







Description

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


2018 IBC and IFC Use of Fire Sprinklers and Alarms




Objectives

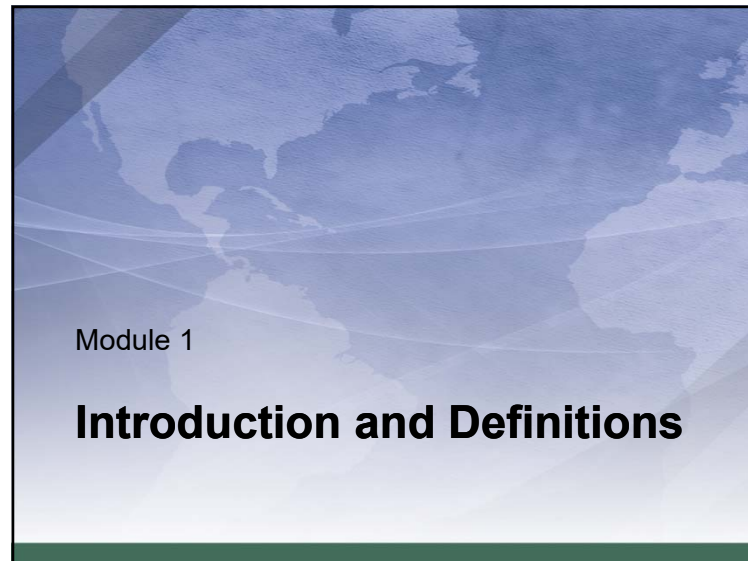
- Upon completion, participants will be better able to:
 - Understand the construction and use of fire areas
 - Identify conditions under which an automatic sprinkler system is required
 - Determine those situations where sprinkler protection can be used as a trade-off for other code requirements
 - 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	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 IBC
▪	Module 8	Retroactive Fire Sprinkler and Alarm Provisions of the IFC


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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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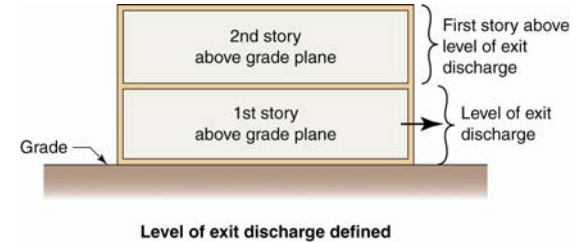
202 Definitions – Commercial Motor Vehicle

- 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



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.



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



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
- 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



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

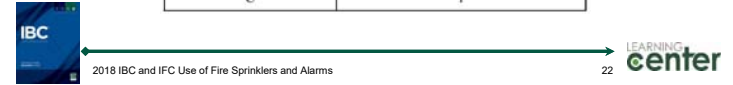


901.7 Fire Areas

- 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



FOR EXAMPLE

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 3-hour fire barrier required

Minimum required separation of fire areas

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.

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 is a complying 2-hour fire barrier per Section 707.3.10 separates the interior and exterior sales areas.

Fire area defined



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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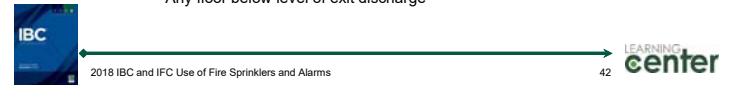
903.2.1.6 Automatic Sprinkler System Required Throughout the Story

- 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



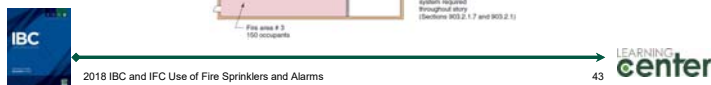
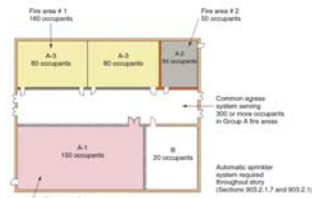
903.2.2 Automatic Sprinkler System Required Throughout the Story

