Occupancy Classifications
Chapter 3

Evaluate to Address the Risk

Chapter 3: Occupancy Classifications

- Based on Similar Characteristics
- To Achieve Equivalent Safety
- Occupant Related Hazards
- Content Related Hazards

Chapter 3
302.1 General Occupancy Definitions

- Assembly
- Business
- Educational
- Factory/Industrial
- Hazardous
- Institutional
- Mercantile
- Residential
- Storage
- Utility

Assembly Group A
Section 303.1

- A-1 Usually fixed seating, viewing, such as motion pictures
- A-2 Food and or drink consumption
- A-3 Worship, recreation or amusement
- A-4 Viewing of indoor sporting events, with spectator seating
- A-5 Viewing or participating in outdoor activities

Assembly Group A
Section 303.1

- Exceptions:
  - Non-accessory building or portion, less than 50 people
  - Accessory room or space, less than 50 people
  - Assembly room or space, less than 750 SF
- Classified as GROUP B, or part of the occupancy

Business Group B
Section 304.1

- Office, professional or service type transactions, including storage of records and accounts.
Lesson 1 – Occupancy Classification

**Educational Group E**  
Section 305

- Six or more persons at any one time for educational purposes through the 12th grade
- Reminder: Spaces accessory to Church are A-3
- Day care for more than 5 children over 2 ½ years old

**Factory-Industrial Group F**  
Section 306

- Two groups,
  - F-1 MODERATE HAZARD
  - F-2 LOW HAZARD
- Not classified as a GROUP H

**F-2 Low Hazard**  
Section 306.3

- Fabrication or manufacturing of NON-COMBUSTIBLE materials
- No significant fire hazard
- Finishing, packing, or processing of materials including …
  - nonalcoholic beverages
  - glass products
  - brick and masonry

**F-1 Moderate Hazard**  
Section 306.2

- Factory-Industrial uses that are not classified as F2 Low Hazard
- This includes aircraft, automobiles, carpet and rugs, dry cleaning, food processing, and woodworking

**High-Hazard Group H**  
[F] Section 307

- Use of a building or portion
- Manufacturing, processing, generation or storage
- Involving materials that present a physical or health hazard
- Triggered by excessive quantities

**High-Hazard Group H Exceptions**

- **Exceptions:** The following shall not be classified in Group H, but shall be classified in the occupancy that they most nearly resemble:
  - 15 Items
Lesson 1 – Occupancy Classification

Group H Categories
Sections 307.3 to 307.7

- H-1 Detonation hazard
- H-2 Deflagration hazard
- H-3 Readily support combustion
- H-4 Health hazards
- H-5 Semiconductor fabrication facilities
  - HPM (hazardous production materials)

Group H Quantities

- “Normal” occupancy limited to quantities in a CONTROL AREA
  - Portion of a building separated by 1 hour construction
- Table 307.7(1) and (2)
  - Specifies the allowed quantities
  - IF any quantity is exceeded …
    - Column 3 specifies the appropriate H category

Determination of Group H
Sample from Table 307.1(1)

<table>
<thead>
<tr>
<th>Material</th>
<th>Class</th>
<th>Group if Quantity Exceeded</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Solid pound</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(cubic ft.)</td>
</tr>
<tr>
<td>Combustible Fiber</td>
<td>Loose</td>
<td>H-3</td>
<td>(100)</td>
</tr>
<tr>
<td></td>
<td>Baled</td>
<td>H-3</td>
<td>(1,000)</td>
</tr>
<tr>
<td>Flammable Liquid</td>
<td>IA</td>
<td>H-2 or H-3</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>IB and IC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Institutional Group I
Section 308

4 Groups based on Characteristics of Exiting

- People with Physical Limitations
  - Health or Age
  - Ambulatory and Non-ambulatory
- Harbored (domiciled)
  - Treatment or Care
  - Detained

Institutional Group I-1
Section 308.2

- SUPERVISED RESIDENTIAL CARE
  - More than 16 persons
  - Ambulatory
  - 24 hour basis
- Such as …
  - Assisted living facilities, group homes, alcohol and drug centers

