

Best of December 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 December 2021. This information is being brought forward as the "Best of December 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 – Minimum Orifice Size on Dry System Trip Test Connection

A single dry system includes both K-8.0 sprinklers and K-5.6 sprinklers. The dry system serves both an ordinary hazard loading dock which utilizes K-8.0 sprinklers and a light hazard office area with K-5.6 sprinklers. The most remote branchline (based on distance) is in the office whereas the most demanding sprinkler is in the dock. The inspectors test connection is in the office area off the most remote branchline.

Is it required to use an orifice equal to the smallest sprinkler (K-5.6) on the inspector's test connection or would a K-8.0 sprinkler be acceptable?

Either a K-5.6 or a K-8.0 orifice would be acceptable.

NFPA 13 does not actually refer to this connection as an "inspector's test" connection in the installation rules. Instead, NFPA 13 refers to this connection as a "trip test connection" because it speaks better of the purpose of the connection. Considering that the connection is intended to simulate the opening of a single sprinkler and considering that we generally test "worse-case" conditions, it would be logical to assume that the orifice should be the same as the smallest orifice in the sprinkler system. However, that is not exactly what NFPA 13 says even though many people think that it does.

Regarding dry-pipe systems, Section 8.17.4.3.1 of the 2013 edition of NFPA 13 (with similar

sections going back at least as far as 1983) reads, “A trip test connection or manifold not less than 1-in. in diameter, terminating in a smooth bore corrosion-resistant orifice, to provide a flow equivalent to one sprinkler of a type installed on the particular system, shall be installed.” Using the language, “of a type installed on the particular system” allows the user to pick any size sprinkler orifice used in the system, not necessarily the smallest one. Note that this is different from wet pipe systems, which are required to use an orifice simulating the smallest sprinkler on the system in the alarm test connection (commonly called an inspector’s test connection as well).

During the development of the 2013 edition of NFPA 13, a proposal was made to change the requirement to having the orifice simulate the smallest orifice on the system, like the requirement for wet pipe systems. This proposal was rejected by the committee with the following substantiation: *“The intent of the standard is to allow the use of any orifice size on the system.”*

Question #2 – Plastic Hose Valve Caps

On a standpipe project, plastic caps were used on all hose valves. A service contractor performed a NFPA 25 inspection and sent the owner a letter stating that the plastic hose valve caps are a "deficiency" and need to be replaced with brass caps.

Three questions have been asked:

- 1. Are plastic caps acceptable per NFPA 14?**
- 2. Would the use of plastic caps qualify as a deficiency?**
- 3. Theoretically would this qualify as a deficiency if brass caps are required locally by the AHJ?**

Plastic caps are allowed by NFPA 14 to be used to protect hose connections threads on a standpipe connection and are not considered a deficiency per NFPA 25.

NFPA 14, Standard for the Installation of Standpipes and Hose Systems requires caps only for the protection of hose threads and does not require any listing for this use.

NFPA 25, Standard for the installation, Testing and Maintenance of Water Based Fire Protection Systems requires caps to be inspected and replaced if missing/damaged or have missing/deteriorating gaskets. The standard does not address the type of material that caps are made from and would not consider a plastic cap to be a deficiency.

If the authority having jurisdiction (AHJ) has amended the local fire code to require brass caps on all standpipe hose connections, a plastic cap would be in violation of the local fire code and enforceable by the fire code official but not a deficiency covered by NFPA 25.

