Welcome

- Instructor Introduction
- Exits
- Breaks and Schedule
- Cell Phones
- Student Introductions – Poll Questions 1 - 3

Presenter Instructions

- Many of these slides contain animation and graphics
- When reviewing this presentation, you should utilize the “slide show presentation mode” or in the “reading view”
  - This will allow you to become aware of the animation and graphics on the slides
  - Click the “View” in the header, then click “Reading View” in the “Presentation Views” group
- Slides which contain animation will have one or more dots at the bottom left corner of the slide. For example, there are 6 dots at the bottom of this slide
- Each dot represents a “click” which is needed for animation on the slide before the next slide will appear
- With each “click,” as an animation occurs, a dot will also disappear
- When all the dots are gone, the next “click” will take you to the next slide
- Also note, “FCO” will be used to designate the Fire Code Official

Description

- This seminar is designed to guide participants through the 2018 IFC requirements related to fire protection systems (Chapter 9) – With State of Utah Amendments
- These requirements include:
  - Fire sprinkler systems
  - Fire-extinguishing systems
  - Standpipe systems
  - Fire alarm systems
  - Automatic detection systems
  - Smoke control/exhaust systems
  - Other fire protection devices and equipment
Goal

- Participants will be able to apply key provisions regarding fire protection systems in the 2018 IFC to aid in code application, administration and enforcement

Objectives

- Upon completion, participants will be better able to:
  - Define key terms
  - Explain why a fire protection system must conform to code criteria and referenced standards
  - Determine where and when fire protection systems are required
  - Explain the principles of how a fire protection system detects and manages a fire
  - Understand the relationship between the code (IFC/IBC) and the referenced standards

Prerequisite Understanding

- Occupancy classifications are based on the use and character of the building
- Many code requirements are based on the occupancy classification
Fire Protection Systems

- Definition of a Fire Protection System:
  Approved devices, equipment and systems or combinations of systems used to detect a fire, activate an alarm, extinguish or control a fire, control or manage smoke and products of a fire or any combination thereof.

- Given this definition, a fire protection system is required to perform certain functions

The IFC’s Intent for Fire Protection Systems

- When a fire protection system is required, it is:
  - Designed and constructed in accordance with the applicable NFPA standards
  - As modified by the code
  - Fire protection system is designed for the specific hazards being protected
  - Exempt fire extinguisher locations – §903.3.1.1
  - Limited area fire sprinkler system – §903.3.8

Why the IFC Requires a Fire Protection System

- Fire protection systems are required inside or outside of buildings because of:
  - Occupancy classification in the fire area or the building
  - Occupant load of the area or floor of a building
  - Height of a building
  - Quantity of hazardous materials stored or used inside of a building
  - Type of hazard stored or used inside of a building
  - Fire loss history for specific hazards
  - Group I-2
  - Building has a story with OL ≥30 of a building
  - Storing or using >100 lbs pyroxylin plastics
  - Type IIB dry cleaning operation
  - Spray application of flammable finishes
Chapter 9 Arrangement

- IFC Chapter 9 is divided into 15 sections, including:
  - 901: General
  - 903: Automatic Sprinkler Systems
  - 904: Alternative Fire-extinguishing Systems
  - 905: Standpipe Systems
  - 907: Fire Alarm and Detection Systems
  - 908: Emergency Alarm Systems
  - 909: Smoke Control Systems
  - 910: Smoke and Heat Removal
  - 914: Fire Protection Based on Special Detailed Requirements of Use and Occupancy
  - 915: Carbon Monoxide Detection