Institutional Group I-2
Section 308.3

- HOSPITALS and NURSING HOMES
  - More than 5, not capable of self preservation
  - 24 hour basis
- CHILD CARE FACILITY
  - 24 hour
  - More than 5 children
  - 2 ½ years or less
Lesson 1 – Occupancy Classification

**Institutional Group I-3**
Section 308.4

- DETENTION FACILITIES
  - More than 5 people
  - Under restraint or security
- 5 conditions
  - Free movement to exit
  - Free movement to smoke compartment
  - Movement confined to smoke compartment
  - Remote control release from space
  - Staff controlled release from space

**Institutional Group I-4**
Section 308.5

- DAY CARE FACILITIES
  - Persons of any age
  - Custodial care for less than 24 hours
  - More than 5 occupants
- Adult Care Facility
  - Exception: A-3 if occupants are capable or responding to an emergency
- Child Care Facility

**Mercantile Group M**
Section 309

- Display and sale of merchandise
- Stocks of goods, wares or merchandise
  - incidental to such purpose and accessible to the public
- Department stores, markets, retail and wholesale, and motor fuel-dispensing facilities

**Residential Group R**
Section 310

- R-1 Transient Residential
  - Hotels, motels
- R-2 Permanent Residential
  - More than 2 dwelling units
- R-3 One and Two Family
  - Not R-1, R-2, R-4 or I
  - Not more than two dwelling units
- R-4 Residential Care, Assisted Living

**Storage Group S**
Section 311

- S1 Moderate Hazard
  - Combustible contents
- S2 Low Hazard
  - Non-combustible goods
- Not classified as Hazardous Occupancy

**Utility and Miscellaneous Group U**
Section 312

- Buildings and Structures of an accessory character
- Typically not occupied
- Don’t fit into other categories
Lesson 2 – Type of Construction

Types of Construction

Chapter 6
Building Code of New York State

Definitions

• Fire Resistance
  – That property of materials or their assemblies that prevents or retards the passage of excessive heat, hot gases, or flames under conditions of use.

• Fire Resistance Ratings
  – The period of time a building element, component or assembly maintains the ability to confine a fire, continues to perform a given structural function, or both as determined by the tests, or the methods based on tests, prescribed in §703.

Primary Goals of Chapter 6

• Maintain STRUCTURAL STABILITY under Fire Conditions
  – Collapse helps no one!

• Reduce the threat to ADJACENT BUILDINGS
  – Let’s not make things worse than they are.

Construction Classification

Section 602

• Types I and II: Noncombustible Elements
• Types III and IV:
  – Exterior elements noncombustible
  – Interior elements combustible
• Type V: Combustible

602.2 Types I and II

“Construction in which the building elements listed in Table 601 are of noncombustible materials.”

• Type I could be called “Fire Resistive”
• Type II is simply “Noncombustible”
Lesson 2 – Type of Construction

Type III Construction

- Exterior walls must be non-combustible
- Interior elements may be of any material permitted by this code
- Fire retardant-treated wood shall be permitted within exterior walls of 2 hour rating or less

Type IV: Heavy Timber

- Exterior walls must be non-combustible
- Interior elements of solid or laminated wood without concealed spaces
- 602.4 provides the specific dimensions
- Fire retard treated wood shall be permitted within exterior walls of 2 hour rating or less

602.4 Type IV

- **TABLE 602.4 WOOD MEMBER SIZE**

<table>
<thead>
<tr>
<th>Minimum Nominal Solid Sawn Size</th>
<th>Minimum Glued-Laminated Net Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width, inch</td>
<td>Depth, inch</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

Type V

“… construction in which the structural elements, exterior walls and interior walls are of any materials permitted by this code.”

