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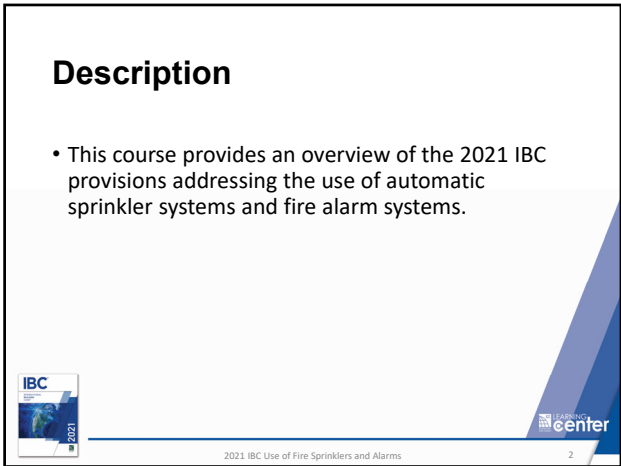
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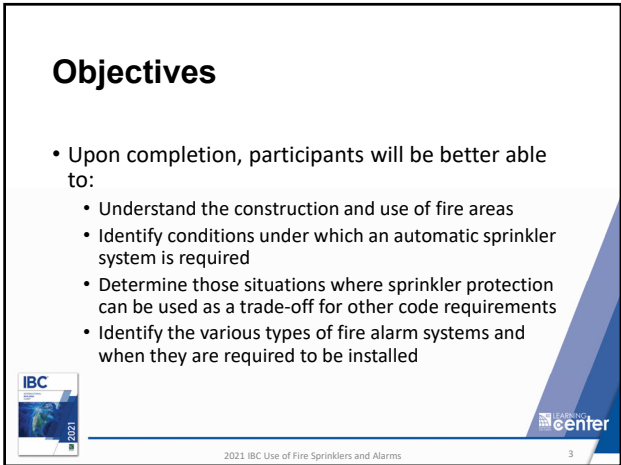
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### Program Outline

- Module 1 Introduction and Definitions
- Module 2 Sprinkler Requirements Based on Occupancy Classification
- Module 3 Miscellaneous Conditions Requiring Sprinkler Protection
- Module 4 Other Required Fire Suppression Systems
- Module 5 Sprinkler Trade-Offs
- Module 6 Fire Alarm Systems
- Module 7 Fire Sprinkler and Alarm Provisions of the IEBC
- Module 8 Retroactive Fire Sprinkler and Alarm Provisions of the IFC



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### Introduction and Definitions

Module 1



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### Introduction

- Chapter 9 of the IBC prescribes minimum requirements for active fire protection equipment systems
  - Included are functions of detecting a fire, alerting the occupants or fire department of an emergency, mass notification, and controlling or extinguishing the fire
- Generally, the requirements are based on the occupancy, height and area of the building, because these are the hazards that most affect fire-fighting capabilities and the building's relative hazard



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### Introduction

- This program focuses on two of the most important fire protection features addressed in the IBC:
  - Automatic sprinkler systems
  - Fire alarm systems
- The scope of the program is limited to identifying the conditions under which sprinkler and alarm protection is required, as well as the use of sprinklers as an alternative to a specific requirement
  - The design and operational aspects of these systems will not be addressed



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### Automatic Sprinkler Systems

- Emphasis in IBC placed on sprinklered buildings
- Buildings typically are sprinklered due to one of two reasons:
  - Mandated by Section 903.2
  - Reduction/elimination of other code requirements
- Many important code applications vary based upon presence of automatic sprinkler system



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### Automatic Sprinkler Systems

- Sprinklers may selectively be required:
  - Throughout the building
  - Throughout the fire area
  - Throughout the occupancy
  - Within specified rooms, areas or spaces
- Sprinkler requirements selectively based on:
  - Occupancy classification
  - Fire area size and/or location
  - Occupant load
  - Special hazards



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### 202 Definitions – Automatic Fire-Extinguishing System

- Automatic fire-extinguishing system defined as: *An approved system of devices and equipment which automatically detects a fire and discharges an approved fire-extinguishing agent onto or in the area of a fire.*



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### 202 Definitions – Automatic Sprinkler System

- Automatic sprinkler system defined in part as: *An integrated system of underground and overhead piping designed in accordance with fire protection engineering standards. The system includes a suitable water supply. The system is usually activated by heat from a fire and discharges water over the fire area.*



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### 202 Definitions – Fire Alarm System

- Fire alarm system defined as: *A system or portion of a combination system consisting of components and circuits arranged to monitor and annunciate the status of fire alarm or supervisory signal-initiating devices and to initiate the appropriate response to those signals.*



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### 202 Definitions – Manual Fire Alarm Box

- Manual fire alarm box defined as: *A manually operated device used to initiate an alarm signal.*



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### 202 Definitions – Emergency Voice/Alarm Communications

- Emergency voice/alarm communications defined as: *Dedicated manual or automatic facilities for originating and distributing voice instructions, as well as alert and evacuation signals pertaining to a fire emergency, to the occupants of a building.*



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### 202 Definitions – Automatic Smoke Detection System

- Automatic smoke detection system defined as: *A fire alarm system that has initiation devices that utilize smoke detectors for protection of an area such as a room or space with detectors to provide early warning of fire.*



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### 202 Definitions – Smoke Alarm

- Smoke alarm defined as: *A single- or multiple-station alarm responsive to smoke.*
  - A single-station smoke alarm is *an assembly incorporating the detector, the control equipment and the alarm-sounding device in one unit, operated from a power supply either in the unit or obtained at the point of installation.*



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### 202 Definitions – Smoke Alarm

- Smoke alarm defined as: *A single- or multiple-station alarm responsive to smoke.*
  - A multiple-station smoke alarm is *two or more single-station alarm devices that can be interconnected such that actuation of one causes all integral or separate audible alarms to operate. It can consist of one single-station alarm device having connections to other detectors or to a manual fire alarm box.*



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### 202 Definitions – Commercial Motor Vehicle

- Commercial motor vehicle defined as: *A motor vehicle used to transport passengers or property where the motor vehicle meets one of the following:*
  - Has a gross vehicle weight rating of 10,000 pounds or more*
  - Is designed to transport 16 or more passengers, including the driver*



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### 202 Definitions – Level of Exit Discharge

- Level of exit discharge defined as: *The story at the point at which an exit terminates and an exit discharge begins*

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### 202 Definitions – Constantly Attended Location

- Constantly attended location defined as: *A designated location at a facility staffed by trained personnel on a continuous basis where alarm or supervisory signals are monitored and facilities are provided for notification of the fire department or other emergency services*

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### 903.3.1.1, 903.3.1.2 NFPA 13 and 13R Sprinkler Systems

- Where provisions of IBC require that building or portion thereof be equipped throughout with automatic sprinkler system in accordance with Section 903.3.1.1, sprinkler system to be installed in accordance with NFPA 13
  - Automatic sprinkler systems in Group R occupancies are permitted to be provided with an NFPA 13R sprinkler system where Group R complies with the required conditions.

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### 903.3.1.2 NFPA 13R Sprinkler Systems

- Scoping for the permitted use of an NFPA 13R sprinkler system in Group R occupancies requires the following conditions must all be met by the Group R to allow for use of an NFPA 13R system:
  - No more than 4 stories above grade plane
  - Floor level of highest story to be no more than 30 feet above lowest level of fire department vehicle access
  - Floor level of lowest story to be no more than 30 feet below lowest level of fire department vehicle access
- In podium buildings (Sec. 510.2 and 510.4), the number of stories shall also be measured from grade plane.



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### 903.2.6 NFPA 13R Sprinkler System in Group I Fire Areas

- An NFPA 13R sprinkler system is also permitted to be installed in Group I-1, Condition 1 facilities



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### Chapter 9 Fire Areas

- Fire area concept based on limited fire size due to compartmentation
- Fire Area defined as *aggregate floor area enclosed and bounded by fire walls, fire barriers, exterior walls or fire-resistance-rated horizontal assemblies* (also includes floor area without enclosing walls where floor or roof above)
- Fire area concept typically has single purpose, to determine need for automatic sprinkler systems as required by Section 903.2



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### 901.7 Fire Areas

- Where buildings, or portions thereof, are divided into fire areas so as not to exceed limits established for requiring fire protection system, such fire areas to be separated by fire barriers and/or horizontal assemblies per Table 707.3.10

TABLE 707.3.10  
FIRE-RESISTANCE RATING REQUIREMENTS FOR  
FIRE BARRIER ASSEMBLIES OR HORIZONTAL  
ASSEMBLIES BETWEEN FIRE AREAS

OCCUPANCY GROUP	FIRE-RESISTANCE RATING (hours)
H-1, H-2	4
F-1, H-3, S-1	3
A, B, E, F-2, H-4, H-5, I, M, R, S-2	2
U	1



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### Fire Areas – Example 1

**Given:** An 18,000 sq ft mixed occupancy nonsprinklered building as shown.

**Determine:** The minimum required fire-resistance rating of a fire barrier used to create a separation of complying fire areas.