IBC Ch 9 is almost identical to IFC Ch 9
Some differences occur in §901

General Provisions

§901

<table>
<thead>
<tr>
<th>Provision</th>
<th>IFC Section</th>
<th>IBC Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction documents</td>
<td>901.2</td>
<td>–</td>
</tr>
<tr>
<td>Permits</td>
<td>901.3</td>
<td>–</td>
</tr>
<tr>
<td>Installation</td>
<td>901.4</td>
<td>901.2</td>
</tr>
<tr>
<td>Modifications</td>
<td>–</td>
<td>901.3</td>
</tr>
<tr>
<td>Threads</td>
<td>–</td>
<td>901.4</td>
</tr>
<tr>
<td>Acceptance testing</td>
<td>901.5</td>
<td>901.6</td>
</tr>
<tr>
<td>Inspection, testing and maintenance</td>
<td>901.6</td>
<td>901.3</td>
</tr>
<tr>
<td>Fire areas</td>
<td>901.4.3</td>
<td>901.7</td>
</tr>
<tr>
<td>Pump and riser room size</td>
<td>–</td>
<td>901.8</td>
</tr>
<tr>
<td>Systems out of service</td>
<td>901.7</td>
<td>–</td>
</tr>
<tr>
<td>Removal of or tampering with equipment</td>
<td>901.8</td>
<td>–</td>
</tr>
<tr>
<td>Termination of monitoring service</td>
<td>901.9</td>
<td>–</td>
</tr>
<tr>
<td>Recall of fire protection components</td>
<td>901.10</td>
<td>–</td>
</tr>
</tbody>
</table>

Construction Documents

§901.2

- Fire Code Official (FCO) are authorized to require the submittal, review and approval of design drawings and calculations for fire protection systems
- A contractor’s statement of compliance can be required
- Documents must show that the system complies with the:
  - Plans
  - Applicable standard
  - Manufacturer’s instructions

Montana Amendment

- Administrative Rule 24.301.146 (13)
- In new or existing structures, the building official may allow the installation of noncode compliant equipment, facilities, or structural elements including but not limited to fire-extinguishing (sprinkler) systems or fire-resistant construction, which are not required by the building code, upon the finding that such installation does not negatively impact the overall compliance of the structure with the building code.
Construction Documents - 901.2 Montana Amendment

- Administrative Rule 24.301.146 (13)
- Subsection 901.2, Fire Protection Systems, is modified by deleting the exception and replacing with the following: "Any fire protection system or portion thereof not required by this code shall be permitted to be installed for partial or complete protection at the discretion of the building official."

Construction Documents – 902.8 Montana Amendment

- Administrative Rule 24.301.146 (16)
- Delete Subsection 903.2.8 and replace with the following:

1. An approved automatic sprinkler system installed in accordance with Section 903.3 shall be provided in all Group R buildings meeting any of the following criteria:
   - "a. 9 or more transient guests or 5 or more transient guestrooms;
   - "b. 9 or more occupants in other than dwelling units;
   - "c. 5 or more dwelling units; or
   - "d. more than 2 stories."
Construction Documents – 902.8 Montana Amendment

- "2. In lieu of the above required automatic sprinkler system in buildings not more than three stories above the lowest level of exit discharge, each transient guestroom may be provided with at least one door leading directly to an exterior exit access that leads directly to approved exits.

Construction Documents – 902.8 Montana Amendment

- "3. "Transient guest" for the purpose of this subsection shall mean an occupant who is primarily transient in nature, staying at one location for 30 days or less."
- "4. "The requirements for automatic sprinkler systems for R-4 occupancies are found in ARM 24.301.146."

Construction Documents - 903.3.5 Montana Amendment

- Administrative Rule 24.301.146 (14)
- Subsection 903.3.5
- Inadequate Water Supply
- Amended by addition of the following:

Construction Documents - 903.3.5 Montana Amendment

- "This subsection shall apply to buildings which are required by the International Building Code to be provided with an automatic fire extinguishing system and do not have access to an existing multiple user water supply system, such as a municipal water supply system or a private community water supply system, capable of providing the water supply requirements of National Fire Protection Association Standard for the Installation of Sprinkler Systems, 2016 edition (NFPA 13)."
Montana Amendment

- Under such circumstances, water storage requirements may be modified by the building official.
- The modified design shall include sufficient storage onsite to operate the hydraulically remote area for the response time of the local fire department.
- Response time is the time from alarm to the time the fire department can apply water to the fire.

