

### Welcome to the

# 2018 Annual Conference Educational Sessions

Session: What to Look For: Basic Site and Commercial Plan Review



## What to Look For: Basic Site and Commercial Plan Review

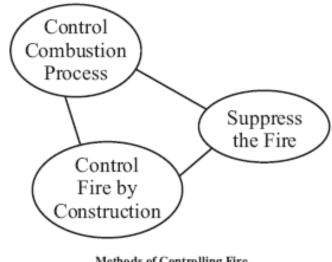
Scott W. Adams - Fire Service Membership Council

### **Objectives**

- Common steps in the Plan Review Process.
- Administrative Requirements.
- Identify the occupancy for the building.
- Identify Key Fire & Life Safety (fire protection, exiting, etc.) Requirements.
- Fire Department Access and Water Supply Requirements (Fire Flow)
- Explain Concepts of code requirements in each of the major commercial fire Code Areas.
- Identify the minimum safe-guards for construction, alteration and demolition operations to provide reasonable safety to life and property from fire during such operations.

### Fire Management Strategies

- Three ways that the code addresses fire management:
  - Fire Control.
  - Fire Suppression.
  - Controlling the Combustion Process.



### **Plan Reviews**

- What is a Plan Review?
  - Examine applications
    - Review proposed work
      - What will be built not necessarily the plans
  - What's required?
    - Sufficient clarity
    - Not "everything"
  - Upon finishing review:
    - Provide comment letter, or
    - Issue permit

[A] 105.4.1.1 Examination of documents. The *fire* code official shall examine or cause to be examined the accompanying construction documents and shall ascertain by such examinations whether the work indicated and described is in accordance with the requirements of this code.

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[A] 105.4.2 Information on construction documents. Construction documents shall be drawn to scale on suitable material. Electronic media documents are allowed to be submitted where approved by the fire code official. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that it will conform to the provisions of this code and relevant laws, ordinances, rules and regulations as determined by the fire code official.

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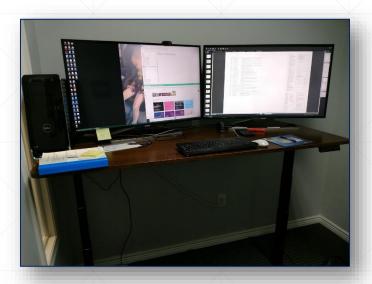
### Considerations

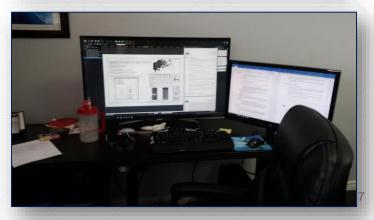
- Does you plan review ignore the experience level of your inspector(s)? (Know your inspectors, involve them)
- Do your plan review comments add value to the project? If so how?
- Does the cost (time is money) of adjusting the plans exceed the cost of making the correction in the field if missed?
- Don't make inspection based comments, in the plan review!
- Are we enforcing this in the field? If not, you're wasting time.
- More comments <u>does not</u> = higher quality
- Leave pet peeves at the door.
- Just because something happened once in 1997, doesn't mean every permit applicant should pay for it for the next 30 years!



### **Equipment**

- Large Monitors
  - Bigger is Better
- Multiple Monitors
  - At least two
- Electronic Codes are Helpful
- PDF Viewer
  - Bluebeam is Best
- Quality Chair
- Standing or Sitting- Healthier
  - (we perform better when we feel good)





### **Review Comments**

- Key Elements:
  - Number your comments
  - Reference a plan sheet
  - Include a code reference
  - Write clearly, use spell check, be specific
  - Provide direction
  - 1. Sheet E1: IRC R302.13 requires a 3" gap to be placed between canned lighting or ceiling fan motors to any combustible insulation. Please indicate how this is being addressed for the main floor ceiling framing. Provide a note or detail on the plans.



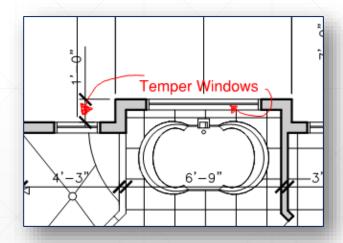
The code requires a 3" gap at can lights.

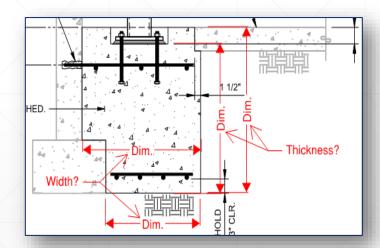


It may take more time initially, but remember you're only typing it once!

### **Pictures**

- A picture paints a 1,000 words
  - Put images in comment letters
  - You can redline on <u>electronic</u> plans
  - It does save time





### **Checklists**

- Is it okay to use checklists?
- Review outlines?
  - Serve as a guide
  - Better than checklists
- Page by Page method?
  - Works, but is inefficient
- The key is to develop a method and stick to it

#### **Code Outline Checklist**

- I. Chapter 1 Scope
- A. Site Plan (107.2.5)
- B. Egress Plan(107.2.3)
- C. Deferred Submittal (107.3.4.1)
- D. Code Analysis (Ch. 3, 5, 6, 10)
- E. Supporting documents (107.1)
- (Calculations, Geotech report, COMchecks, etc.)
- II. Chapter 3 Use Groups
- A. Verify Use Groups
- B. Small Assembly Areas (303.1.2)
- Hazardous materials in Factories or Storage (Table 307.1(1), 307.1(2))
- III. Chapter 4 Special Uses
- A. See if any of these Sections apply.
- 1. Atriums are defined by architect
- a) If Atrium is defined check all exiting requirements!
- IV. Chapter 5 Allowable Height and area
- A. Address Identification (501.2)
- B. Height and area analysis (503)

- F. Emergency Escape and rescue (1029)
- G. Doors (1008)
- Door Swing (1008.1.2)
- 2. Locks (1008.1.9.3)
- H. Stairs (1009)
- I. Ramps (1010)
- J. Exit signs (1011)
- Tactile Exit signs (1011.4)
- K. Handrails (1012)
- L. Guards (1013)
  - Roof Top Guards (1013.2)
  - 2. Operable Windows (1013.4)

#### VII. Chapter 11 – Accessibility

- A. Site Accessibility
- Parking (1106.1)
- 2. Loading Zones (1106.7)
- 3. Site route/entry (1105)
- B. Accessible Route (1104)
- Doors
- Elevators
- C. Assembly Seating (1108.2)
- D. Dwelling Units (1107)
- E. Bathrooms (1109)

### **Comment Letter**

- Key Elements:
  - Reference the applicant and permit number
  - Include received date, and date of comments
  - Follow a logical order
    - E.g. Based on sheet numbers
  - Provide contact information of the reviewer

April 4, 2017

SECOND REVIEW WC<sup>3</sup> Project #: 217-549-011

WC<sup>3</sup> Project #: 217-549-011 Sparks Project #: SBLD17-20238

City of Sparks Building Division Permit Services 431 Prater Way Sparks, Nevada 89431 Phone: (775) 353-2313

Attention: Mark Meranda, Chief Building Official

Subject: Gateway Clubhouse - Plan Review Comments (2nd Review)

#### Mr. Meranda:

West Coast Code Consultants has completed the second review of the proposed Gateway Clubhouse project located in Sparks, NV. This review was based upon the following:

- Architectural drawings by Pacific West Design-Build Services, LLC, sealed and signed by Donald James Burke, Licensed Architect. An Envelope Compliance Certificate (ECC) was also provided.
- 2. Civil drawings by Wood Rodgers, Inc, sealed and signed by Dale L Forbes, Professional Engineer.
- 3. Structural drawings and calculations by ESI.
- Mechanical and plumbing drawings by Alexander <u>Scheflo</u> & <u>Assoc</u>, sealed and signed by Alexander S <u>Scheflo</u> Professional Engineer.
- 5. Electrical drawings by McKimmeny Electric, Inc.
- 6. Geotechnical investigation report (#) by Wood Rodgers, Inc.

### **Review Process**

- Plan Review Outline:
  - 1. Verify Submittal Documents
    - a) Site plan
    - b) Fire Department Vehicle Access
    - c) Fire Hydrant Locations
    - d) Egress plan
    - e) Code analysis
    - f) Water Supply Analysis
    - g) Supporting documents, etc.
  - 2. Identify Use Group(s)
    - a) Check for special uses from the IBC Chapter 4

### **Review Process**

- Plan Review Outline:
  - 3. Verify Construction Type
  - 4. Verify Allowable Heights and Area
  - 5. Verify Means of Egress
  - 6. Verify Fire Protection and Detection Requirements
  - 7. Check Fire Provision (Ch. 7-9)

## Administrative Requirements

### Intent (101.3) – The Purpose of the Fire Code

- Establish the minimum requirements consistent with nationally recognized good practice for providing a reasonable level of life safety and property protection from the hazards of fire, explosion or dangerous conditions in new and existing buildings, structures and premises
- Provide safety to fire fighters and emergency responders during emergency operations.

### Change of Use or Occupancy (102.3)

- A change in occupancy in an existing structure may change the level of inherent hazards that the code was initially intended to address.
- Regardless of whether the change is to an occupancy considered to be more or less hazardous, this section applies the provisions of the IBC for new construction to the existing structure with the new occupancy to match the specific requirements of the code to the specific hazards of the new occupancy.
- Example: Change from an existing Group M mercantile occupancy to a Group B business occupancy renders all Group B provisions applicable to all portions of the structure where the occupancy has changed, or that are adversely affected by the change.

### **Technical Assistance (104.7.2)**

- No one person has the technical knowledge to evaluate all of the various operations and uses from a safety standpoint.
- This section provides the fire code official the authority to require the owner to provide a technical opinion safety report.
- The report is to be prepared by parties that have the technical ability to evaluate the design of the facility or the operational process in question.
- Critical that the preparer of the report have the proper background and experience for the project since the credibility of the report depends on these qualifications.

### **Modifications (104.8)**

- The fire code official may amend or make exceptions to the code as needed to respond to "practical difficulties" in work on new or existing buildings.
- Consideration of a particular difficulty is to be based on the application of the owner and a demonstration that the intent of the code is satisfied.
- This section is not intended to allow a code provision to be set aside or
- ignored; rather, it is intended to provide for the acceptance of equivalent protection.
- Such modifications do not, however, extend to actions that are necessary to correct violations of the code.

### **Modifications (104.8)**

- In other words, a code violation or the expense of correcting a code violation cannot constitute a practical difficulty.
- Comprehensive written records are an essential part of an effective administrative system.
- Unless clearly written records of the considerations and documentation used in the modification process are created and maintained, subsequent enforcement action cannot be supported.

### PERMITS

**SECTION 105** 

### Permits Required (105.1.1)

- Property owner or an authorized owner's agent is required to make application and obtain a permit.
- Owner or the authorized agent performs this function so that they are aware and give consent for the issued permits.

### Types of Permits (105.1.2)

### **Operational Permit**

- Allows applicant to conduct an operation or a business as required by Section 105.6 for either:
  - A prescribed period.
  - Until renewed or revoked.

### **Construction Permit**

 Allows applicant to install or modify systems and equipment for which a permit is required by Section 105.7.

### **Construction Documents (105.4)**

- 105.4.1 Submittals: Construction documents and supporting data shall be submitted in two or more sets with each application for a permit and in such form and detail as required by the fire code official.
- Detailed description of the work for which an application is made must be submitted in the form and detail required by the fire code official.
- 105.4.1.1 Examination of Documents: The fire code official shall examine or cause to be examined the accompanying construction documents and shall ascertain by such examinations whether the work indicated and described is in accordance with the requirements of this code.
- The fire code official can delegate review of the construction documents to subordinates as provided for in Section 103.3.

### Information on Construction Documents (105.4.2)

- Construction documents drawn to scale upon suitable material.
- Electronic media documents are allowed when approved.
- Construction documents must be of sufficient clarity.
- Indicate the location, nature and extent of the work proposed and show in detail
  that it will conform to the provisions of this code and relevant laws, ordinances,
  rules and regulations as determined by the fire code official.

### Information on Construction Documents (105.4.2)

- Construction documents are not sketches.
- They are comprehensive drawings.
- Drawn to scale
- Provide details to verify that the work will comply with the code.
- The permit applicant must be familiar with the code requirements to prepare code-compliant construction documents.
- If the applicant is not familiar with the code, the construction documents will most likely not have sufficient detail to determine compliance and, thus, not be satisfactory as the basis for a permit.

# Key Fire & Life Safety Requirements

### Fire and Life Safety Narrative for Building

- Building Location and Address.
- Owner and facility name.
- Date developed and revision dates.
- Designer 's information (name, address, telephone number and tele-fax number).

### Fire and Life Safety Narrative for Building

- Codes of Record and Other Requirements or Regulations.
- Purpose for Project Construction:
  - New Construction
  - Addition to Existing Building
  - Change in Use of Building and/or Occupancy
  - Renovation of Building
  - Plan of Correction for Existing Code Deficiencies.
- Alternative Design and/or Methods of Construction Used.
- Modifications of Codes and Board of Appeals Case Number.

### **Project Information**

- Occupancy Classification: Occupancy Types for the building in accordance with the IBC, Chapter 3.
- Area of Structure: Determine the actual area calculated for the building versus the allowable area.
- Height of Structure: Determine actual height for the building versus the allowable height.
  - Stories
  - Feet
- Type of construction.
- Fire assembly rating(s) for structural members.

### **Identification of Active Fire Protection Features**

- Automatic suppression systems.
- Fire alarm signaling systems.
- Emergency lighting and power features.
- Smoke control system.
- Decision matrix on how fire protection features are activated.

### **Building Cross-Sectional View**

- Provide a cross-sectional view for the building.
- Helpful for showing:
  - Construction Type
  - Roof Construction Arrangement
  - Interior Construction Features

### **Occupancy Use Groups**

DESCRIPTION	GROUP(S)
Assembly	A-1, A-2, A-3, A-4 & A-5
Business	В
Educational	E
Factory	F-1 & F-2
Hazardous	H-1, H-2, H-3, H-4 & H-5
Mercantile	M
Residential	R-1, R-2, R-3 & R-4
Storage	S-1 & S-2
Utility	U

# Occupancy Classifications IFC Chapter 2 / IBC Chapter 3



- ASSEMBLY GROUP A
  - Small Buildings (IFC 202 / IBC 303.1)
    - < 50 Occupants</li>
      - Group B
  - Small Spaces (IFC 202 / IBC 303.1.2)
    - Group B or part of other Use
      - < 50 occupants</p>
      - < 750 sq. ft.</p>
  - Associated w/ Education (IFC 202 / IBC 303.1.3)
    - Group E
  - Accessory Religious (IFC 202 / IBC 303.1.4)
    - Group A
      - < 100 occupants Not Considered Separate Occupancy</li>

### **Use Groups**

- BUSINESS GROUP B (IFC 202 / IBC 304.1)
  - Ambulatory care facilities
  - Banks
  - Commercial Kitchens
    - Not associated with restaurant
    - o < 2,500 s.f.
  - Educational occupancies for students above the 12th grade
  - Laboratories: testing and research
  - Motor vehicle showrooms
  - Professional services
  - Training and Skill Development not in a school
    - Martial Arts, Tutoring, gymnastics



### Chapter 3 - Occupancies

- FACTORY GROUP F (IFC 202 / IBC 306.1)
  - Use:
    - Manufacturing
    - Assembling
    - Packaging
    - Shipping
  - IBC 306.2 Moderate Hazard (F-1)
    - Bakeries
    - Clothes
  - IBC 306.3 Low Hazard (F-2)
    - Metal (fabrication/assembly)

### Occupancies

- STORAGE GROUP S (IFC 202 / IBC 311.1)
  - 311.2 Moderate Hazard (S-1)
    - Books
    - Lumber
    - Motor vehicle repair
    - Tires
  - 311.3 Low Hazard (S-2)
    - Cement
    - Electric motors
    - Parking Garages
  - Always ask for MSDS
    - Verify quantity of hazardous materials



### IBC Chapter 4 – Special Uses

- 402 Open & closed malls
- 403 High rise buildings
- 404 Atriums
- 405 Underground building
- 406 Motor vehicle
- 407 Group I-2
- 408 Group I-3
- 409 Movie projectors
- 410 Stages/Platforms
- 411 Amusement buildings
- 412 Aircraft related
- 413 High piled storage
- 414 Hazard materials

- 415 Group H
- 416 Spray rooms
- 417 Drying rooms
- 418 Organic coating
- 419 Live/Work
- 420 Group I-1, and R
- 421 Hydrogen cutoff
- 422 Ambulatory Care
- 423 Storm shelters
- 424 Children's Playground
- 425 Hyperbaric Facilities
- 426 Combustible Dusts
- 427 Child Care Centers

### **Site Plan Basics**

- Building Address
- Measuring Scales
- Existing Condition/Demolition
- Site Renovation

# IFC SECTION 507 FIRE PROTECTION WATER SUPPLIES

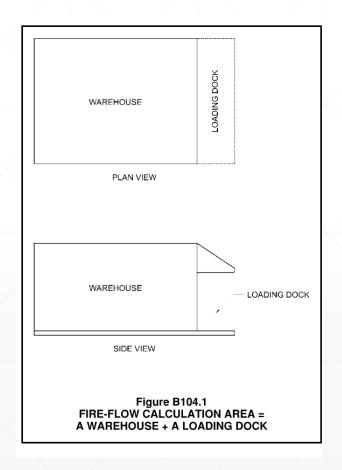
- Required Water Supply: An approved water supply capable of supplying the required fire flow for fire protection must be provided to premises on which facilities, buildings or portions of buildings are hereafter constructed or moved into or within the jurisdiction.
- Type of Water Supply: A water supply must consist of reservoirs, pressure tanks, elevated tanks, water mains or other fixed systems capable of providing the required fire flow.
- Private Fire Service Mains: Private fire service mains and appurtenances shall be installed in accordance with NFPA 24.
- Water Tanks: Water tanks for private fire protection shall be installed in accordance with NFPA 22.