- 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



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



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



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

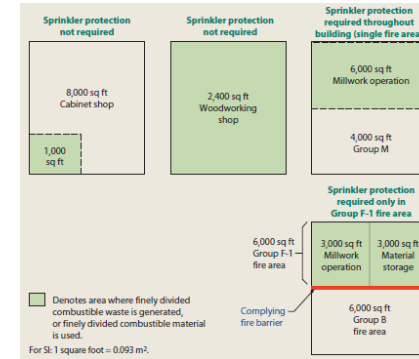


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903.2.4.1 Automatic Sprinkler System Required Throughout the Fire Area



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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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Module 3

Miscellaneous Conditions Requiring Sprinkler Protection

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



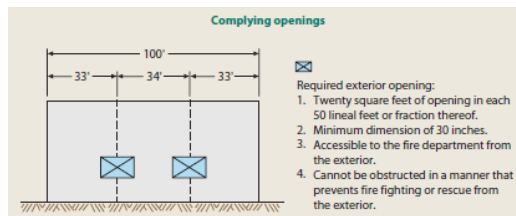
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903.2.11.1, #2 Openings Entirely Above Adjoining Ground Level

- 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.



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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



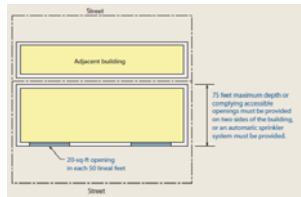
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903.2.11.1.2 Openings on One Side Only

- 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:
 - Open parking structures
 - 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 904.12, 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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Module 4

Other Required Fire Suppression Systems

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

(F) TABLE 903.2.11.6
ADDITIONAL REQUIRED SUPPRESSION SYSTEMS

SECTION	SUBJECT
402.5, 402.6.2	Covered and open mall buildings
403.3	High-rise buildings
404.3	Atriums
405.3	Underground structures
407.6	Group I-2
410.7	Stages
411.4	Special amusement buildings
412.3.6	Airport traffic control towers
412.4.6, 412.4.6.1, 412.6.5	Aircraft hangars
415.11.11	Group H-5 HPM exhaust ducts
416.5	Flammable finishes
417.4	Drying rooms
419.5	Liverwork units
424.3	Children's play structures
427	Buildings containing laboratory suites
507	Unlimited area buildings
509.4	Incidental uses
1029.6.2.3	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



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



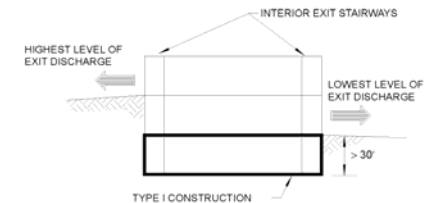
404.3 Atriums

- 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



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.



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



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



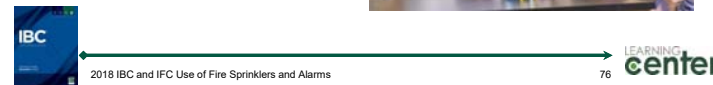
424.3 Children's Play Structures

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



427 Buildings Containing Laboratory Suites

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



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

IFC TABLE 509 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 psi 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 B, 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
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
Stationary storage battery systems having an energy capacity greater than the threshold quantity specified in Table 1206.2 of the International Fire Code	1 hour in Group B, F, M, S and U occupancies; 2 hours in Group A, E, I and R occupancies.
Electrical installations and transformers	See Sections 110.26 through 110.34 and Sections 490.3 through 490.48 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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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, with significant allowances in:
 - 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 NFPA 13 or 13R 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 the 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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Table 504.3 Allowable Building Height in Feet Above Grade Plane

Occupancy Classification	See Footnotes	Type of Construction									
		Type I		Type II		Type III		Type IV		Type V	
		A	B	A	B	A	B	HT	A	B	
A,B,E,F,M,S,U	NS ^b	UL	160	65	55	65	55	65	50	40	
	S	UL	180	85	75	85	75	85	70	60	
H-1, H-2, H-3, H-5	NS ^{a,d}	UL	160	65	55	65	55	65	50	40	
	S	UL	160	65	55	65	55	65	50	40	

Note: UL = Unlimited; NS = Buildings not equipped throughout with an automatic sprinkler system; S = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1

(Only a portion of Table 504.3 is shown above.)