- Response time shall be established by the use of the formula \( T = 6.5 \text{ minutes (mobilization time)} + 1.7 \text{ minutes/mile } D \) (travel time), where \( T \) is response time, in minutes, and \( D \) is distance, in miles, from the fire station to the building.
- The modified water supply shall be sufficient to operate the system for the response time calculated above but not be less than 20 minutes.
- Water supply requirements shall be established by using the area/density method as defined in NFPA 13.

- A reduction in water storage of up to 50 percent, but not less than that required for a 20-minute supply is allowed.
- All automatic fire sprinkler system designs and components shall be in compliance with NFPA 13.
- When a modified water storage is allowed, the automatic fire sprinkler system must be equipped with a flow alarm, digital alarm communicator transmitter, and a fire department connection.

- The automatic fire sprinkler system shall be monitored by an approved central station in accordance with NFPA 72, National Fire Alarm Code, 2016 edition.
Table 1020.1 - Montana Amendment

- (18) For "R" occupancies that are exempt from the requirements of a fire sprinkler system, pursuant to ARM 24.301.146(16), Table 1020.1, referenced in subsection 1020.1, shall be amended in regard to "R" occupancies by the deletion of the language "Greater than 10" and insertion of the language "Greater than 8" under the heading "Occupant Load Serviced By Corridor."

R-4 - Montana Amendment

- (39) Notwithstanding any other provisions within the International Building Code, the following adult group residential facilities, licensed by the Department of Public Health and Human Services will be classified and treated as follows:
  - (a) Category A assisted living facilities with 9 to 19 residents, as referenced in 50-5-226, MCA, will be classified as an R-4 occupancy for building permit and construction standard purposes. Automatic fire sprinkler systems are not required.
  - (b) Category B assisted living facilities with 9 to 19 residents, as referenced in 50-5-226, MCA, will be classified as an R-4 occupancy for building permit and construction standards purposes. In addition, a Category B assisted living facility shall have an automatic fire sprinkler system and provide an accessible sleeping room or space for each Category B resident.
  - (c) An assisted living facility with 20 or more residents, in any combination of Category A or Category B, will be classified as an R-2 occupancy for building permit and construction standards and shall meet accessibility standards as provided in Subsection 1103 of the International Building Code. Automatic fire sprinkler systems are required. A fire wall cannot be used to isolate and reduce occupant loads in order to avoid an R-2 classification.
### Required vs Non-Required

**§901.4.1 and §901.4.2**

- Required fire protection systems must comply with the code and the applicable standards.
- Non-required fire protection systems must also comply with the code and the applicable standards.
- Wherever any code modification or allowance is made as a result of sprinklers, the system becomes a required system.

### Additional Fire Protection Systems

**§901.4.4**

- Where the FCO deems a hazard to be of a unique nature or unduly difficult for fire department access, additional fire protection features can be required.

### Pump and Riser Room

**§901.4.6**

- Pump room or riser room is not required, but, if provided, they must have adequate room for service.
- Following manufacturer’s specifications.
- Ability to remove largest piece of equipment and reinstall.

### Pump and Riser Room

**§901.4.6.1 – 901.4.64**

- Access
- Marking on Access Doors
  - Approved Sign
  - Min height – 2”
  - Min Stroke width – ½ in
- Environment
  - $\geq 40^\circ$ F
- Lighting
Fire Pumps

§913

- Must meet NFPA 20 requirements
- Pump room maintained >40°F
- Cables and circuits protected by 2-HR construction or UL 2196
- IBC §913.2.1: 1-HR separation, 2-HR in high-rise, or ≥50'
- Class II fuel supply is not included in MAQ if it meets IFC §603.3.2

Installation Acceptance Testing

§901.5

- Before a fire protection system can be approved it must be tested
- Fire protection systems must be accepted and approved based on the applicable NFPA fire protection system standards

Systems Out of Service

§901.7

- Fire protection system impairment is a critical event that must be reported to the FCO
- Impairment of fire protection systems requires:
  - An individual be designated as the impairment coordinator
  - A plan of action for the impairment

Poll Question

- Question #4: Who is responsible for arranging and scheduling the Final Inspection and Acceptance Testing for a Fire Protection System?
- Poll Question - #5: When a Fire Protection System is to be taken out of service, the Fire Code Official should only be notified if the system is down for more than:
Important Terms