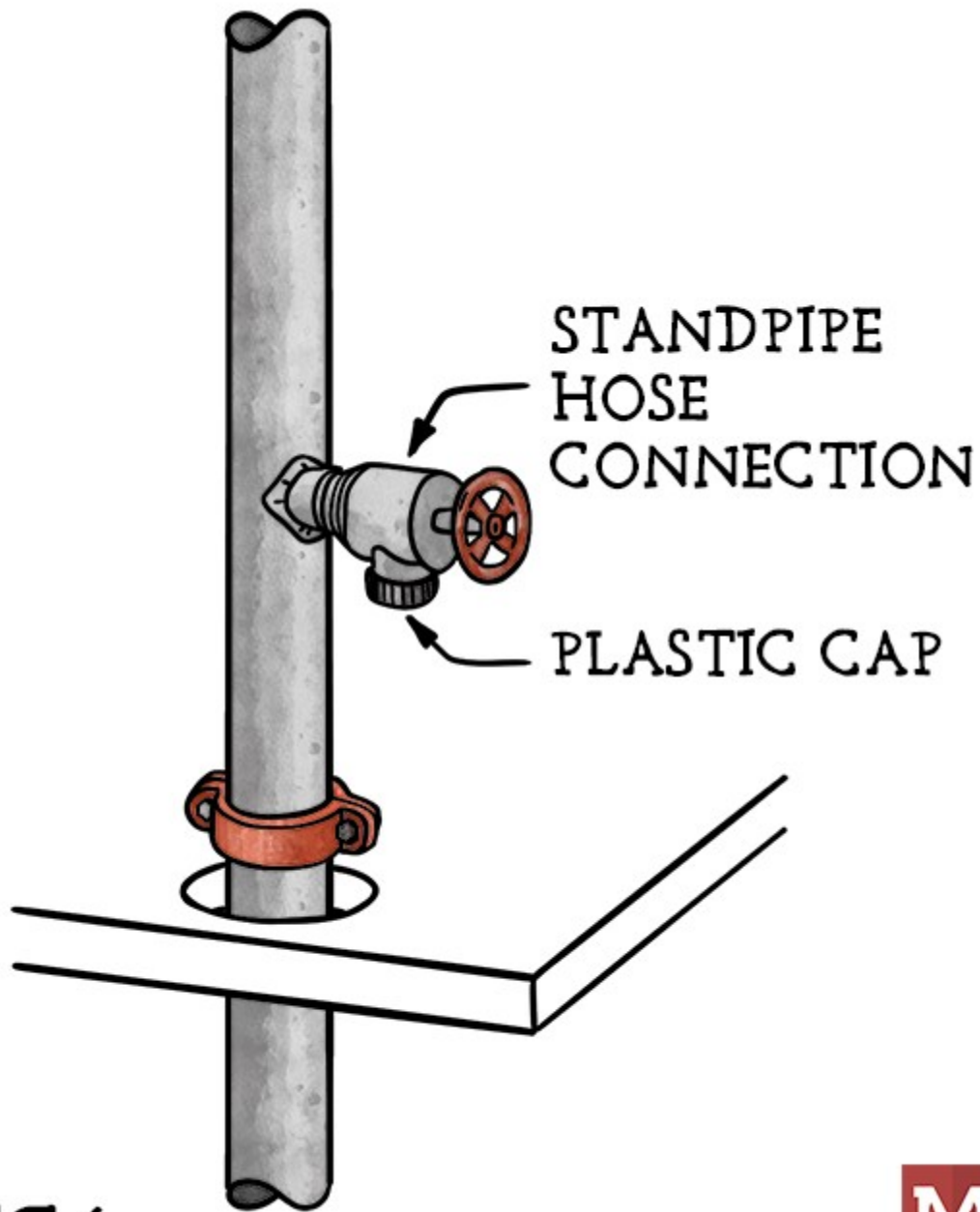


FIG 1



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Question #3 – Alternative to Flushing Underground Pipe

A 6-inch underground main has been installed from a water storage tank and continues underground to a fire pump room in an aircraft hangar. The underground contractor does not have water on site to flush the 16" pipe per Section 10.10.2 of the 2016 edition of NFPA 24. The contractor has however ran a camera the length of the underground pipe and has confirmed that the pipe is clear of debris.

