

## Best of December 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 December 2022. This information is being brought forward as the "Best of December 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.

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### Question #1 – Open Parking Garage with R2 Above

**Which part of the IBC 2015 specifies that a fire sprinkler system is required in an open parking garage under the R-2 Occupancy?**

Standalone open parking garages are exempt from fire sprinklers in the 2015 (although the 2021 IBC requires sprinklers in open parking garages over 48,000 square feet). However, sprinklers are required in the open parking garage (in the 2015 edition) when it is part of the R-2 (residential-apartment) fire area.

Section 903.2.8 requires sprinklers, "...throughout all buildings with a Group R fire area." Where the R-2 is on top of a S-2 open parking garage, it is considered one building and the residential use drives the sprinkler requirement into the open parking garage.

The IBC would consider these separate buildings if separated by true fire walls (Section 706) or a horizontal assembly (Section 510.2 – podium/pedestal). With the R-2 on top of the S-2, vertical fire walls could not be applied, and the horizontal/podium rules require the lower Type I-A to be sprinklered regardless (510.2(5)).



## Question #2 – Hydraulic Placard vs. Main Drain Test

An AHJ is concerned that the main drain test values do not match the info on the hydraulic information sign.

Do the main drain test results need to match with the values found in the hydraulic information sign?

No. The NFPA 13 hydraulic design information sign, as referenced and required by Section 25.5, of the 2016 edition of NFPA 13, is based on the original or latest fire sprinkler layout and design. This was the information used to layout and design the initial system the code official reviewed. The purpose of the sign is to inform future inquiries of the system. The code official would verify the “reviewed and approved” design criteria on the hydraulic sign from: 1) the summary sheet of the hydraulic calculations or 2) from the shop drawings. The information on the hydraulic sign is clear from the list found in Section 25.5.2, i.e., location of design areas, discharge densities, system demand, hazard/commodity classifications, hose stream are all design related.

System design is based on the available water supply from Section 23.2. Static and residual pressures of the water supply are usually out at the street, with readings from flowing hydrants. The results of the main drain test, on a different valve, on a sprinkler riser, factoring in distance and friction loss to the inside the building, are always different from the static and residual pressure at the street water flow test. The NFPA 24 and NFPA 13 standards do not require verification, matching, or correlation of this information. Frankly, it would be suspicious if they, water flow pressure at street and system main drain pressure, did match.

The main drain function is a post-design operational acceptance test that indicates the current supply pressures. The results of the main drain test as well as other acceptance testing are recorded on the General Information Sign.

### Question #3 – Ductile Iron Fittings on Aboveground Pipe

The 2016 edition of NFPA 13, Table 6.4.1 lists acceptable fitting materials for use on aboveground sprinkler system piping. Ductile iron is 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.

Table 6.4.1 addresses fittings that are acceptable when manufactured to the standards found in the table and do not require a specific listing for fire sprinkler use. Ductile iron fittings are not included in Table 6.4.1 simply because there is not a specific ASME or ASTM manufacturing standard for ductile iron fittings comparable to ASME B16.5 for malleable iron fittings.

As ductile iron fittings are not specifically called out in Table 6.4.1, they would need to be listed for fire sprinkler use as permitted by Section 6.4.4.

It should be noted that the installation committee addressed this issue during the revision cycle for the 2019 edition of NFPA 13. During the first draft, the committee added ductile iron fittings to the table citing ASTM A536 as the manufacturing standard. However, during the second draft, this action was reversed with the following committee statement (See SR-413):

- The ASTM A536 standard is a general document for ductile iron castings. There does not seem to be a standard for the manufacture of ductile iron threaded fittings comparable to ASME B16.5 for malleable iron fittings. In a search of the internet, all of the ductile iron threaded fittings located (Tyco, Sigma, Shurjoint, Anvil, SCI, etc.) were seen to be UL listed and/or FM approved. Therefore, ductile iron threaded fittings should not be referenced in Table 7.4.1 (formerly Table 6.4.1). Instead they should be covered under Section 7.4.4 (formerly 6.4.4) for other types of fittings listed for sprinkler service.*



### Question #4 – Sloped Ceiling Adjustment

An existing system is being evaluated. The sprinkler system was installed in 1977 and the building includes sloped ceilings.

