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

Editor - Roland Asp, CET #505 02/14/2023

Best of January 2023

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 January 2023. This information is being brought forward as the "Best of January 2023." 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.

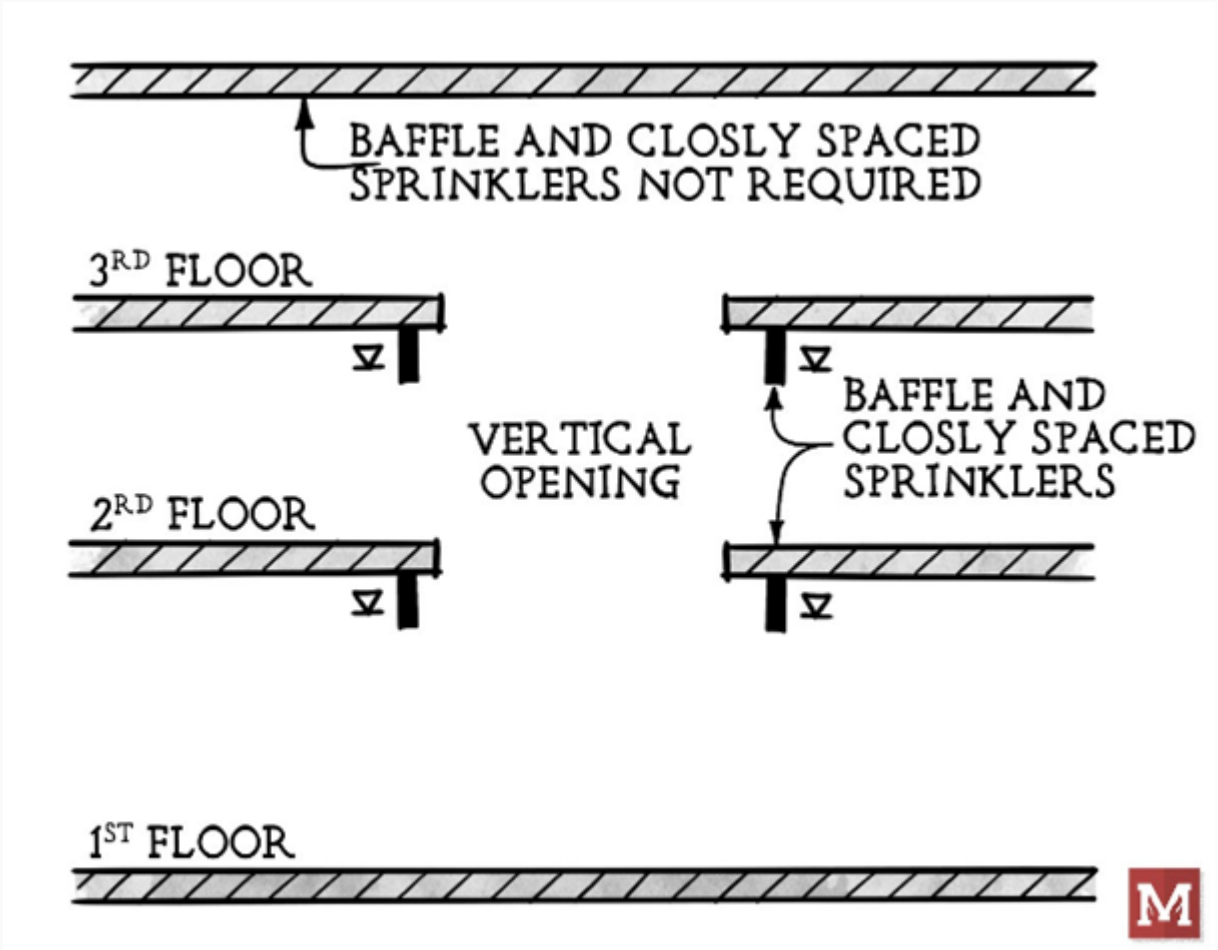
Question #1 – Vertical Openings

A three-story building has a staircase open to the floor on each level. This is considered a vertical opening that will require closely spaced sprinklers and draft curtain in accordance with Section 9.3.5 of the 2019 edition of NFPA 13.

It is understood that for the first and second floors, draft curtains and closely spaced sprinklers are required to protect from a fire on those floors traveling up the staircase to the floor above. However, on the 3rd floor the ceiling above the stairwell does not have an opening.

