

## NFPA 13

### 5.3.2

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**5.3.2.1 Ordinary Hazard (Group 2)** Ordinary hazard (Group 2) occupancies shall be defined as occupancies or portions of other occupancies where the quantity and combustibility of contents is moderate to high, where stockpiles of contents with moderate rates of heat release do not exceed 12 ft (3.66 m), and stockpiles of contents with high rates of heat release do not exceed 8 ft (2.4m).

Occupancies containing Casinos, Mini-Storage Facilities, and Shell Buildings, regardless of occupancy classification (unknown tenants and/or floor layout), shall be designed to meet the requirements of Ordinary Hazard Group 2.

### 6.1.3

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**6.1.3 Rated Pressure.** System components shall be rated for the maximum system working pressure to which they are exposed but shall not be rated at less than 175 psi (12.1 bar) for components installed aboveground and 150 psi (10.4 bar) for components installed underground. When the underground piping can be supplied or pressurized by a Fire Department Connection (FDC), the underground piping shall be designed to withstand a working pressure of not less than 200 psi (Class 200), or 50 psi greater than the system design pressure, whichever is greater.

### 6.2.9.7.1

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**6.2.9.7.1** The list shall be on a machine-engraved metal or rigid plastic sign with capitalized lettering a minimum 14 point (¼ inch high) in Arial or similar font and include the following:

- (1) Sprinkler Identification Number (SIN) if equipped; or the manufacturer, model, orifice, deflector type, thermal sensitivity, and pressure rating.
- (2) General description.
- (3) Quantity of each type to be contained in the cabinet.
- (4) Issue or revision date of the list.

### 6.3.1.1.1

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**6.3.1.1.1** Pipe or tube shall have a minimum Corrosion Resistant Ratio (CRR) of 1.

### 6.8.1.4

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**6.8.1.4** The minimum number of required inlets shall be one 2 ½ inch inlet for every 250 gpm of the sprinkler and/or standpipe demand, or fraction thereof. Fire Department Connections (FDC) shall be provided with internal check valve(s) such that water being supplied into any inlet will not flow back out of any other inlet. For the purposes of this section, internal clapper valve devices provided by the manufacturer in listed FDC shall be considered internal check valves.

### 6.9.1

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**6.9.1** Waterflow alarm devices shall be listed for the service and so constructed and installed that any flow of water from a sprinkler system equal to or greater than that from a single automatic sprinkler of the smallest orifice installed on the system will result in an audible alarm on the premises within 60 seconds ~~5 minutes~~ after such flow begins and until such flow stops.

#### 6.9.1.1

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**6.9.1.1** Multi-story buildings shall have water flow alarm annunciation on a floor by floor basis.

#### 6.9.1.2

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**6.9.1.2** Sprinkler systems, such as those protecting atriums, covered mall buildings, and other areas with non-standard ceiling heights within the building, shall be designed such that system water flow annunciation indicates the protected floor level, rather than the floor level where the system piping occurs.

#### 6.9.3.1

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**6.9.3.1 Alarm Unit(s).** Alarm unit(s) shall be a horn/strobe device listed for fire alarm signaling. An alarm unit shall include a listed mechanical alarm, horn, or siren or a listed electric gong, bell, speaker, horn, or siren

#### 6.9.3.2

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**6.9.3.2. Exterior Alarm Unit(s).** Exterior alarm unit(s) shall be weatherproofed. ~~Outdoor water motor-operated or electrically operated bells shall be weatherproofed and guarded.~~

#### 6.9.3.3

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**6.9.3.3. Exterior Alarm Unit.** There shall be a minimum of one exterior horn/strobe alarm unit provided on the exterior wall above the Fire Department Connection. ~~All piping to water motor-operated devices shall be galvanized or brass or other corrosion-resistant material acceptable under this standard and of a size not less than 3/4 in. (20 mm)~~

#### 6.9.3.4

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**6.9.3.4. Number of Interior Alarm Unit(s).** There shall be a minimum of one interior horn/strobe alarm unit provided in a normally occupied location. In multi-tenant buildings, there shall be one interior alarm unit in each tenant space. All interior alarm units associated with a single sprinkler system shall activate simultaneously upon activation of that fire sprinkler system. ~~Piping between the sprinkler system and a pressure-actuated alarm-initiating device shall be galvanized or of nonferrous metal or other approved corrosion resistant material of not less than 3/8 in. (10 mm) nominal pipe size.~~

#### 6.9.3.5

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**6.9.3.5** Interior alarm units are not required when the building is protected throughout with a fire alarm system in accordance with adopted codes and the fire alarm system will activate upon actuation of any sprinkler system within the building

#### 7.1.3

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**7.1.3** A wet pipe system shall be permitted to supply an auxiliary antifreeze, dry pipe, or preaction, ~~or deluge~~ system ~~provided the water supply is adequate~~ provided the auxiliary system covers less than 10% of the system size.

### 7.2.3.1

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**7.2.3.1** The system capacity (volume) controlled by a dry pipe valve shall be determined by 7.2.3.2, ~~7.2.3.3, 7.2.3.4, 7.2.3.5, or 7.2.3.7.~~

#### A.7.2.3.1

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**A.7.2.3.1** The 60 second limit does not apply to dry systems with capacities of 500 gal (1893 L) or less, nor to dry systems with capacities of 750 gal (2839 L) or less if equipped with a quick opening device.

### 7.2.3.3

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**7.2.3.3** A system size of not more than 500 gal (1893 L) shall be permitted without a quick opening device and shall not be required to meet any specific water delivery requirement to the inspection test connection.

### 7.2.3.4

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**7.2.3.4** A system size of not more than 750 gal (2839 L) shall be permitted with a quick opening device and shall not be required to meet any specific water delivery requirement to the inspection test connection.

### 7.2.3.5

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**7.2.3.5** System size shall be based on dry systems being calculated for water delivery in accordance with 7.2.3.6. Testing of the system shall be accomplished by the methods indicated in 7.2.3.7.