## When did the increase in hydraulic area for sloped ceiling appear in the NFPA 13 Standard?

The rule for increasing the design area by 30% for sloped roofs or ceilings greater than 2 in 12 was added in the 1996 edition and is found in Section 5-2.3.2.5. This new section was added to the standard as a result of Proposal 13-130 found in the Report of Proposals for the 1996 edition of the standard.

In 1977, there is a good chance the system was designed with the pipe schedule method rather than the hydraulic density/area method. The pipe schedule method did not require a design area increase for sloped roofs or ceilings. If the system was hydraulically calculated, NFPA 13 at the time did not have a requirement to increase the calculated area based upon the presence of sloped ceilings.

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## Question #5 - Hospital Patient Lift Tracks - Obstructions?

**Patient lifts are common in hospital projects. Typically, they will have stationary rails mounted on the ceiling with a piece that moves along the tracks, similar to an industrial crane rail. See attached picture.**

**Is there guidance in NFPA 13 on how to apply the obstruction rules for patient lifts/rails mounted near the ceiling?**

NFPA 13, including the 2022 edition and proposed first draft of the 2025 edition, does not specifically address obstructions to sprinkler discharge from hospital patient lifts.

The fixed tracks at or near the ceiling should be treated as obstructions and comply with the standard. Typically, these tracks are 3-4 inches in depth and attached directly to the ceiling. Using the beam rule and standard spray sprinklers, with a fixed beam up to 5.5 inches deep, the sprinkler would be required to be a minimum of 2 feet from the rail.

As noted, the moving rail creates an obstruction that is not possible to comply with when the rail is located anywhere along the track. The performance objective in NFPA 13, 2019 edition, Section 9.5.5.1 indicates sprinklers shall be located so as to minimize obstructions to discharge as defined in 9.5.5.2 and 9.5.5.3, or additional sprinklers shall be provided to ensure adequate coverage of the hazard. (See Figure A.9.5.5.1.). The annex material on this section and Figure A.9.5.5.1 provide a typical spray pattern for a standard spray sprinkler. The sprinkler manufacturers published spray patterns may be referenced as well for the spray pattern specific to the installed sprinkler.

Section 10.2.7.1.1 goes on to indicate sprinklers shall be located so as to minimize obstructions to discharge as defined in 10.2.7.2 and 10.2.7.3, or additional sprinklers shall be provided to ensure adequate coverage of the hazard. Section 10.2.7.2.1.4 indicates for light and ordinary hazard occupancies; structural members only shall be considered when applying the requirements of 10.2.7.2.1.3. The annex material for this section explains it is the intent of this section to exempt

nonstructural elements in light and ordinary hazard occupancies from the obstruction criteria commonly called the “Three Times Rule.” However, the other obstruction rules, including the “Beam Rule” (see 10.2.7.1.2) and the “Wide Obstruction Rule” (see 10.2.7.3.2), still apply. If an obstruction is so close to a sprinkler that water cannot spray on both sides, it is effectively a continuous obstruction as far as the sprinkler is concerned and the Beam Rule should be applied.

In this case, with the sprinkler deflector located above the moving rail, with some clearance, it may be appropriate based on the sprinkler spray pattern to consider the sprinkler as capable of providing water spray on both sides of the obstruction and apply the exception for nonstructural elements of Section 10.2.7.2.1.4.

It is also typical for these patient lift systems to have a “home” or “parked” position when not in use. It would be appropriate to ensure the sprinklers are not obstructed when the lift is parked and not in use.