- Two important definitions must be reviewed and understood
- Several thresholds for requirements are based on these definitions
  - Level of exit discharge (LED)
  - Fire area

Level of Exit Discharge

- Definition of Level of Exit Discharge: The story at the point at which an exit terminates and an exit discharge begins.
- A building can have more than one level of exit discharge

Fire Area

- Definition of Fire Area:
  The aggregate floor area enclosed and bounded by fire walls, fire barriers, exterior walls or horizontal assemblies of a building. Areas of the building not provided with surrounding walls shall be included within the fire area if such areas are included within the horizontal projection of the roof or floor next above.
A building constructed with or without fire-resistant materials or assemblies is a fire area.

A building divided using fire-resistant assemblies can have one or more fire areas.
Fire Areas Using a Fire Wall

- Fire walls can divide a structure into ≥ 2 buildings
- Each building becomes its own fire area
- Each building can be further subdivided with fire barriers

How Many Fire Areas?

- Fire areas. Where buildings, or portions thereof, are divided into fire areas so as not to exceed the limits established for requiring a fire protection system in accordance with this chapter, such fire areas shall be separated by fire barriers constructed in accordance with §707 of the IBC or horizontal assemblies constructed in accordance with §711 of the IBC, or both, having a fire-resistance rating of not less than that determined in accordance with §707.3.10 of the International Building Code.

Fire Area Application

IFC §901.4.3, IBC §901.7

- Fire areas. Where buildings, or portions thereof, are divided into fire areas so as not to exceed the limits established for requiring a fire protection system in accordance with this chapter, such fire areas shall be separated by fire barriers constructed in accordance with §707 of the IBC or horizontal assemblies constructed in accordance with §711 of the IBC, or both, having a fire-resistance rating of not less than that determined in accordance with §707.3.10 of the International Building Code.

IBC Table 707.3.10

Fire-resistance Rating Requirements for Fire Barrier Assemblies or Horizontal Assemblies Between Fire Areas

<table>
<thead>
<tr>
<th>OCCUPANCY GROUP</th>
<th>FIRE-RESISTANCE RATING (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-1, H-2</td>
<td>4</td>
</tr>
<tr>
<td>F-1, H-3, S-1</td>
<td>3</td>
</tr>
<tr>
<td>A, B, E, F-2, H-4, H-5, I, M, R, S-2</td>
<td>2</td>
</tr>
<tr>
<td>U</td>
<td>1</td>
</tr>
</tbody>
</table>

NOTE: a fire area must be at least 1-HR fire-resistance-rated construction
But in most cases, 1-HR is not adequate
### IBC Table 508.4

**Required Separation of Occupancies (hours)**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A, E</td>
<td></td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-1, I-3, I-4</td>
<td>-</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R</td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-2, S-2, U</td>
<td>2</td>
<td>1</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B+, F-1, M, S-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H-1</td>
<td></td>
<td>N</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td>N</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H-2</td>
<td></td>
<td>N</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td>N</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H-3, H-4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H-5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Separate Group I-1 from Group M**

---

### IBC Table 706.4

**Fire Wall Fire-resistance Ratings**

<table>
<thead>
<tr>
<th>GROUP</th>
<th>FIRE-RESISTANCE RATING (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, B, E, H-4, I, R-1, R-2, U</td>
<td>3 (a)</td>
</tr>
<tr>
<td>F-1, H-3 (b), H-5, M, S-1</td>
<td>3</td>
</tr>
<tr>
<td>H-1, H-2</td>
<td>4 (b)</td>
</tr>
<tr>
<td>F-2, R-3, R-4, S-2</td>
<td>2</td>
</tr>
</tbody>
</table>

a. In Type II or V construction, walls shall be permitted to have a 2-hour fire-resistance rating.

b. For Group H-1, H-2 or H-3 buildings, also see Sections 415.7 and 415.8

---

### Design and Installation Requirements §903.3

- Before reviewing the IFC requirements for fire sprinkler systems, it is important to understand:
  - The various standards applicable to fire sprinkler system design
  - The relationship between the code and the standard