### 7.2.7

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**7.2.7 Application of Dry-Pipe Systems.** Dry pipe systems shall not be utilized for the protection of areas that can be maintained above 40 degrees.

**Exception:** When permitted by the fire code official, dry sprinklers may be installed in small conditioned rooms within buildings that otherwise require dry sprinkler systems throughout.

#### 7.3.2.3.1.3

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**7.3.2.3.1.3** The system size for double-interlock preaction systems shall be based on calculating water delivery in accordance with 7.2.3.6, anticipating that the detection system activation and sprinkler operation will be simultaneous. A system meeting the requirements of this section shall be required to also meet the requirements of 7.2.3.5.

### 7.6.2.4

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**7.6.2.4** An antifreeze solution shall be prepared with a freezing point ~~below the expected minimum temperature for the locality~~ at or below 0° F (-17.8° C)

#### 7.6.2.4.1

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**7.6.2.4.1** Where the antifreeze system is intended to be installed at an elevation where temperatures below 0° F (-17.8° C) are expected, the system shall be prepared with a freezing point below the minimum expected temperature for the area.

### 7.10.2.2

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~~7.10.2.2 Sprinklers or automatic spray nozzles in ducts, duct collars, and plenum chambers shall not be required where all cooking equipment is served by listed grease extractors.~~

### 7.10.2.6

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7.10.2.6 Sprinklers protecting cooking exhaust ducts shall be supplied from dedicated supply risers separate from overhead sprinkler systems. Activation of the associated water flow switch shall shut down the fuel and/or electrical power supply to the associated cooking equipment and the makeup air supplied internally to the hood.

### 7.10.3.1

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7.10.3.1 Unless the requirements of 7.10.3.2 or 7.10.3.4 are met, exhaust ducts shall have one sprinkler or automatic spray nozzle located at the top of each vertical riser, and at the midpoint of each offset, and an additional sprinkler shall be installed within the duct at 20-foot intervals on vertical risers where not otherwise provided with sprinklers due to offsets in buildings over two stories.

### 8.2.4

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8.2.4 When acceptable to the authority having jurisdiction, multiple buildings that are assigned the same street address, without independent building numbers, and are attached by canopies, covered breezeways, common roofs, or a common wall(s) shall be permitted to be supplied by a single fire sprinkler riser. The maximum system size shall comply with 8.2.1.

### 8.2.6

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8.2.6 In multi-story buildings, each story requires a separate system with control valve and water flow switch.

### 8.2.7

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8.2.7 For tenant spaces adjacent to and having public access exclusively through an adjacent assembly space, such as tenant spaces adjacent to casinos, covered mall buildings, and other assembly spaces, the tenant spaces shall be provided with individual isolation control valves. For the purposes of this section, the isolation control valve does not define a separate sprinkler system, such that the overall size of the sprinkler system serving the tenant space(s) and adjacent spaces must meet size limitations of 8.2.1 when measured from the control valve located on the system riser.

### 8.3.3.1

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8.3.3.1 Sprinklers in light hazard occupancies, shell buildings of combustile construction, casinos, and exhibition areas shall be one of the following:

- (1) Quick-response type as defined in 3.6.2.9
- (2) Residential sprinklers in accordance with the requirements of 8.4.5

- (3) Standard response sprinklers used for modifications or additions, within the existing compartment, to existing ~~light hazard~~ systems equipped with standard response sprinklers
- (4) Standard response sprinklers used where individual standard response sprinklers are replaced in existing ~~light hazard~~ systems

#### 8.6.4.1.1.3

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**8.6.4.1.1.3** The requirements of 8.6.4.1.1.1 shall not apply for light and ordinary hazard occupancies with ceilings of noncombustible ~~or limited combustible~~ construction, as follows:

(A) Where there is a vertical change in ceiling elevation within the area of coverage of the sprinkler creates a distance of more than 36 in. (914 mm) between the upper ceiling and the sprinkler deflector, a vertical plane extending down from the ceiling at the change in elevation shall be considered a wall for the purpose of sprinkler spacing as shown in Figure 8.6.4.1.1.3(A).

(B) Where the distance between the upper ceiling and the sprinkler deflector is less than or equal to 36 in. (914 mm), the sprinklers shall be permitted to be spaced as though the ceiling was flat, provided the obstruction rules are observed as shown in Figure 8.6.4.1.1.3(B).

#### 8.8.4.1.1.4

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**8.8.4.1.1.4** The requirements of 8.8.4.1.1.1 shall not apply for light and ordinary hazard occupancies with ceilings of noncombustible ~~or limited combustible~~ construction, as follows.

(A) Where there is a vertical change in ceiling elevation within the area of coverage of the sprinkler creates a distance of more than 36 in. (914 mm) between the upper ceiling and the sprinkler deflector, a vertical plane extending down from the ceiling at the change in elevation shall be considered a wall for the purpose of sprinkler spacing.

(B) Where the distance between the upper ceiling and the sprinkler deflector is less than or equal to 36 in. (914 mm), the sprinklers shall be permitted to be spaced as though the ceiling was flat, provided the obstruction rules and ceiling pocket rules are observed.

#### 8.14.6

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**8.14.6** Pilot line detectors shall be permitted to be spaced more than 22 in. (559 mm) below a ceiling or deck where the maximum spacing between pilot line detectors is 10 ft (3 m) or less, and where such spacing is supported by an engineering analysis discussing sprinkler temperature and response rating, plume diameter, temperature within the plume that will pass across the sprinklers, and the expected fire size required to activate the pilot sprinklers.

#### 8.15.1.2.1\*

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**8.15.1.2.1\*** Concealed spaces of noncombustible ~~and limited combustible~~ construction with minimal combustible loading having no access shall not require sprinkler protection. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum. For purposes of this section, "construction" is limited to wall assemblies, floor assemblies, ceiling assemblies, and structural members.

### 8.15.1.2.1.2

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**8.15.1.2.1.2** Minor quantities of combustible materials limited to: cabling, nonmetallic piping conveying non-combustible liquids, and nonmetallic HVAC ductwork as expressly allowed by the current adopted building code, shall be permitted in concealed spaces constructed of non-combustible materials and shall not require sprinklers.