No sprinkler system



Per Table 707.3.10:  
Group B: 2 hours  
Group F-1: 3 hours

Group B  
8,000 sq ft

Group F-1  
10,000 sq ft

Minimum 3-hour fire barrier required

Minimum required separation of fire areas



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### Fire Areas – Example 2

**Given:** A Group M retail sales building that includes a roofed exterior sales area of 3,000 sq ft.



**Determine:** If a sprinkler system is required.

Group M  
retail sales  
11,000 sq ft

Covered  
exterior  
sales area  
3,000 sq ft

**Solution:** As a single Group M fire area of 14,000 square feet, a sprinkler system is required. However, no sprinkler system is required if a complying 2-hour fire barrier per Section 707.3.10 separates the interior and exterior sales areas.

Fire area defined



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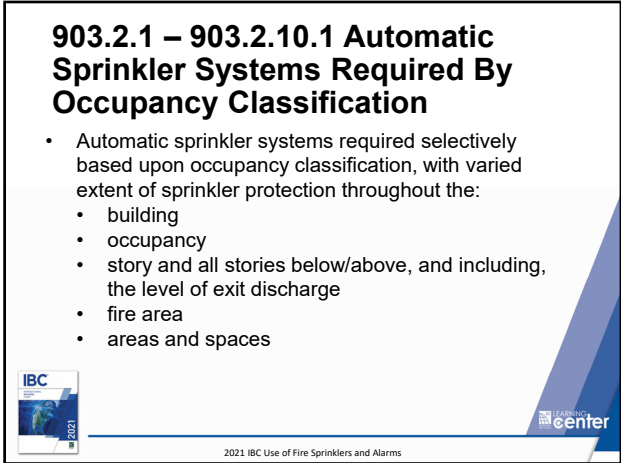
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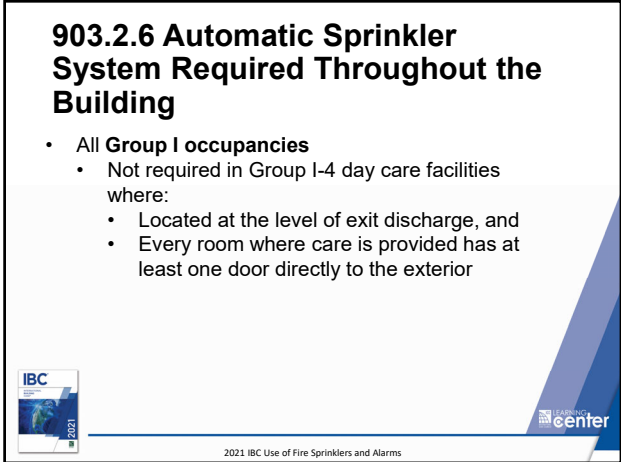
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### 903.2.8 Automatic Sprinkler System Required Throughout the Building

- All **Group R occupancies**
  - NFPA 13R system permitted where:
    - In compliance with Section 903.3.1.2, or
    - Group R-4, Condition 2 occupancies
  - NFPA 13D system permitted in:
    - Group R-3 occupancies
    - Group R-4, Condition 1 occupancies
    - Care facilities with five or fewer individuals in single-family dwellings



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### 903.2.10.2 Automatic Sprinkler System Required Throughout the Building

- All **Group S-2 occupancies used for storage of motor vehicles in a mechanical-access enclosed parking garage**
  - In addition, portion of building containing mechanical-access enclosed parking garage to be protected with a specially engineered automatic sprinkler system



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### 903.2.4 Automatic Sprinkler System Required Throughout the Building

- **Group F-1 occupancies** where at least one of the following conditions exists:
  - Group F-1 fire area exceeds 12,000 square feet, or
  - Group F-1 fire area located four or more stories above grade plane, or
  - Aggregate of all Group F-1 fire areas exceeds 24,000 square feet



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### 903.2.7 Automatic Sprinkler System Required Throughout the Building

- **Group M occupancies** where at least one of the following conditions exists:
  - Group M fire area exceeds 12,000 square feet
  - Group M fire area located four or more stories above grade plane
  - Aggregate of all Group M fire areas exceeds 24,000 square feet
  - Storage of merchandise is in high-piled or rack storage arrays (as set forth in IFC)



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### 903.2.9 Automatic Sprinkler System Required Throughout the Building

- **Group S-1 occupancies** where at least one of the following conditions exists:
  - Group S-1 fire area exceeds 12,000 square feet
  - Group S-1 fire area located four or more stories above grade plane
  - Aggregate of all Group S-1 fire areas exceeds 24,000 square feet
  - Group S-1 fire area used for storage of commercial motor vehicles exceeds 5,000 square feet



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### 903.2.9.1 Automatic Sprinkler System Required Throughout the Building

- **Group S-1 occupancies used as repair garages** where any of the following conditions exists:
  - Building has two or more stories and repair garage fire area exceeds 10,000 square feet
  - Building has one story above grade plane and repair garage fire area exceeds 12,000 square feet
  - Building with repair garage serving vehicles parked in basement
  - Group S-1 fire area exceeding 5,000 square feet used for repair of commercial motor vehicles



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### 903.2.9.2 Automatic Sprinkler System Required Throughout the Building

- Group S-1 occupancies used for the storage of tires where the storage area exceeds 20,000 cubic feet



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### 903.2.10 Automatic Sprinkler System Required Throughout the Building

- Group S-2 occupancies classified as enclosed parking garages where any of the following conditions exist:
  - Fire area of enclosed parking garage exceeds 12,000 square feet, or
  - Enclosed parking garage located beneath a use classified as a different occupancy group, or
  - Building used for storage of commercial motor vehicles where fire area exceeds 5,000 square feet



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### 903.2.10 Automatic Sprinkler System Required Throughout the Building

- Group S-2 occupancies classified as open parking garages where the:
  - Fire area of open parking garage exceeds 48,000 square feet.



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### 903.2.5.2 Automatic Sprinkler System Required Throughout the Building

- Group H-5 occupancies
  - Design criteria for sprinkler protection of various Group H-5 areas to be not less than as established in Table 903.2.5.2

LOCATION	OCCUPANCY HAZARD CLASSIFICATION
Fabrication areas	Ordinary Hazard Group 2
Service corridors	Ordinary Hazard Group 2
Storage rooms without dispensing	Ordinary Hazard Group 2
Storage rooms with dispensing	Extra Hazard Group 2
Corridors	Ordinary Hazard Group 2



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### 903.2.5.1 Automatic Sprinkler System Required Throughout the Occupancy

- Group H-1, H-2, H-3 and H-4 occupancies
  - Sprinkler protection to also be provided in areas where cellulose nitrate film or pyroxylin plastics are manufactured, stored or handled in quantities over 100 pounds (903.2.5.3)



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### 903.2.1.1 Automatic Sprinkler System Required Throughout the Story

- Sprinkler protection required throughout the story containing **Group A-1 occupancies** where Group A-1 fire area:
  - Exceeds 12,000 square feet, or
  - Occupant load is 300 or more, or
  - Located on a floor other than level of exit discharge, or
  - Contains a multitheater complex
- Sprinkler protection to be extended throughout all stories from Group A-1 occupancy to, and including, levels of exit discharge serving Group A-1 occupancy



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### 903.2.1.2 Automatic Sprinkler System Required Throughout the Story

- Sprinkler protection required throughout the story containing **Group A-2 occupancies** where Group A-2 fire area:
  - Exceeds 5,000 square feet, or
  - Occupant load is 100 or more, or
  - Located on a floor other than level of exit discharge
- Sprinkler protection to be extended throughout all stories from Group A-2 occupancy to, and including, levels of exit discharge serving Group A-2 occupancy



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### 903.2.1.3 Automatic Sprinkler System Required Throughout the Story

- Sprinkler protection required throughout the story containing **Group A-3 occupancies** where Group A-3 fire area:
  - Exceeds 12,000 square feet, or
  - Occupant load is 300 or more, or
  - Located on a floor other than level of exit discharge
- Sprinkler protection to be extended throughout all stories from Group A-3 occupancy to, and including, levels of exit discharge serving Group A-3 occupancy



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### 903.2.1.4 Automatic Sprinkler System Required Throughout the Story

- Sprinkler protection required throughout the story containing **Group A-4 occupancies** where Group A-4 fire area:
  - Exceeds 12,000 square feet, or
  - Occupant load is 300 or more, or
  - Located on a floor other than level of exit discharge
- Sprinkler protection to be extended throughout all stories from Group A-4 occupancy to, and including, levels of exit discharge serving Group A-4 occupancy



