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 your 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 does not = 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.

   **Good!**

   **Bad**

   *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 electronic 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 (107.1.5)
   B. Egress Favor (107.2.3)
   C. Deferred Submittal (107.3.4.4)
   D. Code Analysis (Ch. 3, 5, 6, 8)
   E. Supporting documents (107.5.1)
      1. Globalization, design tech report,
         CAG/tech, etc.

II. Chapter 5 - Use Groups
    A. Verify use groups
    B. Small Assembly Areas (803.4.1.2)
    C. Hazardous materials in furniture or storage (Tables 207.1.4, 2307.12.3)

III. Chapter 4 - Special Uses
     A. See if any of these Sections apply
        1. Areas are defined by architect
           a. If required is defined check all
              existing requirements.

IV. Chapter 4 - Accessible Height and Area
    A. Address identification (207.3.2)
    B. Height and area analysis (807.7.3)

V. Emergency Escape and Rescue (107.29)
   1. Doors (1088)
   2. Doors (1088.1.1.2)
   3. Doors (1088.1.3.2)
   4. Signs (1089)
   5. Ramps (1089)
   6. Lift doors (1089)
   7. Traffic control signs (1089.4)
   8. Handrails (1092)
   9. Handrails (1092.3)
   10. Ramps (1092.3)
   11. Operable Windows (1092.4)

VI. Chapter 13 - Accessibility
    A. Site Accessibility
       1. Parking (1105.1.1)
       2. Loading areas (1105.7)
    B. Accessible Routes (1.1)
       1. Doors
       2. Elevators
    C. Assembly seating (1105.2)
    D. Bathrooms (1106)

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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
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.
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

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>GROUP(S)</th>
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<tbody>
<tr>
<td>Business</td>
<td>B</td>
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<tr>
<td>Educational</td>
<td>E</td>
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<tr>
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<tr>
<td>Residential</td>
<td>R-1, R-2, R-3 &amp; R-4</td>
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<tr>
<td>Storage</td>
<td>S-1 &amp; S-2</td>
</tr>
<tr>
<td>Utility</td>
<td>U</td>
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</table>
Occupancy Classifications
IFC Chapter 2 / IBC Chapter 3

- **ASSEMBLY GROUP A**
  - Small Buildings (IFC 202 / IBC 303.1)
    - < 50 Occupants
      - Group B
  - **Small Spaces (IFC 202 / IBC 303.1.2)**
    - Group B or part of other Use
      - < 50 occupants
      - < 750 sq. ft.
  - 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
Use Groups

- BUSINESS GROUP B (IFC 202 / IBC 304.1)
  - **Ambulatory care facilities**
  - Banks
  - **Commercial Kitchens**
    - Not associated with restaurant
    - < 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.
ICF 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>
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<tr>
<th>FIRE-FLOW CALCULATION AREA (square feet)</th>
<th>AUTOMATIC SPRINKLER SYSTEM (Design Standard)</th>
<th>MINIMUM FIRE FLOW (gallons per minute)</th>
<th>FLOW DURATION (hours)</th>
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<td>0–3,600</td>
<td>No automatic sprinkler system</td>
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<td>3,601 and greater</td>
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<td>Duration in Table B105.1(2) at the required fire-flow rate</td>
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<td>$\frac{1}{2}$</td>
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<tr>
<td>3,601 and greater</td>
<td>Section 903.3.1.3 of the <em>International Fire Code</em> or Section P2904 of the <em>International Residential Code</em></td>
<td>$\frac{1}{2}$ value in Table B105.1(2)</td>
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For SI: 1 square foot = 0.0929 m², 1 gallon per minute = 3.785 L/m.
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<th>Type IA and IB*</th>
<th>Type IIA and IIIA*</th>
<th>Type IV and V-A*</th>
<th>Type IB and IIIB*</th>
<th>Type V-B*</th>
<th>FIRE FLOW (gallons per minute)b</th>
<th>FLOW DURATION (hours)</th>
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For SI: 1 square foot = 0.0929 m², 1 gallon per minute = 3.785 L/min, 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>
<thead>
<tr>
<th>AUTOMATIC SPRINKLER SYSTEM (Design Standard)</th>
<th>MINIMUM FIRE FLOW (gallons per minute)</th>
<th>FLOW DURATION (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No automatic sprinkler system</td>
<td>Value in Table B105.1(2)</td>
<td>Duration in Table B105.1(2)</td>
</tr>
<tr>
<td>Section 903.3.1.1 of the <em>International Fire Code</em></td>
<td>25% of the value in Table B105.1(2)(^a)</td>
<td>Duration in Table B105.1(2) at the reduced flow rate</td>
</tr>
<tr>
<td>Section 903.3.1.2 of the <em>International Fire Code</em></td>
<td>25% of the value in Table B105.1(2)(^b)</td>
<td>Duration in Table B105.1(2) at the reduced flow rate</td>
</tr>
</tbody>
</table>