### 8.15.1.2.2

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**8.15.1.2.2** Concealed spaces of non-combustible and limited combustible construction with limited access and minimal combustible loading and not permitting occupancy or storage of combustibles shall not require sprinkler protection. For the purposes of this section, limited access does not include access to catwalks and mechanical mezzanines. Catwalks and mechanical mezzanines require sprinkler protection, which may be designed in accordance with 8.15.1.5. Additionally, "construction" is limited to wall assemblies, floor assemblies, ceiling assemblies, and structural members.

### 8.15.1.2.10

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**8.15.1.2.10** Concealed spaces where rigid materials are used and the exposed surfaces have a flame spread index of 25 or less, and the materials have been demonstrated not to propagate fire when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, extended for an additional 20 minutes in the form in which they are installed, shall not require sprinkler protection.

### 8.15.1.2.11

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**8.15.1.2.11** Concealed spaces in which the exposed materials are constructed entirely of fire retardant treated wood as defined by NFPA 703, *Standard for Fire Retardant Treated Wood and Fire Retardant Coatings for Building Materials*, shall not require sprinkler protection.

### 8.15.1.2.16

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**8.15.1.2.16** Concealed spaces formed by noncombustible or limited combustible ceilings suspended from the bottom of wood joists, composite wood joists, wood bar joists, or wood trusses that have insulation filling all of the gaps between the bottom of the trusses or joists, and where sprinklers are present in the space above the installation within the trusses or joists, shall not require sprinklers.

### 8.15.1.2.17

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**8.15.1.2.17** Concealed spaces formed by noncombustible or limited combustible ceilings suspended from the bottom of wood joists and composite wood joists with a maximum nominal chord width of 2 in. (50.8 mm), where joist spaces are full of noncombustible batt insulation with a maximum 2 in. (50.8 mm) air space between the roof decking material and the top of the batt insulation. Facing that meets the requirements for noncombustible or limited combustible material covering the surface of the bottom chord of each joist and secured in place per the manufacturer's recommendations shall not require sprinklers.

### 8.15.5.1

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**8.15.5.1** Sidewall spray sprinklers shall be installed at the bottom of each elevator hoistway not more than 2 ft (0.61 m) above the floor of the pit. Sprinklers are prohibited at the top of the hoistway and in the machine room, unless otherwise approved by the Authority Having Jurisdiction.

### 8.15.5.2

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**8.15.5.2** The sprinkler required at the bottom of the elevator hoistway by 8.15.5.1 shall not be required for enclosed, noncombustible elevator shafts that do not contain combustible hydraulic fluids.

### 8.15.5.3

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**8.15.5.3** Automatic sprinklers in elevator machine rooms or at the tops of hoistways shall be of ordinary or intermediate temperature rating.

### 8.15.5.4

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**8.15.5.4** Upright, pendant, or sidewall spray sprinklers shall be installed at the top of elevator hoistways.

### 8.15.5.5

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**8.15.5.5** The sprinkler required at the top of the elevator hoistway by 8.15.5.4 shall not be required where the hoistway for passenger elevators is noncombustible and the car enclosure materials meet the requirements of ASME A17.1, *Safety Code for Elevators and Escalators*.

### 8.15.5.6

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**8.15.5.6** Sprinklers shall be installed at the top and bottom of elevators that utilize polyurethane coated steel belts or other similar combustible belt material.

### 8.15.7.1

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**8.15.7.1** Unless the requirements of 8.15.7.2, ~~8.15.7.3~~, or 8.15.7.4 are met, sprinklers shall be installed under exterior roofs, canopies, porte-cocheres, balconies, decks, or similar projections exceeding 4 ft (1.2 m) in width

### 8.15.7.2

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**8.15.7.2** Sprinklers shall be permitted to be omitted where the canopies, roofs, porte-cocheres, balconies, decks, or similar projections are constructed entirely with materials that are noncombustible, ~~limited-combustible, or fire retardant treated wood as defined in NFPA 703, *Standard for Fire Retardant Treated Wood and Fire Retardant Coatings for Building Materials*, and where the canopies, roofs, porte-cocheres, balconies, decks, or similar projections do not support occupancy above.~~

### 8.15.7.3

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**8.15.7.3** Sprinklers shall be permitted to be omitted from below the canopies, roofs, porte-cocheres, balconies, decks, or similar projections of combustible construction, provided the exposed finish material on the roof, canopy, porte-cocheres, balconies, decks, or similar projections of combustible construction, provided the exposed finish material on the roofs, canopies, or porte-cocheres are non-combustible, limited-combustible, or fire retardant treated wood as defined in NFPA 703, *Standard for Fire Retardant Wood and Fire Retardant Coatings for Building Materials*, and the roofs, canopies, or porte-cocheres contains only sprinklered concealed spaces or any of the following unsprinklered combustible concealed spaces:

- (1) Combustible concealed spaces filled entirely with noncombustible insulation
- (2) Light or ordinary hazard occupancies where noncombustible or limited-combustible ceilings are directly attached to the bottom of solid wood joists so as to create enclosed joist spaces 160 ft<sup>3</sup> (4.5

m<sup>3</sup>) or less in volume, including space below the insulation that is laid directly on top or within the ceiling joists in an otherwise sprinklered attic [See 11.2.3.1.4(4)(d)].