Table 504.4 Allowable Number of Stories Above Grade Plane

Occupancy Classification	See Foot-Notes	Type of Construction									
		Type I		Type II		Type III		Type IV		Type V	
		A	B	A	B	A	B	HT	A	B	
A-1	NS	UL	5	3	2	3	2	3	2	1	
	S	UL	6	4	3	4	3	4	3	2	
A-2	NS	UL	11	3	2	3	2	3	2	1	
	S	UL	12	4	3	4	3	4	3	2	
A-3	NS	UL	11	3	2	3	2	3	2	1	
	S	UL	12	4	3	4	3	4	3	2	

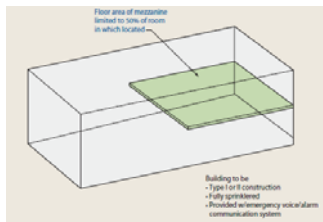
Note: UL = Unlimited; NS = Buildings not equipped throughout with an automatic sprinkler system; S = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1

(Only a portion of Table 504.4 is shown above.)



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%



506.2 Allowable Building Area

- In buildings sprinklered throughout with NFPA 13 system, significant increases in allowable building size permitted
 - 300% increase in single-story buildings
 - 200% increase in multistory buildings



Table 506.2 Allowable Building Area

TABLE 506.2^{a,b} Allowable Building Heights and Areas Factor ($A_1 = NS, S1, S13R$ or SM , as applicable) in Square Feet

Occupancy Classification	See Footnotes	Type of Construction									
		Type I		Type II		Type III		Type IV	Type V		
		A	B	A	B	A	B	HT	A	B	
A-1	NS	UL	UL	15,500	8,500	14,000	8,500	15,000	11,500	5,500	
	S1	UL	UL	62,000	34,000	56,000	34,000	60,000	46,000	22,000	
	SM	UL	UL	46,500	25,500	42,000	25,500	45,000	34,500	16,500	
A-2	NS	UL	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000	
	S1	UL	UL	62,000	38,000	56,000	38,000	60,000	46,000	24,000	
	SM	UL	UL	46,500	28,500	42,000	28,500	45,000	34,500	18,000	
A-3	NS	UL	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000	
	S1	UL	UL	62,000	38,000	56,000	38,000	60,000	46,000	24,000	
	SM	UL	UL	46,500	28,500	42,000	28,500	45,000	34,500	18,000	



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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

- Allowances for openings in exterior walls with limited fire separation distances increased where building is fully sprinklered with NFPA 13 system.

TABLE 705.8
MAXIMUM AREA OF EXTERIOR WALL OPENINGS BASED ON
FIRE SEPARATION DISTANCE AND DEGREE OF OPENING PROTECTION

FIRE SEPARATION DISTANCE (feet)	DEGREE OF OPENING PROTECTION	ALLOWABLE AREA ^a
0 to less than 3 ^{b,c,d}	Unprotected, Nonsprinklered (U.P., NS)	Not Permitted ^d
	Unprotected, Sprinklered (U.P., S)	Not Permitted ^d
	Protected (P)	Not Permitted ^d
3 to less than 5 ^{b,c}	Unprotected, Nonsprinklered (U.P., NS)	Not Permitted
	Unprotected, Sprinklered (U.P., S)	15%
	Protected (P)	15%
5 to less than 10 ^{b,c,d}	Unprotected, Nonsprinklered (U.P., NS)	10% ^b
	Unprotected, Sprinklered (U.P., S)	25%
	Protected (P)	25%
10 to less than 15 ^{b,c,d}	Unprotected, Nonsprinklered (U.P., NS)	15% ^b
	Unprotected, Sprinklered (U.P., S)	45%
	Protected (P)	45%



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705.8.2 Protected Openings

- In addition, for those specific conditions in IBC where protected openings are required, such protection not mandated where:
 - Building fully sprinklered, and
 - Exterior openings protected by water curtains



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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