### Fire Flow Requirement

- Water supply requirements of the facility for fire suppression.
- Fire Marshal to establish the Fire Flow Requirement for Facility
- Fire Flow Based on:
  - Building Construction Type
  - Building Fire Area
  - Fire Sprinkler System
- Design Team to contact applicable water company to determine available water supply for the area.
- Design Team to determine the allowances needed for seasonal and daily fluctuations as a result of increased demands or changes in the operation of the water system.

# IFC SECTION B104 FIRE-FLOW CALCULATION AREA

• Fire-Flow Calculation Area: The total floor area of all floor levels within the exterior walls, and under the horizontal projections of the roof of a building, except as modified in for Type IA and Type IB construction.



## IFC SECTION B104 FIRE-FLOW CALCULATION AREA

- Area Separation: Portions of buildings that are separated by Fire Walls Without Openings, constructed in accordance IBC, are allowed to be considered as separate fire-flow calculation areas.
- Type IA and Type IB Construction: The fire-flow calculation area of buildings constructed of Type IA and Type IB construction is the area of the three largest successive floors.
- Open Parking Garages: Fire-flow calculation area determined by the area of the largest floor.

# IFC SECTION B105 FIRE-FLOW REQUIREMENTS FOR BUILDINGS

- One- and Two-family Dwellings
- Group R-3 and R-4 Buildings
- Townhouses
- Fire-flow and flow duration requirements as specified in:
  - Table B105.1(1)
  - Table B105.1(2).

TABLE B105.1(1)
REQUIRED FIRE FLOW FOR ONE- AND TWO-FAMILY DWELLINGS, GROUP R-3 AND R-4 BUILDINGS AND TOWNHOUSES

FIRE-FLOW CALCULATION AREA (square feet)	AUTOMATIC SPRINKLER SYSTEM (Design Standard)  MINIMUM FIR (gallons per		FLOW DURATION (hours)
0–3,600	No automatic sprinkler system	1,000	1
3,601 and greater	No automatic sprinkler system	No automatic sprinkler system  Value in Table B105.1(2)	
0–3,600	Section 903.3.1.3 of the <i>International Fire Code</i> or Section P2904 of the <i>International Residential Code</i>	500	1/2
3,601 and greater	Section 903.3.1.3 of the <i>International Fire Code</i> or Section P2904 of the <i>International Residential Code</i>	<sup>1</sup> / <sub>2</sub> value in Table B105.1(2)	1

For SI: 1 square foot =  $0.0929 \text{ m}^2$ , 1 gallon per minute = 3.785 L/m.

#### TABLE B105.1(2) REFERENCE TABLE FOR TABLES B105.1(1) AND B105.2

FLOW DURATION	FIRE FLOW	FIRE-FLOW CALCULATION AREA (square feet)				
(hours)	(gallons per minute) <sup>b</sup>	Type V-B <sup>a</sup>	Type IIB and IIIB <sup>a</sup>	Type IV and V-A <sup>a</sup>	Type IIA and IIIA <sup>a</sup>	Type IA and IB <sup>a</sup>
	1,500	0-3,600	0-5,900	0-8,200	0-12,700	0-22,700
	1,750	3,601-4,800	5,901-7,900	8,201-10,900	12,701-17,000	22,701-30,200
2	2,000	4,801-6,200	7,901-9,800	10,901-12,900	17,001-21,800	30,201-38,700
2	2,250	6,201-7,700	9,801-12,600	12,901-17,400	21,801-24,200	38,701-48,300
	2,500	7,701-9,400	12,601-15,400	17,401-21,300	24,201-33,200	48,301-59,000
	2,750	9,401-11,300	15,401-18,400	21,301-25,500	33,201-39,700	59,001-70,900
	3,000	11,301-13,400	18,401-21,800	25,501-30,100	39,701-47,100	70,901-83,700
2	3,250	13,401-15,600	21,801-25,900	30,101-35,200	47,101-54,900	83,701-97,700
3	3,500	15,601-18,000	25,901-29,300	35,201-40,600	54,901-63,400	97,701-112,700
	3,750	18,001-20,600	29,301-33,500	40,601-46,400	63,401-72,400	112,701-128,700
	4,000	20,601-23,300	33,501-37,900	46,401-52,500	72,401-82,100	128,701-145,900
	4,250	23,301-26,300	37,901-42,700	52,501-59,100	82,101-92,400	145,901-164,200
	4,500	26,301-29,300	42,701-47,700	59,101-66,000	92,401-103,100	164,201-183,400
	4,750	29,301-32,600	47,701-53,000	66,001-73,300	103,101-114,600	183,401-203,700
	5,000	32,601-36,000	53,001-58,600	73,301-81,100	114,601-126,700	203,701-225,200
	5,250	36,001-39,600	58,601-65,400	81,101-89,200	126,701-139,400	225,201-247,700
	5,500	39,601-43,400	65,401-70,600	89,201-97,700	139,401-152,600	247,701-271,200
	5,750	43,401-47,400	70,601-77,000	97,701-106,500	152,601-166,500	271,201-295,900
4	6,000	47,401-51,500	77,001-83,700	106,501-115,800	166,501-Greater	295,901-Greater
	6,250	51,501-55,700	83,701-90,600	115,801-125,500	_	_
	6,500	55,701-60,200	90,601-97,900	125,501-135,500	_	_
	6,750	60,201-64,800	97,901-106,800	135,501-145,800	_	_
	7,000	64,801-69,600	106,801-113,200	145,801-156,700	_	_
	7,250	69,601-74,600	113,201-121,300	156,701-167,900	_	_
	7,500	74,601-79,800	121,301-129,600	167,901-179,400	_	_
	7,750	79,801-85,100	129,601-138,300	179,401-191,400	_	_
	8,000	85,101-Greater	138,301-Greater	191,401-Greater	_	_

For SI: 1 square foot = 0.0929 m<sup>2</sup>, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.

a. Types of construction are based on the *International Building Code*.b. Measured at 20 psi residual pressure.

# IFC SECTION B105 FIRE-FLOW REQUIREMENTS FOR BUILDINGS

- Buildings other than one- and two-family dwellings, Group R-3 and R-4 buildings and townhouses.
- Minimum fire-flow and flow duration for buildings other than as specified in Tables B105.2 and B105.1(2).

### TABLE B105.2 REQUIRED FIRE FLOW FOR BUILDINGS OTHER THAN ONE- AND TWO-FAMILY DWELLINGS, GROUP R-3 AND R-4 BUILDINGS AND TOWNHOUSES

AUTOMATIC SPRINKLER SYSTEM (Design Standard)	MINIMUM FIRE FLOW (gallons per minute)	FLOW DURATION (hours)	
No automatic sprinkler system	Value in Table B105.1(2)	Duration in Table B105.1(2)	
Section 903.3.1.1 of the <i>International Fire Code</i>	25% of the value in Table B105.1(2) <sup>a</sup>	Duration in Table B105.1(2) at the reduced flow rate	
Section 903.3.1.2 of the <i>International Fire Code</i>	25% of the value in Table B105.1(2) <sup>b</sup>	Duration in Table B105.1(2) at the reduced flow rate	

For SI: 1 gallon per minute = 3.785 L/m.

a. The reduced fire flow shall be not less than 1,000 gallons per minute.

b. The reduced fire flow shall be not less than 1,500 gallons per minute.

#### TABLE B105.1(2) REFERENCE TABLE FOR TABLES B105.1(1) AND B105.2

FLOW DURATION	FIRE FLOW	FIRE-FLOW CALCULATION AREA (square feet)				
(hours)	(gallons per minute) <sup>b</sup>	Type V-B <sup>a</sup>	Type IIB and IIIB <sup>a</sup>	Type IV and V-A <sup>a</sup>	Type IIA and IIIA <sup>a</sup>	Type IA and IB <sup>a</sup>
	1,500	0-3,600	0-5,900	0-8,200	0-12,700	0-22,700
	1,750	3,601-4,800	5,901-7,900	8,201-10,900	12,701-17,000	22,701-30,200
2	2,000	4,801-6,200	7,901-9,800	10,901-12,900	17,001-21,800	30,201-38,700
2	2,250	6,201-7,700	9,801-12,600	12,901-17,400	21,801-24,200	38,701-48,300
	2,500	7,701-9,400	12,601-15,400	17,401-21,300	24,201-33,200	48,301-59,000
	2,750	9,401-11,300	15,401-18,400	21,301-25,500	33,201-39,700	59,001-70,900
	3,000	11,301-13,400	18,401-21,800	25,501-30,100	39,701-47,100	70,901-83,700
2	3,250	13,401-15,600	21,801-25,900	30,101-35,200	47,101-54,900	83,701-97,700
3	3,500	15,601-18,000	25,901-29,300	35,201-40,600	54,901-63,400	97,701-112,700
	3,750	18,001-20,600	29,301-33,500	40,601-46,400	63,401-72,400	112,701-128,700
	4,000	20,601-23,300	33,501-37,900	46,401-52,500	72,401-82,100	128,701-145,900
	4,250	23,301-26,300	37,901-42,700	52,501-59,100	82,101-92,400	145,901-164,200
	4,500	26,301-29,300	42,701-47,700	59,101-66,000	92,401-103,100	164,201-183,400
	4,750	29,301-32,600	47,701-53,000	66,001-73,300	103,101-114,600	183,401-203,700
	5,000	32,601-36,000	53,001-58,600	73,301-81,100	114,601-126,700	203,701-225,200
	5,250	36,001-39,600	58,601-65,400	81,101-89,200	126,701-139,400	225,201-247,700
	5,500	39,601-43,400	65,401-70,600	89,201-97,700	139,401-152,600	247,701-271,200
	5,750	43,401-47,400	70,601-77,000	97,701-106,500	152,601-166,500	271,201-295,900
4	6,000	47,401-51,500	77,001-83,700	106,501-115,800	166,501-Greater	295,901-Greater
	6,250	51,501-55,700	83,701-90,600	115,801-125,500	_	_
	6,500	55,701-60,200	90,601-97,900	125,501-135,500	_	_
	6,750	60,201-64,800	97,901-106,800	135,501-145,800	_	_
	7,000	64,801-69,600	106,801-113,200	145,801-156,700	_	_
	7,250	69,601-74,600	113,201-121,300	156,701-167,900	_	_
	7,500	74,601-79,800	121,301-129,600	167,901-179,400	_	_
	7,750	79,801-85,100	129,601-138,300	179,401-191,400	_	_
	8,000	85,101-Greater	138,301-Greater	191,401-Greater	_	_

For SI: 1 square foot = 0.0929 m<sup>2</sup>, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.

a. Types of construction are based on the *International Building Code*.b. Measured at 20 psi residual pressure.

# Water Supply for Buildings Equipped with an Automatic Sprinkler System

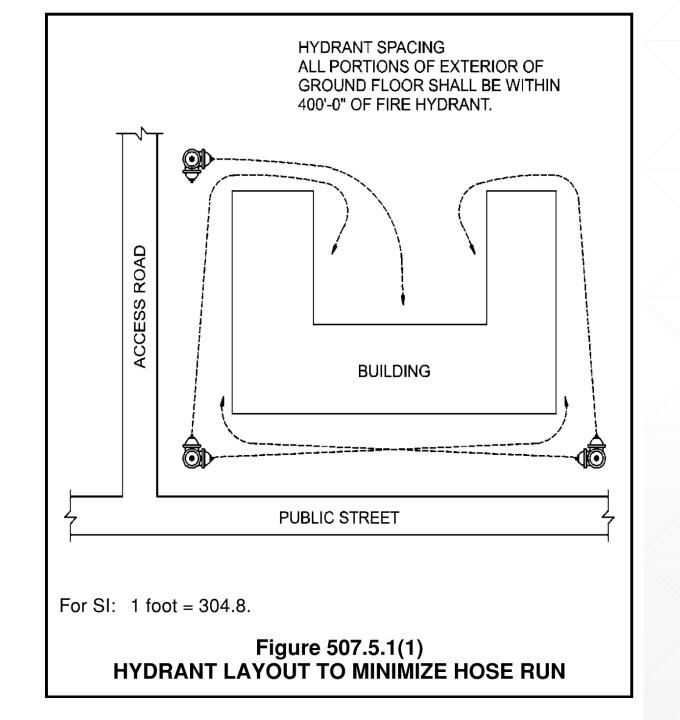
- Water supply must be capable of providing the greater of:
- 1. The automatic sprinkler system demand, including hose stream allowance.
- 2. The required fire flow.

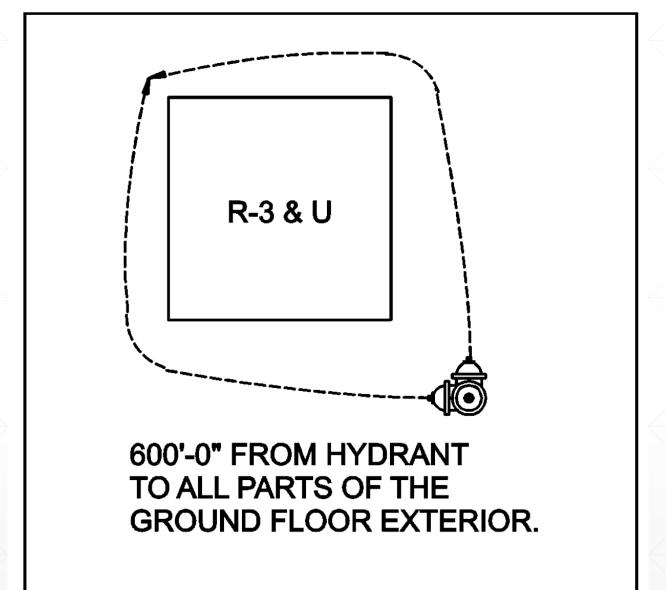
# IFC SECTION 507.5 FIRE HYDRANT SYSTEMS

• Where Required: Where a portion of the facility or building hereafter constructed or moved into or within the jurisdiction is more than 400 feet from a hydrant on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building, on-site fire hydrants and mains must be provided where required by the fire code official.

#### Exceptions:

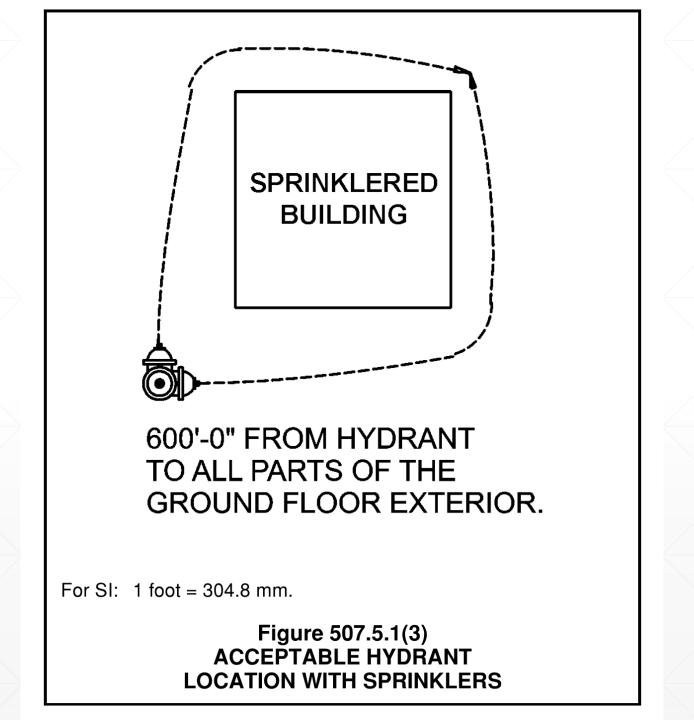
- 1. For Group R-3 and Group U occupancies 600 feet.
- 2. For buildings equipped throughout with an approved automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2 - 600 feet.





For SI: 1 foot = 304.8.

Figure 507.5.1(2)
HYDRANT LOCATION—GROUP R-3 AND U



# IFC SECTION 507.5 FIRE HYDRANT SYSTEMS

- Hydrant for Standpipe Systems:
- Fire hydrant within 100-feet of the fire department connections.
- Exception: Distance permitted to exceed 100 feet where approved by the fire code official.