Is the method of using a camera an approved alternative to flushing the underground water main with water as part of the acceptance testing?

No. There is no prescriptive allowance in NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances, for a visual inspection with a camera to be used as an alternative to a flow test.? NFPA 24 require a physical test (or "flushing") when performing acceptance testing.

The 2016 edition of NFPA 24 requires the underground piping to be flushed at a minimum flow rate of indicated in Table 10.10.2.1.3 which is based upon a velocity on 10 ft/sec. As this table does not go up 16-inch pipe, the required flow rate to flush this system would need to be calculated.

It must be noted that as this underground pipe is feeding a fire pump, NFPA 20 would require greater flows to flush this pipe. This is indicated in the 2016 edition of NFPA 24 in Annex Section A.10.10.2.1.3 and this concept was added to the body of the standard in the 2022 edition of NFPA 24. The flushing flow rates for NFPA 20 are based upon a velocity of approximately 15 ft/sec and for the 16-inch pipe would be a flow rate of 9,400 gpm (See Table 14.1.1.1 of the 2019 edition of NFPA 20.)

Both NFPA 24 and NFPA 20 do allow a reduced flow rate when the water supply cannot provide the required flows. NFPA 24 states that, in this case, the maximum flow rate available to the system is acceptable and NFPA 20 states the flushing flow rate shall be at least 150 percent of the rated flow of the fire pump. NFPA 20 goes on to state that where the 150 percent is not achievable, an acceptable flow would be the greater of either 100 percent of rated flow of the fire pump or the maximum flow demand of the fire protection system.

As it was indicated that there is no water on site, a viable alternative to flushing may be "water main swabbing." This concept was added to the 2022 edition of NFPA 24 as an alternative to the flushing requirements. (See new Section 10.10.2.1.4). Swabbing is the forceful induction of swabs (such as polyurethane foam) into the pipe to clear any debris. This method uses much less water than traditional flushing and may appropriate in this situation.

Question #4 – Powder Coating Oven

Are ovens used to cure powder coating required to be protected with fire sprinklers in accordance with the 2016 edition of NFPA 13?

The prescriptive requirements of the standard do not require ovens to be protected with sprinklers, they only require a study be conducted to determine the need for fixed or portable fire protection systems for ovens, furnaces, or related equipment.?

NFPA 13, 2016 edition, Annex Section 22.16.2 does not provide a requirement for sprinkler protection in oven and Section A.22.16.2.1 explains sprinkler protection should be considered under three conditions but does not provide a requirement.? The 2022 edition of NFPA 13, Section 27.18 for ovens and furnaces simply references NFPA 86.?

NFPA 86, 2019 edition, Section 9.1 requires a study be conducted to determine the need for fixed or portable fire protection systems for ovens, furnaces, or related equipment.? The determination of the need for fire protection systems shall be based on a review of the fire hazards associated with the equipment.? Where determined to be necessary, fixed or portable fire protection systems shall be provided.

Annex Section A.9.1 goes on to explain this standard addresses the protection needs of ovens, furnaces, and related equipment. Fire protection needs external to this equipment are beyond the scope of this standard. The determination and extent of required fixed protection depends on the following:

1. The construction and arrangement of the oven, furnace, or related equipment
2. The materials being processed
3. Whether fixtures or racks are combustible or are subject to loading with excess combustible finishing materials, or whether an appreciable amount of combustible drippings from finishing materials accumulates in the oven or ductwork

NFPA 1, 2021 edition, Section 51.1 requires compliance with NFPA 86 but does not provide requirements for fixed fire protection systems.

Please note, the International Fire Code (IFC) 2021 edition, Section 3006 does provide requirements for fire protection of industrial ovens under specific conditions and could be reviewed for additional guidance.



Question #5 - Stairways for Standpipe Hose Valve Placement

In NFPA 14 and NFPA 101, what is the difference between a "required stair", "required exit stair", and "non-required stair".