Table 601

<table>
<thead>
<tr>
<th>Building Elements</th>
<th>TYPE I</th>
<th>TYPE II</th>
<th>TYPE III</th>
<th>TYPE IV</th>
<th>TYPE V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Element</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>HT</td>
</tr>
<tr>
<td>Structural frame(s)</td>
<td>3(b)</td>
<td>2(b)</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Bearing walls:</td>
<td></td>
<td></td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Exterior (f)</td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Interior</td>
<td></td>
<td></td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Nonbearing walls and partitions</td>
<td></td>
<td></td>
<td>See Table 602</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exterior</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>See section 602 4.6</td>
</tr>
<tr>
<td>Nonbearing walls and partitions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interior</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Floor construction</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>HT</td>
</tr>
<tr>
<td>Roof construction</td>
<td>1½</td>
<td>1½</td>
<td>1½</td>
<td>0</td>
<td>HT</td>
</tr>
</tbody>
</table>

Notes:
- A: A applies
- B: B applies
- HT: High Temperature
- A(d): A applies, door
- A(c): A applies, concealed
- A(dr): A applies, door and return
- A(dh): A applies, door and return, high temperature
Lesson 2 – Type of Construction

**Methods for Fire Resistance**

- Material is **INHERENTLY** Fire Resistive
- Protection is **DIRECTLY** APPLIED
- Protection by MEMBRANE

**Summary: Types of Construction**

- 5 General Classifications
  - Based on Combustibility and Fire Resistance
- Sub-classified
  - “A” more fire resistance than “B”
- Table 601 regulates Building Elements
- Table 602 ALSO regulates Exterior Walls (Future lesson)
Lesson 3 – Building Area

General Building Heights And Areas
Chapter 5

Allowable Building Size

- The Basic Concept
  - Occupancy and Construction
  - Frontage and Sprinklers
- Details
  - Language and Definitions
  - Use of the Table
  - Calculations for Increases

Keep it Simple

- This Lesson will focus on a Single Occupancy Building
  - Learn the basic methodology
- A Future Lesson will deal with Mixed and Accessory Use buildings
  - The terms and application will only confuse the issue at this time

502 Definitions: Building Area

- Area within surrounding Exterior Walls
  - or exterior walls and FIRE WALLS
  - exclusive of shafts and courts
- Areas NOT within Surrounding Walls
  - shall be included IF …
  - within the horizontal projection of the floor or roof above

FIRE WALL … rated wall having protected openings … continuous from foundation to or through the roof … sufficient structural stability … to allow collapse …
A FIRE WALL creates separate BUILDINGS

Definition Flash: 702.1

Table 503: Allowable Height (above grade plane) and Building Area (per story)

<table>
<thead>
<tr>
<th>Type of Construction</th>
<th>Type I</th>
<th>Type V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>A-1</td>
<td>S</td>
<td>UL</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>UL</td>
</tr>
<tr>
<td>A-2</td>
<td>S</td>
<td>UL</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>UL</td>
</tr>
</tbody>
</table>
Lesson 3 – Building Area

**Definition Flash: 502.1**

STORY ... between the upper surface of a floor and the upper surface of the floor or roof next above.

BASEMENT ... partly or completely below grade plane. SHALL be considered as a STORY ABOVE THE GRADE PLANE where the finished floor above is:

1. More than 6' above grade plane
2. More than 12' at any point

**Definition Flash: 502.1**

GRADE PLANE ... A reference plane representing the average finished ground level adjoining the building at exterior walls.

Includes details for ground that slopes away from the exterior walls.

**Definition Flash: 502.1**

HEIGHT, BUILDING ... The vertical distance from the grade plane to the average height of the highest roof surface.

---

**Example: Building Areas**

**Proposed:**
- Office Building (Group B)
- 2 Stories
- Type IIB Construction

What is the maximum area per story?

---

**Table 503: Allowable Height (above grade plane) and Building Area (per story)**

<table>
<thead>
<tr>
<th>Group</th>
<th>Type of Construction</th>
<th>Type I</th>
<th>Type V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UL</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>A-1</td>
<td>S</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>11,500</td>
<td>1,500</td>
</tr>
<tr>
<td>A-2</td>
<td>S</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>11,500</td>
<td>6000</td>
</tr>
</tbody>
</table>

**Height Modifications**

504.2 Automatic Sprinkler Increase

- Sprinkler per 903.3.1.1 (NFPA 13)
  - Values specified on Table 503
  - Increased by 20’ and 1 story

- Sprinkler per 903.3.1.2 (NFPA 13R)
  - Same increase allowed in Group R
  - BUT shall not exceed 4 stories or 60 feet

- Allowed in addition to area increases
Lesson 3 – Building Area

**506 Modifications to Allowable Area**

- **Basic Areas** are specified by Table 503
- Increased Areas are allowed for **FRONTAGE**
  - Accessibility for Fire Service
- Increased Areas are allowed for **SPRINKLER SYSTEM**