#### FIRE HYDRANT LOCATIONS AND DISTRIBUTION

Minimum number of fire hydrants for a building shall be not less than the minimum specified in IFC Table C102.1.

TABLE C102.1
REQUIRED NUMBER AND SPACING OF FIRE HYDRANTS<sup>h</sup>

FIRE-FLOW REQUIREMENT (gpm)	MINIMUM NUMBER OF HYDRANTS	AVERAGE SPACING BETWEEN HYDRANTS <sup>a, b, c, f, g</sup> (feet)	MAXIMUM DISTANCE FROM ANY POINT ON STREET OR ROAD FRONTAGE TO A HYDRANT <sup>d, f, g</sup>
1,750 or less	1	500	250
1,751–2,250	2	450	225
2,251–2,750	3	450	225
2,751–3,250	3	400	225
3,251-4,000	4	350	210
4,001–5,000	5	300	180
5,001–5,500	6	300	180
5,501-6,000	6	250	150
6,001-7,000	7	250	150
7,001 or more	8 or more <sup>e</sup>	200	120

#### FIRE HYDRANT LOCATIONS AND DISTRIBUTION

- a. Reduce by 100 feet for dead-end streets or roads.
- b. Where streets are provided with median dividers that cannot be crossed by fire fighters pulling hose lines, or where arterial streets are provided with four or more traffic lanes and have a traffic count of more than 30,000 vehicles per day, hydrant spacing shall average 500 feet on each side of the street and be arranged on an alternating basis.
- c. Where new water mains are extended along streets where hydrants are not needed for protection of structures or similar fire problems, fire hydrants shall be provided at spacing not to exceed 1,000 feet to provide for transportation hazards.
- d. Reduce by 50 feet for dead-end streets or roads.

#### FIRE HYDRANT LOCATIONS AND DISTRIBUTION

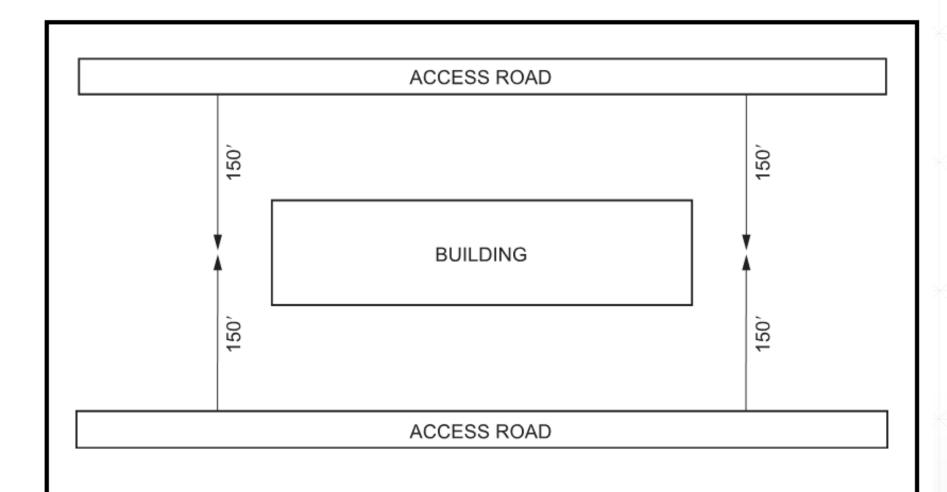
- e. One hydrant for each 1,000 gallons per minute or fraction thereof.
- f. A 50-percent spacing increase shall be permitted where the building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1 of the International Fire Code.
- g. A 25-percent spacing increase shall be permitted where the building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.2 or 903.3.1.3 of the International Fire Code or Section P2904 of the International Residential Code.
- h. The fire code official is authorized to modify the location, number and distribution of fire hydrants based on site-specific constraints and hazards.

#### **IFC SECTION C103 - FIRE HYDRANT SPACING**

- Fire apparatus access roads and public streets providing required access to buildings in accordance with Section 503 shall be provided with one or more fire hydrants, as determined by Section C102.1.
- Where more than one fire hydrant is required, the distance between required fire hydrants shall be in accordance with Sections C103.2 and C103.3.

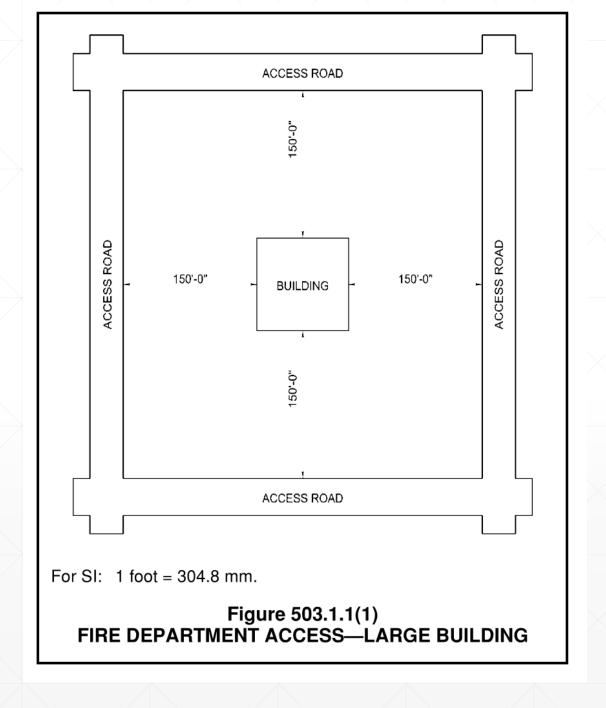
### **Fire Department Access**

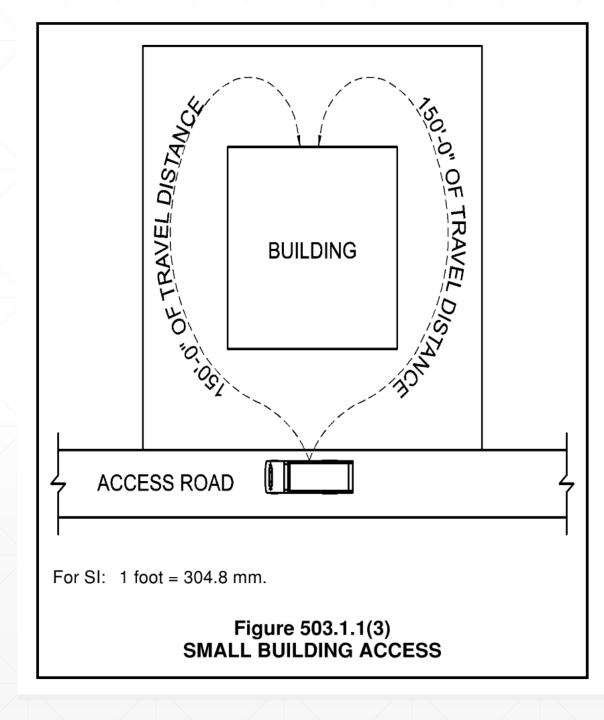
- Site plan provided for review and approval prior to construction.
- Site Plan to exhibit requirements from section 503 of the IFC.
- Building and Facilities: Fire apparatus access roads must be provided such that no portion of the facility or any portion of an exterior wall of the first story of the building is located more than 150-feet from fire apparatus access as measured by an approved route around the exterior of the building or facility. [IFC 503.1.1]



For SI: 1 foot = 304.8 mm.

Figure 503.1.1(2)
FIRE DEPARTMENT ACCESS ON TWO SIDES





#### **Conditions Permitted to Increase 150 feet**

- Building equipped throughout with an approved automatic sprinkler system installed in accordance with Section 903.3.1.1, 903.3.1.2 or 903.3.1.3.
- Fire apparatus access roads cannot be installed because of location on property, topography, waterways, nonnegotiable grades or other similar conditions, and an approved alternative means of fire protection is provided.
- "Alternative Means" may include standpipes, automatic sprinklers, remote fire department connections or additional fire hydrants.

#### **Conditions Permitted to Increase 150 feet**

- Not more than two Group R-3 or Group U occupancies.
  - One- and two-family dwellings and townhouses not falling within the scope of the International Residential Code.
  - Care facilities that accommodate five or fewer people; and congregate living facilities (non-transient) with 16 or fewer persons or congregate living facilities (transient) with 10 or fewer persons, among others.
  - Group U occupancies are utility and miscellaneous accessory buildings or structures.

#### **Conditions Permitted to Increase 150 feet**

- Where approved by the fire code official, fire apparatus access roads shall be permitted to be exempted or modified for solar photovoltaic power generation facilities. Issues for consideration include:
  - 1. Risk/hazard to be mitigated.
  - 2. Risk/hazard to fire fighters or other emergency responders.
  - 3. Interest of public safety and welfare.
  - 4. Economics.
  - 5. Intended access use.
  - 6. Fuel load of the facility and adjacent areas that impact the facility.
  - 7. Array configuration (tightly spaced, access aisles, height).
  - 8. Actual hazard to public safety and welfare.

### **Residential Development Sites**

- Fire apparatus access roads are intended to be applicable to residential development sites upon which buildings are constructed under the provisions of the IRC.
- [A] 102.5 Application of Residential Code. Where structures are designed and constructed in accordance with the International Residential Code, the provisions of this code shall apply as follows:
- 1. Construction and design provisions of this code pertaining to the exterior of the structure shall apply including, but not limited to, premises identification, fire apparatus access and water supplies.

### Residential Development Sites

- IRC regulates the construction of detached one- and two-family dwellings and townhouse structures.
- Does not regulate the design and construction of emergency access to and community fire protection for residential developments containing such dwelling structures.
- Design, construction, regulation and maintenance of fire apparatus access roads for servicing such residential developments must comply with the provisions of Section 503 and, if adopted, Appendix D.
- Design, construction, regulation and maintenance of fire protection water supplies for servicing such residential developments must comply with the provisions of Section 507 and, if adopted, Appendices B and C.
- These specific requirements of the code are applicable because they include design and construction regulations that provide necessary emergency access and community fire protection for residential developments containing structures that are regulated within the scope of the IRC.

### Fire Department Access - Specifications

- **Dimensions:** Fire apparatus access roads must have an unobstructed width of not less than 20 feet, exclusive of shoulders, except for approved security gates in accordance with Section 503.6, and an unobstructed vertical clearance of not less than 13 feet 6 inches. [IFC 503.2.1]
- Authority: The fire code official shall have the authority to require or permit modifications to the required access widths where they are inadequate for fire or rescue operations or where necessary to meet the public safety objectives of the jurisdiction. [IFC 503.2.2]
  - Allows fire code official to require greater, or to allow lesser, access-width dimensions based on the size and maneuverability of the anticipated emergency response apparatus, including mutual-aid apparatus from neighboring communities or agencies, among other considerations.

### **Fire Department Access - Specifications**

- Surface: Fire apparatus access roads must be designed and maintained to support the imposed loads of fire apparatus and must be surfaced so as to provide allweather driving capabilities. [IFC 503.2.3 & D102.1]
  - Written in performance language; therefore, the surface must carry the load of the anticipated emergency response vehicles and be drivable in all kinds of weather.
  - "All-Weather Driving Capabilities" would typically require some type of paved or hard surface. Gravel would be prone to problems in areas subject to heavy rain or in snowy climates where plowing could reduce the gravel roadbed to mud very quickly.
  - Alternatives to concrete or asphalt, such as interlocking pavers, may be used when approved.

### Fire Department Access - Specifications

 Turning Radius: The turning radius of 28-feet must be provided for the fire apparatus access road. [IFC Figure D103.1]

- The required turning radius of a fire apparatus access road shall be determined by the fire code official.
- Turning radius of an access road based on the turning radius of the anticipated responding emergency vehicles.

# IFC SECTION 901.4 FIRE PUMP AND RISER ROOM SIZE

- Where provided Must be designed with adequate space for all equipment necessary for the installation, as defined by the manufacturer, with sufficient working space around the stationary equipment.
- Clearances around equipment to elements of permanent construction, including other installed equipment and appliances, must be sufficient to allow inspection, service, repair or replacement without removing such elements of permanent construction or disabling the function of a required fire-resistance-rated assembly.
- Fire pump and automatic sprinkler system riser rooms must be provided with doors and unobstructed passageways large enough to allow removal of the largest piece of equipment.

## IFC SECTION 901.4 FIRE PUMP AND RISER ROOM SIZE

- Access: Readily accessible.
  - Exterior versus Interior
- Door: Must be permitted to be locked provided that the key is available at all times.
  - Lock-Box
- Marking on Access Doors: Access doors must be labeled with an approved sign.
  - Lettering must be in contrasting color to the background.
  - Letters must have a minimum height of 2 inches with a minimum stroke of 3/8 inch.
- Environment: Must be maintained at a temperature of not less than 40°F.
  - Heating units must be permanently installed.
- Lighting: Permanently installed artificial illumination must be provided.

# IFC SECTION 912 FIRE DEPARTMENT CONNECTIONS (FDC)

- Location: With respect to hydrants, driveways, buildings and landscaping, FDC must be located such that fire apparatus and hose connected to supply the system will not obstruct access to the buildings for other fire apparatus. Location approved by the fire code official.
- Visible Location: FDC must be located on the street side of buildings or facing approved fire apparatus access roads, fully visible and recognizable from the street, fire apparatus access road or nearest point of fire department vehicle access or as other-wise approved by the fire code official.
- Existing Buildings: On existing buildings, wherever the FDC is not visible to approaching fire apparatus, the FDC must be indicated by an approved sign mounted on the street front or on the side of the building. Sign must have the letters "FDC" not less than 6 inches high and words in letters not less than 2 inches high or an arrow to indicate the location. Sign to be approved by fire code official.

# IFC SECTION 912 FIRE DEPARTMENT CONNECTIONS (FDC)

- Access: Immediate access to FDC must be maintained at all times and without obstruction by fences, bushes, trees, walls or any other fixed or moveable object.
   Access to FDC to be approved by the fire code official.
- Fences: Where provided with an access gate equipped with a sign complying with the legend requirements of Section IFC 912.5 and a means of emergency operation. Gate and the means of emergency operation must be approved by the fire code official and maintained operational at all times.
- Locking FDC Caps: Fire code official is authorized to require locking caps
  on the FDC for water-based fire protection systems where the responding fire
  department carries appropriate key wrenches for removal.

# IFC SECTION 912 FIRE DEPARTMENT CONNECTIONS (FDC)

- Metal sign with raised letters not less than 1-inch in size.
- Mounted on all FDC serving automatic sprinklers, standpipes or fire
- pump connections.
- Must Read: AUTOMATIC SPRINKLERS or STANDPIPES or TEST CONNECTION or a combination thereof as applicable.
- Where FDC does not serve the entire building, a sign must be provided indicating the portions of the building served.

