



TechNotes

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#485

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

Question #1 – Standpipe Connections at Horizontal Exits

The International Building Code (IBC) states in Section 905.4 that hose connections can be omitted from one side of a horizontal exit when it is located within 130 feet from a standpipe connection in the stairwell. NFPA 14, however, allows the hose connection to be omitted when it is located 200 feet from a standpipe connection in the stairwell.

What are the applicable requirements for locating standpipe connections at horizontal exits?

NFPA 14 Section 7.3.2.2 requires hose connections on each side of a wall adjacent to the exit opening of a horizontal exit. Section 7.3.2.2.1 allows the removal of one hose connection, on the opposite side, where the travel distance does not exceed 200-feet.

While there is no current definition of "adjacent" the 2023 edition has a Public Input 38-NFPA 14-2019 proposal, approved at first draft, that requires a hose connection at horizontal exits to be visible and within 20 feet of the exit.

The IBC is more restrictive but also allows the removal of a horizontal hose connection when the adjacent side of the horizontal exit is reachable from a 30-foot hose stream from a nozzle attached to 100-feet of hose, connected to an interior exit stairway hose connection. This 130-foot limitation was amended in the code to specifically address the lower level of firefighter protection afforded by horizontal exits.

The IBC, or code would overrule NFPA 14, as a Standard, making the requirement 130-feet.

Substantiation for the 2006 IBC amendment for horizontal hose connection exception is as follows:

“The addition of the exception to Section 905.4(2) provides for a reasonable placement of hose connections on a floor based on the hose layout of 100-feet with a 30-foot hose stream. There are numerous building designs where stairway and horizontal exits are placed in very close proximity to one another. It is a better firefighting practice to leave a stair enclosure with a charged fire line than to enter a floor of a building to hook up to a hose connection that is placed at a horizontal exit. This exception’s criteria for placement of hose connections in the stairwells based on a 30-foot hose stream with 100 feet of hose is reasonable considering that under Section 905.4(6). In a building without a horizontal exit, the hose lay can be up to 150-feet to 200-feet.”

Question #2 – 2-inch Air Gap over Insulation in Concealed Space

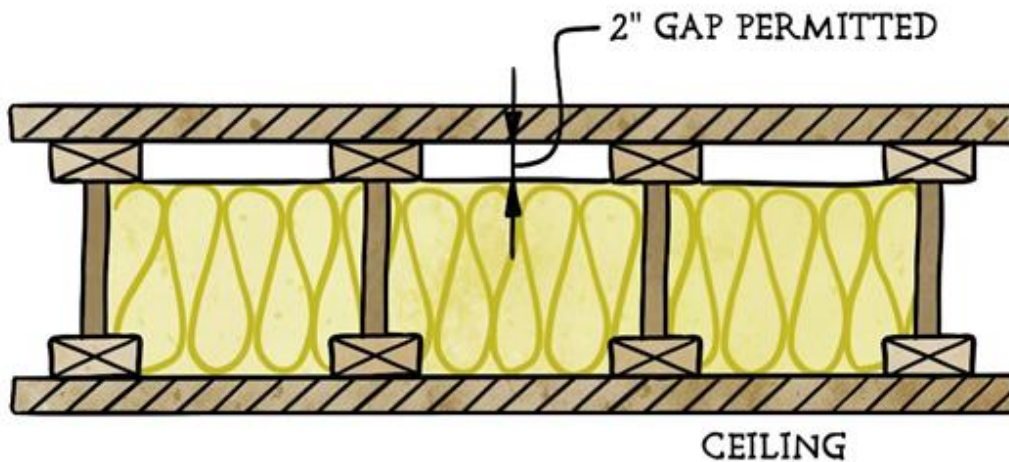
Section 8.15.1.2.7 in the 2013 edition of NFPA 13 allows sprinklers to be omitted from combustible concealed spaces when filled with noncombustible insulation. The next section states that a 2-inch maximum air gap at the top of the space is allowed.