**Formula for Area Increase**

\[
A = [A_t + (A_s \times I_f) + (A_s \times I_s)]
\]

- \(A\) – Allowable Area
- \(A_t\) – Tabular Area
- \(I_f\) – Frontage Increase Factor
- \(I_s\) – Sprinkler Increase Factor

**Formula for Frontage determination**

\[
I_f = \left[ \frac{F}{P} - 0.25 \right] \times \frac{W_{ave}}{30}
\]

- \(I_f\) – Increase factor due to frontage.
- \(F\) – Building perimeter which fronts on a public way or open space having 20 feet open minimum width (feet).
- \(P\) – Perimeter of entire building (feet).
- \(W\) – Width of public way or open space (feet) in accordance with Section 506.2.1.

- “\(P\)” is PERIMETER which is the LENGTH of the entire exterior wall.

- “\(F\)” is the LENGTH of the wall which faces approaching fire service personnel.

- “\(W\)” is the average yard width where fire service may approach the building.
Lesson 3 – Building Area

### 506.2 Frontage Increase
Details for yards and open space

- Building must adjoin or have access to a public way
- Increase allowed is proportional to perimeter FRONTING OPEN SPACE
- Tabular Values “assume” 25%
- OPEN SPACE must be a minimum of 20’ wide, and maximum credit for 30’ wide.

### Terminology
Find definitions for:
- Public Way
- Open Space
- Yard

### SECTION 506
AREA MODIFICATIONS

- 506.2 Frontage increase

\[ I = \left( \frac{F}{P} - 0.25 \right) \times \frac{W_{\text{max}}}{30} \]

- Determination of \( W \)
  - based on the weighted average of each portion of exterior wall and open space where the value of \( W \) is greater than or equal to 20 feet.
  - Where \( W \) exceeds 30 feet, \( W = 30 \)

### Frontage Increase Example
Determine \( W \), then Determine \( I \)

- Exterior walls each 100’
- 3 Yards are 50’ wide
- 1 yard is 25’ wide

### Weighted Average Method

\[ W = \frac{(L_1 \times W_1) + (L_2 \times W_2) + \ldots + (L_n \times W_n)}{L_1 + L_2 + \ldots + L_n} \]
Lesson 3 – Building Area

**Frontage Increase Example**

**Determine** \( W \), then **Determine** \( I_s \)

**STEP 1:** What is the value of \( W \)

\[
W = (200 \times 20) + (95 \times 30) = 295
\]

**STEP 2:** What is the value of \( I_s \)

\[
I_s = \left[ \frac{P - 0.25}{P} \right] \times \frac{W_{perm}}{30}
\]

\[
I_s = \left[ \frac{590 - 0.25}{590} \right] \times \frac{23.22}{30} = 0.774
\]

\[
I_s = 0.774 	imes 1.935 = 1.50
\]

**506.3 Sprinkler Increase**

**This is easy!**

- Approved sprinkler per 903.3.1.1
  - Multi-story building allowed 200% \((I_s=2)\)
  - Single story building allowed 300% \((I_s=3)\)

- This is the factor \( I_s \)

**Section 506: Area Modifications**

**Example #1: Sprinkler Increase**

- **Given:** Group B, One Story, Type IIB
- **What is the Tabular Area?**

- **What is the Allowable Area if sprinklered?**

\[
A_s = \left[ A_t + (A_t \times I_s) + (A_t \times L_t) \right]
\]

- \( I_s \) = Increase factor due to sprinkler
Lesson 3 – Building Area

506.4 Area Determination
Buildings exceeding 1 Story

- For Buildings more than 1 Story above
grade plain
- CUMULATIVE area is limited by allowable
area OF THE FIRST STORY times:
  - 2 if a two-story building
  - 3 if a three-story building or higher
- No story to exceed the Allowable Building Area

506.4 Area Determination
2 Stories

- First story ALLOWABLE AREA = 10,000 SF
  - Two Story Building
  - 10,000 SF x 2
- 20,000 SF total

506.4 Area Determination
3 Stories

- First story ALLOWABLE AREA = 10,000 SF
  - THREE Story or Higher
  - 10,000 SF x 3
- 30,000 SF total

506.4 Area Determination
Exceeding 3 Stories

- First story ALLOWABLE AREA = 10,000 SF
  - FOUR Story Building
  - 10,000 SF x 3 story
- 30,000 SF total

- UNLESS...