- (3) ~~Concealed spaces over isolated small roofs, canopies, or porte cocheres not exceeding 55ft<sup>2</sup> (5.1m<sup>2</sup>) in area~~

#### 8.15.8.1.1

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~~8.15.8.1.1 Sprinkler protection shall be provided in all bathrooms. Unless sprinklers are required by 8.15.8.1.2 or 8.15.8.1.3, sprinklers shall not be required in bathrooms that are located within dwelling units, that do not exceed 55 ft<sup>2</sup> (5.1m<sup>2</sup>) in area, and that have walls and ceilings of noncombustible or limited-combustible materials with a 15-minute thermal barrier rating, including the walls and ceilings behind any shower enclosure or tub.~~

#### 8.15.8.2

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~~8.15.8.2 Closets and Pantries. Sprinklers protection shall be are not required provided in clothes closets, linen closets, and pantries, within dwelling units in hotels and motels where the area of the space does not exceed 24 ft<sup>2</sup> (2.2 m<sup>2</sup>), the least dimension does not exceed 3 feet (0.9 m), and the walls and ceilings are surfaced with noncombustible or limited-combustible materials.~~

#### 8.15.10.1

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~~8.15.10.1 Unless the requirements of 8.15.10.3 are met, Ssprinkler protection shall be required in electrical equipment rooms.~~

#### 8.15.10.3

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~~8.15.10.3 Sprinklers shall not be required in electrical equipment rooms where all of the following conditions are met:~~

- ~~(1) The room is dedicated to electrical equipment only~~
- ~~(2) Only dry type electrical equipment is used.~~
- ~~(3) Equipment is installed in a 2-hour fire-rated enclosure including protection for penetrations.~~
- ~~(4) No combustible storage is permitted to be stored in the room.~~

#### 8.15.14.1

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~~8.15.14.1 Drop-out ceilings shall be permitted to be installed beneath sprinklers where ceilings are listed for that service and are installed in accordance with their listings. Drop-out ceilings are not permitted to be installed beneath fire sprinklers.~~

#### 8.15.14.2

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~~8.15.14.2 Drop-out ceilings shall not be installed below quick-response or extended-coverage sprinkler unless specifically listed for that application.~~

#### 8.15.14.3

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~~8.15.14.3 Drop-out ceilings shall not be considered ceilings within the context of this standard.~~

#### 8.15.14.4

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~~8.15.14.4 Piping installed above drop-out ceilings shall not be considered concealed piping.~~

### 8.15.19.1.1

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**8.15.19.1.1** Unless hydraulically calculated, each one-inch outlet shall supply a maximum of one sprinkler head providing protection below a ceiling, and if necessary, a maximum of one head above the ceiling. Such sprinkler head(s) shall have a k-factor equal to the k-factor of existing upright sprinklers.

### 8.15.19.1.2

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**8.15.19.1.2** Unless otherwise hydraulically calculated, a one-inch outlet shall be allowed to supply a maximum of two sprinkler heads where the two sprinkler heads protect areas that are physically separated by a ceiling, walls and/or doors with a minimum lintel depth of 8 in (203 mm) and maximum total area of door openings into the room of 50 ft<sup>2</sup> (4.6 m<sup>2</sup>). The sprinklers shall have a k-factor equal to the k-factor of existing upright sprinklers.

### 8.15.19.1.3

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**8.15.19.1.3** When approved sprinkler heads installed under a ceiling may have a k factor less than the overhead sprinklers, provided the occupancy hazard classification for the area under the ceiling is less than the classification that the overhead sprinklers are designed for.

### 8.15.19.1.4

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**8.15.19.1.4** Flexible sprinkler hose drops shall be proven by hydraulic calculations.

### 8.15.22.3

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**8.15.22.3** Where there is a noncombustible space above a noncombustible or ~~limited combustible~~ drop ceiling that is sprinklered because it is open to an adjacent sprinklered space on only one side and where there is no possibility for storage above the drop ceiling, the sprinkler system shall be permitted to extend only as far into the space as 0.6 times the square root of the design area of the sprinkler system in the adjacent space.

### 8.15.23

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**8.15.23** Openings in Rated Assemblies. Where sprinkler protection is serving as the alternative to opening protection in rated assemblies, such sprinklers shall be listed for use, and installed in accordance with their listing.

### 8.16.1.1.1.4

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**8.16.1.1.1.4** Valve rooms shall be lighted and heated.

### 8.16.1.1.1.5

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**8.16.1.1.1.5** The source of heat shall be of a permanently installed type.

### 8.16.1.1.1.6

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**8.16.1.1.1.6** Heat tape shall not be used in lieu of heated valve enclosures to protect the valve and supply pipe against freezing.

#### 8.16.1.1.2.1

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**8.16.1.1.2.1** Valves on connections to water supplies, sectional control and isolation valves, and other valves in supply pipes to sprinkler and other fixed water-based fire suppression systems shall be electrically supervised by a one of the following methods:

- (1) Central station, proprietary, or remote station signaling service
- (2) Local signaling service that will cause the sounding of an audible signal at a constantly attended point
- (3) ~~Valves locked in the correct position~~
- (4) ~~Valves located within fenced enclosures under the control of the owner, sealed in the open position, and inspected weekly as part of an approved procedure~~

#### 8.16.1.1.2.3

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**8.16.1.1.2.3** The requirements of 8.16.1.1.2.1 shall not apply to underground gate valves with roadway boxes or to valves at backflow prevention devices at the municipal water supply connection where the valves are locked in the open position.

#### 8.16.4.1.6

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**8.16.4.1.6 Design Temperature and Duration.** The minimum criteria for an engineered solution in calculating heat loss for the requirement to maintain 40°F (4.4°C) shall be 0° F (-17.8°C) for 8 hours. The initial starting temperature of the water shall be no greater than 50°F (10°C).

#### 8.17.1.1

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**8.17.1.1. Local Waterflow Alarms Units.** A local waterflow alarm unit shall be provided on every sprinkler system ~~having more than 20 sprinklers.~~ Such waterflow alarm units shall be installed in accordance with 6.9.

#### 8.17.2.3

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**8.17.2.3 Size.** The size of the pipe for the fire department connection shall be in accordance with one of the following:

- (1) Pipe size shall be a minimum of 4 in. (100 mm) for fire engine connections when the fire department connection has three or fewer 2-1/2 in (65 mm) inlets, and shall be a minimum of 6 in. (150 mm) for fire engine connections when the fire department connection has four or more 2-1/2 in (65 mm) inlets.
- (2) Pipe size shall be a minimum of 6 in. (150 mm) for fire boat connections.
- (3) For hydraulically calculated systems the fire department connection shall be permitted to be less than 4 in. (100 mm) and no less than the size of system riser, where serving one system riser.