# IFC SECTION 912 FIRE DEPARTMENT CONNECTIONS (FDC)





# Means of Egress Basics

# Fundamental Means of Egress Design Issues

- 1. Number of occupants and total width of egress elements
- 2. Number of exits required
- 3. Location of means of egress elements
- 4. Fire-resistance-rated construction
- 5. Component design
- 6. Hardware
- 7. Lighting and signs

### **Means of Egress Basics**

#### IBC and IFC

#### Administration and Definitions

**•** 1001,1002

#### General Means of Egress

**•** 1003-1015

#### Components of Means of Egress

- Exit Access 1016-1021
- Exits 1022-1027
- Exit discharge 1028

#### Miscellaneous

- Assembly 1029
- Emergency Escape and Rescue 1030

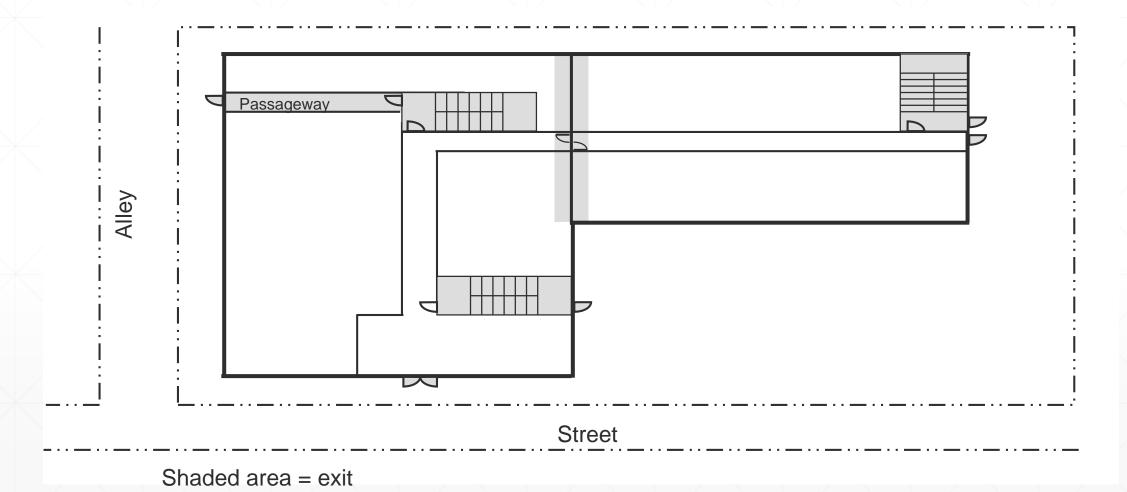
#### IFC provisions only

- Existing Construction
- IFC provisions only
- Maintenance of the Means of Egress 1031

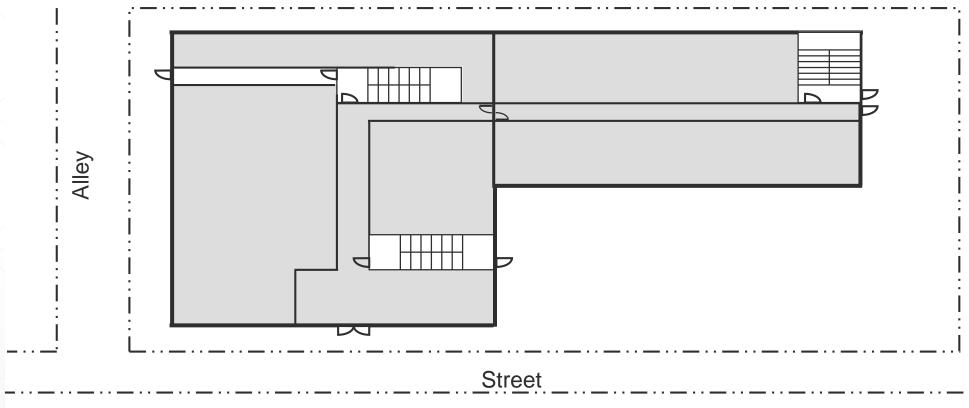
## **Three Parts - Means of Egress**

- Exit Access
- Exit
- Exit Discharge

## **Exit**

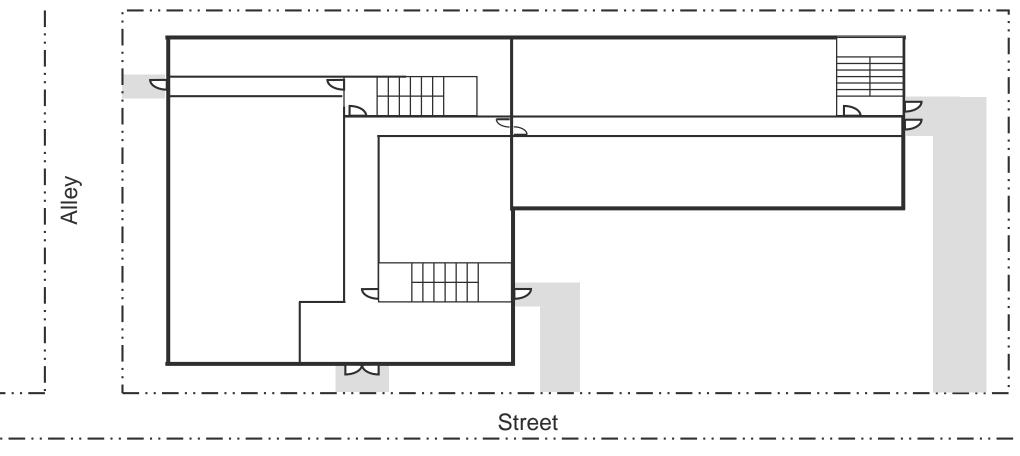


## **Exit Access**



Shaded area = exit access

## **Exit Discharge**



Shaded area = exit discharge

### Occupant Load - Section 1004

- Number of occupants determined in accordance with Section 1004.1
- Where occupants pass through intervening rooms—OL is cumulative for spaces along egress path.
- Where occupants on a mezzanine or story egress through an adjacent floor level—OL is cumulative for that story or other levels exiting through that story.
- In areas without fixed seating—OL computed at the rate of one occupant per unit of area.
- In areas with fixed seating—OL is based on seating capacity.

### Minimum Required Egress Width Stairways

- Minimum width for Stairways
  - Occupant Load (0.L.) served multiplied by 0.3 (O.L. x 0.3-inches/Occupant)
  - For other than Group H and I-2, the minimum width is occupant load served multiplied by 0.15" IF
    - Building is equipped with an emergency voice/alarm communication system and
    - Building is equipped with a fire sprinkler system (NFPA 13 or 13R)
  - Minimum width for egress stairways shall be determined based solely on the occupant load of the story served by the stairway.

# Minimum Required Egress Width Other than stairways (Horizontial)

- Minimum width of all other egress components
  - Occupant Load (0.L.) served multiplied by 0.2" (O.L. x 0.2-inches/Occupant)
  - For other than Group H and I-2, the minimum width is occupant load served multiplied by 0.15" IF
    - Building is equipped with an emergency voice/alarm communication system and
    - Building is equipped with a fire sprinkler system (NFPA 13 or 13R)

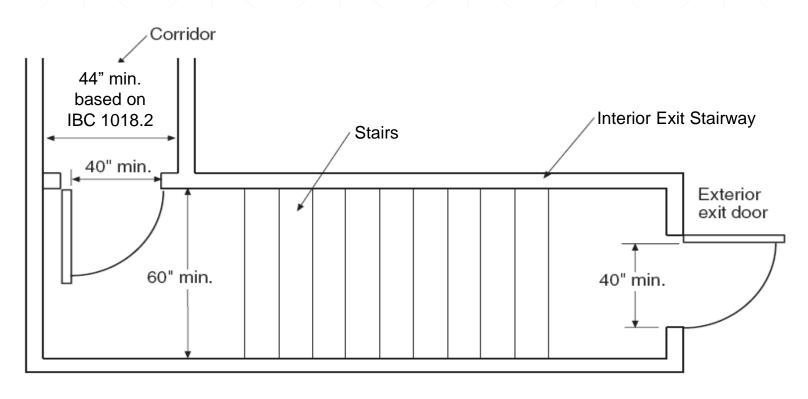
### **Application Example**

- Assuming exit serves 200 people
- Non-sprinklered building
- Occupancy other than H-1, H-2, H-3, H-4, or I-2

200 (occupants) x 0.3 (stairs) = 60" exit width

200 (occupants) x 0.2 (other egress) = 40" exit width

### **Application Example**



For SI: 1 inch = 25.4 mm

### **Common Path of Egress Travel - Section 1014.3**

- That portion of exit access which the occupants are required to traverse before two separate and distinct paths of egress travel to two exits are available.
- Paths that merge are common paths of travel.
- Common paths of egress travel shall be included within the permitted travel distance.

# Common Path of Egress Travel Section 1014.3

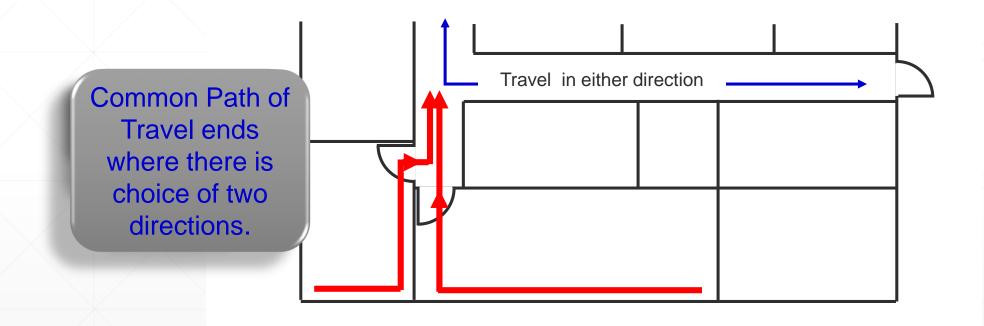


TABLE 1006.2.1 SPACES WITH ONE EXIT OR EXIT ACCESS DOORWAY

OCCUPANCY	MAXIMUM OCCUPANT LOAD OF SPACE	MAXIMUM COMMON PATH OF EGRESS TRAVEL DISTANCE (feet)		
		Without Sprinkler System (feet) Occupant Load		- With Sprinkler System (feet)
		A°, E, M	49	75
В	49	100	75	$100^{a}$
F	49	75	75	$100^{\rm a}$
H-1, H-2, H-3	3	NP	NP	25 <sup>b</sup>
H-4, H-5	10	NP	NP	75 <sup>b</sup>
I-1, I-2 <sup>d</sup> , I-4	10	NP	NP	75ª
I-3	10	NP	NP	$100^{a}$
R-1	10	NP	NP	75ª
R-2	10	NP	NP	125ª
R-3 <sup>e</sup>	10	NP	NP	125ª
R-4 <sup>e</sup>	10	75	75	125ª
$S^{f}$	29	100	75	100 <sup>a</sup>
U	49	100	75	75ª

For SI: 1 foot = 304.8 mm.

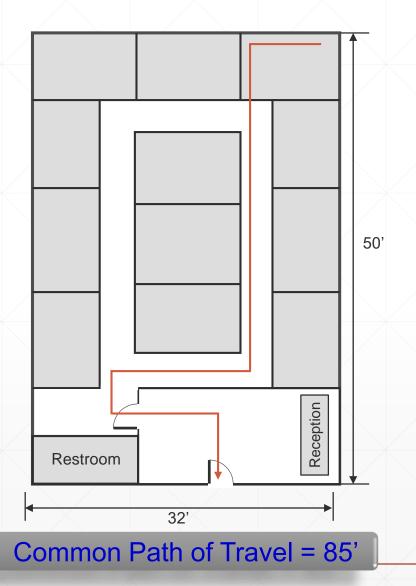
NP = Not Permitted.

- a. Buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2. See Section 903 for occupancies where *automatic sprinkler systems* are permitted in accordance with Section 903.3.1.2.
- b. Group H occupancies equipped throughout with an automatic sprinkler system in accordance with Section 903.2.5.
- c. For a room or space used for assembly purposes having fixed seating, see Section 1029.8.
- d. For the travel distance limitations in Group I-2, see Section 407.4.
- e. The length of common path of egress travel distance in a Group R-3 occupancy located in a mixed occupancy building or within a Group R-3 or R-4 congregate living facility.
- f. The length of common path of egress travel distance in a Group S-2 open parking garage shall be not more than 100 feet.

### Common Path of Egress Travel - Section 1006.2.1

- Building egress was evaluated based on Occupant Load
  - O.L. <u><</u>49
  - Non-Sprinklered Group B
  - Table 1006.2.1 requires 1 exit

2 exits required when the common path of travel is exceeded



#### Common Path of Travel - Section 1006.2.1

- Solutions
  - Add 2<sup>nd</sup> exit
  - Install fire sprinklers
  - Revise egress path

Common Path of Travel

Sprinklered Group B

O.L. ≤30 = 100'

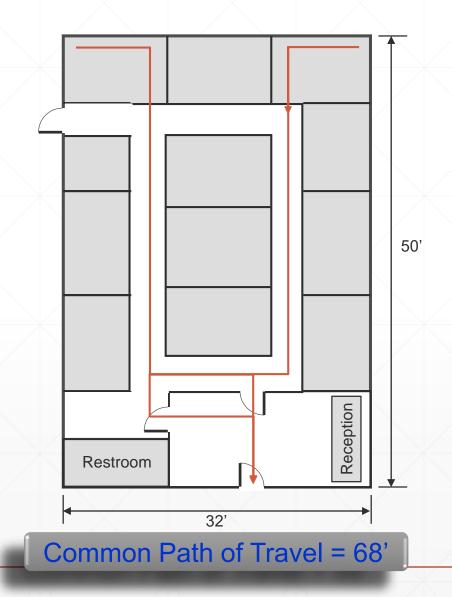


TABLE 1006.3.2(2)
STORIES WITH ONE EXIT OR ACCESS TO ONE EXIT FOR OTHER OCCUPANCIES

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

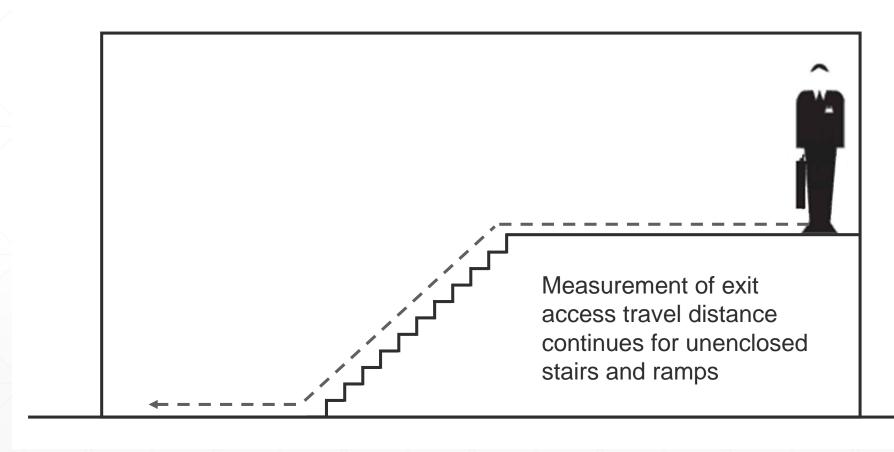
For SI: 1 foot = 304.8 mm.

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 1006.3.2(1).
- d. The length of exit access travel distance in a Group S-2 open parking garage shall be not more than 100 feet.

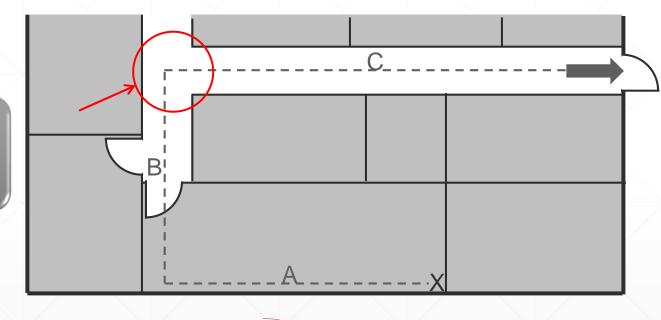
# **Exit Access Travel Distance Section 1017**



#### **Travel Distance Measurement**

Measurement is to "closest' exit

Choice of 2 directions of travel



A = 40 feet

B = 30 feet

C = 75 feet 145 feet

Common path of travel = 70'

Travel Distance = 145'

# TABLE 1017.2 EXIT ACCESS TRAVEL DISTANCE (a)

Occupancy	Without Sprinkler System (feet)	With Sprinkler System (feet)
A, E, F-1, M, R, S-1	200	250 <sup>b,e</sup>
I-1	Not Permitted	250 <sup>b</sup>
В	200	300°
F-2, S-2, U	300	400°
H-1	Not Permitted	75 <sup>d</sup>
H-2	Not Permitted	100 <sup>d</sup>
H-3	Not Permitted	150 <sup>d</sup>
H-4	Not Permitted	175 <sup>d</sup>
H-5	Not Permitted	200°
I-2,I-3	Not Permitted	200°
I-4	150	200°

#### Table 1016.2 - Footnotes

- a. See the following sections for modifications to exit access travel distance requirements:
  - Section 402.8 of the *International Building Code*: For the distance limitation in malls.
  - Section 404.9 of the *International Building Code*: For the distance limitation through an atrium space.
  - Section 407.4 of the *International Building Code*: For the distance limitation in Group I-2.
  - Sections 408.6.1 and 408.8.1 of the *International Building Code*: For the distance limitations in Group I-3.
  - Section 411.4 of the *International Building Code*: For the distance limitation in special amusement buildings.
  - Section 412.7 of the *International Building Code*: For the distance limitations in aircraft manufacturing facilities.
  - Section 1006.2.2.2: For the distance limitation in refrigeration machinery rooms.
  - Section 1006.2.2.3: For the distance limitation in refrigerated rooms and spaces.
  - Section 1006.3.2: For buildings with one exit.
  - Section 1017.2.2: For increased distance limitation in Groups F-1 and S-1.
  - Section 1029.7: For increased limitation in assembly seating.
  - Section 3103.4 of the *International Building Code*: For temporary structures.
  - Section 3104.9 of the *International Building Code*: For pedestrian walkways.

- b. Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2. See Section 903 for occupancies where automatic sprinkler systems are permitted in accordance with Section 903.3.1.2.
- c. Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.
- d. Group H occupancies equipped throughout with an *automatic sprinkler* system in accordance with Section 903.2.5.1.

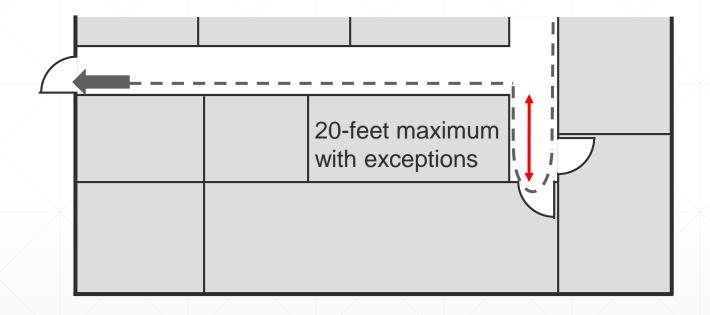
#### Dead-end Corridors - Section 1020.4

 Where more than one exit or exit access doorway is required, the exit access shall be arranged such that there are no dead ends in corridors >20' in length.