The requirement for standpipe hose connection locations comes from the International Building Code (IBC). The IBC requires standpipe hose connections in all interior exit stairways, which is defined by the building code.

An interior exit stairway is an exit component that serves to meet one or more means of egress design requirements, such as required number of exits or exit access travel distance and provides for a protected path of egress travel to the exit discharge or public way.

The use of the term required exit stair by NFPA 14, Standard for the Installation of Standpipe and Hose Systems, is referencing stairways used as part of the required protected means of egress from a building.

NFPA 101 Life Safety Code provides the requirements for stairways used for a means of egress but allows for convenience stairs. A convenience stair does not serve the means of egress and would not be subject to all the requirements of egress or hose connections in buildings with standpipe system.

The use of the term required simply designates stairways that are required as part of the means of egress from the building and meet all the requirements for egress, including a location for the installation of standpipe hose connections.

Open stairs, communicating and convenience stairs not used to meet the building requirements for a means of egress would not require standpipe hose connection installation.

Question #6 – Extension Fittings

Are brass head extension fittings allowed in the 2019 edition of NFPA 13?

Yes, extension fittings are permitted in accordance with Section 16.8.6 of NFPA 13, 2019 edition. This section allows the installation of a single extension fitting up to 2-in without inclusion in the hydraulic calculations, provided that the internal diameter of the extension fitting has the same nominal inlet diameter as the attached sprinkler.

This requirement would be applicable for extension fittings used with K-8.0 and smaller sprinklers in light and ordinary hazard occupancies only. Installation of multiple (two or more) extension fittings would not be permitted for larger dimensional needs.

If needed, extension fittings having lengths greater than 2-in could be used if specifically listed. However, these extension fittings would be required to be included in the hydraulic calculation.

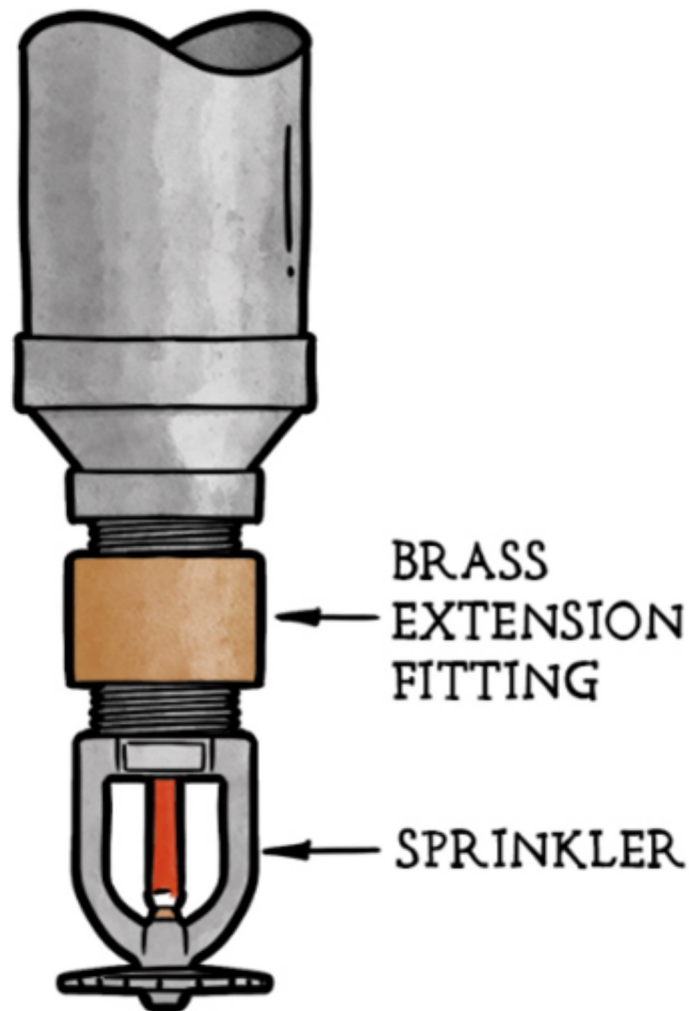


FIG 2



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Question #7 – Moveable Medical Record Storage

A hospital is being protected with a fire sprinkler system in accordance with the 2016

edition of NFPA 13. There is an area with moveable medical record shelf storage in the hospital.