Is the maximum allowable air gap measured from:

- * The top of the insulation to the bottom of the floor above. -or-**
- * From the top of the insulation to the bottom of the top cord of the wood floor truss**

The air gap is measured from the top of the insulation to the bottom of the floor above (or roof deck).

The committee noted that filling a concealed space entirely with insulation presents some practical difficulties. For that reason, the 2013 Edition of NFPA 13 added Section 8.15.1.2.7.1 allowing a 2-inch air gap “between the top of the insulation and the roof or ceiling above”. Figure A.15.1.2.17 in the 2013 Edition of NFPA 13 has a visual reference related to this allowance.



COMBUSTIBLE CONCEALED
SPACE FILLED WITH INSULATION



Question #3 – Design Criteria for Group A Plastics stored between 5 ft. and 12 ft. in height

Section 17.2.1.3 in the 2013 edition of NFPA 13 states that for storage of Group A plastics between 5 ft and 12-ft in height, the requirements for Extra Hazard systems would apply.

Should the design criteria for Extra Hazard Group 1 (0.30 gpm/ft² over 2500 sq. ft) or the criteria for Extra Hazard Group 2 (0.40 gpm/ft² over 2500 sq. ft) be applied for this storage application?

The answer is neither. Section 17.2.1.4 is intended to apply only to installation requirements such issues as sprinkler spacing and types of pipe that can be used, not the design criteria. The design criteria would be determined in accordance with Section 17.2.1.2.1 which states that the density

and area of application would be determined from “Figures 17.2.1.2.1(a) through Figure 17.2.1.2.1(f) depending on the actual arrangement.”

Once the design criteria (density and area) is determined, the installation requirements (sprinkler spacing, types of sprinklers) for extra hazard occupancies apply.

Question #4 – Forward Flow Test for Antifreeze Loop Backflow Preventer

Section 13.7.2.1 in the 2020 edition of NFPA 25 requires a forward flow test be performed on all backflow preventers installed in fire protection systems. It is understood that this requirement applies to the main backflow preventer protecting the municipal water system.

Does this requirement also apply to the small backflow preventer installed in an antifreeze loop?

Yes, a backflow preventor installed on an antifreeze system would require a forward flow test. As stated in this section, NFPA 25 requires that all backflow preventors installed in water-based fire protection system piping have a forward flow test performed on an annual basis.

The purpose of the forward flow test is to exercise the internal check valves of the backflow to ensure that they will fully open in a fire event and provide the required flow rate for the system being served. This objective would apply to the system fed by the antifreeze loop as well as the main backflow preventer.

It should be noted that the NFPA 13, 2019 edition, in Figure 8.6.3.3 for antifreeze backflow installation shows a valve installed after the backflow to conduct the forward flow test.



Question #5 Draft Curtains and ESFR sprinklers

NFPA 13 requires that ESFR sprinkler systems adjacent to sprinkler systems with standard response sprinklers to be separated with a draft curtain. A draft curtain is to be installed along bar joists for this purpose. Due to the configuration of the bar joist, there are small gaps in the draft curtain at the seams.

Do these seams need to be sealed with fire caulk?

No. Draft curtains are defined by the 2019 edition of NFPA 13 in Section 3.3.57 and as noted in the annex to this section are regulated by NFPA 204, *Standard for Smoke and Heat Venting*. Draft curtains separating ESFR, and standard response sprinklers are not required by NFPA 13 or NFPA 204 to be sealed with fire caulk.

A draft curtain is not a fire-rated or fire-resistive member required by the fire or building codes to be sealed. NFPA 204, Section A.7.1 gives some good guidance with the following, *"...A draft curtain is intended to be relatively smoke-tight. The function of a draft curtain is to intercept the ceiling jet and the entrained smoke produced by a fire in the building..."*