#### 8.17.2.7

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**8.17.2.7** The fire department connection shall be located not less than 18 in (457 mm) and not more than 4 ft (1.2 m) above the level of the adjacent grade or access level.

#### 9.1.3.9.3

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**9.1.3.9.3** Powder-driven fasteners shall be allowed for branch lines less than or equal to 2 in. (50 mm) pipe. Representative samples of concrete into which studs are to be driven shall be tested to determine that the

studs will hold a minimum load of 750 lb (341 kg) for 2 in. (50 mm) or smaller pipe; 1000 lb (454 kg) for 2 ½ in., 3 in., 3 ½ in. (65 mm, 80 mm, or 90 mm) pipe; and 1200 lb (545 kg) for 4 in. or 5 in. (100 mm or 125 mm) pipe.

#### 9.1.3.9.4

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**9.1.3.9.4** Increaser couplings shall not be permitted with ~~be attached directly to the~~ powder-driven studs.

#### 9.2.1.3.3.4

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**9.2.1.3.3.4** Where flexible sprinkler hose fittings are supported by a ceiling that does not meet design and installation criteria set forth in 9.2.1.3.3.2, such fitting shall be provided with hangers in accordance with 9.2.3.5, unless the flexible hose fitting is provided with a hanger assembly specifically approved by a Nationally Recognized Testing Laboratory for both the flexible sprinkler hose fitting and the specific method of installation.

#### 9.3.5.6.2

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**9.3.5.6.2** The horizontal force,  $F_{pw}$ , acting on the brace shall be taken as  $F_{pw} = C_p W_p$ , where  $C_p$  is the seismic coefficient selected in Table 9.3.5.6.2 utilizing the short period response parameter  $S_s$ . The value of  $S_s$  used in Table 9.3.5.6.2 shall be 0.95 obtained from the authority having jurisdiction or derived from seismic hazard data from the U.S. Geological Survey using ASCE Standard 7, 2005 edition. Linear interpolation shall be permitted to be used for intermediate values of  $S_s$ .

#### 10.1.5

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**10.1.5 Working Pressure.** Pipe shall be designed to withstand a system working pressure of not less than 150 psi (10.3 bar). When the underground piping can be supplied or pressurized by a Fire Department Connection (FDC), the underground piping shall be designed to withstand a working pressure of not less than 200 psi (Class 200), or 50 psi greater than the FDC design pressure, whichever is greater.

#### 11.2.3.1.4(4)

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**11.2.3.1.4 (4)** The following unsprinklered concealed spaces shall not require a minimum area of sprinkler operation of 3000 ft<sup>2</sup> (279 m<sup>2</sup>):

**11.2.3.1.4(4)(a)** ~~Noncombustible and limited combustible~~ noncombustible concealed spaces with minimal combustible loading having no access. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.

**11.2.3.1.4(4)(b)** ~~Noncombustible and limited combustible~~ noncombustible concealed spaces with limited access and not permitting occupancy or storage of combustibles. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.

**11.2.3.1.4(4)(c)** (No Change)

**11.2.3.1.4(4)(d)** Light or ordinary hazard occupancies where noncombustible ~~or limited-combustible~~ ceilings are directly attached to the bottom of solid wood joists so as to create enclosed joist spaces 160 ft<sup>3</sup> (4.8 m<sup>3</sup>) or less in volume, including space below insulation that is laid directly on top or within the ceiling joist in an otherwise sprinklered attic.

**11.2.3.1.4(4)(e)** ~~Concealed spaces where rigid materials are used and the exposed surfaces have a flame spread index of 25 or less and the materials have been demonstrated to not propagate fire when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, extended for an additional 20 minutes in the form in which they are installed in the space.~~

**11.2.3.1.4(4)(f)** ~~Concealed spaces in which the exposed materials are constructed entirely of fire-retardant treated wood as defined by NFPA 703, *Standard for Fire Retardant Treated Wood and Fire Retardant Coatings for Building Materials*.~~

**11.2.3.1.4(4)(g)** (No Change)

**11.2.3.1.4(4)(h)** (No Change)

**11.2.3.1.4(4)(i)** (No Change)

**11.2.3.1.4(4)(j)** Light or ordinary hazard occupancies where non-combustible ~~or limited-combustible~~ ceilings are attached to the bottom of composite wood joists either directly or on to metal channels not exceeding 1 in. (25.4 mm) in depth, provided the adjacent joist channels are firestopped into volumes not exceeding 160 ft<sup>3</sup> (4.5 m<sup>3</sup>) using materials equivalent to ½ in. (12.7 mm) gypsum board and at least 3 ½ in. (90 mm) of batt insulation is installed at the bottom of the joist channels when the ceiling is attached utilizing metal channels.

### 11.3.1.1

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**11.3.1.1** The design area shall be ~~the area that includes the four adjacent sprinklers that produce the greatest hydraulic demand~~ in accordance with either 11.2.3.2 or 11.2.3.3.

### 11.3.1.3

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**11.3.1.3** Unless the requirements of 11.3.1.4 are met, the minimum required discharge from each ~~of the four most demanding sprinklers~~ sprinkler shall be the greater of the following:

(1) In accordance with the minimum flow rates indicated in the individual listings

(2) Calculated based on delivering a minimum of 0.1 gpm/ft<sup>2</sup> (4.1 mm/min) over the design area in accordance with the provisions of 8.5.2.1 or 8.6.2.1.2.

### 11.3.3.1

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**11.3.3.1** Sprinklers in a water curtain such as described in 8.15.4 ~~or 8.15.16.2 or 8.15.23~~ shall be hydraulically designed to provide a discharge of 3 gpm per lineal foot (37L/min per lineal meter) of water curtain, with no sprinklers discharging less than 15 gpm (56.8 L/min) or per the listing requirements of the specific head being used.

### 11.3.3.3

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**11.3.3.3** ~~If a single fire can be expected to operate sprinklers within the water curtain and within the design area of a hydraulically calculated system,~~ The water supply to the water curtain shall be added to the water demand of the hydraulic calculations and be balanced to the calculated area demand.