#### • Exceptions:

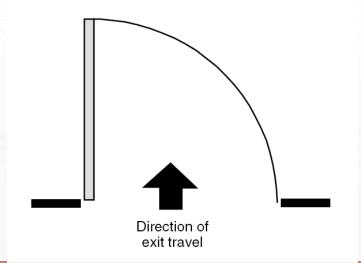
- 1. In Group I-3 Condition 2, 3 or 4 occupancies the dead end in a corridor shall not exceed 50 feet.
- In occupancies in Groups B, E, F, I-1, M, R-1, R-2, S and U, where the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, the length of the dead-end corridors shall not exceed 50 feet.
- 3. A dead-end corridor shall not be limited in length where the length of the dead-end corridor is less than 2.5 times the least width of the dead-end corridor.

### Dead-end Corridors Section 1020.4

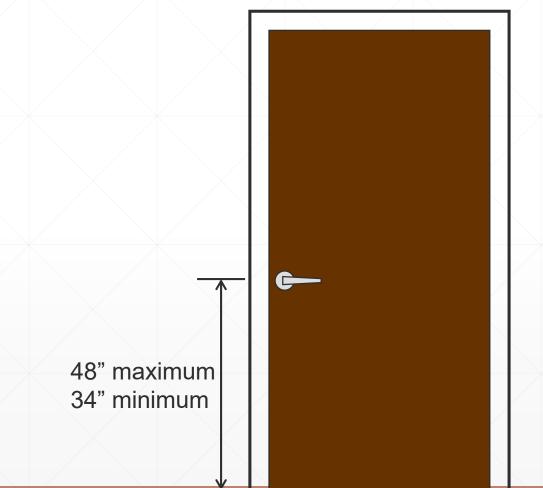


### **Door Swing - Section 1010.1.2**

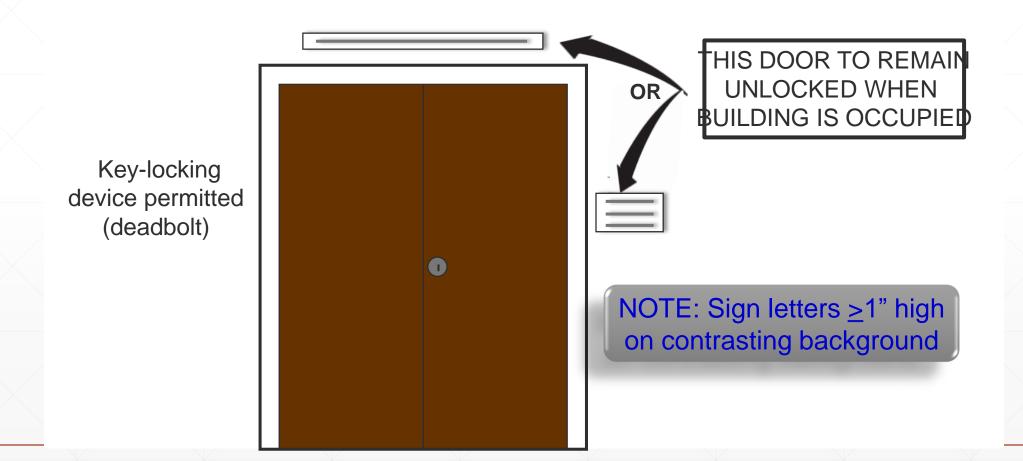
- Egress doors must swing in the direction of travel when serving
  - Occupant load ≥50, or
  - High hazard occupancies
  - Electrical rooms >6' wide with equipment rated ≥1,200 amperes and containing overcurrent devices, switching devices or control devices (IFC 1010.1.10)



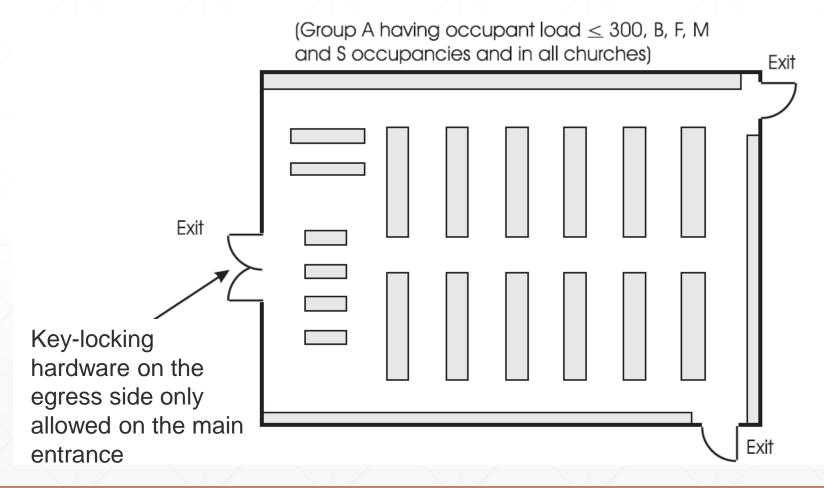
### Lock and Latch Height Section 1010.1.9.2



### **Key Locking Device Section 1010.1.9.4**



### Door Operations Section 1010.1.9.4



## Panic and Fire Exit Hardware Section 1010.1.10

- Panic hardware or fire exit hardware is required in:
  - Group H occupancies
  - Group A with an occupant load of ≥50
    - Exception for main exit when the OL <300, or it is a place of worship</li>
  - Group E with an occupant load of ≥50
  - Doors to electrical rooms >6' wide with equipment rated >1,200 amperes and containing overcurrent devices, switching devices or control devices



Courtesy of ASSA ABLOY Door Hardware

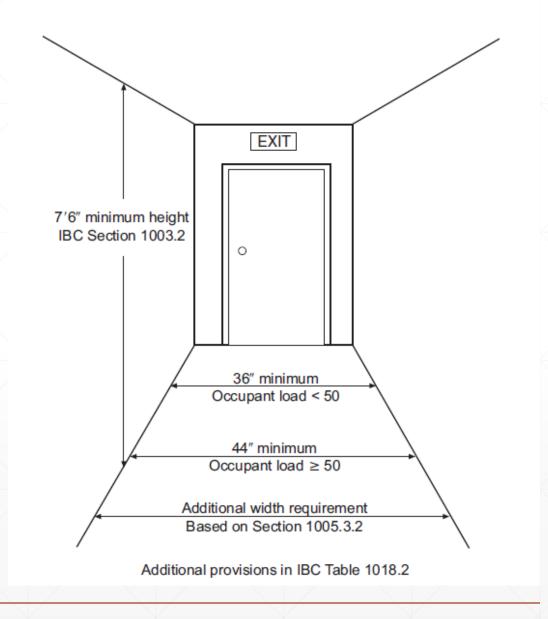
## **Corridors versus Exit Passageways**

Feature	Corridor	Exit Passageway
Component of egress	Exit access	Exit
One direction of travel	Possibly (limitations based on length and number of persons served)	Yes (single directional travel typically permitted)
Fire-resistance rated construction	Possibly (constructed as fire partition)	Yes (constructed as fire barrier)
Provides access to storage areas, mechanical rooms, etc.	Yes	No (except in covered mall buildings)

### **Table 1020.2 - Minimum Corridor Width**

OCCUPANCY	WIDTH (minimum)
Any facilities not listed below	44"
Access to and utilization of mechanical, plumbing or electrical systems or equipment	24"
With a required occupancy capacity less than 50	36"
In Group E with a corridor having a required capacity of 100 or more	72"
In corridors and areas serving stretcher traffic in ambulatory care facilities	72"
Group I-2 in areas where required for bed movement	96"

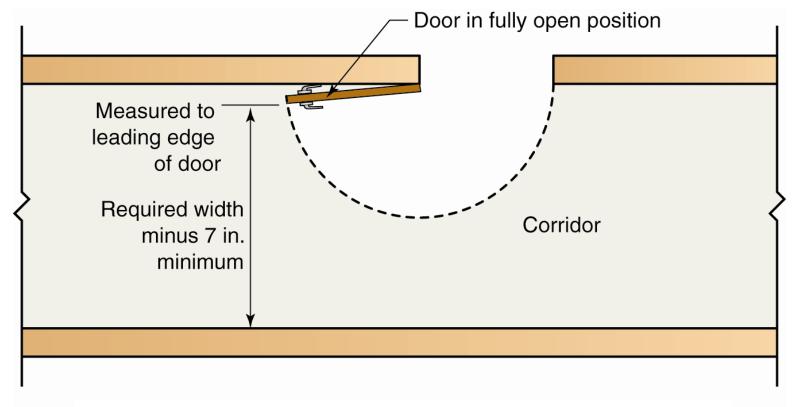
### Corridor and Exit Passageway Widths (Section 1020.2)



# Obstructions in Egress Width Section 1005.7

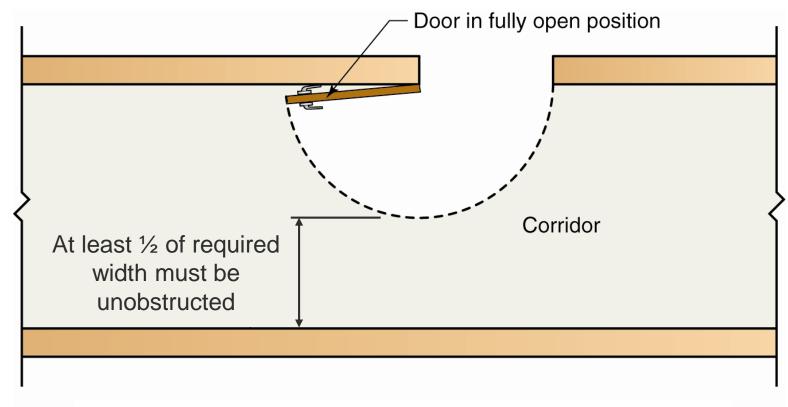
- Doors, when fully opened, and handrails shall not reduce the required means of egress width by more than 7-inches.
- Doors in any position shall not reduce the required width by more than ½.
- Other nonstructural projections such as trim and similar decorative features shall be permitted to project into the required width a maximum of 1½-inches on each side.
  - Exception: The restrictions on a door swing shall not apply to doors within individual dwelling units and sleeping units of Group R-2 and dwelling units of Group R-3.

### **Obstructions in Egress Width Section 1005.7**



Does not apply to dwelling units and sleeping units

### **Obstructions in Egress Width Section 1005.7**



Does not apply to dwelling units and sleeping units

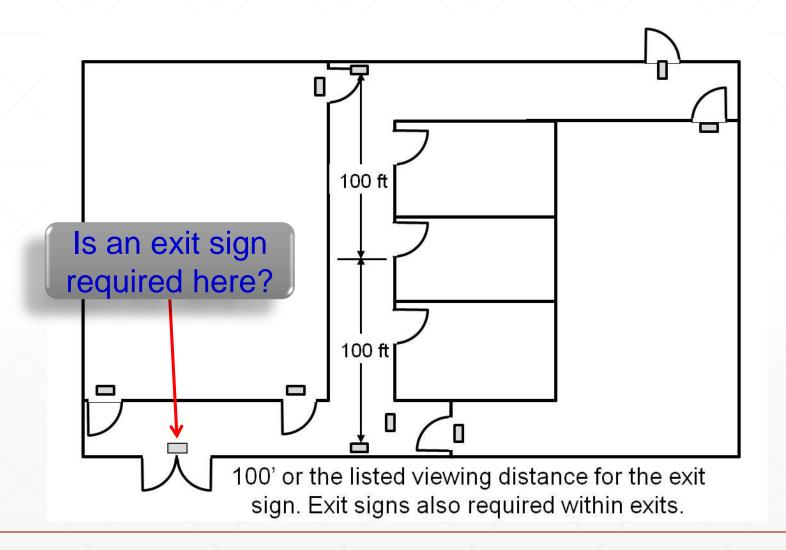
### Table 1020.1 CORRIDOR FIRE-RESISTANCE RATING

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

#### **Emergency Lighting and Exit Signs**

- Exit Signs
- Internally Illuminated Exit Signs
- Power Source
- Stairway Floor Number Signs
- Egress Illumination
- Illumination Emergency Power

#### **Exit Signs - Section 1013**

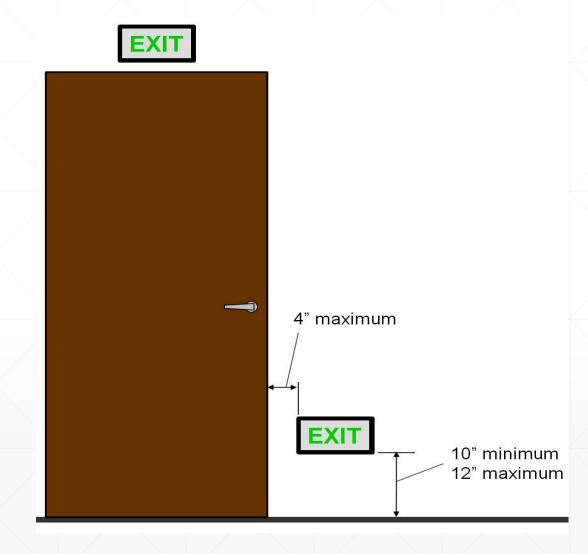


#### Exit Signs - Section 1011.1 - Exceptions

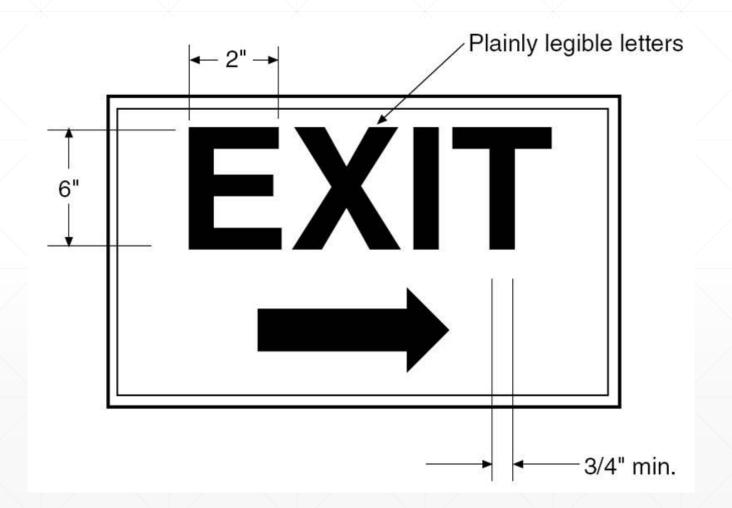
#### **Exit Signs Not Required In:**

- 1. Rooms or areas with 1 exit or exit access
- 2. Main exterior exit doors that are clearly identifiable as exits when approved by the building official
- 3. Group U occupancies and individual sleeping units or dwelling units in Groups R-1, R-2 or R-3
- 4. Sleeping areas in Group I-3
- 5. Group A-4 and A-5 occupancies on the seating side of vomitories

#### Floor Level Exit Signs Section 1013.2



#### Exit Signs - Section 1013.6.1



## Illumination of Exit Signs Sections 1013.5, 1013.6

- Exit signs shall be lighted at all times
- Lighting by one of the following methods:
  - Internally illuminated (IBC Section 1013.5)
  - Externally illuminated (IBC Section 1013.6)
  - Approved self-luminous type
- Tactile signs do not require illumination.





### **Self-luminous or Photoluminescent Section 1013.5**

- Listed and Labeled in accordance with UL 924.
- Installed in accordance with the manufacturer's instructions and Section 1203.
- Exit signs shall be illuminated at all times.