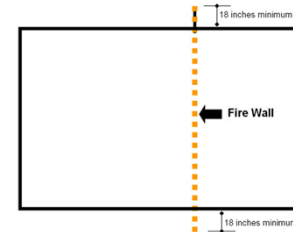
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706.5 Horizontal Continuity at Fire Walls

- 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 NFPA 13 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 combustibile 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 and 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 elevators 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



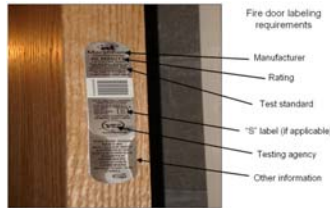
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716.2.2.3 Fire Doors in Interior Exit Stairways and Exit Passageways

- 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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718.3, 718.4 Draftstopping in Floors and Attics

- Concealed spaces created in combustible floor and attic construction typically required to be subdivided in a manner to restrict air movement
 - Maximum horizontal areas of 1,000 square feet in floor/ceiling assemblies
 - Maximum horizontal areas of 3,000 square feet in attic spaces
- Such draftstopping not required in buildings equipped throughout with NFPA 13 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



Table 803.13 Interior Wall and Ceiling Finishes

TABLE 803.13
INTERIOR WALL AND CEILING FINISH REQUIREMENTS BY OCCUPANCY*

GROUP	SPRINKLERED ^b			NONSPRINKLERED		
	Interior exit stairways and ramps and exit passageways ^{a,1}	Corridors and enclosure for exit access stairways and ramps	Rooms and enclosed spaces ^a	Interior exit stairways and ramps and exit passageways ^{a,1}	Corridors and enclosure for exit access stairways and ramps	Rooms and enclosed spaces ^a
A-1 & A-2	B	B	C	A	A ²	B ²
A-3 ¹ , A-4, A-5	B	B	C	A	A ²	C
B, E, M, R-1	B	C ²	C	A	B	C
R-4	B	C	C	A	B	B
F	C	C	C	B	C	C
H	B	B	C ²	A	A	B
I-1	B	C	C	A	B	B
I-2	B	B	B ^{2,1}	A	A	B
I-3	A	A ¹	C	A	A	B
I-4	B	B	B ^{2,1}	A	A	B
R-2	C	C	C	B	B	C
R-3	C	C	C	C	C	C
S	C	C	C	B	B	C
U	No restrictions			No restrictions		



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



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



804.4.2 Interior Floor Finish

	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"



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



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



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



Table 1006.2.1 Spaces with One Means of Egress

TABLE 1006.2.1
SPACES WITH ONE EXIT OR EXIT ACCESS DOORWAY

OCCUPANCY	MAXIMUM OCCUPANT LOAD OF SPACE	MAXIMUM COMMON PATH OF EGRESS TRAVEL DISTANCE (feet)		
		Without Sprinkler System (feet)		With Sprinkler System (feet)
		Occupant Load		
		OL ≤ 30	OL > 30	
A ¹ , E, M	49	75	75	75 ^a
B	49	100	75	100 ^a
F	49	75	75	100 ^a
H-1, H-2, H-3	3	NP	NP	25 ^b
H-4, H-5	10	NP	NP	75 ^b
I-1, I-2 ^c , I-4	10	NP	NP	75 ^b
I-3	10	NP	NP	100 ^b
R-1	10	NP	NP	75 ^b
R-2	20	NP	NP	125 ^{b,d}
R-3 ^e	20	NP	NP	125 ^{b,d}
R-4 ^e	20	NP	NP	125 ^{b,d}
S ^f	29	100	75	100 ^a
U	49	100	75	75 ^a



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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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Tables 1006.3.3(2) Stories with One Means of Egress

TABLE 1006.3.3(2)
STORIES WITH ONE EXIT OR ACCESS TO ONE EXIT FOR OTHER OCCUPANCIES

STORY	OCCUPANCY	MAXIMUM OCCUPANT LOAD PER STORY	MAXIMUM COMMON PATH OF EGRESS TRAVEL DISTANCE (feet)
First story above or below grade plane	A, B ^a , E, F ^a , M, U	49	75
	H-2, H-3	3	25
	H-4, H-5, I, R-1, R-2 ^b	10	75
	S ^{b,c}	29	75
Second story above grade plane	B, F, M, S ^d	29	75
Third story above grade plane and higher	NP	NA	NA