Would a draft curtain be required on the 3rd floor?

NFPA 13 (2019 edition) Section 9.3.5 is specific to vertical openings, therefore it would only apply to the first and second floors that actually have the opening. Since there is no opening in the 3rd floor ceiling Section 9.3.5 is not applicable.



Question #2 – Manual Standpipe Max Pressure

When a manual wet standpipe is being designed in accordance with NFPA 14, is it acceptable to have a pressure at the fire department connection (FDC) in excess of 175 psi?

Yes, a pressure in excess of 175 psi at the FDC is acceptable, but only when all the system components, including the FDC are rated for those pressures.

It should be noted that any surge pressure above the calculated system demand from the FDC, is not included in the system demand/design pressure from the FDC. Signage must indicate the pressure required at the FDC needed to provide system demand/design pressure, when greater than 150psi.
What's your sign say? Standpipe signage requirements - blog March 4, 2020

NFPA 14 states that manual wet standpipes cannot exceed the working pressure of the system components of the standpipe system or a sprinkler system when it's combined (Section 7.8.1.2.1 in the 2019 edition of NFPA 14.)

The definition of *system working pressure* has changed over the last few cycles of NFPA 14 *Standard for the Installation of Standpipes and Hose Systems.*

This definition was once again modified during the 2023 edition cycle to help clarify that the system shall comply with the maximum designed pressure and the calculated pressure at the FDC to provide system demand.

The 2023 edition seems to have finally provided proper guidance on this issue. Defining system working pressure as the maximum anticipated static or residual pressure applied to standpipe system components, exclusive of surge pressure and inclusive of the system design/demand from the FDC.

This revised definition clarifies that the pressures at the FDC are not considered part of the surge pressure and that system components shall be rated for all system design pressures. Design pressure includes system demand and the hydraulically calculated pressure required at the FDC to provide that system demand.

Standpipe System Working Pressure - Blog October 25, 2021

Question #3 – Bathrooms in a 13R system

A building is to be equipped with a sprinkler system in accordance with the 2016 edition of NFPA 13R. This building includes bathrooms with fiberglass tub surrounds that do not have sheet rock behind the tub enclosure. The bathrooms are less than 55 square feet in size.

In accordance with the 2016 edition of NFPA 13R and the 2018 edition of the International Building Code (IBC), can sprinklers be omitted from these bathrooms?

Yes, sprinklers are permitted to be omitted from these small bathrooms. While both NFPA 13 and NFPA 13R have allowances to omit sprinklers from bathrooms 55 square feet or less, there are differences in these requirements.

NFPA 13, Section 8.15.8.1.1 allows sprinklers to be omitted in small bathrooms serving dwelling units and not exceeding 55 square feet where the walls and ceilings are finished with a noncombustible or limited combustible material with a 15-minute thermal barrier. This section specifically includes the walls and ceiling behind the shower enclosure or tub.

By contrast, NFPA 13R simply says that sprinklers are not required in bathrooms that do not exceed 55 square feet. NFPA 13R does not have a requirement to install a 15-minute thermal barrier behind the tub enclosure.

The 2018 edition of the IBC includes similar language. Section 903.3.1.1 contains the same requirement for walls *and ceilings, including the walls and ceilings behind a shower enclosure or tub, are of noncombustible or limited-combustible materials with a 15-minute thermal barrier rating* in order to omit sprinklers in bathrooms not exceeding 55 square feet and are located in dwelling units.

This section, however, only applies to NFPA 13 Systems. Section 903.3.1.2 which applies to NFPA 13R does not have a similar requirement.

Question #4 – Locking Curb Box vs Post Indicating Valve

In lieu of a post indicating valve for a fire main, can a non-indicating valve, such as an underground gate valve in an approved roadway box with T-wrench at least 40 feet from the building, be used?

Yes, this requirement is really within the scope of NFPA 24 and not NFPA 13

The 2022 edition of NFPA 24 states in Section 6.1.1 that all valves controlling connections to supply pipes to sprinkler system must be listed indicating type with two exceptions:

1. Listed, non-indicating valve such as an underground gate valve in an approved roadway box (6.1.1.3)
2. Non-listed, non-indicating valve, including a T-wrench as part of a tapping assembly. (6.1.1.4)

More specifically, Section 6.2.9 of the 2022 edition of NFPA 24 provides 8 options for providing valves on the lead-ins to a fire sprinkler system.