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### 903.2.1.6 Automatic Sprinkler System Required Throughout the Story

- Where a **Group A occupancy is located on the roof** of a building, sprinkler protection to be extended throughout all floors between the occupied roof to, and including, level of exit discharge where occupied roof contains:
  - Group A-2 occupancy with an occupant load greater than 100, or
  - Group A-1, A-3 or A-4 occupancy with an occupant load greater than 300
- Sprinkler protection not required where Group A occupancy located on roof of Type I or II open parking garage



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### 903.2.2 Automatic Sprinkler System Required Throughout the Story

- Sprinkler protection required throughout story containing **Group B ambulatory care facility** where either of following conditions exist at any time:
  - Four or more care recipients within the care facility are incapable of self-preservation, or
  - One or more care recipients within a care facility located at other than level of exit discharge are incapable of self-preservation
    - Sprinkler protection to also extend on all stories below level where such care provided to:
      - Nearest level of exit discharge, and
      - Level of exit discharge, and
      - Any floor below level of exit discharge



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### 903.2.6 Automatic Sprinkler System Required Throughout the Story

- Sprinkler protection required throughout the story containing **Group I-4 occupancies**, and extended throughout all stories from Group I-4 occupancy to, and including, levels of exit discharge
  - Not applicable to levels classified as open parking garage



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### 903.2.1.7 Automatic Sprinkler System Required Throughout the Fire Area

- Sprinkler protection required in **Group A fire areas** where such multiple fire areas:
  - Share exit or exit access components, and
  - Combined occupant load of fire areas is 300 or more
- Provision not applicable to Group A-5 occupancies

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### 903.2.3 Automatic Sprinkler System Required Throughout the Fire Area

- Sprinkler protection required in **Group E fire areas** where fire area:
  - Greater than 12,000 square feet, or
  - Occupant load 300 or more, or
  - Located on other than level of exit discharge serving Group E occupancy
    - Where Group E occupancy located below discharge level, sprinkler protection not required if every classroom has at least one exterior exit door at ground level

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### 903.2.4.1 Automatic Sprinkler System Required Throughout the Fire Area

- Sprinkler protection required in **Group F-1 fire areas** that contain **woodworking operations** exceeding 2,500 square feet:
  - Generate finely divided combustible waste, or
  - Use finely divided combustible materials

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### 903.2.4.1 Automatic Sprinkler System Required Throughout the Fire Area

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### 903.2.4.2 Automatic Sprinkler System Required Throughout the Fire Area

- Sprinkler protection required in **Group F-1 fire areas used for the manufacture of distilled spirits.**

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### 903.2.9.3 Automatic Sprinkler System Required Throughout the Fire Area

- Sprinkler protection required in **Group S-1 fire areas used for the bulk storage of distilled spirits or wine.**

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### 903.2.4.3 Automatic Sprinkler System Required Throughout the Fire Area

- Sprinkler protection required in **Group F-1 fire areas used for the manufacture of upholstered furniture or mattresses** where:
  - Fire area exceeds 2,500 square feet in area.



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### 903.2.7.2 Automatic Sprinkler System Required Throughout the Fire Area

- Sprinkler protection required in **Group M fire areas used for the display and sale of upholstered furniture or mattresses** where:
  - Floor area used for display and sales of upholstered furniture or mattresses exceeds 5,000 square feet in area.



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### 903.2.9.4 Automatic Sprinkler System Required Throughout the Fire Area

- Sprinkler protection required in **Group S-1 fire areas used for the storage of upholstered furniture or mattresses** where:
  - Floor area used for storage of upholstered furniture or mattresses exceeds 2,500 square feet in area.
    - Threshold of 2,500 square feet does not apply to self-storage facilities no more than one story above grade plane provided all storage spaces can be accessed directly from exterior.



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### 903.2.1.5 Automatic Sprinkler System Required Throughout the Space

- Sprinkler protection required throughout **enclosed Group A-5 accessory use areas** exceeding 1,000 square feet
- Sprinkler protection required in enclosed spaces under grandstands and bleachers where:
  - Enclosed area does not exceed 1,000 square feet and space is not constructed in accordance with Section 1029.1.1.1 (minimum 1-hour separation with exceptions), or
  - Enclosed area exceeds 1,000 square feet



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### Miscellaneous Conditions Requiring Sprinkler Protection

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### 903.2.11.1 Stories Without Openings

- Sprinkler protection required throughout all stories where floor area exceeds 1,500 square feet and exterior wall openings do not comply with following criteria for:
  - Openings below grade that lead directly to ground level by a complying exterior stairway or outside ramp
  - Openings entirely above adjoining ground level totaling at least 20 square feet in each 50 linear feet of exterior wall in the story on at least one side



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### 903.2.11.1, #1 Openings Below Grade

- Openings below grade to be located in each 50 linear feet, or fraction thereof, of exterior wall in the story on not less than one side
- Required openings to be distributed so that lineal distance between adjacent openings will not exceed 50 feet



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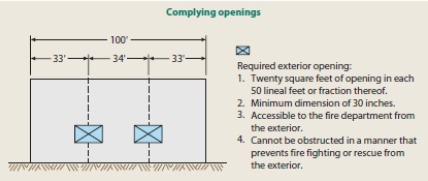
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### 903.2.11.1, #2 Openings Entirely Above Adjoining Ground Level

- Openings to be distributed such that lineal distance between adjacent openings not to exceed 50 feet
- Height of bottom of clear opening to be maximum of 44 inches measured from floor





**Complying openings**

100'

33' 34' 33'

☒ Required exterior opening:

1. Twenty square feet of opening in each 50 linear feet or fraction thereof.
2. Minimum dimension of 30 inches.
3. Accessible to the fire department from the exterior.
4. Cannot be obstructed in a manner that prevents fire fighting or rescue from the exterior.



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### 903.2.11.1.1 Opening Dimensions and Access

- In addition to the required locations for complying exterior openings, such openings to have a minimum dimension of 30 inches
- Access to openings to be provided for the fire department from exterior
  - Openings not to be obstructed so that fire fighting or rescue can be accomplished from exterior



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### 903.2.11.1.2 Openings on One Side Only

- Where openings in a story occur on only one side of building and opposite wall of such story exceeds 75 feet from such openings:
  - Story to be provided with automatic sprinkler system, or
  - Openings to be provided on a minimum of two sides

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### 903.2.11.1.3 Basements

- Sprinkler protection required in basements more than 1,500 square feet in floor area where:
  - Any portion of basement located more than 75 feet from required openings, or
  - Walls, partitions or other obstructions restrict application of water from hose streams

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### 903.2.11.2 Rubbish and Linen Chutes

- Sprinkler protection required at top of rubbish and linen chutes and in their terminal rooms
- Chutes to have additional sprinkler heads installed at:
  - Alternate floors, and
  - Lowest intake
- Where chute extends more than one floor below lowest intake, sprinklers to be installed at alternate floors beginning with second level below last intake and ending with floor above the discharge

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### 903.2.11.3 Mid-Rise Buildings

- Sprinkler protection required throughout buildings with one or more stories with occupant load of 30 or more located a minimum of 55 feet above lowest level vehicle access, with measurement to be taken to finished floor level
  - Not required for:
    - Group F-2 occupancies



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### 903.2.11.4 Ducts Conveying Hazardous Exhausts

- Sprinkler protection to be provided in ducts conveying hazardous exhaust or flammable or combustible materials
  - Not required in ducts where largest cross-sectional diameter of duct is less than 10 inches
- IMC also exempts sprinkler protection for:
  - Metallic and nonmetallic exhaust ducts in semiconductor fabrication facilities
  - Hoods and exhaust systems in laboratories



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### 903.2.11.5 Commercial Cooking Operations

- Sprinkler protection to be provided in commercial kitchen hood and duct systems where automatic sprinkler system used to comply with Section 904.13, Item 2
  - Additional automatic fire-extinguishing systems permitted include:
    - Carbon dioxide extinguishing systems
    - Automatic water mist systems
    - Foam-water sprinkler or spray systems
    - Dry-chemical extinguishing systems
    - Wet-chemical extinguishing systems



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# Other Required Fire Suppression Systems

Module 4



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## 903.2.11.6 Other Required Fire Protection Systems

- Sprinkler protection also selectively required as referenced in Table 903.2.11.6 for:
  - Specific buildings
  - Specific areas within buildings