---

### Design and Installation Requirements §903.3

- NFPA publishes 3 standards governing the design, installation, testing and maintenance of fire sprinkler systems:
  - §903.3.1.1 – NFPA 13, Installation of Sprinkler Systems
  - §903.3.1.2 – NFPA 13R, Installation of Sprinkler Systems in Low-Rise Residential Occupancies
  - §903.3.1.3 – NFPA 13D, Sprinkler Systems for One- and Two-Family Dwellings and Manufactured Homes
Application Matrix of the Sprinkler Design Standards

<table>
<thead>
<tr>
<th>System Feature</th>
<th>NFPA 13</th>
<th>NFPA 13R</th>
<th>NFPA 13D or IRC §P2904</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent of Protection</td>
<td>Throughout the building</td>
<td>Occupied spaces</td>
<td>Occupied spaces</td>
</tr>
<tr>
<td>Design Intent</td>
<td>Life Safety &amp; Property Protection</td>
<td>Life Safety</td>
<td>Life Safety</td>
</tr>
<tr>
<td>Applicability</td>
<td>All Occupancies</td>
<td>Group R up to 4-stories or 60'</td>
<td>1- &amp; 2-family dwellings &amp; Townhomes</td>
</tr>
<tr>
<td>Design Methods</td>
<td>Pipe schedule; Control mode – discharge density/design area; Control mode – specific application; Suppression mode</td>
<td>4 sprinklers per compartment</td>
<td>2 sprinklers per compartment</td>
</tr>
<tr>
<td>Sprinklers</td>
<td>All listed &amp; approved types</td>
<td>Listed Residential</td>
<td>Listed Residential</td>
</tr>
<tr>
<td>Minimum H₂O Supply Duration</td>
<td>30 to 120 minutes</td>
<td>30 Minutes</td>
<td>7 or 10 Minutes</td>
</tr>
</tbody>
</table>

Poll Question

- Question #6: Can an NFPA 13R fire sprinkler system protect an entire building when the primary use of the building is residential, but the building also contains small accessory uses?

“Installed Throughout”

- IFC Table 1017.2 Exit Access Travel Distance, Footnote c
  - Buildings equipped throughout with an automatic sprinkler system in accordance with §903.3.1.1.
- IFC Table 5003.1.1(1) MAQ per Control Area, Note d
  - Maximum allowable quantities shall be increased 100 percent in buildings equipped throughout with an approved automatic sprinkler system in accordance with §903.3.1.1.
- IBC Table 506.2 Allowable Area, Note S1
  - S1 = Buildings a maximum of one story above grade plane equipped throughout with an approved automatic sprinkler system installed in accordance with §903.3.1.1.

What does “equipped throughout” or “installed throughout” mean?

- Under the design of NFPA 13, are all areas in the building protected with sprinklers?
  - NO
    - Attic spaces <6” high
    - Concealed spaces without combustible construction
- Under the design of NFPA 13, are all areas in the building protected with sprinklers? NO
  - Attic spaces without fuel-fired equipment
  - Small bathrooms
- Under the design of NFPA 13D or IRC §P2904, are all areas in the building protected with sprinklers? NO
  - Attic spaces without fuel-fired equipment
  - Small bathrooms
  - Small closets with noncombustible wall covering

So which design provides for fire sprinklers “installed throughout”?
### “Installed Throughout”

- **§903.3.1.1 states:**
  Where the provisions of this code require that a building or portion thereof be equipped throughout with an automatic sprinkler system in accordance with this section, sprinklers shall be installed throughout in accordance with NFPA 13 except as provided in Sections 903.3.1.1.1 and 903.3.1.1.2.

  "Installed throughout" means that sprinklers are installed throughout the building in all locations as required by the design standard and the code.

### Fire Protection Systems

**Given:** 89,000 ft² Group S-1 warehouse. The fire sprinkler system was designed to protect rack storage of Class III commodities in double row racks 24' high. The original tenant moved out of the building and the new tenant is storing Class IV commodities.