Option 5 allows the use of an underground non-rising stem gate valve with an approved roadway box, complete with T-wrench, located not less than 40 feet from the building.

This 40 foot distance is permitted to be reduced when 1) the building is less than 40 feet in height and 2) when a property line or other physical barriers make it impossible to have the valve 40 feet away.

Anyone one of the eight options specified in this section is acceptable.

Question #5 – Ductile Iron Fittings on Aboveground Pipe

Table 6.4.1 in the 2016 edition of NFPA 13 lists acceptable fitting materials for use on fire sprinkler systems aboveground. Ductile iron fittings are not included in the list.

Are ductile-iron fittings acceptable for use in aboveground fire sprinkler systems?

Yes, ductile iron fittings are permitted for aboveground pipe, but they must be listed for such use. They are not included in Table 6.4.1 simply because there is not a specific ASTM standard for ductile iron fittings, therefore, ductile iron fittings are permitted when listed in accordance with Section 6.4.4.

Table 6.4.1 addresses fittings that are acceptable but do not require a listing. The committee addressed this for the 2019 edition. During the first draft stage, a proposal was accepted to add ductile fittings to this table using

ASTM A536. However, during the second draft stage, the committee determined that ASTM 536 is not a manufacturing standard for ductile iron fittings but rather is a general document for ductile iron castings. As such, ductile iron fittings are allowed but they need to be listed for sprinkler service. This action can be reviewed on the second draft report for the 2019 edition of NFPA 13 (available on the NFPA website). See Second Revision No. 413.

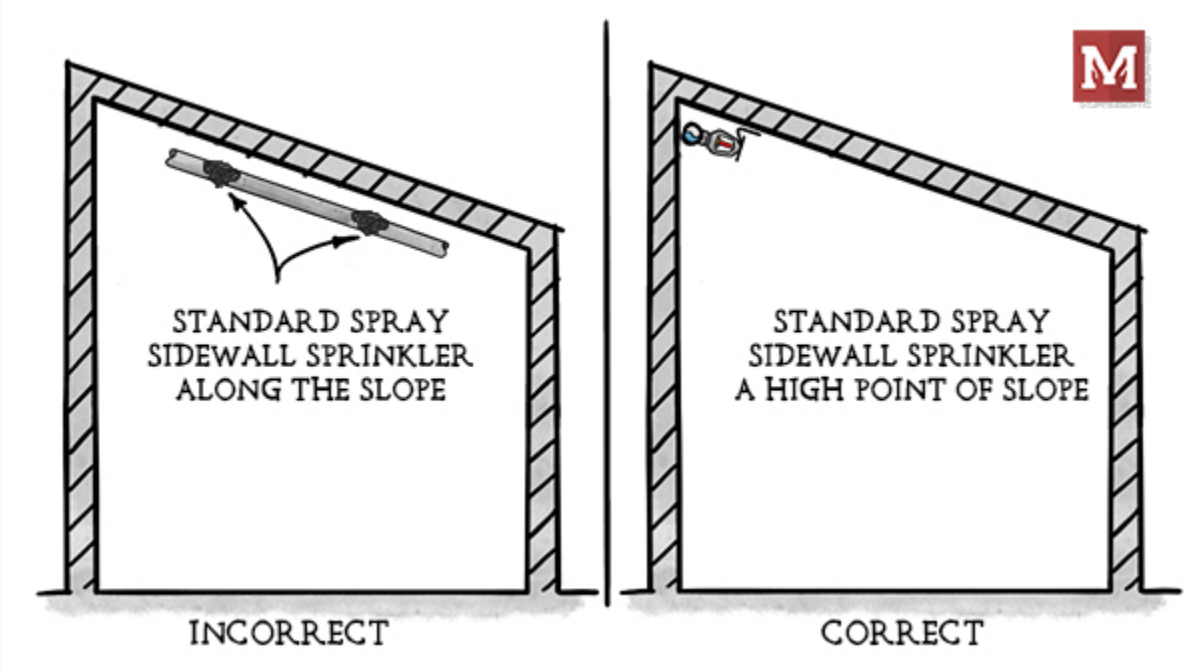
Question #6 – Sidewall Sprinklers and Sloped Ceilings

In accordance with the 2016 edition of NFPA 13, can standard spray sidewall sprinklers be placed along the slope of a flat sloped ceiling, adhering to all the other spacing requirements?