For SI: 1 foot = 304.8 mm.
 NP = Not Permitted.
 NA = Not Applicable.
 a. Buildings classified as Group R-2 equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 and provided with emergency escape and rescue openings in accordance with Section 1030.
 b. Group B, F and S occupancies in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 shall have a maximum exit access travel distance of 100 feet.
 c. This table is used for R-2 occupancies consisting of sleeping units. For R-2 occupancies consisting of dwelling units, use Table 1006.3.3(1).
 d. The length of exit access travel distance in a Group S-2 open parking garage shall be not more than 100 feet.



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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, extending not less than 10 feet horizontally on either side of landing
 - Fire-resistance rating and opening protectives not required in exterior wall where building equipped throughout with automatic sprinkler system

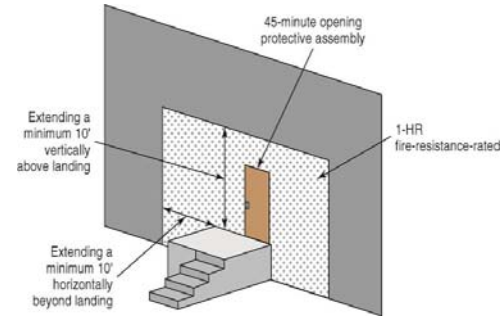


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1009.7.2 Exterior Areas for Assisted Rescue



Not required in fully sprinklered building



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1010.1.9.5 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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1010.1.9.8 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'	250'
I-1	Not Permitted	250'
B	200	300'
F-2, S-2, U	300	400'
H-1	Not Permitted	75'
H-2	Not Permitted	100'
H-3	Not Permitted	150'
H-4	Not Permitted	175'
H-5	Not Permitted	200'
I-2, I-3	Not Permitted	200'
I-4	150	200'



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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 NFPA 13 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 1020.1
CORRIDOR FIRE-RESISTANCE RATING**

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



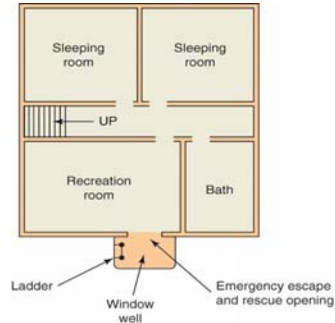
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1030 Emergency Escape and Rescue Openings

- In sprinklered Group R-2 and R-3 buildings, basement sleeping rooms not required to have emergency escape and rescue openings where:
 - One MOE and one EERO, or
 - Two MOEs provided



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Module 6

Fire Alarm Systems

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 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 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 that 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 7

Fire Sprinkler and Alarm Provisions of the IEBC

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 Methods

- 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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IEBC Chapter 5 Prescriptive Compliance Method

- Additions:
 - As for new construction
 - Smoke alarms in existing portion of structure
- Alterations:
 - Smoke alarms in individual units of Group I-1, I-2, I-4 and R occupancies
- Change of occupancy:
 - General requirement such that building to comply with requirements of IBC for use or occupancy
 - Subject to approval of building official, compliance not required where new occupancy less hazardous, based on life and fire risk



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IEBC Chapters 6-12 Work Area Compliance Methods

- Applicable provisions of work area compliance methods include:
 - Level 1 Alteration Chapter 7
 - Level 2 Alteration Chapter 8
 - Level 3 Alteration Chapter 9
 - Change of occupancy Chapter 10
 - Additions Chapter 11



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IEBC Chapter 7 Work Area Compliance – Level 1 Alteration

- Level 1 alterations to maintain level of fire protection already provided



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IEBC Chapter 8 Work Area Compliance – Level 2 Alteration