- What section would apply to ensure the automatic sprinkler system is adequately protecting these new commodities?
  - **§901.4**

### Fire Protection Systems

2. Is an anhydrous ammonia detection system in a refrigeration machinery room a fire protection system?

   - **NO**

   - **§202 Definition of “Fire Protection System”**

3. Which of the following wall assemblies is **not** a method to separate fire areas?
   - A. Fire wall
   - B. Fire partition
   - C. Fire barrier
   - D. Horizontal assembly
Automatic Sprinkler Systems

- NFPA 13 recognizes 4 types of sprinkler systems:
  - Wet-pipe sprinkler system
  - Dry-pipe sprinkler system
  - Pre-action sprinkler system
  - Deluge sprinkler system

These systems are designed for use inside buildings with temperatures >40°F.

Water enters the system upon activation of the detection device; the sprinkler must still activate.

Water enters the system upon activation of the detection device or sprinkler.

Water does not enter the system until activation of the detection device and sprinkler.

These systems are designed for use inside buildings with temperatures ≤40°F.

Allowed Increases Based on Fire Sprinkler Systems

<table>
<thead>
<tr>
<th>Code Section</th>
<th>Modification</th>
<th>NFPA 13</th>
<th>NFPA 13R</th>
<th>NFPA 13D</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBC 504.3 &amp; 504.4</td>
<td>Building Height</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>IBC 506.2</td>
<td>Building Area</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>IBC 507.4, 507.5 &amp; 507.7</td>
<td>Unlimited building area for certain occupancies</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>IFC 503.1.1</td>
<td>Increased distance from building to FD access road</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>IFC 507.5.1</td>
<td>Hydrant spacing increased to 600'</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>IFC 1017.2</td>
<td>Exit access travel distance</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>IFC Table 503.1.1(1) &amp; (2)</td>
<td>100% increase in MAQ for certain hazardous materials</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>IFC Table 503.11.1</td>
<td>100% increase in the MAQ for flammable and nonflammable solid and noncombustible liquid hazardous materials in Group M &amp; S</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>IFC Table 5704.3.4.1</td>
<td>100% increase in the MAQ for flammable and combustible liquids in Group M &amp; S</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Allowed Reductions Based on Fire Sprinkler Systems

<table>
<thead>
<tr>
<th>Code Section</th>
<th>Modification</th>
<th>NFPA 13</th>
<th>NFPA 13R</th>
<th>NFPA 13D</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBC 403.2.1</td>
<td>Reduction in shaft rating in high-rise buildings</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>IBC 404.2</td>
<td>Decorations in, and use of, atriums</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>IBC Table 503.4</td>
<td>Separation of occupancies</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>IBC 705.5.5</td>
<td>Vertical separation of openings</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>IBC 708.3</td>
<td>Fire-resistance rating of fire partitions</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>IBC 708.4.2</td>
<td>Draftstopping in attics of Group R-1 &amp; R-2</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>IFC Table 803.3</td>
<td>Reduction in flame spread rating for interior finish</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>IFC 907.2</td>
<td>Manual fire alarm boxes in Group A, B, E, F, M, R-1, R-2 &amp; R-4</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>IFC 1007.1.1</td>
<td>Separation of exits</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>IFC Table 1020.1</td>
<td>Corridor walls in means of egress</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>IFC 1028.1</td>
<td>Exit discharge</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>IFC Table B105.1(1)</td>
<td>50% reduction in fire flow for Group R-3 &amp; R-4 and 1- and 2-family dwellings</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>IFC Table B105.2</td>
<td>75% reduction in fire flow</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Design Criteria in NFPA 13

- Pipe schedule method
- Control mode – density/design area method
  - This includes residential and quick-response sprinklers
- Control mode – specific application method
  - These designs are generally limited to storage applications or special sprinklers
- Suppression mode method
  - Limited to Early Suppression Fast-Response (ESFR) sprinklers

Types of Sprinklers

- NFPA 13 recognizes several different types of sprinklers configured for upright, pendent or sidewall installation
  - Early Suppression Fast-Response (ESFR)
  - Extended Coverage
  - Quick-Response Extended Coverage
  - Quick-Response (QR)
  - Residential
  - Standard Spray
  - Special
  - Specific Application Control Mode