## **Question #6 - NFPA 13D Plan Requirements**

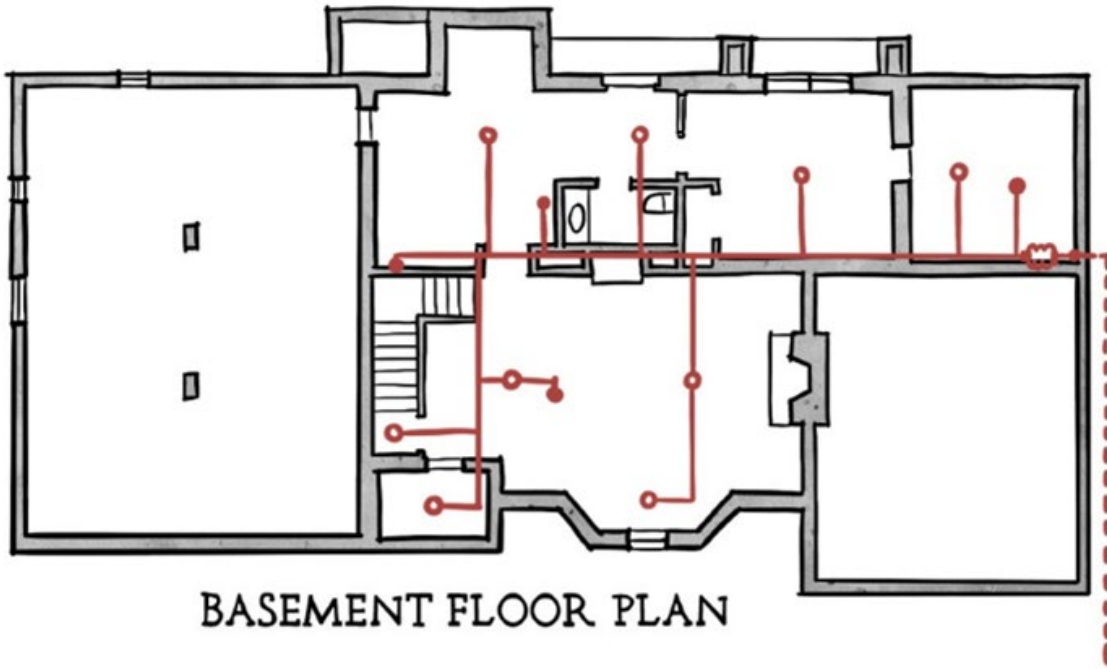
**Is there a list of items needed on a set of NFPA 13D working plans similar to what's contained in NFPA 13 (2016) section 23.1.3?**

No, there is not a list of items needed on a set of NFPA 13D working plans similar to what's contained in NFPA 13, 2016 edition, Section 23.1.3.