Question #6 - Virtual Reality/Gaming Pods

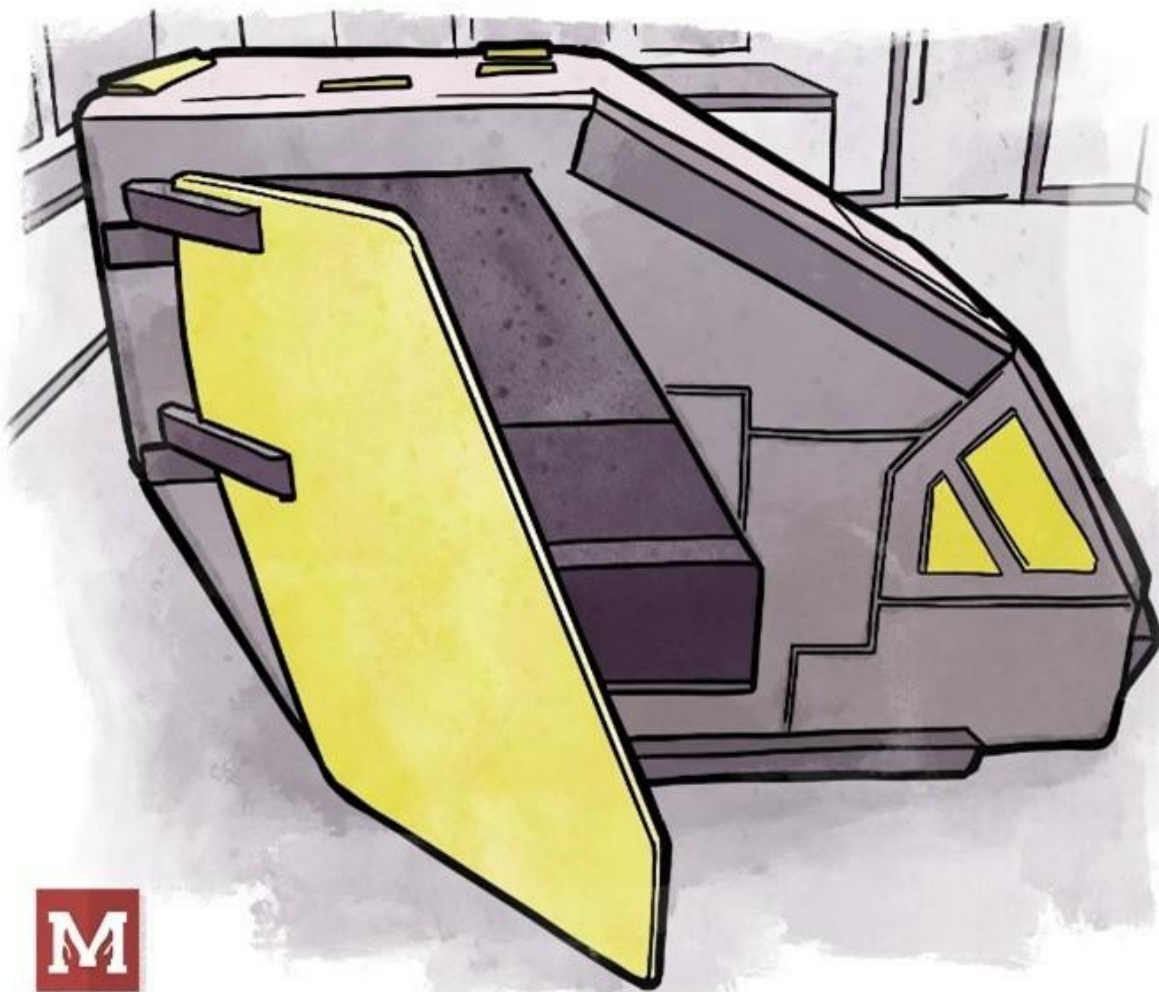
A video arcade store is being provided with a NFPA 13 fire sprinkler system. This arcade includes fully enclosed virtual reality and video game "structures." There does not seem to be an allowance in NFPA 13 to omit sprinklers in these spaces. Section 8.1.1 in the 2016 edition of NFPA 13 does allow sprinklers to be omitted from furniture that is not intended for occupancy. As people are intended to occupy these arcade "enclosures," it does not appear that this section would apply.

Are sprinklers required in these arcade "enclosures"?