SECTION	SUBJECT
402.5, 402.6.2	Covered and open mall buildings
403.3	High-rise buildings
404.3	Atriums
405.3	Underground structures
407.7	Group I-2
410.6	Stages
411.3	Special amusement buildings
412.2.4	Airport traffic control towers
412.3.6, 412.3.6.1, 412.5.6	Aircraft hangars
415.11.11	Group I-2.5 HPM exhaust ducts
416.5	Flammable finishes
417.4	Drying rooms
424.3	Play structures
428	Buildings containing laboratory suites
507	Unlimited area buildings
508.5.7	Live/work units
509.4	Incidental uses
1030.6.2.3	Smoke-protected assembly seating
IFC	Sprinkler system requirements as set forth in Section 903.2.11.6 of the International Fire Code



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## 402.5, 402.6.2 Covered and Open Mall Buildings

- Sprinkler protection required throughout covered and open mall buildings and meet all of following conditions:
  - System to be complete and operative throughout occupied spaces prior to occupancy
  - Protection for mall to be independent from that for tenant spaces and anchor buildings (covered malls)
  - Protection for tenant spaces to be independent from that for anchor buildings (open malls)
  - Protection to be provided beneath exterior circulation balconies adjacent to open mall
  - Tenant spaces supplied by same system to be independently controlled



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### 403.3 High-Rise Buildings

- High-rise buildings to be equipped with automatic sprinkler system throughout, except:
  - Telecommunications equipment buildings, including associated electrical power distribution equipment, batteries and standby engines
- Automatic secondary water supply required in those buildings assigned to Seismic Design Categories C, D, E and F.
  - Water supply to have minimum duration of 30 minutes



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### 404.3 Atriums

- Where an atrium is located within a building, an automatic sprinkler system to be installed throughout the entire building
  - Areas of building adjacent to or above atrium need not be sprinklered where such areas separated from atrium with minimum 2-hour fire barriers and/or horizontal assemblies
- Sprinkler protection at ceiling of atrium not required where ceiling more than 55 feet above atrium floor



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### 405.3 Underground Structures

- Sprinkler protection required for the following portions of underground buildings:
  - Highest level of exit discharge serving underground portions of the building, and
  - All levels below

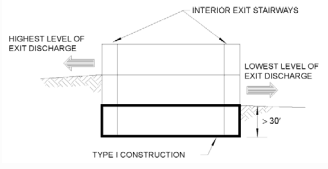




Diagram illustrating the required sprinkler protection for underground structures. The diagram shows a cross-section of a building with an interior exit stairway. The highest level of exit discharge is indicated at the top of the stairway, and the lowest level of exit discharge is indicated at the bottom of the stairway. The structure is labeled as Type I construction and has a height greater than 30 feet.



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### 407.7 Group I-2

- Sprinkler protection required in smoke compartments containing sleeping rooms in Group I-2 occupancies



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### 410.6 Stages

- Stages to be provided with automatic sprinkler system protection, including the following areas:
  - Under roof and gridiron
  - Under catwalks and galleries above stage
  - Accessory areas such as dressing rooms, performer lounges, shops and storerooms



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### 410.6 Stages

- At stages, sprinkler protection not required:
  - Under stage areas where:
    - Less than 4 feet in height, and
    - Utilized exclusively for table/chair storage, and
    - Concealed space separated by minimum 5/8" Type X gypsum board
  - For stages where:
    - Less than 1,000 square feet, and
    - Less than 50 feet in height, and
    - Curtains, scenery, etc. not retractable vertically
  - Within portable orchestra enclosures



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### 411.2 Special Amusement Areas

- In other than temporary conditions, buildings containing special amusement areas to be sprinklered throughout
- Temporary special amusement buildings to be sprinklered unless:
  - Total floor area of temporary special amusement area is less than 1,000 square feet, and
  - Exit access travel distance less than 50 feet
- In temporary buildings, sprinkler water supply to be of an approved temporary means



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### 412.2.4 Airport Traffic Control Towers

- Airport traffic control towers to be provided with an automatic sprinkler system where an occupied floor located more than 35 feet above lowest level of fire department vehicle access



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### 412.3.6, 412.3.6.1, 412.5.6 Aircraft Hangars

- Fire suppression system designed in accordance with NFPA 409 to be provided in:
  - Aircraft hangars, based on Table 412.3.6
  - Group III hangars that contain hazardous operations
    - Group I or II fire suppression system required
  - Aircraft paint hangars



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### 415.11.12 Group H-5 HPM Exhaust Ducts

- In Group H-5 occupancies, approved automatic sprinkler system to be provided in exhaust ducts conveying exhausts from HPM, including:
  - Gases
  - Vapors
  - Fumes
  - Mists
  - Dusts



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### 416.5 Flammable Finishes

- An automatic sprinkler system or fire-extinguishing system to be provided in following spaces where the spray application of flammable finishes occurs:
  - Spray rooms
  - Spray booths



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### 417.4 Drying Rooms

- An approved fire-extinguishing system to be installed in drying rooms designed for high-hazard materials
  - Also includes special occupancies as set forth in Chapter 4



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### 424.3 Play Structures

- Children's play structures to be provided with same level of approved fire suppression as required for other structures in the same occupancy



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### 428.4 Buildings Containing Laboratory Suites

- Group B higher education buildings containing laboratory suites to be equipped throughout with approved automatic sprinkler system



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### 507 Unlimited Area Buildings

- The following unlimited area buildings as permitted by Section 507 required to be provided with automatic sprinkler systems throughout:
  - Groups B, F, M or S in one-story buildings
  - Group A-4, other than Type V, in one-story buildings
  - Groups B, F, M or S in two-story buildings
  - Group A-3 in buildings of Type II, III or IV
  - Group H-5 in buildings not more than 2 stories
  - Group E buildings of Type II, IIIA or IV
  - Motion picture theaters of Type II



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### 508.5.7 Live/Work Units

- Sprinkler protection to be provided throughout live/work units in accordance with the Group R provisions of Section 903.2.8



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### 509.4.2 Incidental Uses

- Where Table 509 permits an automatic sprinkler system without a fire barrier, incidental uses to be separated from remainder of building by construction capable of resisting passage of smoke
  - Installation of sprinkler protection only required within space occupied by incidental use



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### Table 509.1 Incidental Uses

ROOM OR AREA	SEPARATION AND/OR PROTECTION
Furnace room where any piece of equipment is over 400,000 Btu per hour input	1 hour or provide automatic sprinkler system
Rooms with boilers where the largest piece of equipment is over 15 psf and 10 horsepower	1 hour or provide automatic sprinkler system
Refrigerant machinery room	1 hour or provide automatic sprinkler system
Hydrogen fuel gas rooms, not classified as Group H	1 hour in Group R, F, M, S and U occupancies; 2 hours in Group A, E, I and R occupancies
Incinerator rooms	2 hours and provide automatic sprinkler system
Paint shops, not classified as Group H, located in occupancies other than Group F	2 hours, or 1 hour and provide automatic sprinkler system
In Group I occupancies, laboratories and vocational shops not classified as Group H	1 hour or provide automatic sprinkler system
In Group I-2 occupancies, laboratories not classified as Group H	1 hour and provide automatic sprinkler system
In ambulatory care facilities, laboratories not classified as Group H	1 hour or provide automatic sprinkler system
Laundry rooms over 100 square feet	1 hour or provide automatic sprinkler system
In Group I-2, laundry rooms over 100 square feet	1 hour
In Group I-3 cells and Group I-2 patient rooms equipped with padded surfaces	1 hour
In Group I-2, physical plant maintenance shops	1 hour
In ambulatory care facilities or Group I-2 occupancies, waste and linen collection rooms with containers that have an aggregate volume of 10 cubic feet or greater	1 hour
In other than ambulatory care facilities and Group I-2 occupancies, waste and linen collection rooms over 100 square feet	1 hour or provide automatic sprinkler system
In ambulatory care facilities or Group I-2 occupancies, storage rooms greater than 100 square feet	1 hour
Electrical installations and transformers	See Sections 110.20 through 110.34 and Sections 430.8 through 430.48 of NFPA 70 for protection and separation requirements

For SI: 1 square foot = 0.0929 m<sup>2</sup>; 1 pound per square inch (psi) = 6.9 kPa; 1 British thermal unit (Btu) per hour = 0.293 watts; 1 horsepower = 746 watts; 1 gallon = 3.785 L; 1 cubic foot = 0.0283 m<sup>3</sup>.