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>
<thead>
<tr>
<th>Fire-Flow Calculation Area (square feet)</th>
<th>Fire Flow (gallons per minute) (a)</th>
<th>Flow Duration (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type IA and IB*</td>
<td>Type IIA and IIIA*</td>
<td>Type IV and V-A*</td>
</tr>
<tr>
<td>0-22,701-50,200</td>
<td>0-12,701-17,000</td>
<td>0-8,200</td>
</tr>
<tr>
<td>22,701-50,200</td>
<td>12,701-17,000</td>
<td>8,201-10,900</td>
</tr>
<tr>
<td>30,201-38,700</td>
<td>17,001-21,800</td>
<td>10,901-12,900</td>
</tr>
<tr>
<td>38,701-48,300</td>
<td>21,801-24,200</td>
<td>12,901-17,400</td>
</tr>
<tr>
<td>48,301-59,000</td>
<td>24,201-33,200</td>
<td>17,401-21,300</td>
</tr>
<tr>
<td>59,001-70,900</td>
<td>33,201-39,700</td>
<td>21,301-25,500</td>
</tr>
<tr>
<td>70,901-83,700</td>
<td>39,701-47,100</td>
<td>25,501-30,100</td>
</tr>
<tr>
<td>97,701-112,700</td>
<td>54,901-63,400</td>
<td>35,201-40,600</td>
</tr>
<tr>
<td>112,701-128,700</td>
<td>63,401-72,400</td>
<td>40,601-46,400</td>
</tr>
<tr>
<td>128,701-145,900</td>
<td>72,401-82,100</td>
<td>46,401-52,500</td>
</tr>
<tr>
<td>145,901-164,200</td>
<td>82,101-92,400</td>
<td>52,501-59,100</td>
</tr>
<tr>
<td>164,201-183,400</td>
<td>92,401-103,100</td>
<td>59,101-66,000</td>
</tr>
<tr>
<td>183,401-203,700</td>
<td>103,101-114,600</td>
<td>66,001-73,300</td>
</tr>
<tr>
<td>203,701-225,200</td>
<td>114,601-126,700</td>
<td>73,301-81,100</td>
</tr>
<tr>
<td>225,201-247,700</td>
<td>126,701-139,400</td>
<td>81,101-89,200</td>
</tr>
<tr>
<td>247,701-271,200</td>
<td>139,401-152,600</td>
<td>89,201-97,700</td>
</tr>
<tr>
<td>271,201-295,900</td>
<td>152,601-166,500</td>
<td>97,701-106,500</td>
</tr>
<tr>
<td>295,901-Greater</td>
<td>166,501-Greater</td>
<td>106,501-115,800</td>
</tr>
<tr>
<td>—</td>
<td>—</td>
<td>115,801-125,500</td>
</tr>
<tr>
<td>—</td>
<td>—</td>
<td>125,501-135,500</td>
</tr>
<tr>
<td>—</td>
<td>—</td>
<td>135,501-145,800</td>
</tr>
<tr>
<td>—</td>
<td>—</td>
<td>145,801-156,700</td>
</tr>
<tr>
<td>—</td>
<td>—</td>
<td>156,701-167,900</td>
</tr>
<tr>
<td>—</td>
<td>—</td>
<td>167,901-179,400</td>
</tr>
<tr>
<td>—</td>
<td>—</td>
<td>179,401-191,400</td>
</tr>
<tr>
<td>—</td>
<td>—</td>
<td>191,401-Greater</td>
</tr>
</tbody>
</table>

