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

Editor - Roland Asp, CET Issue # 441 June 9, 2020

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June 9, 2020
Best of May 2020

Following are a dozen questions answered by the NFSA's Codes, Standards, and Public Fire Protection Department staff as part of the NFSA's Expert of the Day (EOD) member assistance program during the month of May 2020. This information is being brought forward as the "Best of May 2020." If you have a question for the NFSA EOD (and you are an NFSA member), send your question to eod@nfsa.org.

It should be noted that the following are the opinions of the NFSA 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 their committees. Unless otherwise noted the most recent published edition of the standard referenced was used.

Question #1 - NFPA 13R - System Zoning for Townhouses
In accordance with the 2016 edition of NFPA 13R, does each individual townhouse dwelling unit of a townhouse building need separate control valves for the automatic sprinkler system?
Answer: No. Section 4.5 of the 2016 edition (and earlier) of NFPA 13R provides the options of individual control valves for each unit or a common valve that controls the entire building system as long as it is located in a common area.

Upcoming Technical Tuesdays

June 16, 2020

Seismic Protection for Dummies

Register Here

NFPA Technical Meeting is online:
The debate portion is planned to be open from **June 8th through June 19th 2020** and voting is planned to be open from **June 22nd through June 26, 2020.**

Registration will be open from **June 8th - June 17th** for eligible NFPA Members to register to vote. To register to vote:
https://www.nfpa.org/conference/technical_meeting.html

The NFSA Voting Guide is forthcoming and will be made available prior to June 22.

View older issues in the "Member's Only" section

Each townhouse has an individual owner who is ultimately responsible for the maintenance of the system per NFPA 25. Traditionally, the separation (party) walls between townhouse units are lot lines and the argument for individual valves is strengthened by this requirement; however, the 2018 International Building Code (IBC) Section 706.1.1, Exception 2 eliminates the individual valve and ownership issue for fire sprinkler systems. This section would help support the common valve location for the entire building as permitted by NFPA 13R in Section 4.5.

The IBC is requiring the sprinkler system for the whole residential building (assuming it is a R-2 use). The IBC, Section 903.2.8, permits NFPA 13R to protect this building as a whole, not as individual units. It is important to recognize this protection throughout the entire building with one common valve. The individual dwelling unit control valve position is not to be discounted here; however, if one system is down or the owner is unable to maintain the system, it affects the whole building performance of the fire sprinkler system. The responsibility of maintaining the fire sprinkler system is upon the owner, so, if a common valve is opted for, then the responsibility for maintaining the system for all unit owners needs to be clarified, for example, in the HOA agreement.

Question #2 - NFPA 13R Garages
What is the hazard classification for garages that are accessible only from an individual dwelling unit in accordance with the 2016 edition of NFPA 13R?
Answer: Hazard classifications are not applicable in NFPA 13R unless the room falls outside with dwelling unit per Section 7.2.3. NFPA 13R, section 7.3.3, indicates garages that are accessible only from a single dwelling unit shall be considered as part of that dwelling unit. Section 7.3.3.1 indicates that garages that meet the criteria of 7.3.3 shall be protected in accordance with one of the following:

1. *use of a residential sprinkler in accordance with Section 7.1;U*
2. *se of an extended coverage sprinkler discharging water not less than its listed flow rate for light hazard;*
3. *quick-response spray sprinkler at light hazard spacing in accordance with NFPA 13 designed to discharge at 0.05 gpm/ft2 (2.04 mm/min) density*

Please note that the 2019 edition of NFPA 13R has further clarified this section with a new section 7.3.3 that indicates garages that serve only a single dwelling unit shall be considered as part of that dwelling unit. They also added section A.7.3.4 that indicates garages serving a single dwelling unit include garages that are directly connected to the dwelling unit and garages that are served by a common corridor with access limited to a single owner of tenant.

Question #3-Foam System Piping
NFPA 11 states that metallic foam solution piping shall not be less than standard weight and NFPA 409 states that foam solution piping is permitted to be any ferrous

material meeting the requirements of NFPA 13. The following two questions were asked:

Question 3a: What is the definition of standard weight pipe?
Answer 3a: Standard weight pipe is the same as schedule 40 pipe. Standard weight (schedule 40), extra heavy (schedule 80), and double extra heavy (schedule 160) is how pipe thickness was referred to from a system created in the 1920's. However, these three sizes did not fit all applications and was phased out by the schedule numbers that are used today.