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### 1030.6.2.3 Smoke-Protected Assembly Seating

- Enclosed areas designed as smoke-protected assembly seating to be protected by automatic sprinkler system, except for following conditions:
  - Floor area used for contest, performances or entertainment, roof construction more than 50 feet above floor level, and use restricted to low hazards
  - Press boxes and storage facilities less than 1,000 square feet
  - Outdoor seating, where seating and means of egress in seating area essentially open to outside



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### IFC Sprinkler System Requirements Set Forth in IFC Section 903.2.11.6

- Additional buildings and areas to be provided with fire protection system as noted in IFC Table 903.2.11.6, including the following:
  - Dry cleaning plants and machines
  - Spray finishing operations
  - Aerosol display, merchandising and warehousing
  - Medical gas storage
  - Flammable and combustible liquid storage
  - Cabinets, exhausted enclosures, and rooms for highly toxic and toxic gases



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### Sprinkler Trade-Offs

Module 5



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### Sprinkler Trade-Offs

- In those cases where an automatic sprinkler system is not required, it is often beneficial that such a system be installed due to the many trade-offs provided in the IBC
- Although most sprinkler trade-offs require the building to be sprinklered throughout, in some situations only a portion of the building needs to be sprinklered to obtain the benefit



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### Sprinkler Trade-Offs

- Commonly-applied trade-offs include:
  - Reduced type of construction
    - Allowable story and height increase
    - Allowable area increase
    - Unlimited area buildings
  - Elimination of fire-resistive separation
    - Fire-rated corridors
    - Incidental uses
  - More means of egress flexibility
    - Extended travel distance
    - Decreased exit separation
  - Elimination of areas of refuge



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### Sprinkler Trade-Offs

- Throughout IBC, automatic sprinkler protection selectively allows for reduction or elimination of other requirements
- Sprinkler trade-offs individually regulated for installation of:
  - NFPA 13 system (IBC Section 903.3.1.1)
  - NFPA 13R system (IBC Section 903.3.1.2)



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### Sprinkler Trade-Offs

- Sprinkler trade-offs provided extensively throughout IBC
- Only significant allowances in the following chapters are addressed in this program:
  - Chapter 5 Allowable Building Height and Area
  - Chapter 7 Fire and Smoke Protection Features
  - Chapter 8 Interior Finishes
  - Chapter 10 Means of Egress



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### 503.1.4 Occupied Roofs

- Occupancy located on roof of a building not limited to occupancies allowed on story immediately below roof provided building protected with sprinkler system
  - Occupant notification also required at roof area
- Base requirement limits rooftop occupancies to only those permitted on building's top story



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### 504.1 Building Height and Number of Stories

- The height in feet and number of stories above grade plane for a building can typically be increased where an automatic sprinkler system is provided throughout the building.
  - Height and story sprinkler increases not permitted for selected high-hazard and institutional occupancies



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### 505.2.1 Area Limitation of Mezzanines

- Aggregate area of mezzanines in buildings of Type I and II construction limited to 50% of floor area of room when building is sprinklered and provided with EV/AC system
  - Generally, increase limited to 33%

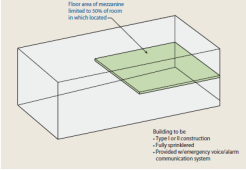





Diagram illustrating the area limitation of mezzanines. The diagram shows a 3D perspective of a room with a mezzanine. A green shaded area on the mezzanine represents the floor area of the mezzanine. A larger green shaded area on the floor below represents the floor area of the room in which the mezzanine is located. Text labels indicate: 'Floor area of mezzanine' and 'Floor area of room in which located'.



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### 506.2 Allowable Building Area

- In buildings sprinklered throughout with NFPA 13 system, significant increases in allowable building size permitted
- In many cases, the following increases in allowable area are provided:
  - 300% increase in single-story buildings
  - 200% increase in multistory buildings



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### 705.2.3.1 Combustible Balconies

- Balconies and similar projections on buildings of Types III, IV and V construction permitted to be of non-rated Type V construction where sprinkler protection extended to such projections
  - Also allows unlimited aggregate length of balcony
    - Typically limited to 50% of building's perimeter per floor



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### 705.8.1 Allowable Area of Openings

- Maximus area of openings in exterior walls with limited fire separation distances increased where building is fully sprinklered

FIRE SEPARATION DISTANCE (feet)	DEGREE OF OPENING PROTECTION	ALLOWABLE AREA <sup>a</sup>
0 to less than 5 <sup>1-3</sup>	Unprotected, Nonsprinklered (UP, NS)	Not Permitted <sup>d</sup>
	Unprotected, Sprinklered (UP, S)	Not Permitted <sup>d</sup>
	Protected (P)	Not Permitted <sup>d</sup>
3 to less than 5 <sup>1-3</sup>	Unprotected, Nonsprinklered (UP, NS)	Not Permitted
	Unprotected, Sprinklered (UP, S)	15%
	Protected (P)	15%
5 to less than 10 <sup>1-3</sup>	Unprotected, Nonsprinklered (UP, NS)	10%
	Unprotected, Sprinklered (UP, S)	25%
	Protected (P)	25%
10 to less than 15 <sup>1-3,4</sup>	Unprotected, Nonsprinklered (UP, NS)	15%
	Unprotected, Sprinklered (UP, S)	45%
	Protected (P)	45%



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### 705.11 Parapets

- Parapets, otherwise required by the IBC, need not be provided where exterior wall permitted to have at least 25% of wall areas containing unprotected openings
  - Based on allowances in Table 705.8 recognizing increased unprotected opening percentages where building fully sprinklered
    - At 5 feet or more in sprinklered building
    - At 15 feet or more in nonsprinklered building



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### 706.5 Horizontal Continuity at Fire Walls

- Horizontal continuity of fire walls requiring extension at least 18 inches beyond exterior surface not required where:
  - Fire wall terminates at interior surface of noncombustible exterior sheathing, and
  - Building on each side of fire wall provided with automatic sprinkler system



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### 706.8, 707.6 Openings in Fire Walls and Fire Barriers

- Openings in fire walls not limited in size where both buildings sprinklered
  - Base requirement limits size of any individual opening to 156 square feet
- Similar allowance for fire barriers where adjoining floor areas provided with sprinkler protection



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### 708.3 Fire Ratings of Fire Partitions

- Dwelling unit and sleeping unit fire partition separations mandated by Section 420.2 in buildings of Types IIB, IIIB and VB construction to be of minimum ½-hour fire-resistance-rated construction where building equipped with sprinkler system
  - Otherwise, fire partitions to have minimum rating of 1 hour



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### 708.4 Continuity of Fire Partitions

- Fire partitions used to create fire-resistance-rated corridors not required to extend above lower membrane of corridor ceiling provided:
  - Corridor ceiling equivalent to corridor wall membrane, and
  - Building equipped with automatic sprinkler system, and
  - Automatic sprinklers installed in space between top of fire partition and underside of floor or roof above



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### 708.4.2 Fireblocks and Draftstops at Fire Partitions

- Fireblocking and draftstopping typically required in combustible construction where fire partitions do not extend to underside of floor or roof above not required where building complies with either of the following:
  - Building sprinklered in accordance with NFPA 13, or
  - Building sprinklered in accordance with NFPA 13R and protection extended to space between top of fire partition and underside of floor or roof above



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### 711.2.4.3 Horizontal Assemblies Separating Dwelling & Sleeping Units

- Dwelling unit and sleeping unit horizontal assembly separations mandated by Section 420.3 in buildings of Types IIB, IIIB and VB construction to be of minimum ½-hour fire-resistance-rated construction where building equipped with NFPA 13 sprinkler system
  - Otherwise, horizontal assemblies to have minimum rating of 1 hour



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### 712.1.3 Vertical Openings for Escalators

- Vertical openings for escalators permitted to be addressed by one of following methods where building protected by NFPA 13 sprinkler system
  - Protection of openings with draft curtains and closely space sprinklers, or
  - Automatic shutters with minimum 1½-hour fire-resistance ratings at every penetrated floor
- Where neither condition can be met, shaft enclosure protection typically required



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### 716.2.2.3 Fire Doors in Interior Exit Stairways and Exit Passageways

- Fire door assemblies in interior exit stairways and exit passageways to have maximum transmitted temperature rise of 450 degrees F above ambient at end of 30 minutes of standard fire test exposure
  - Where automatic sprinkler system installed throughout building, maximum transmitted temperature rise not required



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### 717.5.2, 717.5.4 Duct Penetrations of Fire Barriers and Fire Partitions

- Fire dampers not required in fire barriers and fire partitions where:
  - Walls penetrated by ducted HVAC system, and
  - Walls have minimum required fire-resistance rating of 1 hour, and
  - Area not classified as Group H occupancy, and
  - Building equipped throughout with automatic sprinkler system



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### 803.5.2 Textile and Expanded Vinyl Wall and Ceiling Finishes

- Two methods available to verify compliance of textile and expanded vinyl wall and ceiling finishes:
  - NFPA 265 room corner test, or
  - ASTM E84 or UL 723 test
    - Class A flame spread index, and
    - Protected by automatic sprinkler system



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### 803.13 Interior Wall and Ceiling Finishes

- Where interior wall and ceiling finishes tested under conditions of ASTM E84 or UL723, Table 803.13 identifies maximum interior finish requirements based on occupancy
- Reduction in maximum classification of one class typically permitted where protected by automatic sprinkler system