#### Power Source Section 1013.6.3

• Illumination required for a minimum of 90 minutes after power loss



### **Means of Egress Illumination Section 1008.1**

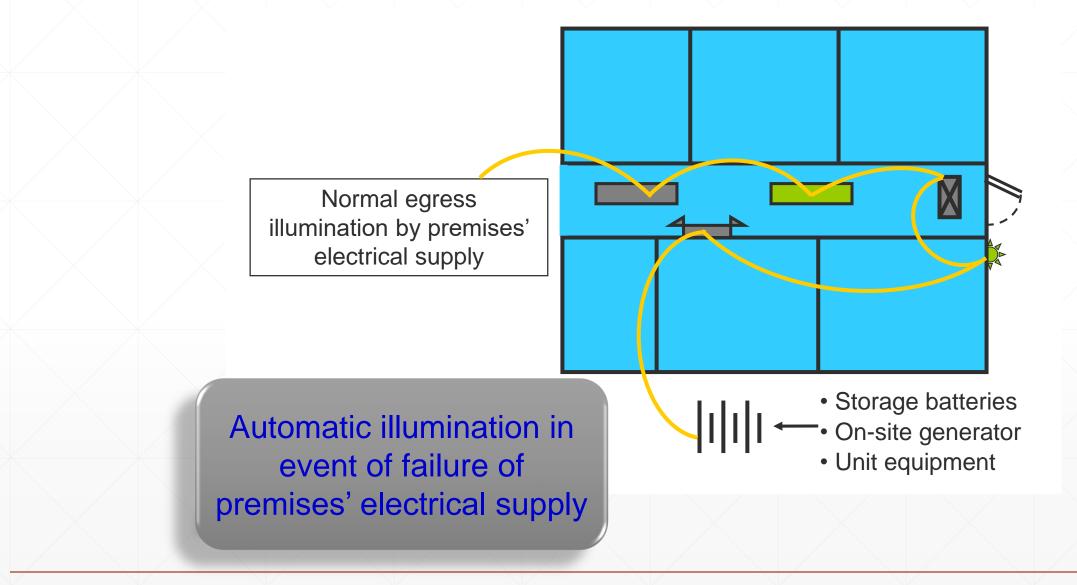
- Different than exit sign illumination
- But can be combined devices providing both exit sign illumination and means of egress illumination







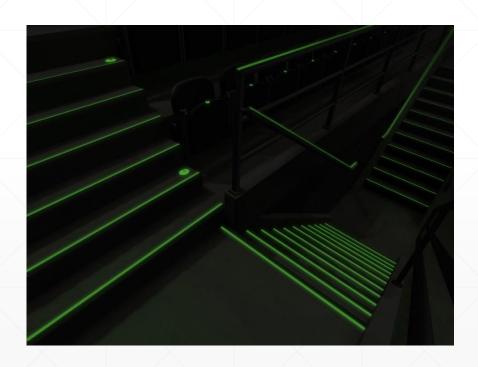
#### Illumination Emergency Power - Section 1008.3



### Luminous Egress Path Markings (Section 1025)

- High-rise Group A, B, E, I, M and R-1
- Egress path markings in interior exit stairways and exit passageways
- Markings on:
  - Stair treads
  - Landings
  - Handrails
  - Door Frames

- Listing:
  - UL 1994
  - ASTM E 2072 with specific conditions



### Fire Protection System

When the IFC Requires Them

## When the IFC Requires Fire Protection System

#### Fire protection systems required because of:

- The proposed occupancy in the fire area or the building.
- Proposed or Change in the occupant load of the building or occupancy.
- Building's height or area.
- The amount or hazards of the materials stored or used inside of a building.
- The fire loss history of the given hazard.

#### **Chapter 9 Arrangement**

- Chapter 9 is divided into 14 sections, including:
  - 901: General
  - 902: Definitions
  - 903: Automatic Sprinkler Systems
  - 904: Alternative Fire Extinguishing Systems
  - 906: Portable Fire-extinguishers
  - 907: Fire Alarm and Detection Systems
  - 908: Emergency Alarm Systems
  - 909: Smoke Control Systems
  - 910: Smoke And Heat Removal
  - 914: Fire Protection Based on Special Detailed Requirements of Use and Occupancy

#### **Fire Area Application**

• In mixed occupancy buildings housing Group H-5, I-1, I-2, I-3 or Group R fire areas, the IFC requires automatic sprinklers throughout the building.



Juvenile Detention Center

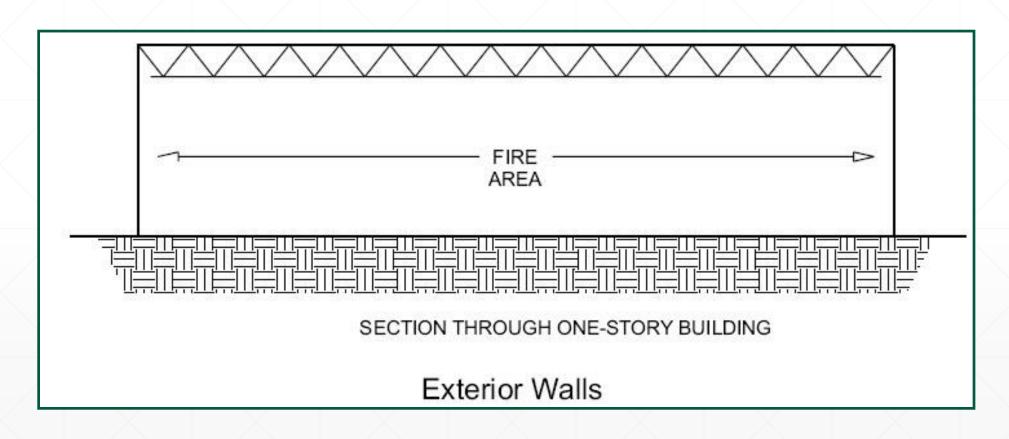


Group Home

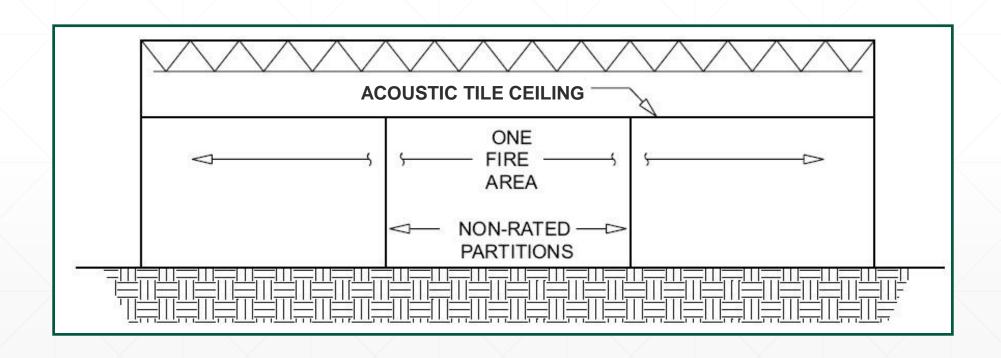
#### **Fire Area Application**

- When fire walls are used to create a separate building and fire area, the hourly fire-resistance rating shall comply with IBC Section 706.4.
- When fire barriers are used to create separate fire areas, the hourly fireresistance rating shall comply with IBC Section 707.3.10.
- In mixed occupancy buildings housing Group H-5, I-1, I-2, I-3 or Group R fire areas, the IFC requires automatic sprinklers throughout the building.

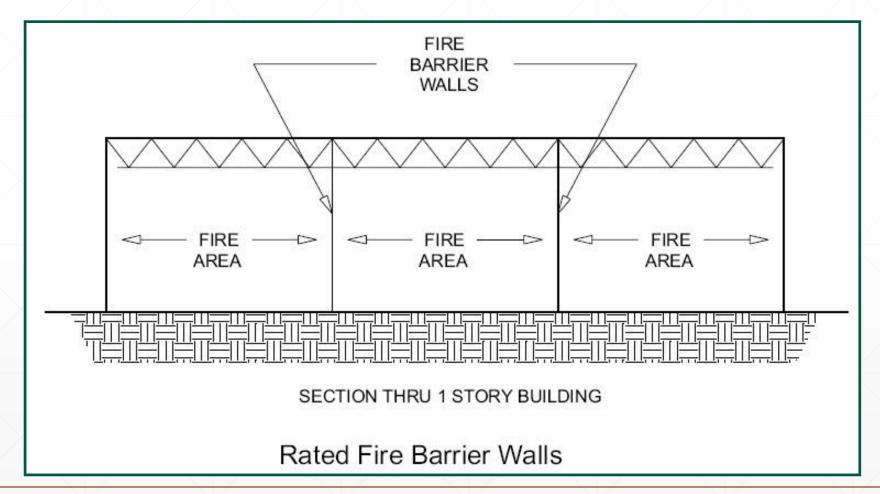
## Fire Area Bounded by Wall, Floor and Roof Elements



## Fire Area Bounded by Exterior Walls, Floor and Roof

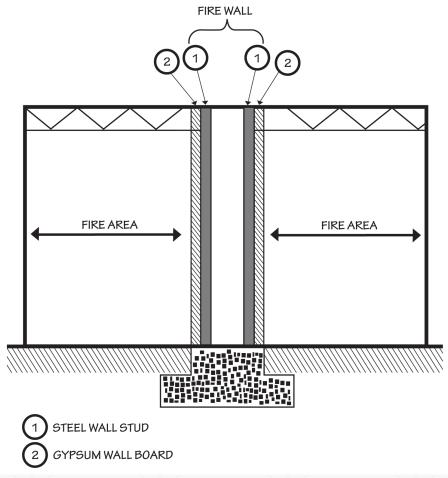


## Fire Area Compartmentalized Using Fire Barriers



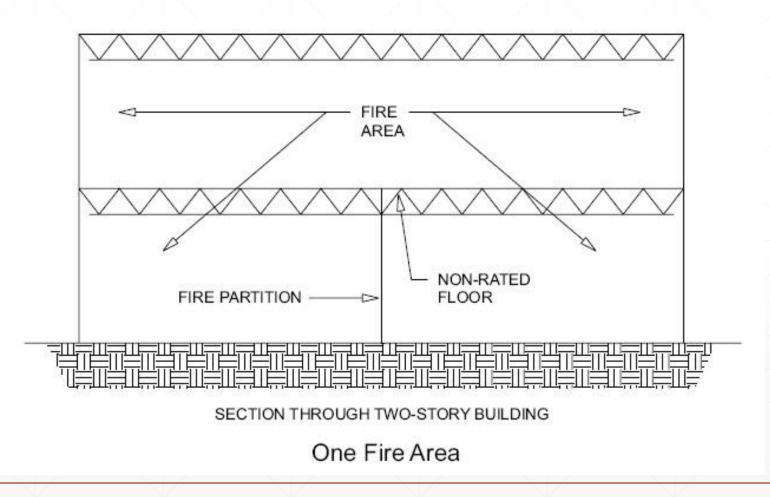
2012 IFC Fire Protection Systems

# Fire Area Separated Using a Fire Wall

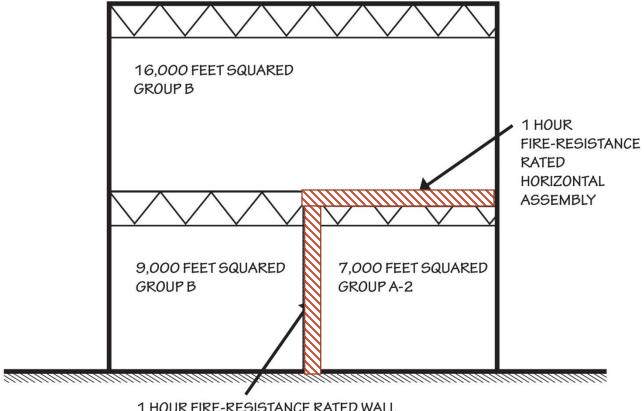


2012 IFC Fire Protection Systems

## Fire Area Bounded by Wall, Floor and Floor-Ceiling Elements



#### **Determine the Fire Areas**



1 HOUR FIRE-RESISTANCE RATED WALL (IBC TABLE 508.4)

## IFC Section 903.3 Design and Installation Requirements

- Before reviewing the 2018 IFC requirements for an automatic sprinkler system, it is important to understand the NFPA construction standards and how these systems are designed and function.
- NFPA publishes three standards governing the design, erection, testing and acceptance of automatic sprinkler systems:
  - NFPA 13—Installation of Sprinkler Systems
  - NFPA 13R—Sprinkler Systems for Residential Occupancies up to and Including Four Stories in Height
  - NFPA 13D—Sprinkler Systems for One- and Two-Family Dwellings and Manufactured Housing

2012 IFC Fire Protection Systems

#### **Application Matrix - NFPA Sprinkler Standards**

NFPA STANDARD	NFPA SPRINKLER STANDARD				
DESIGN CONSIDERATION	NFPA 13	NFPA 13R	NFPA 13D (IRC P2904)		
Extent of Protection	Throughout the building (IFC Section 903.3.1.1)	Occupied spaces (IFC Section 903.3.1.2)	Occupied spaces (IFC Section 903.3.1.3)		
Design Intent	Life Safety & Property Protection	Life Safety	Life Safety		
Applicability	All IBC & NFPA Occupancies	Group R Occupancies to 4 stories	One- & Two- family dwellings & Townhomes		
Design Methods	Pipe schedule; Control mode – discharge density/design area; Control mode – specific application; Suppression mode	4- sprinklers/compartment	2- sprinklers/compartment (Designs using IRC P2904 are prescriptive)		
Sprinklers	All listed & approved types	Listed Residential	Listed Residential		
Minimum H <sub>2</sub> O Supply Duration	120 to 30 minutes depending on the design	30 Minutes	10 Minutes		

### Permitted Increases - Type of Sprinkler System

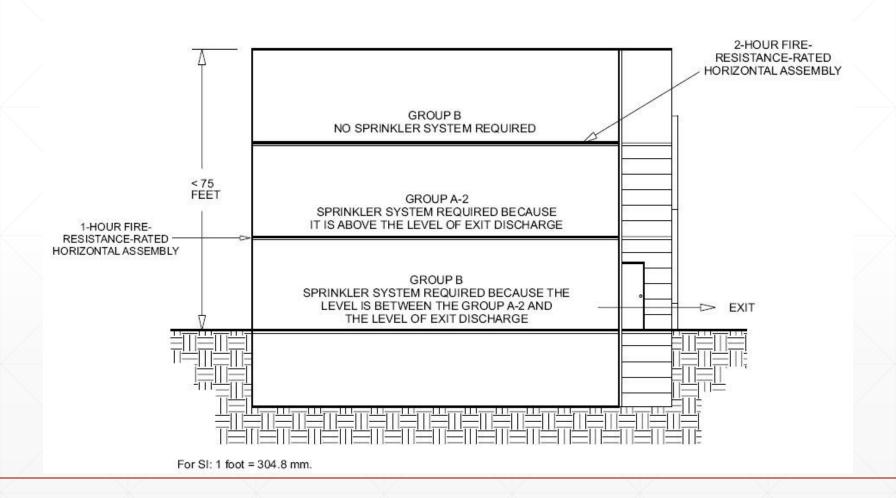
Code Section	Modification		NFPA 13 NFPA 13R NFPA 13D		
IBC Table 504.3	Building Height	Yes	Yes	No	
IBC Table 506.2	Building Area	Yes	No	No	
IBC 507.3 & 507.4	Unlimited building area for certain occupancies		No	No	
IFC 503.1.1	Increased distance between buildings and FD access roads		Yes	Yes	
IFC 507.5.1	Hydrant spacing increased to 600 feet		Yes	No	
IFC 1005.3	Egress width/occupant		Yes	No	
IFC Table 1017.2	Means of egress travel distance		Yes	No	
IFC Table 5003.1.1(1) & (2)	100% increase in the MAQ for certain hazardous materials	Yes	No	No	
IFC Table 5003.11.1	100% increase in the MAQ for nonflammable solid and nonflammable and noncombustible liquid hazardous materials in Group M & S occupancies	Yes	No	No	

# Automatic Sprinkler Requirements

#### **Group A-2 Occupancies**

- IFC Section 903.2.1.2
- Requires protection when one of the following conditions exists:
  - The fire area exceeds 5,000 square feet.
  - The fire area occupant load is 100 or more.
  - The fire area is located on a floor other than a level of exit discharge.

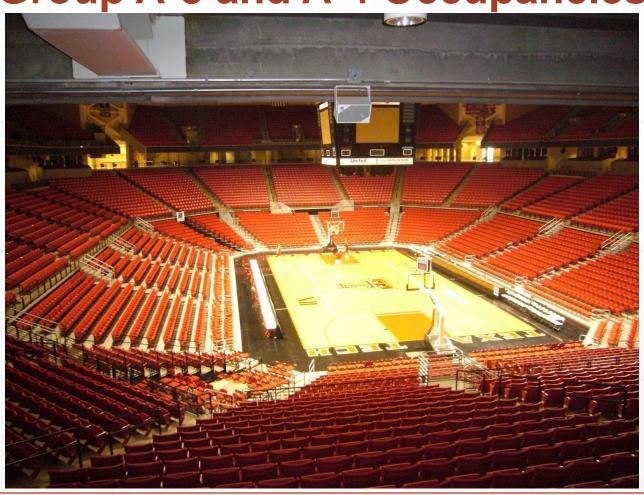
#### **Group A-2 Occupancies**



#### **Group A-3 and A-4 Occupancies**

- IFC Sections 903.2.1.3 and 903.2.1.4
- Require automatic sprinkler protection when one of the following conditions exist:
  - The fire area is > 12,000 square feet.
  - The occupant load is 300 or more.
  - The fire area is located on a floor other than a level of exit discharge.

**Group A-3 and A-4 Occupancies** 



#### **Ambulatory Care Facilities (ACF)**



- IFC Section 903.2.2
- Installed throughout the entire floor containing an ACF facility where either of the following conditions exist at any time:
- 1. Four or more care recipients are incapable of selfpreservation.
- 2. One or more care recipients that are incapable of selfpreservation are located at other than the level of exit discharge serving such a facility.
- In buildings where ACF is provided on levels other than the level of exit discharge, an automatic sprinkler system shall be installed throughout the entire floor as well as all floors below where such care is provided, and all floors between the level of ambulatory care and the nearest level of exit discharge, the level of exit discharge, and all floors below the level of exit discharge.
- Exception: Floors classified as an open parking garage are not required to be sprinklered.