Question 3b: Does NFPA 409,Section 7.1.7 allow the use of any ferrous material meeting the requirements of the 2016 edition of NFPA 13 (i.e. Schedule 30, 10, or 7)?
Answer 3b: No, foam system piping must be at minimum standard weight (schedule 40) pipe in accordance with NFPA 11. Sections 7.1.6 and 7.1.7 are new in the 2016 edition of NFPA 409. The intent of these sections was to allow systems installed in aircraft hangars to use pipe other than galvanized or stainless pipe for the foam solution side of the fire protection system as long as the pipe meets the requirements of ferrous pipe found in NFPA 13. This change was intended to address the material of the pipe, but not the thickness. Section 7.1.6 of NFPA 409 requires the system to be designed, installed, and maintained in accordance with NFPA 11 and section 4.7.2.6 of NFPA 11 requires metallic foam solution pipe to be at least standard weight or schedule 40 but no less.

Per the 2016 edition of NFPA 409:

> ***7.1.6*** *Each foam protection system shall be designed, installed, and maintained in accordance with NFPA 11.*
> ***7.1.7*** *Foam solution piping shall be permitted to be any ferrous material meeting the requirements of NFPA 13.*

Per the 2016 edition of NFPA 11, 2016:

> ***4.7.2* Foam Solution Pipe Materials.***
> ***4.7.2.1**** *Foam solution pipe shall be made of one of the following materials:*
>
> 1. *Galvanized steel*
> 2. *Stainless steel*
> 3. *Internal/external corrosion-resistant pipe in accordance with the foam manufacturer's specification for compatibility and acceptable to the authority having jurisdiction*
> 4. *Unprotected carbon steel pipe, when the discharge devices are closed to the atmosphere*
>
> ***4.7.2.6*** *Metallic foam solution pipe shall not be less than standard weight.*

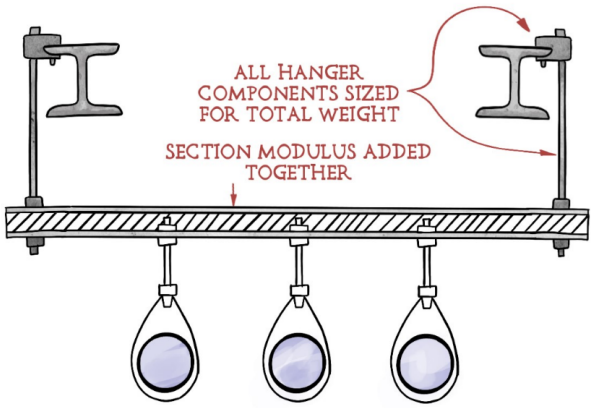
Question #4 - Multiple Pipes on Single Trapeze Hanger
Is it permissible to support three 6-in. pipes from a single trapeze hanger, and if so, how is the trapeze material

sized?
Answer: Yes, multiple pipes can be supported by the same trapeze hanger by adding their section modulus together and then choosing a hanger that has a section modulus greater than the combined total of the pipes being supported.

This is made clear in the annex language found in the 2016 edition of NFPA 13 in section A.9.1.1.7 which states in part, "where multiple mains are to be supported or multiple trapeze hangers are provided in parallel, the required or available section modulus can be added. "This section also gives guidance for sizing the trapeze materials when supporting multiple mains and indicates that the section moduli can be added for multiple pipes supported by the same trapeze hanger. As an example, assume the trapeze hanger were to span 6 ft between structural members and was used to support the three 6-inch mains (schedule 10). Based upon Table 9.1.1.7.1(a), the required section modulus to support 6-inch schedule 10 pipe would be 0.71. As there are three 6-inch schedule 10 pipes, the section modulus (0.71) would be multiplied by three and the total section modulus would be 2.13 (0.71 x 3 = 2.13).

The trapeze hanger would need to have a section modulus of 2.13 or greater. Based upon Table 9.1.1.7.1(b), the trapeze hanger could consist of 4 x 4 x 5/8 angle iron (or larger). Based upon section 9.1.1.7.2 other types of materials with an equal or greater section modulus could also be used.