Probably not and the 2022 edition has added a section that appears to apply to this situation. The new section 9.2.10 is titled "Small Temporarily Occupied Enclosures" allows sprinklers to be omitted from small isolated temporarily occupied enclosures that:

- Do not extend to the ceiling
- Contain no storage
- Do not exceed 24 square feet

Although this section was intended for spaces such as hearing testing booths, lactation rooms, phone booths, or pods, the described spaces appear to meet these criteria. The Authority Having Jurisdiction can apply the equivalency clause (Section 1.5 of NFPA 13) to allow the use of this section from the 2022 edition of NFPA 13.



Question #7 – Required Hanger Locations on Armover Piping

Section 9.2.3.5 in the 2016 edition of NFPA 13 is titled “Unsupported Armover Length” and allows a 1-in. armover pipe without a hanger to be up to 24 in., OR, for pendent sprinkler below ceiling over 100 psi to be up to 12 in.

Can an armover WITH a hanger, for 1-in. pipe, be up to 3 ft. in length between the hanger on the armover pipe and the sprinkler itself as allowed by Section 9.2.3.4.1? In other words, can the unsupported length Section 9.2.3.4 be applied to armovers?

No. NFPA 13 has these two rules in separate sections for a reason. Section 9.2.3.4 is carefully worded, with descriptive figures, to only apply to the “...end sprinkler and the last hanger on the line...” The “line” is intended to mean branch line, where (assuming) a continuous piece of pipe is being installed and the hanger is bearing the weight of the cantilevered pipe.

In this case, the 1 in. pipe can cantilever 3 ft. from the last hanger. Section 9.2.3.5 is specifically for armovers that are assembled short pieces of piping with several fittings. These assemblies cannot carry the same load as a cantilevered pipe in the above section, so the standard limits it to the 24 in. cumulative horizontal length before a hanger is required. Armovers are typically smaller diameter piping, but unlike in 9.2.3.4, there is not an increase for hanger distance based on pipe diameter.

Question #8 – Dry Pipe System Size

A dry pipe system has a system volume of 980 gallons.

On a system this size (over 750-gallon capacity), is it a requirement of the 2019 edition of NFPA 13 to have a water delivery time of 60 seconds or less?

This is not a straightforward yes or no answer. For dry systems exceeding 750 gallons, NFPA 13 requires one of two methods be followed:

1. NFPA 13 allows the 750 gallons capacity to be exceeded if initial water discharge to the ITC occurs in 60 seconds or less. This is outlined in the 2019 Edition of NFPA 13, Section 8.2.3.2.
2. The volume limitation can be exceeded where water delivery is calculated with a listed calculation method or initial water discharge is verified by an appropriately sized test manifold. These conditions are addressed in Sections 8.2.3.5 and 8.2.3.7, respectively. Table 8.2.3.6.1 will apply if this option is chosen (as opposed to option #1) as the method for water delivery time.

For condition #1, the NFPA 13 Handbook goes on to say, “this test connection is piped from the most remote branch line at the highest elevation of that branch line. The time interval starts when the valve is fully open and stops upon initial discharge of water.” It goes on to say that a steady stream of water is not required, but water should be flowing from the ITC within the 60-second delivery time.



Question #9 – Sprinkler Omission Above Indoor Swimming Pools

A new indoor pool facility for the local high school is being installed. The building includes a pool and locker rooms, bathrooms, storage and office areas. There is concern about being able to maintain the sprinkler system (mainly the sprinklers) located over the pool as they are roughly 30 feet above the pool deck and will be difficult to reach over the pool area. (A code review page and plans were provided)

Does Section 507.4 of the International Building Code (or other provision of the code) allow the automatic fire sprinkler system to be omitted from the pool area?