#### **Group F-1 Occupancies**

- IFC Section 903.2.4
  - 1. Group F-1 fire area exceeds 12,000 square feet.
  - 2. Group F-1 fire area is located more than three stories above grade plane.
  - 3. Combined area of all Group F-1 fire areas on all floors, including any mezzanines, exceeds 24,000 square feet.
  - 4. Group F-1 occupancy used for the manufacture of upholstered furniture or mattresses exceeds 2,500 square feet.



#### **Woodworking Operations**

#### IFC Section 903.2.4.1

- Fire area is > 2,500 square feet; and
- The process generates finely divided waste or uses finely divided material.



### **Group H Occupancies**



- IFC Section 903.2.5 requires an automatic sprinkler system in all Group H occupancies.
- IFC Section 5004 requires automatic sprinkler systems be designed using a minimum Ordinary Hazard Group 2 density based on a 3,000square-foot design area.
  - 0.17 gpm/ft² in a 3,000-square-foot design area.

### **Group H-5 Occupancies**

- For H-5 occupancies, IFC Section 903.2.5.2 requires automatic sprinkler protection throughout the building.
- IFC Table 903.2.5.2 establishes the design criteria for automatic sprinklers based on the location in the building.



### **Group I Occupancies**

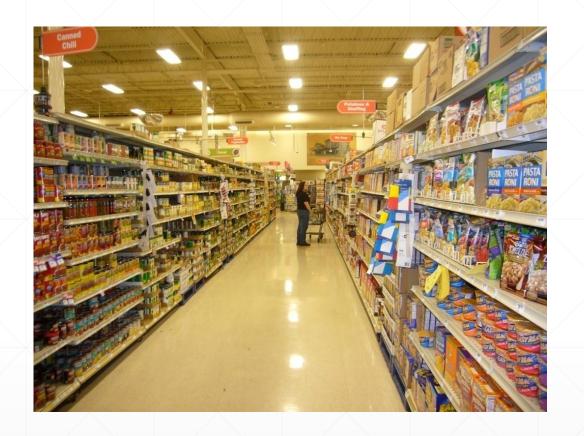
- Buildings housing Institutional uses require automatic sprinkler protection throughout the building, regardless of the area of the I occupancy.
- In Group I-1 occupancies, IFC Section 903.2.6 permits the installation of NFPA 13R or 13D systems.
- In I-2 occupancies, IFC Section 903.3.2 requires the installation of QR or residential sprinklers throughout smoke compartments housing patient sleeping rooms.



### **Group M Occupancies**

IFC Section 903.2.7 when one of the following conditions exists:

- Fire area is > 12,000 square feet.
- Group M fire area is more than 3 stories above the grade plane.
- The combined area of all Group M fire areas on all floors (including mezzanines) exceeds 24,000 square feet.
- Group M Occupancy used for the display and sale of upholstered furniture or mattresses exceeds 5,000 ft<sup>2</sup>



### **Group M Occupancies**



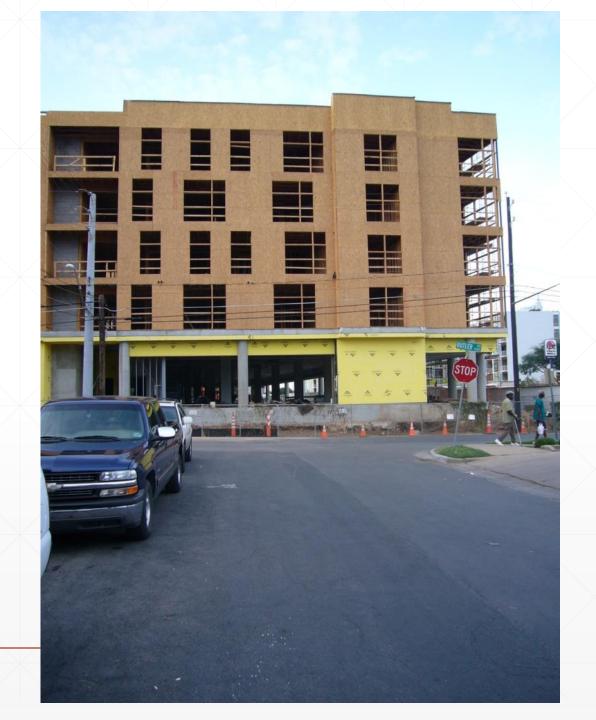
- In Group M occupancies containing high piled-storage, IFC Section 903.2.7.1 requires the building and the automatic sprinkler system to also comply with Chapter 32.
- Group M occupancies storing highhazard commodities require automatic sprinkler protection when:
  - The height of storage is > 6 feet; and
  - The storage area is > 500 square feet.

### **Group R Occupancies**

- IFC Section 903.2.8 requires automatic sprinkler protection throughout buildings housing a Group R fire area.
- One- and two-family dwellings and townhomes require automatic sprinkler protection in accordance with the 2018 International Residential Code.

#### **Pedestal/Podium Construction**

- IBC Section 510
- Addresses Group R occupancies mixed with Group A, B, M or S occupancies.
- Depending on the construction and the building's height and area, the design of the automatic sprinkler system may be based on either:
  - NFPA 13
  - NFPA 13R
  - Combination of NFPA 13 and 13R.



### Pedestal/Podium Construction (continued)



#### **Pedestal/Podium Construction**



NFPA 13 Design

### **Group S-1 Occupancies**

- IFC Section 903.2.9 Requires automatic sprinkler protection when one of the following conditions exists:
- 1. Fire area is > 12,000 square feet.
- 2. Group S-1 fire area is located more than three stories above the grade plane.
- Combined area of all Group S-1 fire areas on all floors (including mezzanines) exceeds 24,000 square feet.
- 4. Storage of commercial trucks or buses when the fire area is > 5,000 square feet.
- 5. Storage of upholstered furniture or mattresses exceeds 2,500 ft<sup>2</sup>.



### **Group S-1 Repair Garages**

- IFC Section 903.2.9.1 Automatic sprinkler system shall be provided throughout all buildings used as repair garages in accordance with Section 406.8 of the IBC, as shown:
- 1. Buildings having two or more stories above grade plane, including basements, with a fire area containing a repair garage exceeding 10,000 square feet.
- 2. Buildings not more than one story above grade plane, with a fire area containing a repair garage exceeding 12,000 square feet.
- 3. Buildings with repair garages servicing vehicles parked in basements.
- 4. A Group S-1 fire area used for the repair of commercial motor vehicles where the fire area exceeds 5,000 square feet.



### **Group S-2 Enclosed Parking Garages**

- IFC Section 903.2.10 Automatic sprinkler protection shall be provided throughout buildings classified as enclosed parking garages in accordance with Section 406.6 of the IBC where either of the following conditions exists:
- 1. Where the fire area of the enclosed parking garage exceeds 12,000 square feet.
- 2. Where the enclosed parking garage is located beneath other groups.

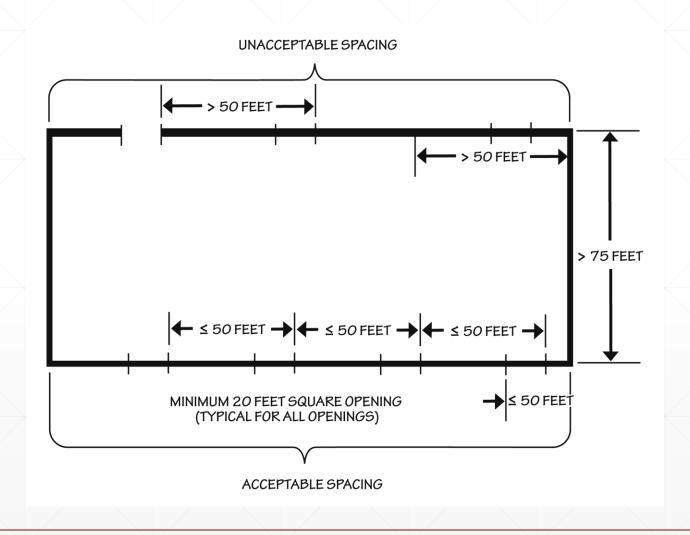
Exception: Enclosed parking garages located beneath Group R-3 occupancies.



#### **Basements and Stories without Windows**

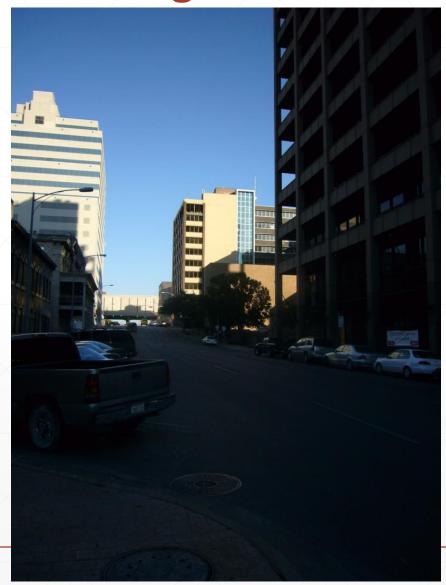
- IFC Section 903.2.11
- Requires automatic sprinklers in basements and building stories without windows when:
  - The basement floor area is > 1,500 square feet.
  - The travel distance to exit discharge doors or windows is > 75 feet.
  - The area and spacing of egress or rescue openings does not meet Section 903.2.11.1

### **Basements and Stories without Windows**



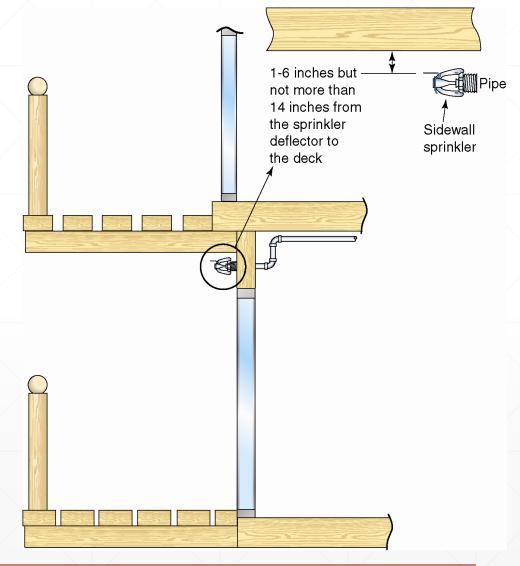
# **Buildings 55 Feet or More in Height**

- IFC Section 903.2.11.3 An automatic sprinkler system shall be installed through-out buildings that have one or more stories with an occupant load of 30 or more located 55 feet or more above the lowest level of fire department vehicle access, measured to the finished floor.
- Exceptions:
  - 1. Open parking structures.
  - 2. Occupancies in Group F-2.



### Balconies and Decks (903.3.1.2.1)

- In buildings of Type V construction, balconies, decks and patios require sprinkler protection provided a roof or deck is located above.
- The sprinklers must be installed within 1-6 inches of a structural member and no more than 14 inches below the deck.



### **Quick-response and Residential Sprinklers**

- IFC Section 903.3.2
- Requires the installation of quick-response or residential sprinklers in:
  - Spaces within a Group I-2 smoke compartment containing patient sleeping areas.
  - Dwelling and sleeping units in Group I-1 and R-2 occupancies.
  - Spaces with a smoke compartment containing treatment rooms in ambulatory health care facilities
  - Any light-hazard occupancy as defined in NFPA 13.



## **Sprinkler System Monitoring and Alarms**

- Water-flow switches, pressure switches and valves that control the water supply for an automatic sprinkler system must be electrically supervised.
- IFC Section 903.4 contains seven exceptions for one- and two-family dwellings, limited area systems, certain control valves and valve trim.



### **Sprinkler System Alarm Signals**

- IFC Section 903.4.1
- Requires alarm signals be sent to an approved station.
- The code official can permit the alarm signal to sound an audible alarm at a constantly attended location.



Photo courtesy of Property Protection Inc.

### IFC Section 901.2 Construction Documents

- Fire code officials are authorized to require the submittal, review and approval of design drawings and calculations for fire protection systems.
- A contractor's statement of compliance to document that the system complies with the applicable NFPA standards can also be required when IFC Section 901.2.1 is applied.

# IFC Section 901.7 Systems Out of Service

- Fire protection system impairment (systems out of service) is a critical event that must be reported to a code official.
- Impairment of fire protection systems requires:
  - An individual be designated as the impairment coordinator. (IFC Section 901.7.1).
  - A plan of action for the impairment.

\$U.S GPO: 2001-674-953

No. 11500

## FIRE PROTECTION SYSTEM OR COMPONENT OUT OF SERVICE

REMOVAL BY AUTHORIZED PERSONNEL ONLY
ATTACH TO SYSTEM OR COMPONENT OUT OF SERVICE

TECH AREA:	BLDG:	FLOOR: V	VING:
FIRE PROTECTION WA	ATER CONTROL	VALVE NO:	
HYDRANT NO:			
SYSTEM NO:			
ALARM INITIAT	ING DEVICE	S: (CHECK ONE)	
PS[], FS[],	HD[], SD	[ ], MPS [ ], PJV S	WITCH [ ]
		TCH [ ], ZONE CIRCUIT	
SPRINKLER SYSTEM			
HALON SYSTEM[],	CO2 S	SYSTEM [ ]. FIRE	EDOOR[],
FIRE PUMP[],			
DESCRIPTION O	F IMPAIPM	ENT.	
DESCRIPTION O	TIVITALKVI	E111.	
AUTHORIZED BY:			
	MPONENT O	OUT OF SERVICE	
DATE	TIME	NAME	
1 /	:		
RESTORED TO S	ERVICE:		
DATE / /	TIME	SIGNATURE	
WORK PERFORMED	: h:		
100			
POST OUTAGE TEST	& VERIFICATI	ION:	
<ol> <li>2" SPRINKLER DR</li> </ol>	AIN TEST: STA	TICPSI, FLOW	VPSI
2. ALARM INIȚIATII	NG DEVICE TES	T AND ALARM VERIFICAT	TION
BRASS NO		ZONE	
3. OTHER:			<del></del>
OBSERVERS (OR WI	INESSES)		
VERIFIED FOR	SSS BY:		
DATE/	/ SIGN	ATURE	
VERIFIED FOR	LANL FIRE PRO	OTECTION:	
DATE/	/ SIGN	ATURE	
SSS COPY		LANL FIRE PROTECTION	N Form .008 Rev. 5/01

### Standpipe Systems (IFC 905.3)

- Standpipes are required by the IFC in buildings or areas to assist in manual fire-fighting operations.
- Standpipe systems shall be installed throughout buildings where any of the following conditions exist:
- 1. Four or more stories are above or below grade plane.
- 2. The floor level of the highest story is located more than 30 feet above the lowest level of the fire department vehicle access.
- 3. The floor level of the lowest story is located more than 30 feet below the highest level of fire department vehicle access.
- 4. When the occupant load of a Group A occupancy is > 1,000.
- Covered mall buildings.
- 6. Stages with an area > 1,000 ft<sup>2</sup>.
- 7. Underground buildings.
- 8. Marinas and boatyards in accordance with NFPA 303.

# **Commercial Cooking Systems**

- IFC Section 904.11
- Requires all commercial cooking systems be protected using a UL300 or an automatic sprinkler system listed for this application.
- Systems must be installed in accordance with their listing and the manufacturer's installation instructions.



# Commercial Cooking Appliances Defined IFC Section 202:

 Appliances used in a commercial food service establishment for heating or cooking food and which produce grease vapors, steam, fumes, smoke or odors that are required to be removed through a local exhaust ventilation system.



# Commercial Cooking Appliances Such Appliances Include:

- Deep fat fryers;
- Upright broilers;
- Griddles;
- Broilers;
- Steam-jacketed kettles;
- Hot-top ranges;
- Under-fired broilers (charbroilers);

- Ovens;
- Barbecues;
- Rotisseries;
- Similar appliances.
- For the purpose of this definition, a food service establishment shall include any building or a portion thereof used for the preparation and serving of food.

# Fire Alarm and Detection Systems

IFC Section 907

### **Fire Alarm and Detection Systems**

- IFC Section 907 specifies the requirements for installation, performance and maintenance of fire alarm and detection systems.
- The IFC contains requirements for new buildings in IFC Section 907.2. IFC Section 907.9 contains requirements for the retroactive installation of fire alarm and detection systems.
- Retroactive requirements are limited to Group E, I and R occupancies and are found in Chapter 11, Construction Requirements for Existing Buildings.

### **Layout of Section 907**

- 907.1 General requirements
- 907.2 Where required New Buildings and Structures
- 907.3 Fire safety functions
- 907.4 Initiating devices
- 907.5 Occupant notification devices
- 907.6 Installation of fire alarm and detection systems
- 907.7 Acceptance tests and completion
- 907.8 Inspection, testing and maintenance
- 907.9 Where required in existing building

### Purpose of a Fire Alarm and Detection System

A fire alarm and detection system can be designed to perform several functions:

- Providing notification of an emergency.
- Monitoring and notification of supervisory and trouble signals.
- Alerting the occupants.
- Summoning aid.
- Controlling fire safety functions.