Special Sprinklers

NFPA 13 §8.4.8

- Special sprinklers have been evaluated & listed for performance in specific conditions:
  - Fire tests related to the intended hazard
  - Spray pattern distribution with respect to obstructions and wetting of walls and floors
  - Evaluation of the sprinkler’s thermal sensitivity
  - Sprinkler performance under horizontal or sloped ceilings
  - Area of design
  - Allowable clearance to ceilings

Automatic Fire Sprinklers Data Sheet

- Sprinkler data sheets generally contain:
  - Sprinkler selection criteria for residential, light hazard, ordinary hazard, extra hazard, special designs and storage applications
  - Minimum design pressure
  - Minimum or maximum clearances from the sprinkler to the hazard
  - Installation requirements based on the selected sprinkler
  - The SIN (Sprinkler Identification Number)
Automatic Sprinkler Systems

3. What is RTI and what range of RTI is required for a sprinkler to be either fast response, quick response or residential?

\[ \text{RTI} = \text{Response Time Index} \]

RTI of 50 – 80

4. What type of fire sprinkler system is designed for all sprinklers to flow simultaneously?

Deluge sprinkler system

Module 3
Sprinkler System Requirements

- Does IBC/IFC §1020.4 allow an increase the length of a dead-end corridor in a Group R-1 occupancy when an NFPA 13R automatic fire sprinkler system is installed?

- What prescriptive method of design is permitted for the design of an automatic sprinkler system?

Only NFPA 13 system, even in Group R §1020.4


**Required Fire Sprinklers**

- Fire sprinklers requirements are based on:
  - Occupancy classification
  - Size of fire area containing a specific occupancy
  - Occupant load in a specific occupancy
  - Floor level of the specific occupancy
  - Specific operation occurring in the building
  - Modification of other code requirements

**Fire Sprinkler System Installation**

- The area to be protected by sprinklers is dependent on the occupancy classification.

**Fire Sprinklers in Group A**

- Where fire sprinklers are required in a Group A occupancy located on a story other than LED, fire sprinklers must be installed on all stories leading to all levels of exit discharge that are used by the Group A occupancy.

**Group A-1 §903.2.1.1**

- Fire sprinklers required and throughout all stories from the Group A-1 occupancy to and including the levels of exit discharge serving that occupancy where one of the following conditions exists:
  - Fire area >12,000 ft²
  - Fire area has an OL ≥300
  - Fire area is located on a level other than LED
  - Fire area contains a multitheater complex
Group A-2
§903.2.1.2
- Fire sprinklers required and throughout all stories from the Group A-2 occupancy to and including the levels of exit discharge serving that occupancy where one of the following conditions exists:
  - Fire area >5,000 ft²
  - Fire area has an OL ≥100
  - Fire area is located on a level other than LED

Group A-3 & A-4
§903.2.1.3, §903.2.1.4
- Fire sprinklers required and throughout all stories from the Group A-3, A-4 occupancy to and including the levels of exit discharge serving that occupancy where one of the following conditions exist:
  - Fire area >12,000 ft²
  - Fire area has OL ≥300
  - Fire area is located on a level other than LED

Group A-5
§903.2.1.5
- Fire sprinklers required in the following areas in excess of 1,000 ft² that are accessory to stadiums or arenas:
  - Concession areas
  - Retail areas
  - Press boxes

Group A-5
§903.2.1.5.1
903.2.1.5.1 Spaces under grandstands or bleachers.
- Enclosed spaces under grandstands or bleachers shall be equipped with an automatic sprinkler system in accordance with Section 903.3.1.1 where either of the following exist:
  1. The enclosed area is 1,000 square feet (93 m²) or less and is not constructed in accordance with Section 1029.1.1.1.
  2. The enclosed area exceeds 1,000 square feet (93 m²).
Assembly Occupancies on Roofs
§903.2.1.6
- Fire sprinklers are required on all floors between an occupied roof and the LED discharge where assembly uses occur on the rooftop and:
  - OL >100 for Group A-2, or
  - OL >300 for other Group A occupancies

Multiple Group A Fire Areas
Montana Amendment - 903.2.1.7
- Montana Amendments to the International Building Code
- Administrative Rule 24.301.146
- Modifications to the International Building Code Applicable to Both the Department’s and Local Government Code Enforcement Programs
- (12) Subsection 903.2.1.7 - Multiple Fire Areas
- Deleted in its entirety.