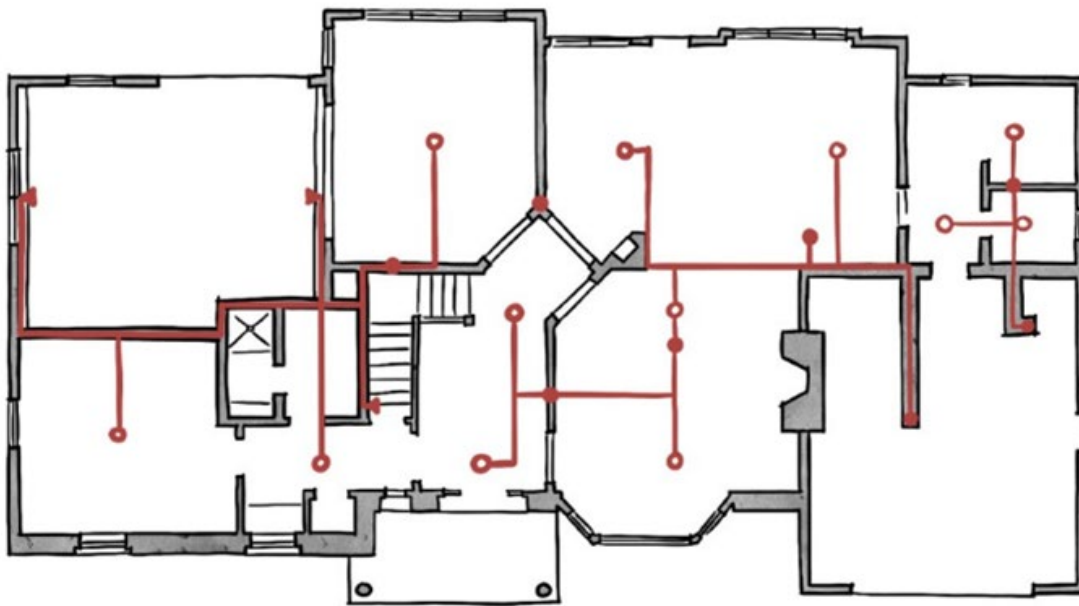
NFPA 13D, 2016 edition, Section 4.5 for documentation simply requires documentation be provided upon request to demonstrate that the water supply, listed devices, and sprinkler coverage comply with the requirements of this standard. Annex Section A.4.5 explains a scaled drawing where required should show the following:

1. Address, if known
2. Size and type of domestic line, including length to city connection
3. Water meter size
4. Current static water pressure
5. Interior walls
6. Model, manufacturer, temperature, orifice size, and spacing requirements of sprinklers
7. Type of pipe
8. Hanger spacing requirement per the pipe manufacturer
9. Riser detail
10. Installing contractor information
11. Preliminary hydraulic calculations

NFPA 13D does not mandate the production of formal plans, specifications, and calculations as is the case with NFPA 13 or NFPA 13R, however, it is common that the AHJ requests this documentation.



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**Question #7 – Tee at Suction of Fire Pump**

**In accordance with NFPA 20, 2022 edition, tees or bends within 10 pipe diameters from the suction flange are not typically allowed. However, Figure A.4.16.4 shows the supply coming vertical into a tee connected right to the suction flange.**

**Is this allowed and what would go on the other side of the tee?**

NFPA 20, 2022 edition, Section 4.16 provides the requirements for pump suction pipe and fittings. Figure A.4.16.6 provides examples of acceptable and unacceptable suction pipe arrangements. This includes the acceptable use of “vertical” tees and elbows on the fire pump suction flange.

Typically, this arrangement is done with a vertical elbow. It is not common to install a tee on the suction flange as shown in Figure A.4.16.6, but the standard does permit it. The tee could be used for a secondary water supply to the pump or for the pump bypass piping if arranged in accordance with Section 4.16.4.

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## **Question #8 – Sprinklers Installation After Pipe is Installed**

**Is it a requirement of the 2016 edition of NFPA 13 that sprinklers must only be installed when the pipe is in place?**

No, this is not a specific requirement of the standard. However, Annex Section A.8.3.1.1 does indicate, “*whenever possible, sprinklers should be installed in piping after the piping is placed in its final position and secured by hangers in accordance with this standard.*”

This recommendation is presumably so the sprinklers are not damaged during installation and are positioned properly. As this is an annex section, this is not a requirement of the standard.

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## **Question #9 – Low-piled Storage**

**Section 15.2.1 of NFPA 13, 2016 edition, specifically addresses storage of Group A plastics less than 5 feet. This section was deleted in the 2019 edition.**

**Does the 2019 edition have similar requirements for Group A plastic storage less than 5 feet?**

Yes. Section 15.2.1 of the 2016 edition of NFPA 13 was deleted but replaced in Chapter 4 of the 2019/2022 editions.