No. Sidewall sprinklers are permitted to be installed under sloped ceilings, but they must be installed at the high point of the slope and positioned to discharge down the slope. NFPA 13 does not permit standard spray sidewall sprinklers to spray across the slope. This requirement is found in Section 8.7.4.2.2 of the 2016 edition of NFPA 13. This subject was also discussed in TechNotes, Issue #375, on June 13, 2017, as *Horizontal Sidewalls and Sloping Ceilings*.

It should be noted the same restriction is not found in the residential sprinkler section and as the standard is silent on this issue, the manufactures instructions would need to be adhered to which in some cases permits residential sprinklers to be installed along the slope.

It should also be noted that a First Revision (FR-1054) has been accepted to the upcoming 2025 edition of NFPA 13 to specially allow residential sprinkler to be installed either at the highpoint discharging down the slope or along the slope discharging across the slope. As the 2025 edition has not finished its revision cycle, this accepted first revision cannot yet be considered a change to the standard



Question #7 – NFPA 25 and Fire Pumps

Clarification is needed on the requirements of the 2020 edition of NFPA 25 in regard to fire pumps inspections, testing & maintenance.

Is it required to always have a person stand with the pump while the pump is running, or is it intended to have someone start the pump verify that it is running free of obvious issue before walking away to perform required service & testing like drain test, flow test, or hydrant flow test?

No, it is not always required to have someone in constant attendance while the fire pump is running.

Section 4.4 of NFPA 25 states that systems shall remain in service during inspection, testing and maintence activities unless under constant attendance or the requirements of chapter 15 are followed. Chapter 15 is the impairment chapter.

Having someone in constant attendance of the fire pump while running may not be cost effective and would not allow for remote inspection and testing as the standards now allow.

Question #8 – Fire Department Pipe Sizing

A project includes a sprinkler system (no standpipe) fed by a 8 inch riser. It was our understanding that NFPA 13 only required a 4 inch fire department connection (FDC) pipe size regardless of the size of the riser. We are being told that as this system is hydraulically calculated, Section 16.12.4 (3) in the 2019 edition would apply and the piping from the must be at least the size of the riser.

If you have an 8 inch riser, do you need a minimum 8 inch pipe to the FDC?

No, it is acceptable to have a 4 inch FDC piping for an 8 inch riser. NFPA 13, 2019 edition, Section 16.12.4 provides three different options for FDC piping sizing, only one of which needs to be applied. This is why this section reads that the size of the pipe for the FDC *shall be in accordance with one of the following:*

- Option 1 is for fire engine connections and requires a minimum of 4 inch pipe. For most systems, this is the option that would apply.
- Option 2 is for fire boat connections, and only needs to be applied in the case where the responding fire response is via fire boat.
- Option 3 allows the pipe for the FDC to be smaller than 4 inches, but not less than the largest riser be served by the FDC. In order to use this option, the system must be hydraulically calculated.

The confusion may be because the third option states, "…hydraulically calculated." However, this language is not stating that every hydraulically calculated system must meet the requirements of Section 16.12.4(3). Instead, it is giving a path to allow the FDC piping to be less than 4 inches, but not less than the size of the riser as long as the system is hydraulically calculated.

It must be understood that the FDC is not intended to provide the system demand, rather it is simply meant to supplement the pressure of a sprinkler system. This concept is explained in Annex section A.16.12.4.

There have been proposals to NFPA 13 in the past to match the FDC pipe size to the flow rate of the system or to match the size of the riser. The committee has rejected such proposals with the following substantiation:

The FDC is a supplemental supply and therefore does not need to be sized as proposed.

Question #9 – NFPA 13 - Horizontal barriers in rack storage

Sections 25.8.1.4.1 and 25.8.3.2.5 in the 2019 edition of NFPA 13 outlines construction requirements for horizontal barriers for alternative in-rack sprinkler protection. These sections state the barriers must be sheet metal, 22 gauge minimum, or plywood, 3/8 in. minimum.

What are the critical factors in determining acceptable barrier material thickness, nominal size, or millimeters? Is standard corrugated sheet metal deck acceptable or must it be flat sheet metal? Does "plywood" only mean conventional or is OSB an acceptable material, provided it meets the required thickness?