The IBC does allow A-4 occupancies, such as indoor pools, to exempt sprinklers above the pool area. The subchapter, 507, provides criteria for buildings with unlimited area. Specifically, Section 507.4 requires a NFPA 13 system and provides the exception to sprinklers above the pool area; however, there are several points in 507 that must apply to the project in order to gain this exception. Upon reviewing the provided code review page, the project does not appear to qualify for the sprinkler exception for following issues:

- 507.1 – allows the unlimited A-4 area, but this project has a basement that appears to qualify as a story
- 507.1.1 and 507.4 – allows the A-4 to be unlimited in area, but not as a mixed-use building. Accessory occupancies are allowed in unlimited area buildings when not exceeding 10% of the total A-4 area.
- 507.2 and 507.4 – allows the A-4 to be unlimited in area with side yards 60 feet or greater surrounding the building. It is not clear if this building has 60 ft. side yards.
- 507.4 Exception 2 – This is the exception that removes sprinklers over the pool area only with:
 - Exit doors directly to the outside. It is not clear if this exception is met.
 - Fire alarm system with manual pull stations. It is not clear if this exception is met.

Section 8.1.1(1) of NFPA 13 requires all spaces in the building to be protected with sprinklers. There is no exception for spaces over pools. Frequently, owners will purchase pool covers to allow the space above the water to be used for other purposes. For example, there is a scene at the beginning of the movie “It’s a Wonderful Life” where the pool cover is placed over the pool and the space is used for a dance. Even if a pool cover is not used, the pool is sometimes drained and used for a variety of purposes.

The inspection of sprinklers per NFPA 25 is done from the floor. Aside from an activation, there is little reason or cause to physically get to the sprinkler.

Question #10 – Exterior Bathroom in NFPA 13D

A single-family house is being equipped with a residential sprinkler system in accordance with NFPA 13D. There is a bathroom (over 55 sq ft) that will serve the outside pool. This bathroom is attached to the house but does not have a door or unprotected opening into the dwelling.

Are sprinklers required in this bathroom?

Yes, based upon the prescriptive requirements of NFPA 13D, sprinkler protection would be required in a bathroom over 55 sq. ft even if there are no unprotected openings into the dwelling unit.

Section 8.3.1 (in 2019 edition with similar language in other editions) states that sprinklers shall be installed in all areas except where a specific section allows sprinklers to be omitted. There is no section that would allow the described bathroom to be not equipped with sprinkler protection.

Section 8.3.8 does allow sprinklers to be omitted from exterior closets that do not have unprotected openings into the dwelling unit; however, this section is specific to closets in garages and exterior closets and cannot be expanded (at least prescriptively) to include bathrooms that do not open to a dwelling unit.

Question #11 – Connection for Anti-vortex Plate

The handbook of NFPA 20 shows a long turn elbow connected to the anti-vortex plate with a welded connection.

Is it permitted for the long turn radius pipe to be connected to the anti-vortex plate with a flanged coupling or must it be welded?

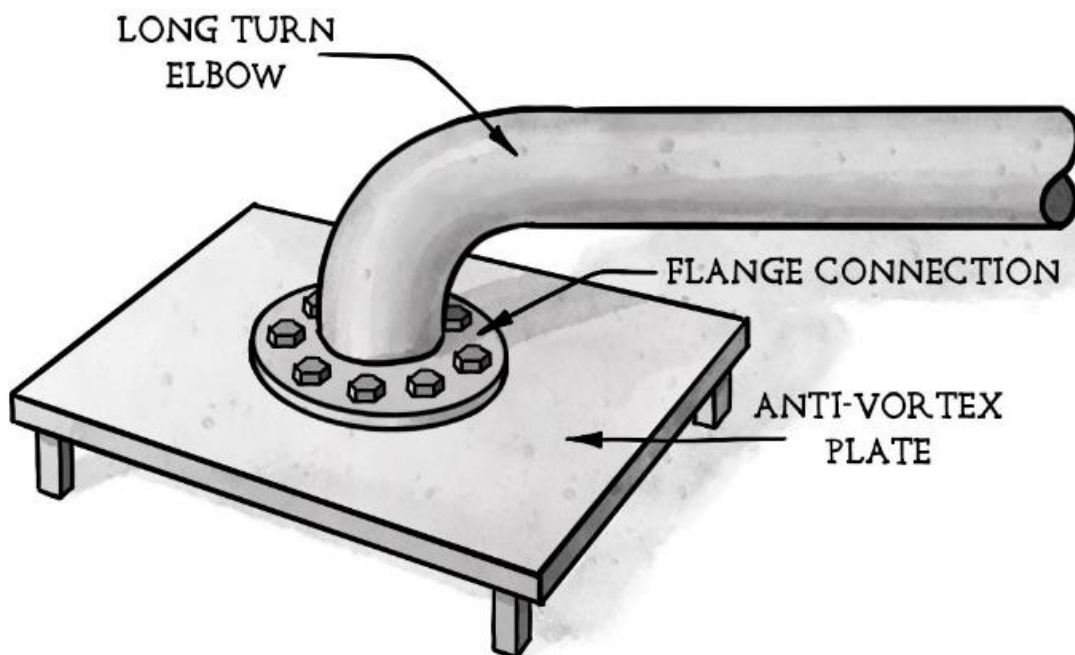
Yes, the antivortex plate can be connected to the long turn elbow with a flange in lieu of a welded connection.