## 11.3.4

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### **11.3.4 NONSTORAGE OCCUPANCIES WITH HIGH CEILINGS**

**11.3.4.1 Light and Ordinary Hazard Group 1 and 2 Occupancies with ceiling heights between 25 and 50 feet.** Light and Ordinary Hazard 1 and 2 occupancies shall be designed to provide a minimum density of 0.10 gpm/ft<sup>2</sup>, 0.15 gpm/ft<sup>2</sup> and 0.20 gpm/ft<sup>2</sup> respectively. The minimum design area shall be equal to the ceiling height times 100. The sprinkler system shall utilize listed quick response sprinklers with a K-factor of 11.2 or greater. The maximum sprinkler discharge pressure allowed is 30 psi.

**11.3.4.2 Non-storage occupancies with ceiling heights over 50 feet.** All structures, regardless of occupancy or hazard classification, with ceiling heights exceeding 50'-0", require a design analysis from a licensed Fire Protection Engineer. This analysis must be submitted to the Authority Having Jurisdiction for review and approval prior to the start of construction. Deluge systems shall be installed using sprinklers with a minimum k-factor of 11.2 with a maximum sprinkler discharge pressure of 30 psi.

**11.3.4.3 Extra Hazard Occupancies with ceiling height over 25 feet.** Extra Hazard occupancies with ceiling heights over 25 feet require a design analysis from a licensed Fire Protection Engineer. This analysis must be submitted to the Authority Having Jurisdiction for review and approval prior to the start of construction.

**11.3.4.4 Exhibition Spaces and Stages with Fly Galleries.** For design criteria for Exhibition Spaces and Stages with Fly Galleries, see Section 11.3.5.

## 11.3.5

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### **11.3.5 SPRINKLER PROTECTION FOR EXHIBITION SPACES AND STAGES WITH FLY GALLERIES**

**11.3.5.1 Exhibition Spaces and Stages with Fly Galleries with ceiling heights up to 35 feet.** Sprinkler systems protecting exhibition spaces and stages with fly galleries with ceiling heights up to 35 feet shall be designed to provide a minimum density of 0.30 gpm/ft<sup>2</sup>. The minimum design area shall be 2,500 square feet. The sprinkler system shall utilize standard coverage quick response sprinklers with a k-factor of 8.0 or greater. The maximum sprinkler discharge pressure allowed is 30 psi. A hose stream demand of 500 gpm shall be provided.

**11.3.5.2 Exhibition Spaces and Stages with Fly Galleries with ceiling heights between 35 and 60 feet.** Sprinkler systems protecting exhibition spaces and stages with fly galleries with ceiling heights between 35 and 60 feet shall be designed to provide a minimum density of 0.45 gpm/ft<sup>2</sup>. The minimum design area shall be 2,500 square feet. The sprinkler system shall utilize standard coverage quick response sprinklers with a k-factor of 11.2 or greater. The maximum sprinkler discharge pressure allowed is 30 psi. A hose stream demand of 500 gpm shall be provided.

**11.3.5.3 Exhibition Spaces and Stages with Fly Galleries ceiling heights over 60 feet.** Exhibition spaces and stages with fly galleries with ceiling heights exceeding 60'-0", require a design analysis from a licensed Fire Protection Engineer. This analysis must be submitted to the Authority Having Jurisdiction for review and approval prior to the start of construction. Deluge systems shall be installed using standard coverage sprinklers with a minimum k-factor of 11.2 with a maximum sprinkler discharge pressure of 30 psi. A hose stream of 500 gpm shall be provided.

## 12.9.2

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**12.9.2** The following unsprinklered concealed spaces shall not require a minimum area of sprinkler operation of 3000 ft<sup>2</sup> (279 m<sup>2</sup>):

**12.9.2(1)** Noncombustible ~~and limited combustible~~ concealed spaces with minimal combustible loading having no access. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.

**12.9.2(2)** Noncombustible ~~and limited combustible~~ concealed spaces with limited access and not permitting occupancy or storage of combustibles. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.

**12.9.2(3)** (No Change)

**12.9.2(4)** Light or ordinary hazard occupancies where noncombustible ~~or limited combustible~~ ceilings are directly attached to the bottom of solid wood joists so as to create enclosed joist spaces 160 ft<sup>3</sup> (4.8 m<sup>3</sup>) or less in volume, including space below insulation that is laid directly on top or within the ceiling joist in an otherwise sprinklered attic.

**12.9.2(5)** ~~Concealed spaces where rigid materials are used and the exposed surfaces have a flame spread index of 25 or less and the materials have been demonstrated to not propagate fire when tested in accordance with NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials, extended for an additional 20 minutes in the form in which they are installed in the space.~~

**12.9.2(6)** ~~Concealed spaces in which the exposed materials are constructed entirely of fire retardant treated wood as defined by NFPA 703, Standard for Fire Retardant Treated Wood and Fire Retardant Coatings for Building Materials.~~

**12.9.2(7)** (No Change)

**12.9.2(8)** (No Change)

**12.9.2(9)** (No Change)

**12.9.2(10)** Light or ordinary hazard occupancies where non-combustible ~~or limited combustible~~ ceilings are attached to the bottom of composite wood joists either directly or on to metal channels not exceeding 1 in. (25.4 mm) in depth, provided the adjacent joist channels are firestopped into volumes not exceeding 160 ft<sup>3</sup> (4.5 m<sup>3</sup>) using materials equivalent to ½ in. (12.7 mm) gypsum board and at least 3 ½ in. (90 mm) of batt insulation is installed at the bottom of the joist channels when the ceiling is attached utilizing metal channels.

**21.15.2.2.1.3.3**

**21.15.2.2.1.3.3 Chute Sprinkler Supply.** Sprinklers serving chutes shall be on separate dedicated supply risers.

**21.38**

**21.38 Protection Matrix for Group R Division 3 Occupancies and buildings built under the IRC.**

**21.38.1 General.** When a sprinkler system is being installed to mitigate the minimum Fire Code requirements for fire flow, number of fire hydrants, or fire department access, for a Group R Division 3 Occupancy, the design requirements in Table 21.37.1 shall be applied.