The horizontal barrier requirements for these sections were new in the 2016 edition. The criteria and testing come from Class IIIB combustible liquids in plastic containers for NFPA 30. Test references to support such criteria for Class IIIB liquids is provided by NFPA 30, Table D.2(e) 1 as P-21 to P-31 from the *Directory of Fire Tests Involving Storage of Flammable and Combustible Liquids in Containers*, 3rd edition.

The text (size, dimension, product) for the horizontal barriers is specific because it was tested with these products, so, staying with these prescriptive dimensions and materials is important.

Section 1.6.1.4 indicates where multiple dimensions or equivalences are indicated, the first-dimension rules. Where 22-gauge steel is required, use the gauge size versus the metric measurement but consider that many of these products are manufactured with a range of tolerances, acceptable by that product industry.

Regarding the 22-gauge corrugated versus flat sheet stock, the standard does not indicate a specific form, so either would be acceptable. However, plywood is specific and is prescriptively required, but the authority having jurisdiction (AHJ) may be amenable to oriented-strand board (OSB) of equal or thicker material. Testing labs use plywood because of its legacy and durability to last several tests without delaminating.

Question #10 – Drain Riser Sizes

We have a project that includes a combination system (standpipe/sprinkler) that includes a 5 inch floor control valve assembly and pressure reducing valve.

Is it the intent of Section 7.11.1(1) of the 2013 edition of NFPA 14 that the drain riser to also be 6 inches?

Yes, NFPA 14 *Standard for the Installation of Standpipe and Hose System* is addressing the standpipe requirement for drains greater than 2 1/2 inches and requires the drain to be sized by the discharge outlet when a pressure-regulating device is greater than 2 ½ inches.

The requirement found in Section 7.11.1 (1) is specific to the drain sizing when a standpipe is equipped with a pressure-regulating device greater than 2 ½ inches. In this case the drain must be sized according to the outlet discharge of the pressure-regulating device.

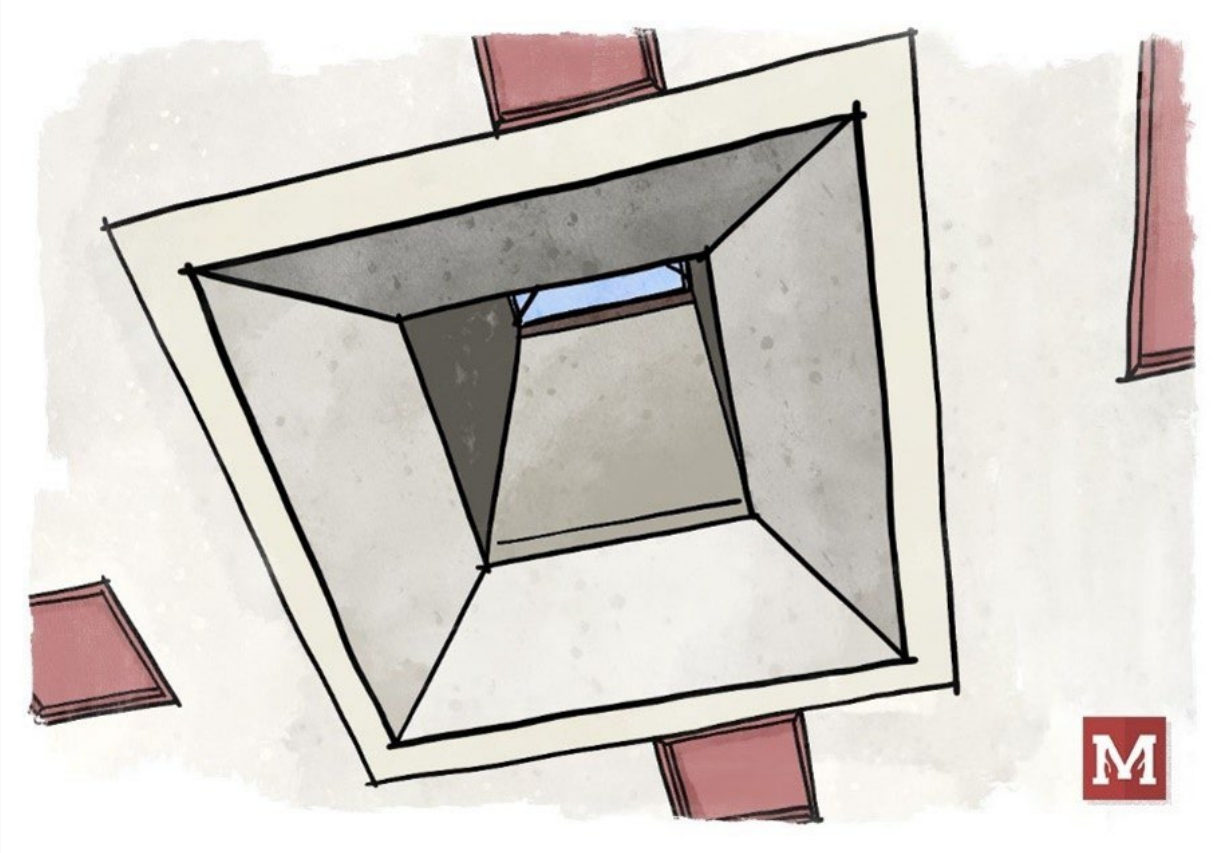
The requirements of the 2013 edition NFPA 13 *Standard for the Installation of Sprinkler Systems* contains similar, but not the same, guidance in Section 8.16.2.4.5 for drains serving sprinkler systems with pressure-reducing devices, stating that they be sized to permit the greatest system demand supplied by the pressure-reducing valve. Instead of requiring a specific size, NFPA 13 simply sizes the drain as being capable of handling the flow.

