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**Description**

- This course provides an overview of the 2018 IBC provisions addressing the use of automatic sprinkler systems and fire alarm systems.

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## Objectives

- Upon completion, participants will be better able to:
  - Understand the construction and use of fire areas
  - Identify conditions under which an automatic sprinkler system is required
  - Determine those situations where sprinkler protection can be used as a trade-off for other code requirements
  - Identify the various types of fire alarm systems and when they are required to be installed



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## Program Outline

- Module 1 Introduction and Definitions
- Module 2 Sprinkler Requirements Based on Occupancy Classification
- Module 3 Other Required Fire Suppression Systems
- Module 4 Fire Alarm Systems
- Module 5 Retroactive Fire Sprinkler and Alarm Provisions of the IFC



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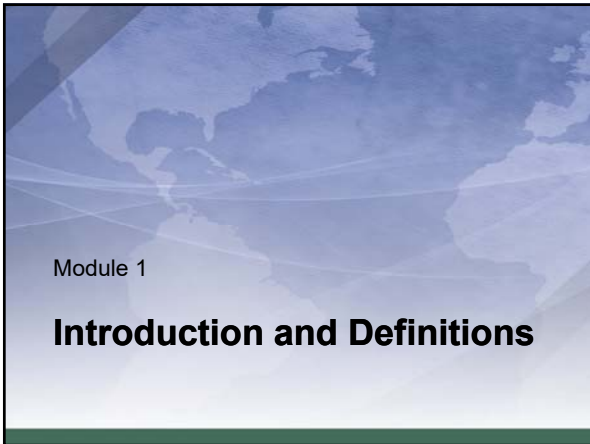
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Module 1

## Introduction and Definitions



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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 of IBC on sprinklered buildings
- Buildings typically 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 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.
  - 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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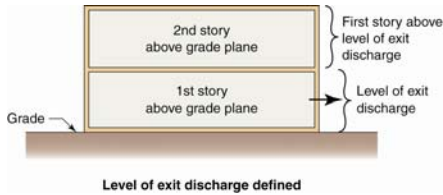
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### 202 Definitions – Level of Exit Discharge

- 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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### 903.3.1.1.1, 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
- Where provisions of IBC allow residential building or portion thereof to be equipped throughout with automatic sprinkler system in accordance with Section 903.3.1.2, sprinkler system may be installed in accordance with NFPA 13R, provided building does not exceed four stories nor 60 feet in height



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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
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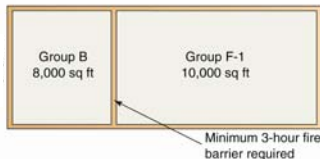


## Fire Areas – Example 1

**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



Minimum required separation of fire areas




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**FOR EXAMPLE**

## 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.

**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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Module 2

## Sprinkler Requirements Based on Occupancy Classification

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### 903.2.1 – 903.2.10.1 Automatic Sprinkler Systems Required By Occupancy Classification

- Automatic sprinkler systems required selectively based upon occupancy classification, with varied extent of sprinkler protection throughout the:
  - building
  - occupancy
  - story and all stories below/above, and including, the level of exit discharge
  - fire area
  - areas and spaces

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### 903.2.6 Automatic Sprinkler System Required Throughout the Building

- **Group I occupancies**
  - Not required in Group I-4 day care facilities where:
    - Located at the level of exit discharge, and
    - Every room where care is provided has at least one door directly to the exterior
  - NFPA 13R system permitted in Group I-1, Condition 1 facilities



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### 903.2.8 Automatic Sprinkler System Required Throughout the Building

- **Group R occupancies**
  - NFPA 13R system permitted in:
    - 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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### 903.2.4 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
  - Group F-1 fire area located four or more stories above grade plane
  - Aggregate of all Group F-1 fire areas exceeds 24,000 square feet
  - Group F-1 occupancy used for manufacture of upholstered furniture or mattresses exceeds 2,500 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
  - Group M occupancy used for display and sale of upholstered furniture or mattresses exceeds 5,000 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
  - Group S-1 occupancy used for storage of upholstered furniture or mattresses exceeds 2,500 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** used as enclosed parking garages where either of the following conditions exist:
  - Fire area of enclosed parking garage exceeds 12,000 square feet
  - Enclosed parking garage located beneath a use classified as a different occupancy group
  - Building used for storage of commercial motor vehicles where fire area exceeds 5,000 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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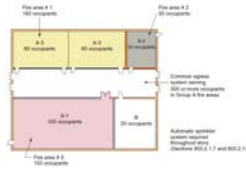