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### 803.15.2 Set-Out Construction

- Where walls and ceilings required to be fire-resistance-rated or noncombustible construction, Class A finish materials required where walls set out or ceilings dropped excessive distances
  - Class A finish materials not required where materials protected on both sides by automatic sprinkler system



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### 804.4.2 Interior Floor Finish

- In all occupancies, carpet and similar fibrous floor finishes regulated for critical radiant flux where installed in stairway enclosures, exit passageways, corridors, and rooms not separated from corridors by full-height partitions
- Where building equipped with automatic sprinkler system, Class II materials permitted where Class I materials required, and DOC FF-1 'pill test' materials permitted where Class II materials required

	Nonsprinklered Building	Sprinklered Building
Groups I-1, I-2 and I-3	Class I	Class II
Groups A, B, E, H, I-4, M, R-1, R-2, S	Class II	DOC FF-1 "pill test"



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### 1005.3.1 Required Capacity of Means of Egress Stairways

- Where regulating means of egress stairways, required capacity based on occupant load based on 0.3 inches per occupant
  - 0.2 inches per occupant to be applied where:
    - Other than Group H and I-2 occupancies
    - Building equipped with sprinkler system throughout
    - EV/AC system installed



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### 1005.3.2 Required Capacity of Egress Components Other Than Stairways

- Where regulating means of egress components other than stairways, required capacity based on occupant load based on 0.2 inches per occupant
  - 0.15 inches per occupant to be applied where:
    - Other than Group H and I-2 occupancies
    - Building equipped with sprinkler system throughout
    - EV/AC system installed



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### 1006.2.1 Spaces with One Means of Egress

- Single means of egress permitted from spaces where:
  - Maximum permitted occupant load not exceeded, and
  - Maximum common path of egress travel not exceeded
    - For some occupancies, increase in maximum common path of travel where building protected throughout with automatic sprinkler system



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### 1006.3.3 Stories with One Means of Egress

- Single means of egress permitted from stories where:
  - Maximum permitted occupant load (or number of dwelling units) not exceeded, and
  - Maximum common path of egress travel not exceeded
    - For Group B, F and S occupancies, increase in maximum common path of travel where building protected throughout with automatic sprinkler system



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### 1007.1.1 Means of Egress Configuration

- Where two exit or exit access doorways required from any portion of exit access, they shall be placed a minimum distance apart of 1/2 length of maximum overall diagonal of building or area to be served
  - Where building protected with sprinkler system, separation not to be less than 1/3 length of diagonal



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### 1009.2.1 Elevators Used as Accessible Means of Egress

- In buildings where required accessible floor located four or more stories above level of exit discharge, at least one accessible means of egress to be an elevator
- Where building is fully sprinklered, accessible elevator not required:
  - On floors provided with horizontal exit and located at or above levels of exit discharge, or
  - On floors provided with complying ramp



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### 1009.3.2 Accessible Stairway Width

- As base requirement, stairways considered as part of accessible means of egress to be minimum of 48 inches in width
  - Clear width of at least 48 inches not required where building sprinklered throughout



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### 1009.3.3 Areas of Refuge

- Stairways considered as portion of accessible means of egress to either incorporate an area of refuge within enlarged floor-level landing or be accessed from a complying area of refuge
  - Areas of refuge not required at stairways in buildings equipped throughout with automatic sprinkler system



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### 1009.4.2 Areas of Refuge

- Elevators considered as portion of accessible means of egress to be provided with standby power and be accessed from a complying area of refuge
  - Areas of refuge not required at elevators in buildings equipped throughout with automatic sprinkler system



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### 1009.7.2 Exterior Areas for Assisted Rescue

- Where exit discharge is not accessible from exit located at level of exit discharge to public way, exterior area for assisted rescue to be provided
- Exterior area for assisted rescue to be separated from interior of building with exterior wall having minimum 1-hour fire-resistance rating with openings protected a minimum of 45 minutes
  - Fire-resistance rating and opening protectives not required in exterior wall where building equipped throughout with automatic sprinkler system



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### 1010.2.5 Bolt Locks on Means of Egress Doors

- Manually operated flush bolts and surface bolts not typically permitted on means of egress doors
  - Manually operated edge- or surface-mounted bolts permitted on inactive leaf of pair of doors where:
    - Doors serve Group B, F or S occupancies, and
    - Inactive leaf not need to meet egress capacity requirements, and contains no doorknobs, panic bars or similar operating hardware, and
    - Building is protected with automatic sprinkler system throughout



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### 1010.2.13 Delayed Egress Locking Systems

- As a general rule, delayed egress locking systems not permitted for use in Group A, E and H occupancies
  - Where building sprinklered throughout, delayed egress devices permitted on exit and exit access doors (other than main exit or exit access door) serving a courtroom



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1017.2 Exit Access Travel Distance

- Exit access distance limitations permitted to be increased in most occupancies where automatic sprinkler system required throughout building

TABLE 1017.2  
EXIT ACCESS TRAVEL DISTANCE\*

OCCUPANCY	WITHOUT SPRINKLER SYSTEM (feet)	WITH SPRINKLER SYSTEM (feet)
A, E, F-1, M, R, S-1	200 <sup>a</sup>	250 <sup>a</sup>
I-1	Not Permitted	250 <sup>a</sup>
B	200	300 <sup>a</sup>
F-2, S-2, U	300	400 <sup>a</sup>
H-1	Not Permitted	75 <sup>a</sup>
H-2	Not Permitted	100 <sup>a</sup>
H-3	Not Permitted	150 <sup>a</sup>
H-4	Not Permitted	175 <sup>a</sup>
H-5	Not Permitted	200 <sup>a</sup>
I-2, I-3	Not Permitted	200 <sup>a</sup>
I-4	150	200 <sup>a</sup>



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1019.3 Exit Access Stairways

- Exit access stairways and ramps need not be enclosed with shaft enclosure where:
  - Building protected with sprinkler system, and
  - Vertical opening between stories limited to twice horizontal projected area of stairway, and
  - Openings protected by draft curtains and closely space sprinklers, and
  - In other than Group B and M occupancies, limited to openings connect four or less stories



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1020.1 Corridor Construction

- In Group A, B, E, F, I-4, M, S and U occupancies, a minimum 1-hour fire-resistance-rated corridor not required where building sprinklered throughout
- In Group R occupancies, sprinkler protection will reduce the minimum required rating from 1 hour to ½ hour

TABLE 1020.2  
CORRIDOR FIRE-RESISTANCE RATING

OCCUPANCY	OCCUPANT LOAD SERVED BY CORRIDOR	REQUIRED FIRE-RESISTANCE RATING (hours)	
		Without sprinkler system	With sprinkler system
H-1, H-2, H-3	All	Not Permitted	1 <sup>a</sup>
H-4, H-5	Greater than 30	Not Permitted	1 <sup>a</sup>
A, B, E, F, M, S, U	Greater than 30	1	0
R	Greater than 10	Not Permitted	0.5/1 <sup>a</sup>
I-2 <sup>a</sup>	All	Not Permitted	0
I-1, I-3	All	Not Permitted	1 <sup>a</sup>
I-4	All	1	0



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### 1020.4 Dead Ends in Corridors

- As a general rule, dead ends in corridors where more than one means of egress is required limited to a length of 20 feet
- Where building sprinklered throughout, length of dead ends permitted to be up to 50 feet in Groups B, E, F, I-1, M, R-1, R-2, S and U



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## Fire Alarm Systems

Module 6



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### 907.2 Fire Alarm Systems

- Manual fire alarm systems to be installed in accordance with IBC and NFPA 72, with notification provided in accordance with Section 907.5
  - Unless modified by other provisions of IBC



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### 907.2 Manual Fire Alarm Systems

- Minimum of one manual fire alarm box to be provided in approved location to initiate a fire alarm signal for fire alarm systems employing:
  - Automatic fire detectors, or
  - Waterflow detection devices
- Where other provisions allow elimination of alarm boxes due to sprinklers, single fire alarm box to be installed
- Single fire alarm box not required for:
  - Fire systems dedicated to elevator recall control and supervisory service
  - Group R-2 occupancies, unless required by fire code official as means of fire watch personnel to initiate an alarm during sprinkler system impairment event



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### 907.2 Manual Fire Alarm Systems

- Manual fire alarm boxes not required where building is:
  - Sprinklered throughout, and
  - Occupant notification appliances will activate throughout notification zones upon sprinkler water flow
- Use of this allowance permitted in following cases:
  - 907.2.1 Group A occupancies
  - 907.2.2 Group B occupancies
  - 907.2.2.1 Ambulatory care facilities
  - 907.2.4 Group F occupancies
  - 907.2.7 Group M occupancies
  - 907.2.10 Group S occupancies