506.4 Area Determination
Exceeding 3 Stories

- Exception:
  - Building with 903.3.1.2 (NFPA 13R)
    Sprinkler
  - Multiply by Allowable Area by the number
    of stories
- FYI
  - 13R does not qualify for an area increase

506.4 Area Determination
Exceeding 3 Stories

- First story
  ALLOWABLE AREA = 10,000 SF
- And NFPA 13 R
- 40,000 SF Allowed
Lesson 3 – Building Area

Example: Building Areas
Exceeding 3 Stories

<table>
<thead>
<tr>
<th>Proposed:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Office Building (Group B)</td>
</tr>
<tr>
<td>• 4 Stories</td>
</tr>
<tr>
<td>• Type IIB Construction</td>
</tr>
</tbody>
</table>

What is the …

| • Maximum area per story? |
| • Maximum cumulative Building Area? |

Chapter 5: Summary
Building Height and Area

<table>
<thead>
<tr>
<th>• Table 503</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Based on Occupancy and Construction</td>
</tr>
<tr>
<td>– Regulates Height and Area</td>
</tr>
<tr>
<td>• Heights may be Increased</td>
</tr>
<tr>
<td>– If Sprinklered</td>
</tr>
<tr>
<td>• Areas may be Increased</td>
</tr>
<tr>
<td>– Based on Frontage and Sprinklers</td>
</tr>
</tbody>
</table>
Lesson 4 – Incidental, Accessory and Mixed Uses

Incidental, Accessory, and Mixed Uses

More stuff in Chapter 5

Section 508 Mixed Use and Occupancy

In this lesson …

• Incidental Uses and Table 508.2
• Mixed use occupancies, can be either ...
  – Accessory uses
  – Non-separated
  – Separated

Introduction to Fire Safe Design

Terminology

• Incidental use area
• Accessory Use
• Mixed Use

THERE ARE NO DEFINITIONS!

Introduction to Fire Safe Design

Descriptions

• Incidental use area
  – Ancillary to the main occupancy
• Mixed Occupancies
  – Accessory
  • Subsidiary to the Main Use
  – Non-separated Occupancies
  – Separated Occupancies

Introduction to Fire Safe Design

508.2 Incidental Use Area

• Separated and Protected per Table 508.2 and Classified by the Main Use
OR
• Classified as a mixed occupancy and comply with Section 508.3

Introduction to Fire Safe Design

Incidental Use Using Table 508.2

• FIRE BARRIER and/or HORIZONTAL ASSEMBLY to be provided where rating is required

What is … FIRE BARRIER?

A fire-resistance-rated wall assembly of materials designed to restrict the spread of fire in which continuity is maintained.
Lesson 4 – Incidental, Accessory and Mixed Uses

**Incidental Use Using Table 508.2**

- FIRE BARRIER and/or HORIZONTAL ASSEMBLY to be provided where rating is required
- Where Sprinkler is permitted without Fire Barrier, SMOKE TIGHT construction
  - Sprinkler only required in the hazard area
  - Partitions extend to rated ceiling assembly or deck
  - Doors self or automatic closing

**508.3 Mixed Occupancies**

- Each portion individually classified
- Where there is more than one occupancy group …
  - 508.3.1 Accessory
  - 508.3.2 Non-separated… OR
  - 508.3.3 Separated

**Mixed Occupancies 508.3.1 Accessory Use**

508.3.1 Accessory occupancies. … subsidiary to the main occupancy of the building or portion thereof.

- Aggregate area
  - ≤ 10 % of the STORY
  - not exceed Table 503
  - WITHOUT Height and Area increases

**Mixed Occupancies 508.3.1 Accessory Use**

- 508.3.1.1 Occupancy classification.
  - Each space individually classified
  - THROUGHOUT the BUILDING or PORTION thereof … Apply
    - High Rise requirements
    - Fire Protection requirements