Is there guidance in NFPA 13 to protect this type of shelving units?

Yes, the 2016 edition of NFPA 13, Section 20.6 provides guidance for sprinkler protection for mobile shelving units. This section (20.6.1) covers mobile storage up to 8 ft. in height for commodities consisting of paper files, magazines, books, and similar documents to be classified as light hazard. As 20.6.1 indicates this section is intended to cover “limited configurations of compact mobile storage units and materials”.?

The key section in 20.6 is covered in Section 20.6.2 that requires the top of storage be a minimum of 18 in. from the sprinkler deflector.? Several years ago, NFSA participated in a research study done by the Fire Protection Research Foundation to try to determine design specifications for this unique type of storage configuration. NFSA thought that it would be a good idea to try using horizontal sidewall sprinklers to spray across the top of the units or to try sprinklers like residential sprinklers or extended coverage sprinklers because they have broader, flatter spray patterns. But the manufacturers of the compact module shelving units refused to allow any testing that did not have an 18-inch clearance. They promised that they would always ensure that their units would be used with a minimum of 18-inch clearance and that they would make sure their customers knew how important this requirement is. ?

The results of the FPRF project are found in Section 20.6 of NFPA 13 along with the minimum 18-inch clearance that is required to protect this storage (Section 20.6.2). This space is needed for the sprinkler deflector to develop a spray pattern that covers the protection area of the sprinkler.

Question #8 – Temperature Rating of ESFR Sprinklers

Section 9.4.2.1 of the 2019 edition of NFPA 13 allows the use of intermediate-rated sprinklers in lieu of ordinary-rated sprinklers throughout a building.

Does this also apply to ESFR sprinklers?

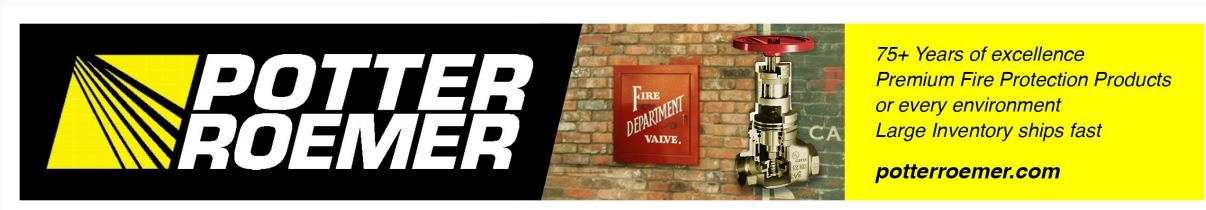
Yes, if the 2022 edition of NFPA 13 is applied.

In the 2019 edition of NFPA 13, Section 14.2.6 specifically states that ESFR sprinklers must be ordinary temperature unless 9.4.2 requires intermediate- or high-temperature ratings.?Based upon this section in the 2019 edition of NFPA 13, unless there is a reason to use an intermediate temperature such as the requirements listed in Section 9.4.2.5, ordinary temperature sprinklers must be used.

However, this section (14.2.6) was modified in the 2022 edition to state that either ordinary or intermediate ESFR sprinklers may be used unless Section 9.4.2 requires intermediate sprinklers.

Based upon this revised wording, the current edition of NFPA 13 allows the uses of either ordinary temperature or intermediate temperature ESFR sprinkler throughout an occupancy.