For SI: 1 square foot = 0.0929 m², 1 gallon per minute = 3.785 L/min, 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.
HYDRANT SPACING
ALL PORTIONS OF EXTERIOR OF
GROUND FLOOR SHALL BE WITHIN
400'-0" OF FIRE HYDRANT.

ACCESS ROAD

BUILDING

PUBLIC STREET

For SI: 1 foot = 304.8.

Figure 507.5.1(1)
HYDRANT LAYOUT TO MINIMIZE HOSE RUN
600'-0" FROM HYDRANT TO ALL PARTS OF THE GROUND FLOOR EXTERIOR.

For SI: 1 foot = 304.8.

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

600'-0" FROM HYDRANT TO ALL PARTS OF THE GROUND FLOOR EXTERIOR.

For SI: 1 foot = 304.8 mm.

Figure 507.5.1(3) ACCEPTABLE HYDRANT LOCATION WITH SPRINKLERS
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>
<thead>
<tr>
<th>FIRE-FLOW REQUIREMENT (gpm)</th>
<th>MINIMUM NUMBER OF HYDRANTS</th>
<th>AVERAGE SPACING BETWEEN HYDRANTS(^{h, b, c, f, g}) (feet)</th>
<th>MAXIMUM DISTANCE FROM ANY POINT ON STREET OR ROAD FRONTAGE TO A HYDRANT(^{d, f, g})</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,750 or less</td>
<td>1</td>
<td>500</td>
<td>250</td>
</tr>
<tr>
<td>1,751–2,250</td>
<td>2</td>
<td>450</td>
<td>225</td>
</tr>
<tr>
<td>2,251–2,750</td>
<td>3</td>
<td>450</td>
<td>225</td>
</tr>
<tr>
<td>2,751–3,250</td>
<td>3</td>
<td>400</td>
<td>225</td>
</tr>
<tr>
<td>3,251–4,000</td>
<td>4</td>
<td>350</td>
<td>210</td>
</tr>
<tr>
<td>4,001–5,000</td>
<td>5</td>
<td>300</td>
<td>180</td>
</tr>
<tr>
<td>5,001–5,500</td>
<td>6</td>
<td>300</td>
<td>180</td>
</tr>
<tr>
<td>5,501–6,000</td>
<td>6</td>
<td>250</td>
<td>150</td>
</tr>
<tr>
<td>6,001–7,000</td>
<td>7</td>
<td>250</td>
<td>150</td>
</tr>
<tr>
<td>7,001 or more</td>
<td>8 or more(^e)</td>
<td>200</td>
<td>120</td>
</tr>
</tbody>
</table>
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
For SI: 1 foot = 304.8 mm.

**Figure 503.1.1(1)**
FIRE DEPARTMENT ACCESS—LARGE BUILDING

**Figure 503.1.1(3)**
SMALL BUILDING ACCESS
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.
  - 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 town-house 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 all-weather 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)

Figure 912.5
FIRE DEPARTMENT CONNECTION WITH SIGN
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

Shaded area = 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 (O.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 (Horizontal)

- 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

\[200 \text{ (occupants)} \times 0.3 \text{ (stairs)} = 60'' \text{ exit width}\]

\[200 \text{ (occupants)} \times 0.2 \text{ (other egress)} = 40'' \text{ exit width}\]
Application Example

For SI: 1 inch = 25.4 mm
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

Common Path of Travel ends where there is choice of two directions.
## TABLE 1006.2.1
### SPACES WITH ONE EXIT OR EXIT ACCESS DOORWAY