**Mixed Occupancies 508.3.1 Accessory Use**

- 508.3.1.2 Allowable Area and Height.
  - Building Height and Area based on the Main Occupancy
  - Height of Accessory space restricted by Table 503
- 508.3.1.3 - NO separation required
  - Except Group H
Lesson 4 – Incidental, Accessory and Mixed Uses

### Accessory Use

**10% Example**
- Building area = 22,000 SF
- Offices and sales room are less than 10% of area of the story – therefore no separation required
- Warehouse area exceeds 10% of the story …
  - Does not qualify as an accessory use

<table>
<thead>
<tr>
<th>Offices (B)</th>
<th>Factory (F-1)</th>
<th>Warehouse (S-1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>800 SF</td>
<td>15,000 SF</td>
<td>5,000 SF</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sales Room (M)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1,200 SF</td>
<td></td>
</tr>
</tbody>
</table>

### Accessory Use Building Area Example
- Building area = 11,000 SF
- Offices are less than 10% of area of the story
- PROPOSED: Type II-B Construction

<table>
<thead>
<tr>
<th>Offices (B)</th>
<th>Factory (F-1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000 SF</td>
<td>10,000 SF</td>
</tr>
</tbody>
</table>

**What is the Allowable Area??**
- Based on the F-1
- Table 503 allows 15,500 SF

### Mixed Occupancies

**508.3.2 Non-separated Occupancies**
- Each occupancy individually classified
  - Treat each use separately for most issues
- Apply THROUGHOUT the BUILDING or portion thereof …
  - High Rise
  - Fire Protection

### Non-separated Mixed Use Example
- Each Occupancy Classified
- Most RESTRICTIVE requirements for FIRE PROTECTION
  - Applied to the entire building

- Group M  Retail Sales Area
- Group A-2  Cafe
- No physical separation required
- **Group A-2 MAY require Sprinkler THROUGHOUT**

### Mixed Occupancies

**508.3.2 Non-separated Occupancies**
- Height and Area based on MOST RESTRICTIVE
- No Separation required
  - Except Group H

### Non-separated Mixed Use Example
- PROPOSED: Type II-B Construction
  - Based on the F-1
  - Table 503 allows 15,500 SF

<table>
<thead>
<tr>
<th>Group F-1  Manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group B  Offices</td>
</tr>
<tr>
<td>Group S-1  Storage</td>
</tr>
</tbody>
</table>

No physical separation required
Lesson 4 – Incidental, Accessory and Mixed Uses

**Non-Separated Mixed Use**

**Example: Restaurant/Store (A-2/M)**

- Proposed:
  - One story, type V-B construction
  - A-2 occupancy is 3,000 SF
  - M occupancy is 4,000 SF
- Is this acceptable? Use Table 503
  - NO!
  - The proposed building area is 7,000 SF
  - Table 503 allows only 6,000 SF for an A-2

**Non-Separated Mixed Occupancy**

**Example: Hotel/Restaurant (R-1/A-2)**

- Go to Table 503 – 3 Story, Type VA proposed
- The R-1
  - Allowed 12,000 SF building area
  - Allowed 3 stories
- A-2 restaurant
  - Allowed 11,500 SF building area
  - Limited to a 2 story building
- Apply MOST RESTRICTIVE BUILDING AREA
- Apply the MOST RESTRICTIVE HEIGHT
  - 3 story is not allowed

**Mixed Occupancies**

**508.3.2 Non-separated Occupancies**

- Requirements specific to each USE are APPLICABLE to the PORTION
- APPLY the MOST restrictive throughout for …
  - HIGH RISE
  - FIRE PROTECTION
- FIRE SEPARATIONS are NOT REQUIRED unless otherwise specified

**508.3.3 Separated Occupancies**

- Each occupancy individually classified
  - Separated by fire-resistant assemblies (coming soon)
- Each FIRE AREA shall comply …

**Definition Preview**

**FIRE AREA**

The aggregate floor area enclosed and bounded by Fire Walls, Fire Barriers, Exterior Walls or Fire-Resistance-Rated Horizontal Assemblies of a building