In the 2019 edition, the criteria for low-piled and miscellaneous Group A, less than 5 feet, storage starts in 4.3.1.7, then to Table 4.3.1.7.1; however, when the storage is not classified as miscellaneous, but still low-piled, Table 4.3.1.7.1 is used for criteria and Section 4.3.1.5.2 requires in-rack sprinklers, for solid shelves, from Section 25.6.1.



The 2022 edition did further rearrange and clarify some of this text in 4.3.1.7.2. It does not appear there are technical changes, but where the 2019 is light on specific application of low-piled and/or miscellaneous criteria, the 2022 provides additional clarification on this subject.



## Question #10 – System Protection Area Limitations

A project consists of a storage warehouse to be protected with ESFR sprinklers in accordance with the 2016 edition of NFPA 13. The warehouse will also contain some areas of ordinary hazard. Two questions on this project are as follows.

The first question is regarding system area limitations: The project consists of 40,000 square feet of extra hazard high piled storage, and the system then continue past a separating wall to feed another 8,000 square feet of Ordinary Group II hazard.

Is this acceptable as long as the entire system feeding both separate areas is under 52,000 square feet?

The second question is regarding sprinkler type for the ordinary hazard areas: Can the additional 8,000 square feet of Ord Haz II also be protected with ESFR protection even though it is not required to be?

The answer to both questions is yes.

NFPA 13, 2016 edition, Section 8.2.3 indicates, "where single systems protect extra hazard, high-piled storage, or storage covered by other NFPA standards, and ordinary or light hazard areas, the extra hazard or storage area coverage shall not exceed the floor area specified for that hazard and the total area coverage shall not exceed 52,000 square feet."

So long as the total area of the extra hazard occupancy does not exceed 40,000 square feet, the same system can protect additional light and ordinary hazard areas so long as the total system area does not exceed 52,000 square feet in total.

Regarding the ESFR sprinklers protecting non-storage applications, NFPA 13, 2016 edition, Section 8.4.6.6 states "ESFR sprinklers designed to meet any criteria in Chapter 12 through Chapter 20 shall be permitted to protect light and ordinary hazard occupancies."

## Question #11 – Tank Sump Feed

**A current project has an underground tank with a wet sump into the building with a vertical turbine type fire pump. Due to site conditions the tanks will be installed at a distance from the building.**

**Does the 2013 edition of NFPA 20 limit the minimum size of the underground pipe that feeds from the tank to the sump and is there a maximum length it can travel?**

NFPA 20 provides a recommendation for the pipe size between the tank and the vertical pump well. NFPA 20, 2013 edition, Section A.7.2.2.2 for the water supply to vertical turbine pumps indicates the velocities in the intake pipe should not exceed approximately 2 feet/second. The intake pipe from the tank to the fault should be sized such that the velocity is approximately 2 feet/second when the pump is operating at 150% of rated capacity.

There is no requirement in the standard for the maximum length of this pipe. Given that the tank is gravity feeding the vertical pump well, it would be appropriate to ensure the pressure in the pipe remains positive and a negative pressure is not created. This would require the elevation of the water in the tank at the end of the water supply duration to be able to overcome the friction loss in the pipe from the tank to the vault.

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## **Question #12 –EV Chargers in Parking Garage**