**Table 21.38.1 Protection Matrix for Group R Division 3 Occupancies and buildings built under the IRC<sup>4</sup>**

<b>Building Area SIZE RANGE <sup>6</sup></b>	<b>PROTECTION RESIDENTIAL SYSTEM TYPE<sup>1,3</sup></b>	<b>SEPARATE SPRINKLER LEAD-IN REQUIRED <sup>5</sup></b>	<b>MINIMUM UNDERGROUND PIPE SIZE <sup>5</sup></b>	<b>MINIMUM WATER SIZE<sup>7</sup></b>	<b>METER</b>	<b>SPRINKLERS REQUIRED IN AREAS SUBJECT TO FREEZING.</b>

<3,600 sq ft	Standard NFPA 13D <sup>2</sup>	See NFPA 13D for design requirements.			
≥3,600 sq ft & <10,000 sq ft	Enhanced NFPA 13D <sup>1,2</sup>	See NFPA 13D for design requirements			
≥10,000 sq ft & <15,000 sq ft	Enhanced NFPA 13R <sup>1</sup>	See NFPA 13R for design requirements			
≥ 15,000 sq ft	Modified NFPA 13 <sup>1</sup>	Yes	N/A	N/A	Yes

N/A = Not Applicable

1. This protection constitutes a building "protected with an approved fire sprinkler system" per the IFC.
2. Domestic demand of 5 gpm is required to be added to the sprinkler demand in the hydraulic calculations.
3. Free-standing detached buildings with one or more sleeping rooms shall be protected by a minimum Enhanced NFPA 13D system.
4. Excluding Group Care Homes.
5. U.G. lead-in shall be the minimum size required hydraulically as proven by the sprinkler contractor and shall be hydrostatically tested and flushed, witnessed by the fire dept.
6. Building area is defined as all areas under roof except for porches, patios, balconies, carports and porte cocheres.
7. Water meters used for residential sprinkler systems shall be residential fire service meters or other meters approved by the water purveyor.

**21.38.2 Modified 13 Design Criteria.** When Table 21.38.1 requires a Modified 13 Design, the sprinkler system shall be installed to meet the requirements of this code, with the exception of the following items:

1. **Fire Department Connections (FDC):** A 2½-inch fire department connection is required. A single snoot connection will be accepted. The FDC shall be located on the garage wall facing the street except for special circumstances where the FDC may be freestanding and located adjacent to the street or private drive. A freestanding FDC in these circumstances may be designed into the mailbox column.
2. **Riser Room:** Risers shall be located in either the garage or within a dedicated room with an exterior door. Provided the garage/room is fully insulated the requirement for maintaining 40°F will not require a source of heat.
3. **Inspectors Test Connection:** The inspectors test location may be piped off the system riser.
4. **Piping in locations less than 40°F:** Dry pipe systems are not permitted for the protection of living spaces, anti-freeze systems shall be used. The protection of non-living spaces such as attics may be protected by dry-pipe systems.
5. **Anti-Freeze Loops:** The capacity shall not exceed 80 gallons.
6. **Separate Water Supply:** A separate water lead-in for the fire sprinkler system along with an approved (by the local water authority) back-flow prevention device is required. The back-flow prevention device shall be located at the street with in an approved insulated enclosure. The lead-in shall be sized using the minimum pipe size available that provides the calculated flow.
7. **Control Valves:** All valves used to control the sprinkler system are required to be indicating. A Post Indicator Valve (PIV) is not permitted.
8. **Electrical Supervision:** When required by the *fire code official*, the main control valves shall be electrically supervised. The back-flow valves are not required to be electrically supervised.
9. **Fire Pumps:** Electric fire pumps normally accepted in NFPA -13D systems for residential use (UL listed jockey pump) are acceptable.

10. **Notification Devices:** Interior – One (1) interior horn/strobe shall be installed in a location specified by the homeowner. Exterior – One (1) exterior horn/strobe shall be located above the FDC or other acceptable location. The sprinkler flow switch shall activate both of the required devices.
11. **Residential Sprinkler Heads:** Residential sprinkler heads shall be utilized and the design allowances specified in section 11.2.3.2.3.1 (reduction to design area) may be applied.
12. **Hangers and Earthquake Bracing:** The hanging of sprinkler pipe shall be in accordance Chapter 9. Earthquake bracing is not required.
13. **Garages:** Garages shall be classified as Ordinary Hazard Group I. Commercial style QR sprinkler heads are required.
14. **Location of Sprinklers:** Sprinklers shall be installed in all areas except where omissions are permitted as follows:
  - a. Inaccessible attic spaces.
  - b. Exterior overhangs, porches, and carports.
  - c. Rooms not provided with environmental control.

**21.38.3 Other Protection Designs:** For the other protection designs listed in Table 21.37.1, see the respective revised codes for NFPA 13D and NFPA 13R design requirements.

### **22.1.3**

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**22.1.3** Working plans shall be drawn to an indicated scale, on sheets of uniform size, with a plan of each floor, and shall show those items from the following list that pertain to the design of the system:

- (1) Name of owner and occupant
- (2) Location, including street address
- (3) Point of compass
- (4) Full height cross section, or schematic diagram, including structural member information is required for clarify and including ceiling construction and method of protection for nonmetallic piping
- (5) Ceiling/roof heights and slopes not shown in the full height cross section
- (6) Location of partitions
- (7) Location of fire walls
- (8) Occupancy class, label and name of each all areas or rooms
- (9) Location and size of concealed spaces, closets, attics, and bathrooms
- (10) Any small enclosures in which no sprinklers are to be installed
- (11) Size of city main in street and whether dead end or circulating; if dead end, direction and distance to nearest circulating main; and city main test results and system elevation relative to test hydrant (see A.23.1.8)
- (12) Other sources of water supply, with pressure and elevation
- (13) Make, type, model, and nominal K-factor of sprinklers including sprinkler identification number
- (14) Temperature rating and location of high-temperature sprinklers
- (15) Total area protected by each system on each floor
- (16) Number of sprinklers on each riser per floor
- (17) Total number of sprinklers on each dry pipe system, preaction system, combined dry pipe-preaction system, or deluge system
- (18) Approximate capacity in gallons of each dry pipe system
- (19) Pipe type and schedule of wall thickness
- (20) Nominal pipe size and cutting lengths of pipe (or center-to-center dimensions). Where typical branch lines prevail, it shall be necessary to size only one typical line
- (21) Location and size of riser nipples
- (22) Type of fittings and joints and location of all welds and bends. The contractor shall specify on drawing any sections to be shop welded and the type of fittings or formations to be used