Also note that the trapeze and its components (fasteners and rods) must be sized based on the total combined weight of the pipes being supported.



TRAPEZE WITH MULTIPLE PIPES

IMAGE BY: MeyerFire

Question #5 - Air Vent on Auxiliary Antifreeze System
Does an antifreeze system that is auxiliary to a wet pipe system need a separate air vent?
Answer: No. Section 8.1.5 requires a single air vent per each wet pipe system. System is the key word. NFPA 13 does not define the term auxiliary; however, Webster defines auxiliary as, "helping, aiding, assisting." This means that if the antifreeze system and the wet pipe system is counted as one system as defined by NFPA

13 (Section 3.3.206) then a single air vent would suffice. Section 8.1.3 supports this by stating other systems, such as dry systems, can be auxiliary to a wet pipe system. It does not indicate antifreeze system in the list of systems that are considered auxiliary. The definition of the antifreeze system, Section 3.3.206.1, defines antifreeze as, "a wet pipe system," so, as written, it is a wet system as it defined in 3.3.206.10.

The only time a separate air vent could be required in this situation would be when the wet system and antifreeze system are separate systems meeting the definition of a system. Section 3.3.206 of NFPA 13 for a sprinkler system, consists of, "water supply source, a water control valve, a waterflow alarm, and a drain." Where an antifreeze meets all four of the criteria, then it would not be considered auxiliary anymore and be a separate system, and an individual air vent would be required because it is technically a wet system.

Question #6-Backflow Installation
The following three questions refer to the installation requirements for a backflow assembly.

Question 6a: How is the water supply classified as low hazard or high hazard?
Answer 6a: Ultimately it up to the water utility or relevant AHJ to determine the hazard and the appropriate backflow prevention device needed.

To determine the degree of hazard, AWWA M-14 is usually the document referenced. In general, M-14 considers a sprinkler system fed from the potable water with no chemicals (such as antifreeze) to be low hazard. If chemicals such as antifreeze are contained within the system, it would be usually classified as a high hazard.

Question 6b: When would a reduced pressure zone RPZ backflow preventer be needed?
Answer 6b: As stated in question 1, this determination is usually based upon the water utilities cross-connection program. In general, if the sprinkler system is considered a low hazard, then a double check valve assembly is recommended by AWWA M14. If it is considered a high hazard, anRPZ Backflow prevention device is recommended.

Question 6c: How are AWWA M14 Classification determined?
Answer 6c: In accordance with AWWA M14, a high hazard includes: "any substance that could, if introduced into the potable water supply, cause death or illness, spread disease" In regard to sprinkler systems this would include systems supplied withnon-potable water or systems including chemicals such as foam or antifreeze. As stated above, AWWA recommends that "high hazard sprinkler system be equipped with an RPZ type backflow. A low hazard is defined by AWWA M14 as including "any substance that generally would not be a health hazard but would constitute a nuisance or be aesthetically objectionable if introduced into the potable water supply." This would include sprinkler systems fed from the municipal water systems, with no added chemicals and no cross-connections to non-potable water sources. Low hazard sprinkler systems are

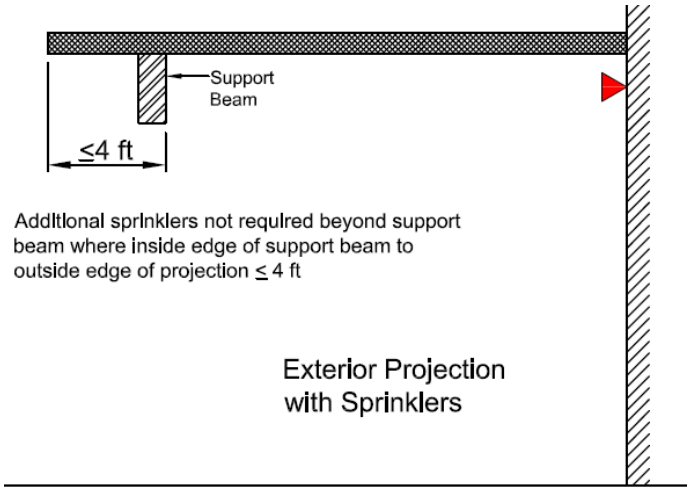
recommended by AWWA M14 to be protected with a double check valve assembly.
The final determination of the type of required backflow prevention device would be up to the local water utility or AHJ.