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### 907.2.1 Manual Fire Alarm Systems

- Manual fire alarm system that activates occupant notification system to be installed in **Group A occupancies** where:
  - Occupant load due to Group A occupancies is 300 or more, or
  - Group A occupant load above or below lowest level of exit discharge is more than 100
- Where Group A occupancies not separated from each other per Section 707.3.10, such occupancies to be considered as a single occupancy
  - Minimum separation to be 2-hour fire barriers and/or horizontal assemblies



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### 907.2.2 Manual Fire Alarm Systems

- Manual fire alarm system to be installed in **Group B occupancies** where:
  - Occupant load due to Group B occupancies on all floors is 500 or more, or
  - Group B occupant load above or below lowest level of exit discharge is more than 100, or
  - Fire area contains an ambulatory care facility



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### 907.2.3 Manual Fire Alarm Systems

- Manual fire alarm system that activates occupant notification system to be installed in **Group E occupancies**, except where occupant load of Group E is 50 or less



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### 907.2.3, Exception 3 Manual Fire Alarm Boxes

- Manual fire alarm boxes not required where:
  - Interior corridors protected by smoke detectors, and
  - Auditoriums, cafeterias, gymnasiums and similar areas protected by heat detectors or other approved detection devices, and
  - Shops and laboratories involving dusts or vapors protected by heat detectors or other approved detection devices, and
  - Manual activation provided from a normally occupied location



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### 907.2.3, Exception 4 Manual Fire Alarm Boxes

- Manual fire alarm boxes not required where:
  - Building equipped with automatic sprinkler systems throughout, and
  - Emergency voice/alarm communication system to activate on sprinkler waterflow, and
  - Manual activation provided from a normally occupied location



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### 907.2.1 Manual Fire Alarm Systems

- Portions of Group E educational occupancies occupied for assembly purposes and classified as Group A occupancies to be provided with fire alarm system as required for Group E occupancies



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### 907.2.4 Manual Fire Alarm Systems

- Manual fire alarm system that activates occupant notification system to be installed in **Group F occupancies** where:
  - Group F occupancy is two or more stories in height, and
  - Group F occupancy has an aggregate occupant load of 500 or more above and/or below lowest level of exit discharge



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### 907.2.5 Manual Fire Alarm Systems

- Manual fire alarm system that activates occupant notification system to be installed in:
  - Group H-5 occupancies**, and
  - Occupancies used for the manufacture of organic coatings



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### 907.2.6 Manual Fire Alarm Systems

- Manual fire alarm system that activates occupant notification system to be installed in all **Group I occupancies**
  - Manual fire alarm boxes in sleeping units of Group I-1 and I-2 occupancies not required at exits if boxes located at all care providers' control stations or other constantly attended staff locations
    - Manual alarm boxes to be visible, provide with ready access, and within applicable travel
  - Occupant notification appliances not required to be activated where fire code official approves installation of private mode signaling



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### 907.2.6.3.2 Manual Fire Alarm Boxes

- In Group I-3 occupancies, manual fire alarm boxes not required to be located per Section 907.4.2 where fire alarm boxes provided at staff-attended locations having direct supervision over areas where manual fire alarm boxes have been omitted
- In detainee areas, manual fire alarm boxes to be locked provided staff members are present in such areas and have keys readily available to operate boxes



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### 907.2.7 Manual Fire Alarm Systems

- Manual fire alarm system to be installed in **Group M occupancies** where:
  - Occupant load due to Group M occupancies on all floors is 500 or more, or
  - Group M occupant load above or below lowest level of exit discharge is more than 100
- System not required in covered and open mall buildings



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### 907.2.7.1 Manual Fire Alarm Systems

- During those times that Group M occupancy is occupied, initiation of signal from manual fire alarm box or from waterflow switch not required to activate alarm notification appliances when:
  - Alarm signal activated at a constantly attended location from which evacuation instructions can be initiated over an EV/AC system



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### 907.2.8.1 Manual Fire Alarm Systems

- Manual fire alarm system that activates occupant notification system to be installed in **Group R-1 occupancies**, except where following conditions of Exception 1 exist:
  - Building no more than two stories in height, and
  - All individual sleeping units and contiguous attic and crawl spaces separated from each other and public or common areas by minimum 1-hour fire partitions, and
  - Each individual sleeping unit has an exit directly to a public way, egress court or yard



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### 907.2.8.1, Exception 2 Manual Fire Alarm Boxes

- Manual fire alarm boxes also not required throughout Group R-1 buildings where:
  - Building is provided with automatic sprinkler system, and
  - Notification appliances will activate upon sprinkler water flow, and
  - Minimum of one manual fire alarm box installed at an approved location



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### 907.2.9.1 Manual Fire Alarm Systems

- Manual fire alarm system that activates occupant notification system to be installed in **Group R-2 occupancies** where any of following conditions apply:
  - Any dwelling unit or sleeping unit located three or more stories above lowest level of exit discharge, or
  - Any dwelling unit or sleeping unit located more than one story below highest level of exit discharge of exits serving dwelling unit or sleeping unit, or
  - Building contains more than 16 dwelling units or sleeping units



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### 907.2.9.1, Exception 1 Manual Fire Alarm Systems

- Manual fire alarm system not required in Group R-2 occupancies where:
  - Building no more than two stories in height, and
  - All individual sleeping units and contiguous attic and crawl spaces separated from each other and public or common areas by minimum 1-hour fire partitions, and
  - Each individual sleeping unit has an exit directly to a public way, egress court or yard



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### 907.2.9.1, Exception 2 Manual Fire Alarm Boxes

- Manual fire alarm boxes not required in Group R-2 occupancies where:
  - Building equipped with automatic sprinkler system, and
  - Occupant notification appliances automatically activate throughout notification zones upon sprinkler water flow



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### 907.2.9.1, Exception 3 Manual Fire Alarm Systems

- Manual fire alarm system not required in Group R-2 occupancies where:
  - Building does not have interior corridors serving dwelling units, and
  - Building protected by automatic sprinkler system, and
  - Dwelling units to be:
    - Provided with means of egress door opening directly to exterior exit access that leads directly to exits, or
    - Served by open-ended corridors



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### 907.2.10 Manual Fire Alarm Systems

- Manual fire alarm system that activates occupant notification system to be installed in **Group S public- and self-storage occupancies** three or more stories in height
  - Applicable only to interior corridors and interior common areas
  - Visible notification appliances not required within storage units



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### 907.2.2.1 Automatic Smoke Detection Systems

- Fire areas containing **Group B ambulatory care facilities** to be provided with an electronically supervised automatic smoke detection system
- System to be installed within ambulatory care facility as well as in public areas outside of tenant spaces



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### 907.2.5 Automatic Smoke Detection Systems

- An automatic smoke detection system to be installed in **Group H occupancies** where the following materials are located:
  - Highly toxic gases
  - Organic peroxides
  - Oxidizers



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### 907.2.6 Automatic Smoke Detection Systems

- An automatic smoke detection system that activates occupant notification system to be installed in the following **Group I occupancies** as further specified:
  - Group I-1 occupancies
  - Group I-2 occupancies
    - Condition 1
    - Condition 2
  - Group I-3 occupancies



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### 907.2.6.1 Automatic Smoke Detection Systems

- An automatic smoke detection system to be installed in **Group I-1 occupancies** in following areas:
  - Corridors
    - Not required for exterior balconies
  - Waiting areas open to corridors
  - Habitable spaces other than sleeping units and kitchens
    - Not required in habitable spaces of Group I-1, Condition 1 occupancies where facility is sprinklered throughout



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### 907.2.6.2 Automatic Smoke Detection Systems

- An automatic smoke detection system to be installed in **Group I-2, Condition 1 occupancies** in following areas as permitted by Section 407.2:
  - Corridors
  - Spaces permitted to be open to corridors
    - Waiting and similar areas
    - Care providers' stations
    - Psychiatric treatment areas
    - Gift shops
    - Nursing home housing units
    - Nursing home cooking facilities



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### 907.2.6.2, Exceptions Automatic Smoke Detection Systems

- Corridor smoke detection system not required in Group I-2 smoke compartments that contain sleeping units where either of two conditions exist:
  - Provided with smoke detectors complying with UL 268
    - Detectors provide visual display on corridor side of each unit and audible/visual alarm at care providers' station attending each unit
  - Where sleeping unit doors equipped with automatic door-closing devices with integral smoke detectors on the unit sides, provided the integral detectors perform the required alerting function



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### 907.2.6.2 Automatic Smoke Detection Systems

- **Group I-2, Condition 2 occupancies** to be equipped with an automatic smoke detection system as required in Section 407.2 for the following spaces open to a corridor:
  - Waiting rooms, public-use areas and group meeting spaces
  - Psychiatric treatment areas
  - Shared living spaces, group areas and multipurpose therapeutic spaces