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>MAXIMUM OCCUPANT LOAD OF SPACE</th>
<th>MAXIMUM COMMON PATH OF EGRESS TRAVEL DISTANCE (feet)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Without Sprinkler System</td>
<td>With Sprinkler System</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(feet)</td>
<td>(feet)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Occupant Load</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>OL ≤ 30</td>
<td>OL &gt; 30</td>
</tr>
<tr>
<td>A', E, M</td>
<td>49</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>B</td>
<td>49</td>
<td>100</td>
<td>75</td>
</tr>
<tr>
<td>F</td>
<td>49</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>H-1, H-2, H-3</td>
<td>3</td>
<td>NP</td>
<td>NP</td>
</tr>
<tr>
<td>H-4, H-5</td>
<td>10</td>
<td>NP</td>
<td>NP</td>
</tr>
<tr>
<td>I-1, I-2&lt;sup&gt;a&lt;/sup&gt;, I-4</td>
<td>10</td>
<td>NP</td>
<td>NP</td>
</tr>
<tr>
<td>I-3</td>
<td>10</td>
<td>NP</td>
<td>NP</td>
</tr>
<tr>
<td>R-1</td>
<td>10</td>
<td>NP</td>
<td>NP</td>
</tr>
<tr>
<td>R-2</td>
<td>10</td>
<td>NP</td>
<td>NP</td>
</tr>
<tr>
<td>R-3&lt;sup&gt;e&lt;/sup&gt;</td>
<td>10</td>
<td>NP</td>
<td>NP</td>
</tr>
<tr>
<td>R-4&lt;sup&gt;e&lt;/sup&gt;</td>
<td>10</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>S&lt;sup&gt;f&lt;/sup&gt;</td>
<td>29</td>
<td>100</td>
<td>75</td>
</tr>
<tr>
<td>U</td>
<td>49</td>
<td>100</td>
<td>75</td>
</tr>
</tbody>
</table>

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 I 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. \( \leq 49 \)
  - 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 = 85’
Common Path of Travel - Section 1006.2.1

- Solutions
  - Add 2nd exit
  - Install fire sprinklers
  - Revise egress path

**Sprinklered Group B O.L. \( \leq 30 = 100' \)**

Common Path of Travel = 68'
<table>
<thead>
<tr>
<th>STORY</th>
<th>OCCUPANCY</th>
<th>MAXIMUM OCCUPANT LOAD PER STORY</th>
<th>MAXIMUM COMMON PATH OF EGRESS TRAVEL DISTANCE (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First story above or below grade plane</td>
<td>A, B&lt;sup&gt;b&lt;/sup&gt;, E F&lt;sup&gt;b&lt;/sup&gt;, M, U</td>
<td>49</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>H-2, H-3</td>
<td>3</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>H-4, H-5, I, R-1, R-2&lt;sup&gt;bc&lt;/sup&gt;, R-4</td>
<td>10</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>S&lt;sup&gt;b, d&lt;/sup&gt;</td>
<td>29</td>
<td>75</td>
</tr>
<tr>
<td>Second story above grade plane</td>
<td>B, F, M, S&lt;sup&gt;d&lt;/sup&gt;</td>
<td>29</td>
<td>75</td>
</tr>
<tr>
<td>Third story above grade plane and higher</td>
<td>NP</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

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

Measurement of exit access travel distance continues for unenclosed stairs and ramps.
Travel Distance Measurement

- Measurement is to ‘closest’ exit

Choice of 2 directions of travel

A = 40 feet
B = 30 feet
C = 75 feet

Common path of travel = 70’

Travel Distance = 145’
# TABLE 1017.2
## EXIT ACCESS TRAVEL DISTANCE (a)