Photograph courtesy of Siemens Building Systems Inc.

#### **Construction Documents**

- IFC Section 907.1.1 Requires the submittal to the fire code official of construction documents, to include:
  - Show drawings
  - Equipment data sheets

• IFC Section 907.1.2 - Specifies the minimum requirements for any plan submittal.

# Required Systems for New Buildings (Change of Use)

• IFC Section 907.2 specifies the requirements for fire alarm and detection systems for all new buildings (Change of Use).

The installed system must comply with NFPA 72, National Fire Alarm Code.

 IFC Section 907.1.3 requires the components be listed and approved for the particular application.

### **Group A Occupancies - IFC Section 907.2.1**

- Manual fire alarm system that activates the occupant notification system in Group A occupancies with an occupant load of 300 or more.
- In sprinklered buildings, manual fire alarm boxes are not required when the occupant notification system activates upon sprinkler water flow.



### **Group A Occupancies - IFC Section 907.2.1.1**

- Requires a emergency voice/alarm communication system that complies with IFC Section 907.5.2.2 in Group A occupancies with an occupant load of 1,000 or more.
- This system must be connected to a source of emergency power.



### **Group B Occupancies - IFC Section 907.2.2**

- Requires a manual fire alarm system in Group B occupancies with an occupant load of 500 or more,
- When more than 100 persons are located above or below the lowest level of exit discharge,
- Or in fire areas housing an ambulatory health care facility.
- In sprinklered buildings, manual fire alarm boxes are not required when the occupant notification appliances activate upon sprinkler water flow.



### **Group F Occupancies - IFC Section 907.2.4**

- Requires a manual fire alarm system in Group F occupancies that:
  - Are two or more stories in height.
  - Have an occupant load of 500 or more above or below the lowest level of exit discharge.
- In sprinklered buildings, manual fire alarm boxes are not required when the occupant notification appliances activate upon water flow.



### **Group I Occupancies**

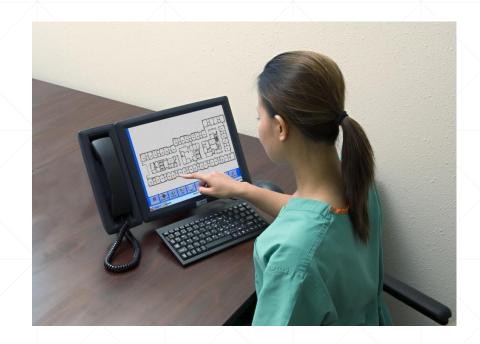


- IFC Section 907.2.6 requires a manual fire alarm system in all Group I occupancies.
- The requirements for an automatic smoke detection system will vary based on the occupancy classification.

## **Group I Occupancies**

- 1. Manual fire alarm boxes in sleeping units of Group I-1 and I-2 occupancies are not required at exits if located at all care providers' control stations or other constantly attended staff locations, provided that such manual fire alarm boxes are visible and provided with ready access, and the distances of travel required in Section 907.4.2.1 are not exceeded.
- 2. Occupant notification systems are not required to be activated where private mode signaling installed in accordance with NFPA 72 is approved by the fire code official and staff evacuation responsibilities are included in the fire safety and evacuation plan required by Section 404.

- IBC Section 407.7 and IFC Section 907.2.6.2 require an automatic fire detection system in open corridors of Group I-2 occupancies.
- Exception 1 permits the use of smoke detection in the patient sleeping room.
   Detector activation shall initiate a visible alarm in the corridor and an audible and visual alarm at the nurse's station.



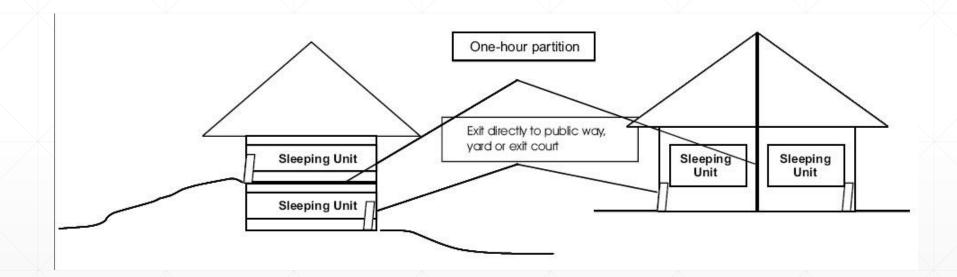
• IFC Section 907.2.6.2, Exception 2, does not require smoke detection in corridors of Group I-2 occupancies when the patient sleeping unit doors are equipped with smoke detection and automatic door closing devices.



Photograph courtesy of ASSA ABLOY Door Security Solutions, New Haven CT

IFC Section 907.2.8.1 requires a manual fire alarm system in Group R-1 occupancies.

- Exception 1 does not require this system when:
  - The building is not more than 2 stories in height.
  - Sleeping units, attics & crawl spaces have a minimum 1-hour separation.
  - Each individual sleeping unit has an exit directly to a public way, exit court or yard.



- Exception 2 of IFC Section 907.2.8.1 eliminates manual fire alarm boxes when:
  - The building is protected by an NFPA 13 or 13R automatic sprinkler system.
  - Notification appliances activate upon sprinkler flow.
  - One manual fire alarm box is installed at an approved location.



- In Group R-1 occupancies with interior corridors serving sleeping rooms, IFC Section 907.2.8.2 requires an automatic fire alarm system.
  - The exception does not require the fire alarm system when the sleeping unit means of egress door opens directly to an exterior exit access.



- IFC Section 907.2.9 requires a manual fire alarm system in R-2 occupancies when:
  - Any dwelling unit is located 3 or more stories above the lowest level of discharge.
  - Any dwelling unit is located more than one story below the highest level of exit discharge.
  - Buildings house more than 16 dwelling or sleeping units.



- IFC Section 907.2.9, Item 3, Exception 2, exempts manual fire alarm boxes when:
  - The building is protected by an NFPA 13 or 13R automatic sprinkler system.
  - Occupant notification devices activate upon sprinkler flow.



## **Special Amusement Buildings**

A special amusement building represents a high fire and life safety challenge based on its definition in IFC Section 202 and IBC Section 411.2:

A building that is temporary, permanent or mobile that contains a device or system that conveys passengers or provides a walkway along, around or over a course in any direction as a form of amusement arranged so that the egress path is not readily apparent due to visual or audio distractions or an intentionally confounded egress path, or is not readily available because of the mode of conveyance through the building or structure.

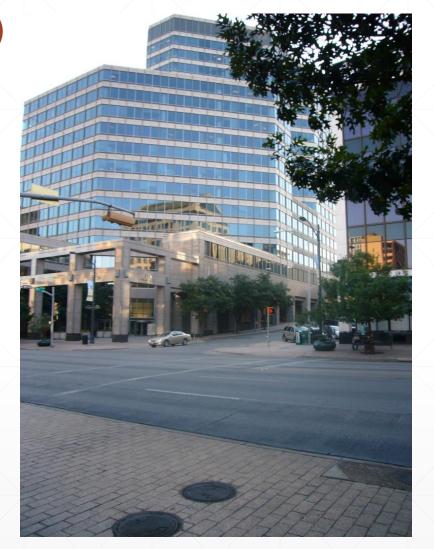
## **Special Amusement Buildings**

- IFC Section 907.2.12 specifies requirements for the activation of smoke or fire detection system:
  - Illuminate the means of egress and shut off sound and any source that confuses occupants attempting to egress.
  - System response requirements.
  - An emergency voice/alarm communication system.



## High-Rise Buildings (IFC Section 907.2.1)

- Automatic Smoke Detection:
- Each mechanical equipment, electrical, transformer, telephone equipment or similar room that is not provided with sprinkler protection.
- Each elevator machine room, machinery space, control room and control space and in elevator lobbies.
- 3. Air handling systems Duct Smoke Detectors.
- Emergency voice/alarm.
- Fire department communication systems.



## **Duct Smoke Detection**

IFC Section 907.3.1

Duct smoke detectors are required by IMC Section 602 when:

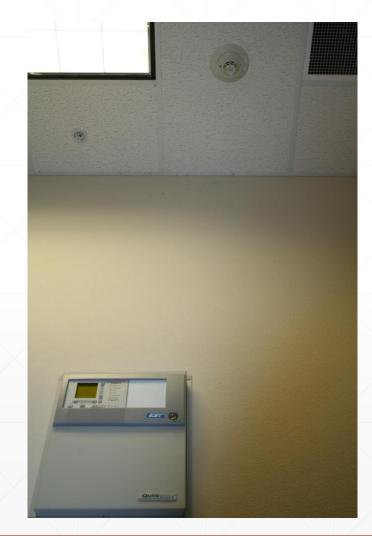
- Return air systems have a capacity > 2,000 CFM.
- Common supply and return air systems have a capacity > 2,000 CFM.
- Return air risers serving two or more stories have a design capacity > 15,000 CFM.



Photograph courtesy of Air Products and Control, Inc., Pontiac MI

## **Protection of the Fire Alarm Control Unit**

- IFC Section 907.4.1
- Fire alarm control unit must be protected by a single smoke or heat detector when the unit is not located in a conspicuously occupied area.



## **Manual Fire Alarm Boxes**

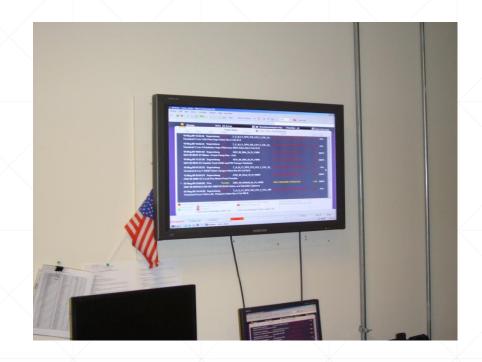
IFC Section 907.4.2.

- Located a maximum of 5 feet from each exit and have a maximum travel distance of 200 feet.
- Activation handle is 42-48" AFF.
- Red in color.
- Can be equipped with protective covers.



## **Occupant Notification Systems**

- NFPA 72 defines a notification appliance as a fire alarm component that provides audible, tactile or visible outputs, or any combination thereof.
- IFC Section 907.5 establishes requirements for all occupant notification systems.
- Occupant notification must occur upon activation of a fire detection, sprinkler water, manual fire alarm box or an automatic fireextinguishing system.



## **Audible Alarms**

- IFC Section 907.5.2 specifies the requirements for audible alarms.
- IFC Section 907.5.2.1.1 specifies the minimum required sound pressure level for all appliances and for certain areas of buildings.
- Emergency voice/alarm communication systems must comply with IFC Section 907.5.2.2.



## **Visual Alarms**

- IFC Section 907.5.2.3.1 requires visual alarms in all public and common areas.
- IFC Section 907.5.2.3.2 specifies that the ampacity of the notification appliance circuit be designed with a minimum 20% spare capacity in all employee work areas.



## Monitoring

- IFC Section 907.6.5 requires all required fire alarm systems to be monitored by an approved supervising station.
- Supervision is not required for:
  - Smoke alarms or smoke detectors in Group I-3.
  - Automatic sprinklers in one- and two-family dwellings.
  - Smoke alarms required by IFC Section 907.2.11.



Photo courtesy of Property Protection Inc.

## **Acceptance Tests and Completion**

- IFC Section 907.7 requires the fire alarm system and its components to be tested in accordance with NFPA 72.
- NFPA 72, Section 10.6.1, requires that a permanent record of the as-built installation drawings, operations & maintenance manual, and the sequence of operation be maintained.



## **Inspection, Testing** and Maintenance

- IFC Section 907.8 require acceptance testing of fire detection & alarm systems.
- IFC Section 907.8.2 requires testing in accordance with the schedules in NFPA 72.



## **Show on Schematic Floor Plan – Architectural Features**

- Graphic bar scale.
- North indicator.
- Building drawings with clear identification of new, remodeled, and existing areas.
- All permanent partitions taller than 6 feet.
- Each room and space labeled with plain text, keynotes, or legends.
- Occupant load of assembly rooms.
- Total occupant load for each floor level.
- Stair and shaft enclosures and ratings with identification of openings and ratings.
- Rated corridors and openings with identification of openings and ratings.

## Show on Schematic Floor Plan – Architectural Features

- Occupancy and area separations walls.
- Horizontal exit arrangements, exit passageways, smoke compartments.
- Designated required exterior exits and capacity.
- Location of all power and fuels shut-off for building.
- Distances to exposures and property lines.
- Grade elevation at each corner of building.
- Location of any special hazards or conditions.
- Location of any planned additions.

## **Show on Schematic Floor Plan – Fire Protection Features**

- Fire department access to property and buildings.
- Location of fire hydrants that serve the building.
- Fire department connections for fire sprinkler systems and/or standpipe(s).
- Location of fire sprinkler system risers and floor control valve(s).
- Location of standpipes.
- Location of Fire Department Command Center.
- Location of main fire alarm panel and remote annunciator.
- Location of Smoke Control Panel.

## **Hazardous Materials Identified by Hazard Class**

- Inside storage.
- Outside storage.
- In-use-open systems.
- In-use-closed systems.

- Buildings undergoing construction and alteration must comply with Chapter 33 of the IFC.
- Fire protection, including fire apparatus access roads and water supplies for fire protection are required to be installed before any combustibles can be on the site.
- Fire protection and fire department access must be installed and made serviceable prior to and during the time of construction.
- Standpipes: Where required by Section 905.3.1, not less than one standpipe must be installed for use during construction prior to construction exceeding 40-feet in height above the lowest level of fire department vehicle access.
  - Standpipe must be provided with fire department hose connections at locations adjacent to stairways complying with Section 3311.1.
  - As construction progresses, the standpipe must be extended to within one floor of the highest point of construction having secured decking or flooring.

- Means of Egress
- Stairways: Where building construction exceeds 40-feet in height above the lowest level of fire department vehicle access, a temporary or permanent stairway must be provided. As construction progresses, such stairway must be extended to within one floor of the highest point of construction having secured decking or flooring.
- Maintenance: Required means of egress and required accessible means of egress must be maintained during construction and demolition, remodeling or alterations and additions to any building.
  - Exception: Approved temporary means of egress and accessible means of egress systems and facilities.

- Automatic Sprinkler System
- Completion Before Occupancy: Buildings where an automatic sprinkler system is required, it is unlawful to occupy any portion of a building or structure until the automatic sprinkler system installation has been tested and approved, except as provided in Section 105.3.4.
- Operation of Valves: Operation of sprinkler control valves is allowed only by properly authorized personnel and must be accompanied by notification of duly designated parties. Where the sprinkler protection is being regularly turned off and on to facilitate connection of newly completed segments, the sprinkler control valves must be checked at the end of each work period to ascertain that protection is in service.

## **Owner's Responsibility For Fire Protection**

- The owner or owner's authorized agent is responsible for the development, implementation and maintenance of a written plan establishing a fire prevention program at the project site applicable throughout all phases of the construction, repair, alteration or demolition work.
- The plan must address the requirements of Chapter 33 and other applicable portions of the IFC, the duties of staff, and staff training requirements.
- The plan must be made available for review by the fire code official upon request.

### **Pre-Fire Plans**

Fire prevention program superintendent must develop and maintain an approved Pre-Fire
plan in cooperation with the fire chief. The fire chief and the fire code official must be notified
of changes affecting the utilization of information contained in such Pre-Fire plans.

- Fire Watch: Where required by the fire code official or the Pre-Fire Plan established in accordance with Section 3308.3, a fire watch must be provided for building demolition and for building construction that is hazardous in nature, such as temporary heating or hot work.
- Fire Watch During Construction: A fire watch shall be provided during nonworking hours for new construction that exceeds 40 feet in height above the lowest adjacent grade.
- Fire Watch Personnel: Trained personnel must be provided to serve as an on-site fire watch. Fire watch personnel must be provided with not fewer than one approved means for notification of the fire department, and the sole duty of such personnel must be to perform constant patrols and watch for the occurrence of fire. The combination of fire watch duties and site security duties is acceptable. Fire watch personnel must be trained in the use of portable fire extinguishers.
- Fire Watch Location and Records: The Fire Watch must include areas specified by the Pre-Fire plan established in accordance with Section 3308.3. The fire watch personnel must keep a record of all time periods of duty, including a log entry each time the site was patrolled and each time a structure under construction was entered and inspected. The records and log entries must be made available for review by the fire code official upon request.

- Cutting and Welding: Welding, cutting, open torches and other hot work operations and equipment shall comply with Chapter 35.
- Electrical: Temporary wiring for electrical power and lighting installations used in connection with the construction, alteration or demolition of buildings, structures, equipment or similar activities shall comply with NFPA 70.

## Questions



# Scott W. Adams West Coast Code Consultants, Inc.

## BUILDING PERMIT

This card must be kept posted in a conspicuous place on site of

Contact Info 385.237.3722 ScottA@WC-3.com www.WC-3.com





## Thank You For Attending