Using an updated edition of NFPA 13 is permitted through Sections 1.5 and 1.7 of the standard. This revised allowance could be presented to the authority having jurisdiction (AHJ) for approval of the use of intermediate-rated ESFR sprinklers.



Question #9 – Protecting Open Top Containers

An ESFR system for a warehouse is being designed. There is one area of the warehouse that has open-top containers.

As NFPA 13 does not allow ESFR sprinklers with open-top containers, the owner wants to know if a “top” can be placed on the container so that they are no longer considered to be “open-top” and if so, does NFPA provide any guidelines on the construction of the ‘top’?

Yes, a top may be placed on the container so that it would no longer be considered be an “open-top” container. NFPA does not provide any detailed guidance on construction that could or should be used to cover the tops of the containers mentioned; however, NFPA 13, 2022 Section A.3.3.149 does provide four options on how open top containers could be addressed.

- Option one is not relevant to this situation.
- Option two states to place all open-top containers on the floor.
- Option three is to have openings in the containers that are large enough that it enters and discharges from the container at the same flow rate and discharges into the flue space.
- Option four is to permanently affix domed or flat lids in the racks directly over the open containers.

Option four states that if “permanently affixed domed or flat lids in the racks directly over the open containers” are provided then the containers should not be considered an open-top container. As this section does not include detailed prescriptive construction details of the lid, the engineer of record and AHJ should be consulted to determine the most cost-effective material to use.

Question #10 – Single-Family House connected to a Stable

There is a single-family house connecting to a caretaker's unit and stable via an exterior covered walkway/breezeway. The applicable NFPA standards are the 2013 editions of NFPA 13 and NFPA 13D.

Could a single-family house connecting to the caretaker's unit and stable via the exterior covered walkway / breezeway be designed with NFPA 13D? And the stable be designed with NFPA 13?

Yes, a single-family dwelling could be protected as an NFPA 13D system with an adjacent building with a caretaker unit and stable protected as a NFPA 13 system, even if they are connected by a covered walkway.?

The concern might be the requirement for protection of the covered walkway.? For the NFPA 13D system associated with the single-family dwelling, the attached covered walkway would not require sprinkler protection.? This is found NFPA 13D, 2013 edition, Section 8.3.6 which indicates sprinklers shall not be required in covered, unheated projections of the building at entrances/exits as long as the dwelling unit has another means of egress.?

However, for the NFPA 13 system in the stable building, NFPA 13, 2013 edition, Section 8.15.7 for exterior projects must be reviewed to determine if the covered walkway is required to be protected with sprinklers to meet the requirements of this standard as used for the stable building.



Question #11 – Class II Standpipe Design in 1977

What flow and PSI was required for wet automatic Class II standpipe in a partially sprinkled building per NFPA 14 in 1977?

The requirements for the minimum pressure and flow of a Class II standpipe (1 ½ in.) have varied and were often amended by local jurisdictions over the years. 1 ½ in. hose connections were also frequently installed on fire sprinkler system, which did not require them to meet any of the requirements for pressure or flow found in NFPA 14.

Since the 1970's new Class II hose connections installed under NFPA 14 have been required to meet a minimum 100 gpm flow and a minimum pressure of 65 psi. NFPA 13 still allows small hose

connections (1 ½ in.) to be installed on a fire sprinkler system and does not require them to meet the requirements of a Class II system as defined by NFPA 14.

Note: The International Fire Code and NFPA 1 Fire Code both allow the hose/nozzle portions of a class II standpipe to be removed at the discretion of the authority having jurisdiction (AHJ). This is allowed as the minimum flow rate of Class II standpipes does not meet the standards minimum flow rates for structural firefighting.

Question #12 – Dry Sidewall Clearance

When a dry sidewall goes through an outside wall or beam, is seismic clearance required?