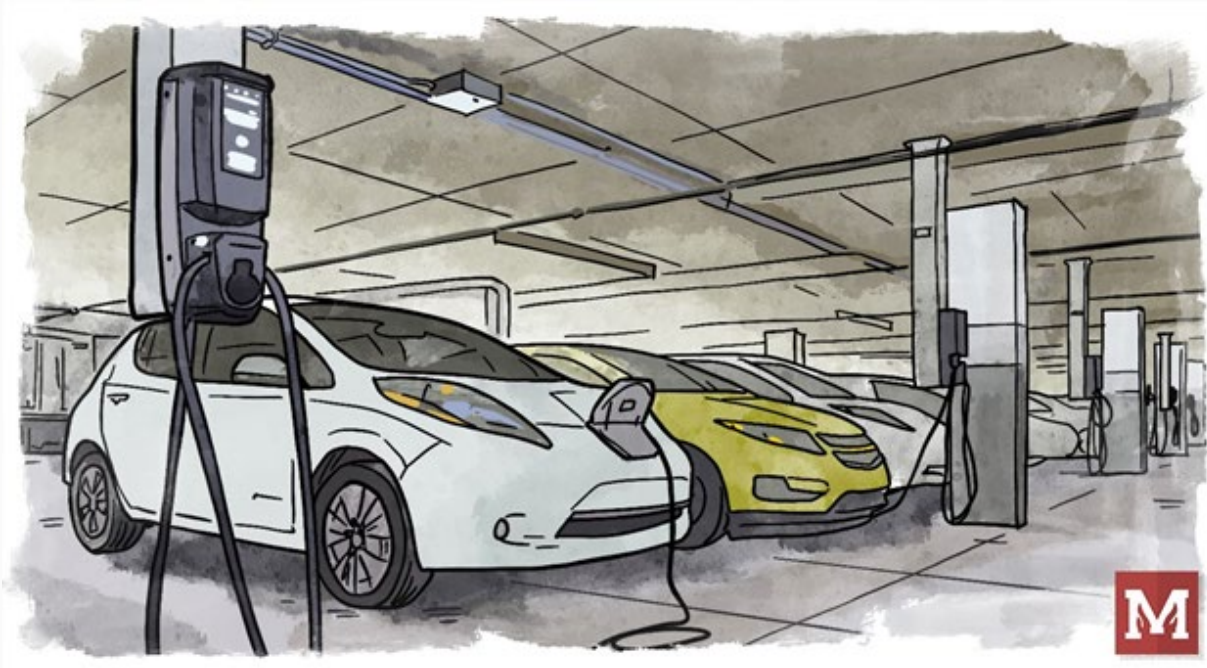
**Are there any special requirements for electric vehicle charges in parking garages pertaining to fire sprinklers?**

No. NFPA and ICC have not specifically addressed fire protection for or around charging stations in parking garages, private or public. The 2018 and 2021 International Building Code (IBC) added Section 406.2.7, and the 2024 International Residential Code (IRC) added a new section that states, “Where provided, electric vehicle charging systems shall be installed in accordance with NFPA 70. Electric vehicle charging system equipment shall be listed and labeled in accordance with UL 2202. Electric vehicle supply equipment shall be listed and labeled in accordance with UL 2594...” While this does not translate into fire sprinkler installation and discharge rules specific to charging stations, the recent codes and standards have made several changes to parking garages.

The 2021 IBC had a huge change to require sprinkler systems in open parking garages when the fire area exceeds 48,000 square feet or 55 feet in height, the 2024 editions of NFPA 101 and NFPA 5000, require sprinklers at lower threshold. The 2024 NFPA 101 and NFPA 5000 references the NFPA 88A, *Standard for Parking Structures*, for construction and protection of open, enclosed, and other parking systems. During this cycle, for the 2023 edition of NFPA 88A, the technical committee removed all open parking sprinkler exceptions and replaced with Section 6.4.1 which states, “Automatic sprinkler systems shall be installed in all parking structures...”. These codes (NFPA 1, NFPA 101 and NFPA 5000) extract and reference NFPA 88A and now require sprinklers in all open and enclosed parking structures.

The changes for parking structures also exist in the 2022 NFPA 13, referenced by the 2024 model codes. The NFPA 13 technical committees made several changes related to parking, such as:

- Increasing the occupancy of parking from ordinary hazard group 1 (OH1) to ordinary hazard group 2 (OH2).
- Where car stackers are installed, the ceiling system is OH2 if sidewall sprinklers are installed under each stacked car.
- Where car stackers do not have sidewalls under each car, the ceiling system is increased to extra hazard group 2 (EH2).



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