NFPA 20, 2019 edition, Section 4.16.10 indicates where a tank is used as the suction source for a fire pump, the discharge outlet of the tank shall be equipped with an assembly that controls vortex flow in accordance with NFPA 22.

NFPA 22, 2018 edition, Section 14.2.13 for the anti-vortex plate assembly indicates the discharge outlet for every suction tank shall be equipped with an anti-vortex plate assembly. The assembly shall consist of a horizontal steel plate that is at least twice the diameter of the outlet on a long radius elbow fitting, where required, mounted at the outlet a distance above the bottom of the tank equal to one-half the diameter of the discharge pipe. The minimum distance above the bottom of the tank shall be 6 in.

The standard itself, as noted above, does not include specific requirements pertaining to the connection method of the anti-vortex plate of the elbow. The annex explanatory material in Section A.14.2.13 and Figures B.1(p)(q) while not a requirement of the standard, indicates the use of a welded long turn elbow.

The use of a coupling with a rubber gasket may not be appropriate for the low to negative pressures associated with the suction side of the fire pump.



ANTI-VORTEX PLATE



Question #12 – Minimum Flowrate for Fire Pump Performance Testing

During acceptance testing of a 2,500 gpm rated fire pump, the test was stopped at 2,800 gpm due to a low suction pressure (5 psi). The water source is a city water main. On this system, the maximum demand of the fire sprinkler system is 2,163 gpm. The AHJ stated that the pump must be tested at 150% of rated capacity.

In accordance with the 2013 edition of NFPA 20, is testing beyond 100% of rated flow required?

No, fire pump acceptance testing does not require the pump to be tested at 150% of the rated capacity.

NFPA 20, 2013 edition, Section 4.6 for the water supply source, indicates in Section 4.6.2.3.1 where the maximum flow available from the water supply cannot provide a flow of 150 percent of the rated flow of the pump, but the water supply can provide the greater of 100 percent of rated flow or the maximum flow demand of the fire protection system(s), the water supply shall be deemed to be adequate.

The water supply for this system must be capable of achieving both the 2,500 gpm rated fire pump flow and the maximum system demand of 2,163 gpm.

Section 14.2.6.2.6 for field acceptance testing and fire pump flow testing, indicates where the maximum flow available from the water supply cannot provide a flow of 150 percent of the rated flow of the pump, the fire pump shall be operated at the greater of 100 percent of rated flow or the maximum flow demand of the fire protection system(s) maximum allowable discharge to determine its acceptance.

Section 14.2.6.2.6.1 goes on to indicate this reduced capacity shall constitute an acceptable test, provided that the pump discharge exceeds the fire protection system design and flow rate.

In this case the fire pump is required to be acceptance tested at 2,500 gpm. This is the greater of 100 percent of rated flow (2,500 gpm) or the maximum flow demand of the fire protection system(s) (2,163 gpm) as required by the standard.



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