What is the PURPOSE of FIRE AREA
- Determine sprinkler requirements

**Separated Mixed Use Example**

- Each Occupancy Classified
- Each FIRE AREA may be treated separately FIRE PROTECTION
**Lesson 4 – Incidental, Accessory and Mixed Uses**

**Mixed Occupancies**

**508.3.3 Separated Occupancies**

- 508.3.3.2 Allowable Area.
  - Determined for each STORY
  - Sum of the Ratios shall not exceed ONE

- For each USE on a story:
  \[
  \text{Ratio} = \frac{\text{Proposed Area}}{\text{Allowable Area}}
  \]

**Example of Ratio Calculation**

- **Proposed:**
  - 1 story, type VB construction
  - Barbershop 900 SF
    - B (business)
  - Restaurant 4000 SF
    - A-2 assembly
  - Where do we go next?

- From Table 503
  - Barbershop allowed 9,000 SF
    - Ratio is 900/9000 = .10
  - Restaurant allowed 6,000 SF
    - Ratio is 4000/6000 = .67

- Sum is .77
  - Complies

**Separated Occupancies**

**Sum of the Ratios**

- **Type II-B Construction**

  - F-2: Proposed 12,000 SF
    - Allowed 23,000 SF
    - No rating required (trust me for a minute)
  - S-2 Storage: Propose 12,000 SF
    - Allowed 26,000 SF

  \[
  \begin{align*}
  \text{Sum of the Ratios:} & \quad \frac{12,000\text{SF}}{23,000\text{SF}} = .52 \\
  & \quad \frac{12,000\text{SF}}{26,000\text{SF}} = .46 \\
  \text{Sum} & = .98 \\
  \text{Complies}
  \end{align*}
  \]

**Mixed Occupancies**

- **508.3.3 Separated Occupancies**

  - GIVEN: Type II-B Construction
  \[
  \frac{\text{Actual Area}}{\text{Allowable Area}} + \frac{\text{Actual Area}}{\text{Allowable Area}} \leq 1
  \]

  - Factory allowed 15,500 SF
    - Offices (B) 6,000 SF

- **508.3.3.3 Allowable Height**

  - Each occupancy must comply based on Type of Construction

**What the ... does that mean??**

- The sum of the ratios applies to every mixed use on the story even when Table 508.3.3 does not require a fire-resistance rating between the proposed uses.
Lesson 4 – Incidental, Accessory and Mixed Uses

508.3.3 Separated Occupancies

Example of Allowable Height

- PROPOSED:
  - Type V-B Construction
  - 3 Story Building

Is this allowed?

According to Table 503 … NO!

Elevation View

508.3.3 Separated Occupancies

Mixed Occupancies

508.3.3 Separated Occupancies

508.3.3.4 Separation. … separated … in accordance with Table 508.3.3.

- Fire Barriers in accordance with 706
- Horizontal Assemblies as in 711

Mixed Separated Uses Example

Non-sprinklered Building

NO fire-rated separation required 2 hr fire-rated separation required

Group F-1 Manufacturing

Group B Offices

508.3.3 Separated Occupancies

Example #2 of Ratio Calculation

- Given:
  - Type IIIB Construction
  - 3 Stories
  - Mercantile, Office and Educational
  - No Sprinkler

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>A⁺⁺, E⁺⁺</th>
<th>I</th>
<th>R⁺⁺</th>
<th>B⁺⁺</th>
<th>F-2, S-2⁺⁺, U⁺⁺</th>
<th>M⁺⁺</th>
<th>F-1, S-1</th>
<th>H-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>A⁺⁺, E⁺⁺</td>
<td>S NS</td>
<td>S NS</td>
<td>S NS</td>
<td>S NS</td>
<td>S NS</td>
<td>S NS</td>
<td>S NS</td>
<td>S NS</td>
</tr>
<tr>
<td>I</td>
<td>N N N</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>R⁺⁺</td>
<td>1 2 1 2</td>
<td>1 2</td>
<td>1 2</td>
<td>1 2</td>
<td>1 2</td>
<td>1 2</td>
<td>1 2</td>
<td></td>
</tr>
<tr>
<td>B⁺⁺</td>
<td>N N N</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>F-2, S-2⁺⁺, U⁺⁺</td>
<td>N N</td>
<td>N N</td>
<td>N N</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>M⁺⁺</td>
<td>N N N</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>F-1, S-1</td>
<td>N N N</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

508.3.3 Separated Occupancies

Example #2 of Ratio Calculation

- Required Separation Rating?