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### 907.2.6.3.3 Automatic Smoke Detection Systems

- Automatic smoke detection system to be installed in **Group I-3 occupancies** throughout resident housing areas, including:
  - Sleeping units
  - Contiguous day rooms
  - Group activity spaces
  - Other common spaces normally open to residents
- Exceptions:
  - Allow for other approved smoke detection arrangements, such as detectors in exhaust ducts
  - Not required in Use Conditions 2 and 3, or in sleeping units with four or fewer occupants where smoke compartment sprinklered



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### 907.2.8.2 Automatic Smoke Detection Systems

- An automatic smoke detection system that activates occupant notification system to be installed in **Group R-1 occupancies** throughout all interior corridors serving sleeping units
  - Smoke detection system not required in buildings:
    - That do not have interior corridors serving sleeping units, and
    - Where each sleeping unit has means of egress door opening directly to an exit or to an exterior exit access than leads directly to an exit



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### 907.2.9.3 Automatic Smoke Detection Systems

- An automatic smoke detection system that activates occupant notification system to be installed in **Group R-2 occupancies operated as a college or university for student or staff housing** in all of following locations:
  - Common spaces outside of dwelling units and sleeping units
  - Laundry rooms, mechanical equipment rooms and storage rooms
  - Interior corridors serving sleeping units or dwelling units



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### 907.2.9.3 Automatic Smoke Detection Systems

- Smoke detection system not required in Group R-2 college and university buildings:
  - That do not have interior corridors serving sleeping units, and
  - Where each sleeping unit has means of egress door opening directly to an exit or to an exterior exit access than leads directly to an exit



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### 907.2.1.1 Emergency Voice/Alarm Communication System

- Activation of fire alarm system in **Group A occupancies** to initiate signal using emergency voice/alarm communication (EV/AC) system where:
  - Group A occupancy occupant load of 1,000 or more
- If approved, prerecorded announcement allowed to be manually deactivated for no more than 3 minutes to allow for live voice announcements from an approved, constantly attended location



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### 907.2.3 Emergency Voice/Alarm Communication System

- Activation of fire alarm system in **Group E occupancies** to initiate signal using emergency voice/alarm communication (EV/AC) system
  - Where Group E occupancy has an occupant load of 100 or less, EV/AC system not required provided activation of manual fire alarm system initiates an approved occupant notification signal



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### 907.5.2.2 Emergency Voice/Alarm Communication System

- Additional conditions under which an emergency voice/alarm communication system required include:
  - Covered mall buildings greater than 50,000 square feet in floor area
  - Open mall buildings greater than 50,000 square feet within established perimeter line
  - High-rise buildings



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### 907.2.11 Smoke Alarms

- Single- and multiple-station smoke alarms to be installed in accordance with Section 907.2.11 in the following occupancies:
  - Group I-1
  - Group R-1
  - Group R-2
    - In college and university buildings, required alarms to be interconnected with fire alarm system
  - Group R-3
  - Group R-4



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### 907.2.11.7 Smoke Alarms

- Smoke detectors provided as part of building fire alarm system to be an acceptable alternative to single- and multiple-station smoke alarms, and to comply with following:
  - Fire alarm system to comply with all applicable requirements in Section 907
  - Activation of smoke detector in a dwelling unit or sleeping unit to:
    - Initiate alarm notification in unit
    - Not activate alarm notification appliances outside of unit, provided that a supervisory signal generated and monitored



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## Fire Sprinkler and Alarm Provisions of the IEBC

Module 7



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### 101.2, 101.3 IEBC Intent and Scope

- IEBC to apply to repair, alteration, change of occupancy, and addition to existing buildings
- Intent is to provide flexibility to permit use of alternative approaches to achieve compliance with minimum requirements to safeguard public health, safety and welfare



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### 301.3 IEBC Compliance

- Alteration, addition or change of occupancy of all existing buildings to comply with one of the following three compliance methods:
  - Prescriptive Chapter 5
  - Work area Chapters 6-12
  - Performance Chapter 13



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### 307 Smoke Alarms

- Section 307 regulates the installation of smoke alarms, regardless of which compliance method is applied, for:
  - Alterations
  - Additions
  - Changes of occupancy
  - Relocation
- Installation of smoke alarms applicable in:
  - All Group R occupancies
  - Group I-1 occupancies



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### 307 Smoke Alarms

- Existing buildings regulated by IEBC to be provided with smoke alarms in accordance with:
  - IFC, or
  - Section R314 of IRC
- Installation of smoke alarms not required where work classified as Level 1 Alterations



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### IEBC Work Area Method Fire Protection Requirements

- Fire sprinkler and fire alarm features are also selectively required for buildings being regulated by the IEBC under the Work Area Method as follows:
  - Alteration—Level 2      Section 803
  - Alteration—Level 3      Section 904
  - Change of Occupancy    Section 1004
  - Additions                    Section 1102.3



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### Retroactive Fire Sprinkler and Alarm Provisions of the IFC

Module 8



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### IFC 1101.1, 1101.2 Scope and Intent

- Intent of IFC Chapter 11 is to provide a minimum degree of fire and life safety to persons occupying existing buildings by providing minimum construction requirements where such buildings do not comply with minimum requirements of IBC



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### IFC 1103.1 Required Fire Safety Requirements for Existing Buildings

- Existing building to comply with not less than minimum provisions specified in:
  - Table 1103.1 and
  - Specific requirements of Sections 1103.2 through 1103.10
- Provisions not intended to allow elimination of fire protection systems or reduction in level of fire safety provided in buildings constructed in accordance with previously adopted codes



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### IFC 1103.5.1 Group A-2 Occupancies

- Sprinkler protection required throughout a Group A-2 fire area where both of the following conditions exist:
  - Alcohol beverages are consumed within the occupancy, and the
  - Group A-2 occupancy has an occupant load of 300 or more



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### IFC 1103.5.2, 1105.9 Group I-2 Occupancies

- In a Group I-2 occupancy, automatic sprinkler protection to be provided throughout floor containing Group I-2 fire area
  - In addition, such protection to be extended on all floors between the Group I-2 occupancy and level of exit discharge, the level of exit discharge, and all floors below level of exit discharge
    - Not applicable to floors classified as open parking garage



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**IFC 1105.10**  
**Group I-2 Occupancies**

- An automatic fire alarm system to be installed in existing Group I-2 occupancies
  - Exception for manual fire alarm boxes in patient sleeping areas



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**IFC 1103.5.3 Group I-2, Condition 2**

- In Group I-2, Condition 2 occupancies, typically hospitals, existing buildings to be equipped throughout with approved automatic sprinkler system



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**IFC 1103.5.4 High-Rise Buildings**

- Where IFC Appendix M has not been adopted, existing high-rise buildings that do not have a previously approved fire sprinkler system shall be provided with an automatic sprinkler where any one of three conditions exist.
  - When specifically adopted, Appendix M mandates that a sprinkler system be installed in all existing high-rise buildings
- Under both Section 1103.5.4 and Appendix M, building owners must file a compliance schedule with the retrofit completed within 12 years



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### IFC 1103.5.4 High-Rise Buildings

- Conditions that trigger a sprinkler retrofit include where high-rise building has occupied floor:
  - More than 120 feet above lowest level of fire department vehicle access (LLFDVA), or
  - More than 75 feet and not more than 120 feet above LLFDVA, and building does not have:
    - At least two interior exit stairways complying with Section 1104.10 (rise/run configuration) and separated a minimum of 2 hours, or
    - A fire alarm system that includes smoke protection in specified areas and at specified locations



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### IFC 1103.5.5 Pyroxylin Plastics

- Sprinkler system to be installed throughout existing buildings where cellulose nitrate film or pyroxylin plastics are manufactured, stored or handled in quantities exceeding 100 pounds



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### IFC 1103.7 Fire Alarm Systems

- An approved fire alarm system to be installed in existing buildings as specifically addressed in Sections 1103.7.1 through 1103.7.6, including:
  - Group E occupancies
  - Group I-1, I-2 and I-3 occupancies
  - Group R-1 hotels and motels
  - Group R-1 boarding and rooming houses
  - Group R-2 occupancies
- Single- and multiple-station smoke alarms to be installed in existing Group I-1 and R occupancies



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### Conclusion

- This concludes the presentation addressing the use of fire sprinkler and fire alarm systems.
- The provisions address two main areas:
  - Required systems
  - Optional systems used as a trade-off
- The installation of such systems is to be in accordance with the IBC, IFC and applicable standards as referenced



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### Final Reflection

This slide will help the learner to reflect on the day and what they will take back to the job and apply.

- **What?** What happened and what was observed in the training?
- **So what?** What did you learn? What difference did this training make?
- **Now what?** How will you do things differently back on the job as a result of this training?



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