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**903.2.1.7 Automatic Sprinkler System Required Throughout the Fire Area**

- 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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**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 containing woodworking operations over 2,500 square feet in area that:
  - Generate finely divided combustible waste, or
  - Use finely divided combustible materials




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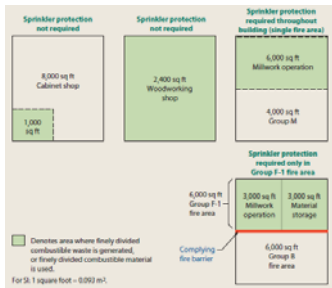
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**903.2.4.1 Automatic Sprinkler System Required Throughout the Fire Area**




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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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### 903.2.11.6 Other Required Fire Suppression 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
405.6	Group I-2
430.7	Stages
431.4	Special amusement buildings
432.3.6	Airport traffic control towers
432.4, 432.4.6.1, 432.6.5	Aircraft hangars
435.11.11	Group H-5 HPM exhaust ducts
436.5	Flammable families
437.4	Drying rooms
439.5	Liter/word units
434.3	Children's play structures
427	Buildings containing laboratory units
507	Unfinished area buildings
509.4	Incidental uses
1029A.2.3	Smoke-protected assembly seating
IBC	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:
  - Open parking garages
  - 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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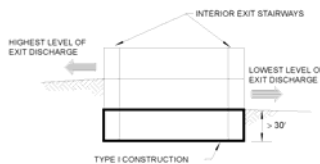
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### 405.3 Underground Structures

- 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.



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### 407.6 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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### 411.4 Special Amusement Buildings

- Other than temporary buildings, special amusement buildings to be sprinklered throughout
- Temporary special amusement buildings to be sprinklered unless:
  - Total floor area 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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### 412.3.6 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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### 415.11.11 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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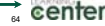
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### 419.5 Live/Work Units

- 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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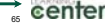
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### 424.3 Children's Play Structures

- 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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### 427 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
- Sprinkler protection not required in Group F-2 or S-2 buildings no more than 2 stories in height




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## 509.4 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 509.4 Incidental Uses

ROOM OR AREA	SEPARATION AND/OR PROTECTION
Paint rooms where any piece of equipment is over 400,000 Btu per hour input	1 hour or provide automatic sprinkler system
Boilers with boilers where the largest piece of equipment is over 1.5 psi and 10 horsepower	1 hour or provide automatic sprinkler system
Maintenance machinery rooms	1 hour or provide automatic sprinkler system
Hydrogen fuel gas rooms, not classified as Group H	1 hour in Group B, E, M, S and U occupancies; 2 hours in Group A, E, I and R occupancies
Bioreactor 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 E 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
Group I-1, lobbies and Group I-2 patient rooms equipped with public 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 50 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	2 hours or provide automatic sprinkler system
In ambulatory care facilities or Group I-2 occupancies, storage rooms greater than 100 square feet	1 hour
Recharge storage battery systems having an energy capacity greater than the threshold quantity specified in Table 1204.2.1 of the International Fire Code	2 hours in Group B, E, M, S and U occupancies; 2 hours in Group A, E, I and R occupancies
Electrical installations and transformers	See Sections 110.20 through 110.24 and Sections 470.4 through 470.6 of NFPA 70 for protection and separation requirements




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### 1029.6.2.3 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, or
  - Press boxes and storage facilities less than 1,000 square feet, or
  - 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 suppression 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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Module 4

## Fire Alarm Systems

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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



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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
  - 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
- 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



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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 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
- 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 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 Manual Fire Alarm Boxes

- Manual fire alarm boxes 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 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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### 907.2.9.1, 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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### 907.2.2.1 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 smoke compartments that contain sleeping units:
  - Provided with smoke detectors complying with UL 268
    - Such detectors to 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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### 907.2.7 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
  - Not required 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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### 907.2.10 Smoke Alarms

- Single- and multiple-station smoke alarms to be installed in accordance with Section 907.2.10 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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### 907.2.10.7 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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Module 5

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

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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, 1105.10 Group I-2

- In a Group I-2 occupancy, 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
- 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 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

- **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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