Question #7 -Balcony Support Beam
There is an exterior deck with a large support beam supporting the roof above. This space requires sprinkler protection and a dry sidewall sprinkler is preferred. However, the support beam is an obstruction to the discharge and the sidewall sprinkler cannot meet the obstruction rules. Is the only option to add a line of sprinkler beyond the beam?

Answer: No. A new annex section was added to the 2019 edition of NFPA 13 which addresses this very condition. Annex section A.9.3.19.1 states that the sprinkler protecting under the exterior projection should not be required to spray past the support beam as long as the distance from the interior edge of the beam and the edge of the projection does not exceed 4 feet. This section reads:

> *A.9.3.19.1 Sprinkler protection under exterior projections should not be required to spray beyond the support beam on the exterior edge of the exterior projection as long as the maximum distance from the interior edge of support beam to the exterior edge of the projection does not exceed 4 ft (1.2 m). An additional line of sprinklers on the exterior edge is not required due to obstruction rules. This is considered a reasonable level of protection because sprinklers are located between the structure and the exterior edge. See Figure A.9.3.19.1.*

This concept is illustrated by Figure A.9.3.19.1 which looks similar to this:



Question #8 -Large Pipe Schedule System Modification
Is an existing OH2 pipe schedule system permitted to be revamped by removing existing drops and replacing with 4 ft 5 in. sprigs and adding new branch lines if the system exceeds 275 sprinklers?
Answer: Yes, as long as the total area of the system does not exceed 52,000 sq. ft in accordance with Section 4.5."

In the 2019 edition of NFPA 13, pipe schedule systems are permitted to be revamped under two conditions:

> *29.4.1 The pipe schedule method shall be permitted as follows:*
>
> 1. *Additions or modifications to existing pipe schedule systems sized according to the pipe schedules of Section 27.5*
> 2. *Additions or modifications to existing extra hazard pipe schedule systems*

The modifications would be permitted if they meet the requirements of Section 27.5.3 for Ordinary Hazard pipe schedule systems and do not exceed the maximum number of sprinklers per pipe size per Table 27.5.3.4.

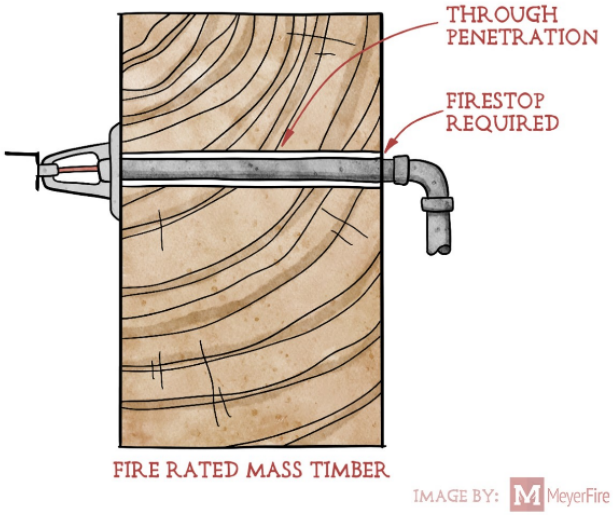
Question #9 -Sprinklers Installed in Mass Timber Beams

Are metal escutcheons adequate for penetration protection of a fire-rated mass timber beam per the 2018 IBC?

Answer: No, the metal escutcheon is not adequate for a penetration in a fire-rated mass timber beam.

The mass timber beam is a fire-rated assembly and is unlike a fire-rated wall assembly of studs and layers of gypsum. A hole through a mass timber beam for a sidewall sprinkler is considered a through-penetration and would be required to be protected as such. In a stud wall, a branch line can be hidden inside the stud wall and the sidewall penetrates the membrane or gypsum layer, and the code allows metal escutcheon (2018 IBC Section 714.4.2) to protect it. A mass timber wall typically does not have a cavity to conceal piping, therefore a hole that extends through to allow a branch line or cross-main is a through-penetration and an approved through-penetration firestop system is required per the International Building Code (IBC), Section 714.4. It is important to note that only the required fire rated assemblies, i.e. structural and non-structural walls, beams, and floors, are required to have the through-penetration firestop protection. This means non-structural non-rated aesthetic walls could be protected by metal escutcheons. Where mass timber has a trough or a channel to run mechanical, electrical, and plumbing (MEP), this could be considered a membrane penetration and a sidewall sprinkler metal escutcheon would be adequate and approved by the code.