<table>
<thead>
<tr>
<th>Occupancy</th>
<th>Without Sprinkler System (feet)</th>
<th>With Sprinkler System (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, E, F-1, M, R, S-1</td>
<td>200</td>
<td>250^{b,e}</td>
</tr>
<tr>
<td>I-1</td>
<td>Not Permitted</td>
<td>250^{b}</td>
</tr>
<tr>
<td>B</td>
<td>200</td>
<td>300^{c}</td>
</tr>
<tr>
<td>F-2, S-2, U</td>
<td>300</td>
<td>400^{c}</td>
</tr>
<tr>
<td>H-1</td>
<td>Not Permitted</td>
<td>75^{d}</td>
</tr>
<tr>
<td>H-2</td>
<td>Not Permitted</td>
<td>100^{d}</td>
</tr>
<tr>
<td>H-3</td>
<td>Not Permitted</td>
<td>150^{d}</td>
</tr>
<tr>
<td>H-4</td>
<td>Not Permitted</td>
<td>175^{d}</td>
</tr>
<tr>
<td>H-5</td>
<td>Not Permitted</td>
<td>200^{c}</td>
</tr>
<tr>
<td>I-2, I-3</td>
<td>Not Permitted</td>
<td>200^{c}</td>
</tr>
<tr>
<td>I-4</td>
<td>150</td>
<td>200^{c}</td>
</tr>
</tbody>
</table>
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.

2. 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

20-feet maximum
with exceptions
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

48” maximum
34” minimum
Key Locking Device
Section 1010.1.9.4

Key-locking device permitted (deadbolt)

THIS DOOR TO REMAIN UNLOCKED WHEN BUILDING IS OCCUPIED

NOTE: Sign letters ≥1” high on contrasting background
Door Operations
Section 1010.1.9.4

Key-locking hardware on the egress side only allowed on the main entrance

(Group A having occupant load \( \leq 300 \), B, F, M and S occupancies and in all churches)
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
  - 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
## Corridors versus Exit Passageways

<table>
<thead>
<tr>
<th>Feature</th>
<th>Corridor</th>
<th>Exit Passageway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component of egress</td>
<td>Exit access</td>
<td>Exit</td>
</tr>
<tr>
<td>One direction of travel</td>
<td>Possibly (limitations based on length and number of persons served)</td>
<td>Yes (single directional travel typically permitted)</td>
</tr>
<tr>
<td>Fire-resistance rated construction</td>
<td>Possibly (constructed as fire partition)</td>
<td>Yes (constructed as fire barrier)</td>
</tr>
<tr>
<td>Provides access to storage areas, mechanical rooms, etc.</td>
<td>Yes</td>
<td>No (except in covered mall buildings)</td>
</tr>
</tbody>
</table>
# Table 1020.2 - Minimum Corridor Width

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

At least $\frac{1}{2}$ of required width must be unobstructed.
<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>OCCUPANT LOAD SERVED BY CORRIDOR</th>
<th>REQUIRED FIRE-RESISTANCE RATING (hours)</th>
<th>Without sprinkler system</th>
<th>With sprinkler systems&lt;sup&gt;c&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-1, H-2, H-3</td>
<td>All</td>
<td>Not Permitted</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>H-4, H-5</td>
<td>&gt;30</td>
<td>Not Permitted</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>A, B, E, F, M, S, U</td>
<td>&gt;30</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>&gt;10</td>
<td>Not Permitted</td>
<td>0.5&lt;sup&gt;c&lt;/sup&gt; / 1&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>I-2&lt;sup&gt;a&lt;/sup&gt;</td>
<td>All</td>
<td>Not Permitted</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>I-1, I-3</td>
<td>All</td>
<td>Not Permitted</td>
<td>1&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>I-4</td>
<td>All</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> I-2 refers to certain types of occupancy.  
<sup>b</sup> I-1 and I-3 have specific requirements for fire resistance.  
<sup>c</sup> Fire resistance ratings with sprinkler systems vary depending on occupancy type.  
<sup>d</sup> Fire resistance ratings with sprinkler systems for R occupancy are specified as 0.5 hours with sprinkler systems.
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

Is an exit sign required here?