Note: Standpipes without pressure-regulating devices would be sized in accordance with Section 7.11.2.3.

Question #11 – Skylights

A light hazard project includes a transition to the opening (see figure). The transition is 6 feet-10 inches square and 1 foot-6 ½ inches tall. The actual opening to the skylight is 3 feet-9 inches square. Can the sprinkler be omitted?

Yes. The area of the actual skylight, up to 32 square feet, is calculated, not the transition. When skylights are 32 square feet or less, sprinklers can be omitted per Section 8.5.7 of the 2016 edition of NFPA 13. The transition portion could be considered as a ceiling pocket, and it would not include the “shaft” of the skylight. A light hazard occupancy would permit the ceiling pocket rules in Section 8.6.7 to have sprinklers in the ceiling covering the floor area under the skylight/ceiling pocket area.



Question #12 – Water Storage Tank Size

A project consists of a light hazard and municipal water supply is insufficient for the needs of the sprinkler system and a fire pump with a water storage tank(s) is required.

The fire pump and water storage tank(s) will be in a detached building. As the fire pump will be a diesel, the sprinkler system in the pump house will be designed to an extra hazard group 2 occupancy.

Does the water storage tank need to be sized based on the EH2 calculation or can it be based on the major occupancy for this project, which is the light hazard daycare?

The tank is required to provide the duration for the most demanding hydraulic scenario being served which is the extra hazard group II pump house.

The 2023 edition of NFPA 22 simply states that the tank capacity is *determined by the required fire flow and duration for the attached fire protection system(s)*.

It is NFPA 13 that would drive the required tank capacity.

Hydraulic calculations for each hazard area should be done, including the appropriate durations. This is in accordance with Section 19.1.6.1(1) of the 2022 edition of NFPA 13, which states, “the water supply requirements for the highest hazard classification within the system shall be used.”

When the higher classification hazard, pump house, is limited to a small area, it may be that the light hazard area is what drives the tank size. However, multiple calculations would be needed to determine the hydraulically most demanding situation. Along this line, Section 19.1.6.1(3) addresses higher classified areas served by a system that are limited to no more than 400 sqare feet. It states, this type of room “only lies within single rooms less than or equal to 400 sqare feet in area with no such rooms adjacent, the water supply requirements for the principal occupancy shall be used for the remainder of the system.”

This would mean that the light hazard hose stream and water supply duration could be used if the pump house is under the 400 square feet requirement. This may reduce the required tank capacity. It should be noted that this section applies to a “system” with multiple hazard classifications and may not be allowed if the pump house and the day care are separate systems. I suggest that the AHJ be consulted if this option is to be considered.

Another potential option to reduce the tank capacity would be to calculate the pump house based upon the room design method as permitted in Section 19.2.3.1.1. Assuming the pump house is less than 2,000 square feet, this may result in a smaller required tank capacity.

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National Fire Sprinkler Association
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1-800-683-NFSA (6372)