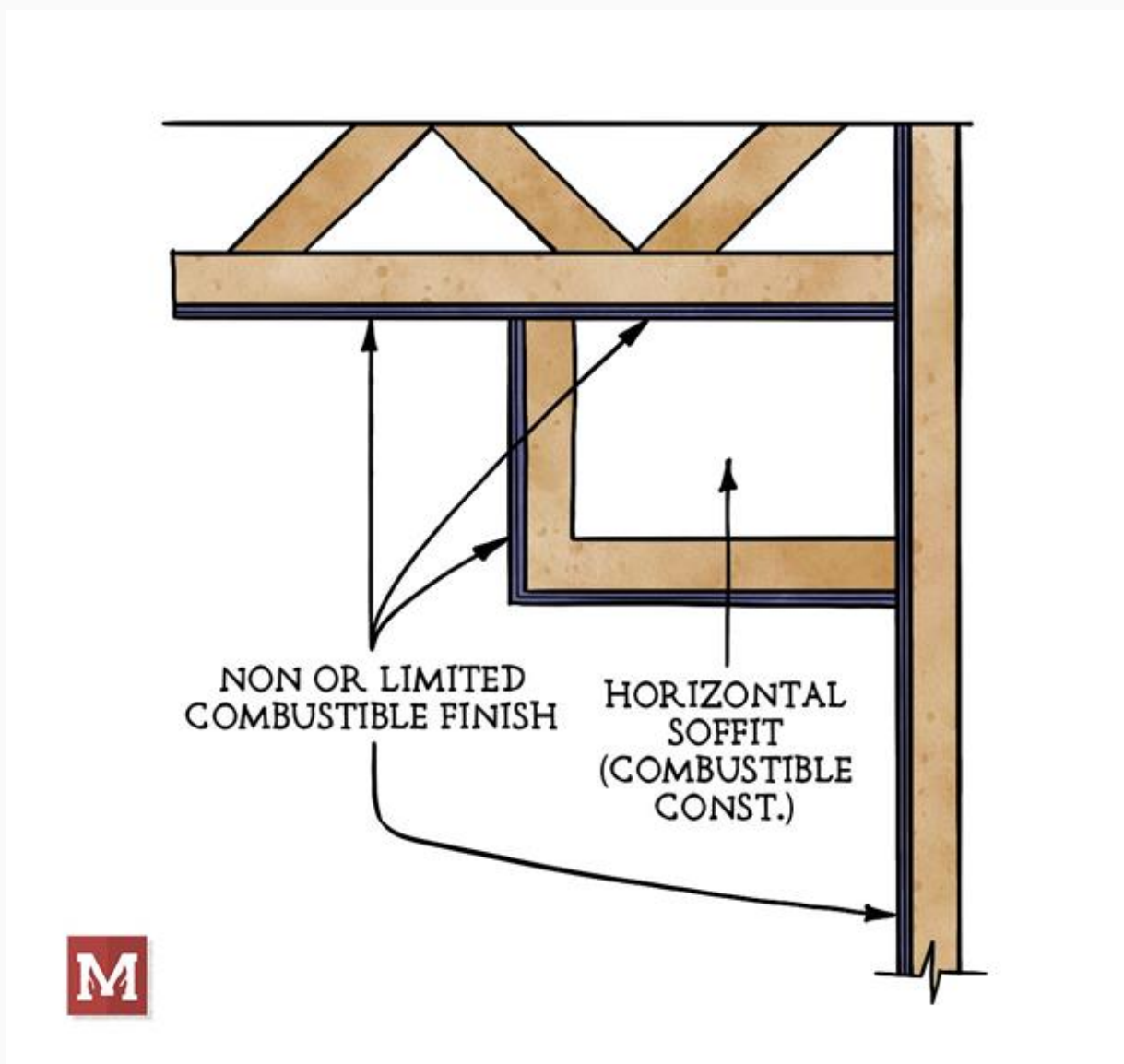
Question #12 – Protection of Combustible Soffit

An inaccessible wood construction soffit is being built beneath a finished ceiling to conceal mechanical ductwork and sprinkler piping in a building designed to meet NFPA 13 requirements. The soffit will have exposed wood on the inside and be finished with gypsum board on the outside and have maximum dimensions of 40” wide by 17” deep.

Are sprinklers required within this soffit?

This arrangement was not directly addressed prior to the 2022 edition of NFPA 13; however, a section was added to provide direction in that addition. Section 9.2.1.11 of the 2022 edition of NFPA 13 states “Concealed spaces created by soffits of combustible construction below noncombustible or limited combustible ceilings separated into volumes each not exceeding 160 cubic feet by noncombustible or limited combustible materials shall not require sprinkler protection.” If the volume of the concealed space is greater than 160 cubic feet, sprinklers will be required in this space. The annex material for this section provides a diagram describing the requirement.

There are a couple of ways sprinklers can be avoided in this area, one is to install vertical barriers of noncombustible material periodically to limit a single area of the soffit interior to 160 cubic feet as stated in section 9.2.1.11 referenced above. As stated in this section, the combustible soffit would need to be installed below a noncombustible or limited combustible ceiling. Another common practice is to utilize steel studs for the soffit framing, in which case this would be classified as a noncombustible space and no sprinklers would be required.



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