100’ or the listed viewing distance for the exit sign. Exit signs also required within exits.
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

- 4” maximum
- 10” minimum
- 12” maximum
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

Normal egress illumination by premises’ electrical supply

Automatic illumination in event of failure of premises’ electrical supply

- Storage batteries
- On-site generator
- Unit equipment
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.
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 fire-resistance 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

Diagram showing a fire area bounded by exterior walls, floor, and roof. The area includes an acoustic tile ceiling and non-rated partitions.
Fire Area Compartmentalized Using Fire Barriers

SECTION THRU 1 STORY BUILDING

Rated Fire Barrier Walls
Fire Area Separated Using a Fire Wall
Fire Area Bounded by Wall, Floor and Floor-Ceiling Elements

SECTION THROUGH TWO-STORY BUILDING

One Fire Area
Determine the Fire Areas
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
# Application Matrix - NFPA Sprinkler Standards

<table>
<thead>
<tr>
<th>NFPA STANDARD DESIGN CONSIDERATION</th>
<th>NFPA SPRINKLER STANDARD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NFPA 13</td>
</tr>
<tr>
<td>Extent of Protection</td>
<td>Throughout the building (IFC Section 903.3.1.1)</td>
</tr>
<tr>
<td>Design Intent</td>
<td>Life Safety &amp; Property Protection</td>
</tr>
<tr>
<td>Applicability</td>
<td>All IBC &amp; NFPA Occupancies</td>
</tr>
<tr>
<td>Design Methods</td>
<td>Pipe schedule; Control mode – discharge density/design area; Control mode – specific application; Suppression mode</td>
</tr>
<tr>
<td>Sprinklers</td>
<td>All listed &amp; approved types</td>
</tr>
<tr>
<td>Minimum H₂O Supply Duration</td>
<td>120 to 30 minutes depending on the design</td>
</tr>
</tbody>
</table>
## Permitted Increases - Type of Sprinkler System

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

GROUP A-2
SPRINKLER SYSTEM REQUIRED BECAUSE IT IS ABOVE THE LEVEL OF EXIT DISCHARGE

GROUP B
SPRINKLER SYSTEM REQUIRED BECAUSE THE LEVEL IS BETWEEN THE GROUP A-2 AND THE LEVEL OF EXIT DISCHARGE

2-HOUR FIRE-RESISTANCE-RATED HORIZONTAL ASSEMBLY

1-HOUR FIRE-RESISTANCE-RATED HORIZONTAL ASSEMBLY

< 75 FEET

EXIT

For SI: 1 foot = 304.8 mm.
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 self-preservation.
    - 2. One or more care recipients that are incapable of self-preservation 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 3,000-square-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 ft²
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 high-hazard 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)

Type IA Construction with a 3-hour horizontal assembly

If 4 stories or less and the height is 60 feet or less

NFPA 13R Design

NFPA 13 Design
Pedestal/Podium Construction

Type IA Construction with a 3-hour horizontal assembly

Not more than 4 stories; > 60 ft height < 70 ft.

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.

3. 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 ft².
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.


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.
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.
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.
  5. Covered mall buildings.
  6. Stages with an area > 1,000 ft².
  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.
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.
Group I-2 Occupancies

- 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.
Group I-2 Occupancies

- 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.
Group R-1 Occupancies

- 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.
Group R-1 Occupancies
Group R-1 Occupancies

- 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.
Group R-1 Occupancies

- 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.
Group R-2 Occupancies

- 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.
Group R-2 Occupancies

- 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:

1. Each mechanical equipment, electrical, transformer, telephone equipment or similar room that is not provided with sprinkler protection.

2. 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 fire-extinguishing 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.
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 Under Construction

▪ 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.
Buildings Under Construction

▪ **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.
Buildings Under Construction

▪ **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.
Buildings Under Construction

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.
Buildings Under Construction

- **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.
Buildings Under Construction

- **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
Thank You For Attending