Lastly, aside from the main question, make sure every hole or cut into the mass timber beam is directed and approved by the registered design professional. Misplaced holes and unverified size and placement affect the load bearing capabilities of these panels and repairs are very costly and time consuming.



Question #10 - Pressure Test for Underground Storage Tanks
A below grade fire water tank upon inspection appears to have a leak due to a consistent low water level alarm. It is unclear of the tank material or if the tank is equipped with a vertical fire pump or if its gravity feeds a fire pump. The 2017 edition of NFPA 25 was identified as applicable.

If a leak is suspected because of a consistent low water level, can the AHJ order the owner to do a pressure test? Is there a code section for that?

Answer: No. Underground tanks (except for pressure tanks as noted in NFPA 22, 2018 edition, Chapter 7) would be either gravity tanks or suction tanks as defined by the 2018 edition NFPA 22 Section 3.3.3 and not intended to be pressurized. They would be required by NFPA 22 to be equipped with a vent and/or overflow piping that is open to the atmosphere which would not allow pressurization.

The 2017 edition of NFPA 25 Chapter 9 provides the requirements for inspection, testing, and maintenance of water storage tanks. Section 9.2.1 requires the water level to be inspected monthly or quarterly with a supervised water level alarm. Section 9.4.2 requires the water level to be maintained full or at the designated water level. Section 3.3.7.1 defines a critical deficiency as a deficiency that, if not corrected, can have a material effect on the ability of the fire protection system or unit to function as intended in a fire event.

It can be difficult to locate and repair underground water leaks. Typically, this effort requires a process of isolating underground sections of the system in an attempt to locate the section of underground piping or tank(s) that is leaking. This can require a coordinated plan to locate and repair any leaks as well as an approved impairment plan.

Question #11 - Standpipe Testing
Is the first-floor hose connection an acceptable location for additional standpipe flow verification for acceptance?
Answer: Yes, the first-floor hose connection may be utilized to verify the 250 gpm flow requirement for

additional standpipes, but the two highest hose connections must be used on the most remote standpipe.

The 2013 edition of NFPA 14, Section 11.5 titled Flow Tests covers acceptable locations of hose connections for acceptance testing. The test shall be conducted by flowing water simultaneously from all hose connections indicated in the approved calculations. This section sends the user back to Chapter 7 for design requirements being verified in acceptance.

> **11.5.1.1** *This test shall be conducted by flowing water simultaneously from the outlet(s) indicated in the approved hydraulic calculations of each standpipe as required by section 7.8 and 7.10.*

Section 7.10.1.2.1 requires the 500 gpm flow to be met at the two most hydraulically remote hose connections and 250 gpm at the connection point of each of the other standpipes, with minimum residual pressure as required in Section 7.8. The pressure requirements found in Section 7.8.1 only apply to the two hydraulically most remote hose connections.

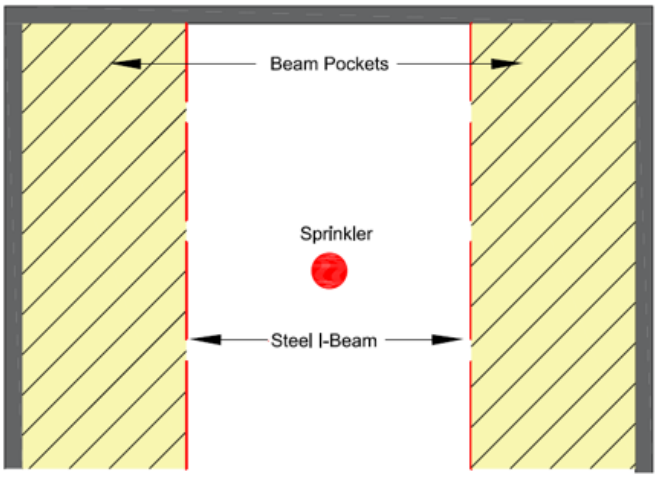
> ***7.10.1.2.1*** *Hydraulic calculations and pipe size for each standpipe shall be based on providing 250 gpm at the two hydraulically most remote hose connections on the standpipe and at the connection point of each of the other standpipes at the minimum residual pressure required by section 7.8.*