- Level 2 alterations to comply with Level 1 plus sprinkler protection to be provided in high-rise buildings for:
 - Work areas shared by more than one tenant or have exits or corridors serving an occupant load greater than 30 to be sprinklered throughout entire work area
 - Only required where work area located on a floor that has sufficient sprinkler water supply system from existing standpipe or sprinkler riser serving that floor
 - Where work area on any floor exceeds 50% of floor area, sprinkler protection required throughout floor
 - Not applicable to occupied tenant spaces entirely outside work area



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IEBC Chapter 8 Work Area Compliance – Level 2 Alteration

- Level 2 alterations to comply with Level 1 plus sprinkler protection to be provided in Group A, B, E, F-1, H, I, M, R-1, R-2, R-4, S-1 and S-2 for:
 - Work areas shared by more than one tenant or have exits or corridors serving an occupant load greater than 30 where one of these conditions occur:
 - Work area required by IBC to be sprinklered for new construction, or
 - Work area exceeds 50% of floor area
 - Exception where building does not have sufficient water supply and automatic smoke detection system provided
 - Other than sleeping or dwelling units



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IEBC Chapter 8 Work Area Compliance – Level 2 Alteration

- Level 2 alterations to comply with Level 1 plus sprinkler protection to be provided in windowless stories:
 - As required by IBC provided building has sufficient municipal water supply without installation of new fire pump



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IEBC Chapter 8 Work Area Compliance – Level 2 Alteration

- Level 2 alterations to comply with Level 1 plus fire alarm system protection to be provided in work areas of:
 - Group E
 - Groups I-1, I-2 and I-3
 - Group R-1
 - Group R-2 apartment buildings
- Where work area exceeds 50% of floor area, alarm system to extend to entire floor
- Smoke alarms required in Group R and I-1 occupancies



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IEBC Chapter 9 Work Area Compliance – Level 3 Alteration

- Level 3 alterations to comply with Levels 1 and 2, plus sprinkler protection to be provided in work areas of:
 - High-rise buildings (if water supply available)
 - Rubbish and linen chutes within work area
 - Buildings with upholstered furniture or mattresses
 - Group F-1 Over 2,500 square feet
 - Group M Over 5,000 square feet
 - Group S-1 Over 2,500 square feet
 - Buildings or areas listed in IBC Table 903.2.11.6 where work areas shared by more than one tenant or have exits or corridors serving an occupant load greater than 30 (if sufficient water supply available)



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IEBC Chapter 9 Work Area Compliance – Level 3 Alteration

- Level 3 alterations to comply with Levels 1 and 2 plus fire alarm system protection to be provided in work areas where required by IBC for new buildings
 - Alarm-initiating and notification appliances not required to be installed in tenant spaces outside work area
 - Visual alarm notification appliances not required except where existing system upgrade or replaced, or where new fire alarm system installed
- Where required by IBC for new buildings, automatic fire detection systems to be provided throughout work area



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IEBC Chapter 10 Work Area Compliance – Change of Occupancy

- Where change in occupancy classification occurs or where there is a change of occupancy within a space where there is a different automatic sprinkler system requirement in IBC Chapter 9 that requires sprinkler protection, such sprinkler protection to be provided where change of occupancy occurs
- Similar conditions apply to fire alarm and detection systems
 - Existing alarm notification appliances to be automatically activated throughout building
 - Where building not equipped with fire alarm system, notification appliances to be provided throughout area where change of occupancy occurs



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IEBC Chapter 11 Work Area Compliance – Addition

- Addition to comply with fire protection requirements of IBC for new construction without requiring existing building to comply with any of those requirements, except:
 - Where addition made to Group R or I-1 occupancy, existing building to be provided with smoke alarms per Section 1103.8 of IFC



IEBC Chapter 13 Performance Compliance Methods

- For work address in performance compliance method, investigation and evaluation of specified fire safety and means of egress issues to be performed and submitted to building official for compliance determination
- Fire protection areas addressed include:
 - Automatic fire detection
 - Fire alarm systems
 - Automatic sprinklers
- Status of existing building features to be compared with benchmarks established in Chapter 13



Module 8

Retroactive Fire Sprinkler and Alarm Provisions of the IFC

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.



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



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



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



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



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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