Multiple Group A Fire Areas
§903.2.1.7
- Sprinklers required where multiple fire areas contain Group A-1, A-2, A-3 or A-4 occupancies that share egress components and OL ≥300

Ambulatory Care Facilities
§903.2.2
- Fire sprinklers required on floors with a Group B Ambulatory Care Facility when:
  - ≥4 care recipients incapable of self-preservation
  - ≥1 care recipients incapable of self-preservation on a floor other than LED
§903.3.2 requires the installation of QR or residential sprinklers throughout smoke compartments containing treatment rooms

How do you determine the number of care recipients?
Count the beds
Ambulatory Care Facilities
§903.2.2
- In buildings where ambulatory care is provided on levels other than the level of exit discharge, an automatic sprinkler system shall be installed throughout the entire floor as well as all floors below where such care is provided, and all floors between the level of ambulatory care and the nearest level of exit discharge, the level of exit discharge, and all floors below the level of exit discharge.
- Exception: Floors classified as an open parking garage are not required to be sprinklered.

Group E
§903.2.3
- Fire sprinklers required in the occupancy when one of the following conditions exist:
  1. Fire area >12,000 ft²
  2. All portions below LED
     - Sprinklers not required in areas below LED where each classroom has at least one exterior exit door at ground level
  3. The Group E fire area has an occupant load of >300

Group F-1
§903.2.4
- Fire sprinklers required throughout the building where one of the following conditions exist:
  - Fire area >12,000 ft²
  - Fire area is >3 stories above grade
  - Aggregate fire areas >24,000 ft²
  - Used for manufacture of upholstered furniture or mattresses >2,500 ft²

Woodworking Operations
§903.2.4.1
- Fire sprinklers required throughout the building where both of the following conditions exist:
  - Fire area >2,500 ft²
  - The process generates finely divided waste or uses finely divided combustible materials
Group H
§903.2.5
- Fire sprinklers required in all Group H occupancies
- §5004.5 requires systems to meet Ordinary Hazard Group 2 criteria, at minimum with 3,000 ft² design area
  - 0.17 gpm/ft²
  - Many materials require more water
- Flammable & combustible liquids
- Flammable & pyrophoric gases
- Level 2 & 3 aerosols
- Organic peroxides
- Oxidizers

Group H-5
§903.2.5.2
- Fire sprinklers required throughout the building
- IFC Table 903.2.5.2 establishes minimum design criteria for automatic sprinklers based on the location in the building

Group I
§903.2.6
- Fire sprinklers required throughout the building
- §903.2.6 allows the installation of NFPA 13R systems in Group I-1 Condition 1
- §903.3.2 requires the installation of QR or residential sprinklers in:
  - All areas of smoke compartments containing care recipient sleeping units in Group I-2
  - Sleeping units in Group I-1

Group M
§903.2.7
- Fire sprinklers required throughout the building where one of the following conditions exist:
  - Fire area >12,000 ft²
  - Fire area >3 stories above grade
  - Aggregate fire areas >24,000 ft²
  - Used for display and sale of upholstered furniture or mattresses >5,000 ft²
Group R §903.2.8

- Fire sprinklers required throughout the building for all Group I occupancies
- NFPA 13D systems in Group R-3, R-4 Condition 1 and care facilities with ≤5 clients
- NFPA 13R systems in Group R-4 Condition 2
- §903.3.2 requires the installation of QR or residential sprinklers in dwelling units and sleeping units

Pedestal/Podium Construction

IBC §510.4

- Group R occupancies with parking beneath
- Depending on the construction and the building’s height and area, the design of the sprinkler system may be based on NFPA 13, 13R or a combination of NFPA 13 and 13R