> ***7.8.1*** *Minimum Design Pressure for Hydraulically Designed Systems. Hydraulically designed standpipe systems shall be designed to provide the waterflow rate required by Section 7.10 at a minimum residual pressure of 100 psi at the hydraulically most remote 2 ½ in hose connection and 65 psi at the outlet of the hydraulically most remote 1 ½ in hose connection.*

This allows the additional standpipe flow to be verified at any of the hose connections on the additional standpipe. This was clarified in NFPA 2016 edition in section 11.5.1.2.1.

> ***11.5.1.2.1*** *For each additional standpipe, the required flow shall be permitted to be taken from any hose connection on the standpipe.*

Question #12 - Ceiling Pockets vs Beam Pockets
A small room includes two exposed 33-inch-deep I-beams intersecting the room. The obstruction caused by these beams make it impossible to protect with a line of sprinklers in the center of the room. Is it permitted to treat the "beam pockets" at the perimeter of the room as ceiling pockets and omit sprinklers in accordance with the 2016 edition of NFPA 13 "ceiling pocket" rules (section 8.6.7)? The following figure illustrates this situation:



Answer: No.The "inside pockets" between the I-beam and the wall would not be considered ceiling pockets and the rules of section 8.6.7 would not apply. If the obstruction rules cannot be applied than sprinkler protection would be required in these "beam pockets".

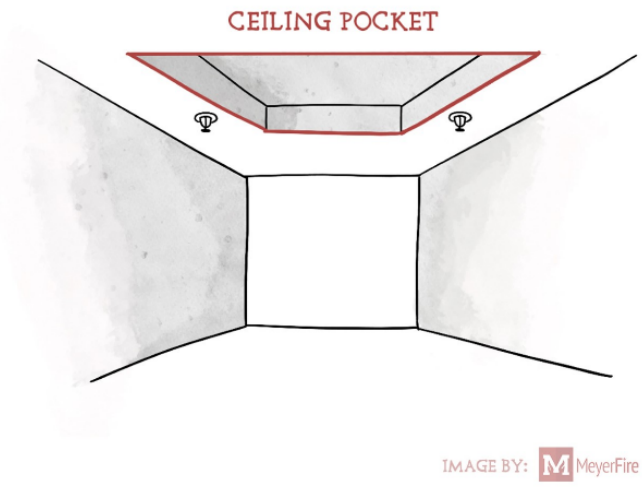
Ceiling pockets are defined in the 2016 edition of NFPA 13 as:

> ***3.3.4* Ceiling Pocket**. An architectural ceiling feature that consists of a bounded area of ceiling located at a higher elevation than the attached lower ceiling.*

In this case, the I-beams would not be considered an architectural ceiling feature and there is no attached lower ceiling. The I-beams are structural members and the ceiling pocket definition would not apply. This is made clear by the annex to this section which reads in part:

> ***A.3.3.4 Ceiling Pocket**. It is not the intent of this definition to be applied to structural and/or framing members otherwise used to define obstructed or unobstructed construction.*

The space between the I-beams would be better described as "Beam Pockets"



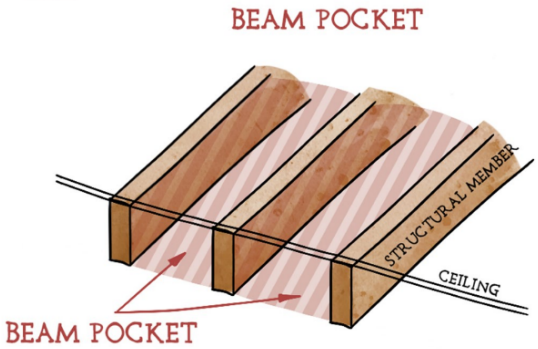


IMAGE BY: MeyerFire

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