The seismic clearance requirements of Section 9.3.4 of the 2016 edition of NFPA 13 apply to dry sidewall sprinklers in Seismic Design Categories C, D, E, and F, extending through an exterior wall. However, exceptions exist in Sections 9.3.4.3 through 9.3.4.7 and 9.3.4.10 to reduce or eliminate the annular (clearance) space around the dry sidewall pipe. For example:

- the frangible construction of the exterior wall eliminates clearance if not required to be fire-rated.
- dry barrel sprinklers with flexible hose are not required to have clearance.
- where the rigid piping is supported directly by structural beams, clearance is not required.

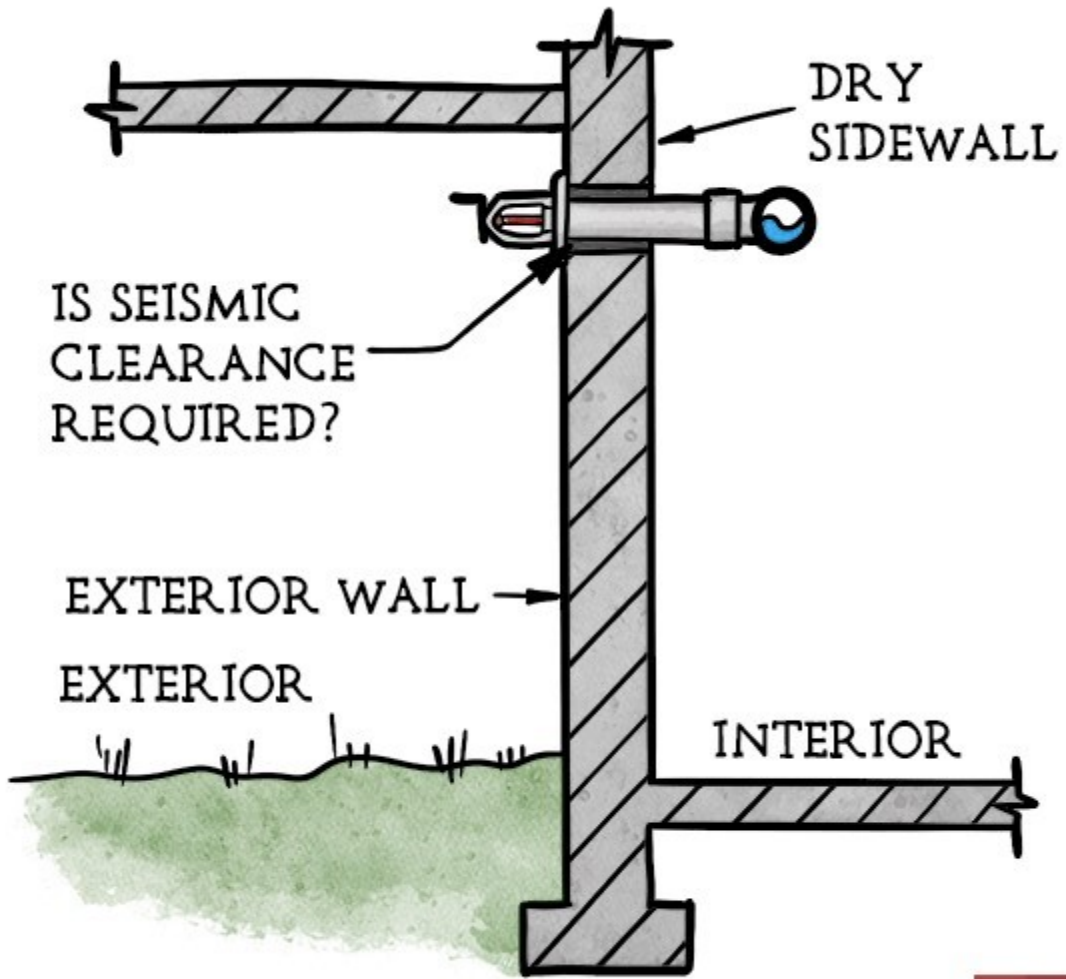


FIG 3



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