- (23) Type and locations of hangers, sleeves, braces, and methods of securing sprinklers when applicable
- (24) All control valves, check valves, drain pipes, and test connections
- (25) Make, type, model, and size of alarm or dry pipe valve
- (26) Make, type, model, and size of preaction or deluge valve
- (27) Kind and location of alarm bells
- (28) Size and location of standpipe risers, hose outlets, hand hose, monitor nozzles, and related equipment
- (29) Private fire service main sizes, lengths, locations, weights, materials, point of connection meters, and valve pits; and the depth that the top of the pipe is laid below grade
- (30) Piping provisions for flushing
- (31) Where the equipment is to be installed as an addition to an existing system, enough of the existing system indicated on the plans to make all conditions clear
- (32) For hydraulically designed systems, the information on the hydraulic data nameplate
- (33) A graphic representation of the scale used on all plans
- (34) Name, ~~and~~ address, phone number, and contractor's license number of sprinkler contractor
- (35) Nevada State Fire Marshal registration number
- (36) Signature and NICET number, or engineer's seal, of the designer
- (37) General notes as required by the AHJ
- (38) Hydraulic reference points shown on the plan that correspond with comparable reference points on the hydraulic calculation sheets
- (39) The minimum rate of water application (density or flow or discharge pressure), the design area of water application, in-rack sprinkler demand, and the water required for hose streams both inside and outside
- (40) The total quantity of water and the pressure required noted at a common reference point for each system
- (41) Relative elevations of sprinklers, junction points, and supply or reference points
- (42) If room design method is used, all unprotected wall openings throughout the floor protected
- (43) Calculation of loads for sizing and details of sway bracing
- (44) The setting for pressure-reducing valves
- (45) Information about backflow preventers (manufacturers, size, type)
- (46) Information about antifreeze solution used (type and amount)
- (47) Size and location of hydrants, showing size and number of outlets and if outlets are to be equipped with independent gate valves. Whether hose houses and equipment are to be provided, and by whom, shall be indicated. Static and residual hydrants that were used in the flow tests shall be shown
- (48) Utility plans and/or plumbing plans necessary to show connection from water supply to fire sprinkler system
- (49) Size, location, and piping arrangement of fire department connections
- (50) Ceiling/roof heights and slopes not shown in the full height cross section
- (51) Edition year of NFPA 13 that the sprinkler system is designed to.

### 22.2.1

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**22.2.1 Water Supply Capacity Information.** Water supply information shall only be valid for a period of 6 months from the date the flow test was conducted to the initial submittal. The following information shall be included:

- (1) Location and elevation of static and residual test gauge with relation to the riser reference point
- (2) Flow location
- (3) Static pressure, psi (bar)
- (4) Residual pressure, psi (bar)
- (5) Flow, gpm (L/min)
- (6) Date
- (7) Time

- (8) ~~Test conducted by or information supplied by.~~ Flow tests shall be witnessed by the Authority Having Jurisdiction
- (9) Other sources of water supply, with pressure or elevation

#### 22.2.1.1

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**22.2.1.1** Where a water flow test is used for the purposes of system design, the test shall be conducted no more than 6 ~~12~~-months prior to working plan submittal.

#### 22.4.1.6

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**22.4.1.6** The maximum velocity for use in hydraulic calculations shall be 32 ft/sec (9.8 m/sec).

#### 22.4.1.7

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**22.4.1.7** Hydraulically calculated fire sprinkler systems shall be designed to ensure the required system pressure is a minimum of ten (10) psi below the available supply pressure.

#### 24.2.3.2.2

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**24.2.3.2.2** The test shall measure the time to trip the valve and the time for water to be discharged from the inspector's test connection. The flow from the inspector's test shall be predominantly continuously flowing water with small amounts of air permitted. All times shall be measured from the time the inspector's test connection is completely opened.

#### 24.2.3.2.2.1

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**24.2.3.2.2.1** Dry systems calculated for water delivery in accordance with 7.2.3.6 shall be required to prove ~~the exempt from any~~ specific water delivery time requirement set forth in 7.2.3.5 and 7.2.3.7.

#### 24.5.1

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**24.5.1** The installing contractor shall identify a hydraulically designed sprinkler system with a machine-engraved permanently marked weatherproof metal or rigid plastic sign with capitalized lettering a minimum 14 point (¼ inch high) in Arial or similar font secured to the riser it serves with corrosion-resistant wire, chain, or other ~~approved~~ approved by the AHJ. Such signs shall be placed at the alarm valve, dry pipe valve, preaction valve, or deluge valve supplying the corresponding hydraulically designed area. Signs located at the system control riser shall be allowed to be combined with the General Information Sign described in 24.6.

#### 24.6.1

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**24.6.1** The installing contractor shall provide a general information sign used to determine system design basis and information relevant to the inspection, testing, and maintenance requirements required by NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*.

**24.6.1.1** Such general information shall be provided with a ~~permanently marked~~ machine-engraved weatherproof metal or rigid plastic sign with capitalized lettering a minimum 14 point (1/4 inch high) in Arial or similar font, secured with corrosion resistant wire, chain, or other acceptable means.

**24.6.1.2** Such signs shall be placed at each system control riser, antifreeze loop, and auxiliary system control valve. Signs located at the system control riser shall be allowed to be combined with the Hydraulic Design Information Sign described in 24.5.