Group B 10,000 SF

Group B 2,000 SF

Group E 8,000 SF

Group M 10,000 SF

Elevation View

2 hr fire-rated separations required

Group B

Group B

Group E

Group M
Lesson 4 – Incidental, Accessory and Mixed Uses

508.3.3 Separated Uses
Example #2 of Ratio Calculation

- First Story: Is all one use, Group M
  - Actual 10,000 SF
  - 12,500 SF Allowed
- Second story: Must be calculated
  - Business: 2,000/19,000 SF = .105
  - Educational: 8,000/14,500 = .55
  - SUM is .655, less than 1 complies
- Third story: all Group B
  - 10,000 SF actual
  - 19,000 allowed

Remember this ... Lesson 3

506.4 Area determination. The maximum area of a building with more than one story above grade plane shall ...

- Limits the cumulative floor area of the building
- Multiply $A_i$ (Allowable Area) of the first story
  - 2x for two story building
  - 3x for three or more stories

RULES for Mixed Occupancies ...

506.4 (Cumulative) Area Determination

- Non-separated Use = Most Restrictive
  - Applies to the First Story, Multiply by 3

- Separated Use: Sum of the Ratios for the ENTIRE BUILDING shall not exceed:
  - 2 for a two story building
  - 3 for buildings three or more stories

EXAMPLE: 3 stories same on each
Allowable AREA of the BUILDING

Sum of the Ratios = .95 on the FIRST STORY
Sum of the Ratios = .95 on the SECOND STORY
Sum of the Ratios = .95 on the THIRD STORY

SUM of the Ratios = 2.85
Less than 3 COMPLIES

EXAMPLE: 4 stories same on each
Allowable AREA of the BUILDING

Sum of the Ratios = .95 on the FIRST STORY
Sum of the Ratios = .95 on the SECOND STORY
Sum of the Ratios = .95 on the THIRD STORY
Sum of the Ratios = .95 on the FOURTH STORY

SUM of the Ratios = 3.80
Greater than 3 does NOT comply
Lesson 5 – Location on the Property

Exterior Walls and Location on the Property

Preventing Exterior Fire Spread

Location on the Property
Definition 702: Fire Separation Distance
The distance measured from the building face to one of the following:
1. The closest Interior Lot Line;
2. To the Centerline of a Street, an Alley or Public Way; or
3. To an Imaginary Line between two buildings on the property.
The distance shall be measured at right angles from the face of the wall.

Fire Separation Distance
704.3 Buildings on the Same Lot
• 704.3 Exception – buildings may be treated as one
• Aggregate Area does not exceed Allowable Area

Preventing Exterior Fire Spread
Issues and Concerns:
• Fire Separation Distance
  ➢ Lot Lines and Imaginary Property Lines
• Exterior Wall Construction
  ➢ Fire Resistance Ratings from Chapter 6
• Openings in the Exterior Wall
  ➢ Fire Protection Ratings from Chapter 7

Table 601 Fire-resistance Rating Requirements for Building Elements (Hours)

<table>
<thead>
<tr>
<th>Building Elements</th>
<th>TYPE I</th>
<th>TYPE II</th>
<th>TYPE III</th>
<th>TYPE IV</th>
<th>TYPE V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonbearing walls and partitions</td>
<td>See Table 602</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 602
Fire-Resistance Rating for Exterior Walls

<table>
<thead>
<tr>
<th>Fire Separation Distance (ft)</th>
<th>Construction Type</th>
<th>Group H</th>
<th>Group F-1, M, S-1</th>
<th>Group A, B, E, F-2, I, R(b), S-2, U</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5</td>
<td>ALL</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>≥ 5 &lt; 10</td>
<td>IA</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>≥ 10 &lt; 30</td>
<td>IA, IB</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>≥ 30</td>
<td>All</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Example of Tables 601 and 602

- Table 601: Based on Construction
  - Type IIB Building
    - Requires a "0" hour rated wall
- Table 602: Based on Distance
  - >5' <10', M Occupancy, Type IIB Building
    - Requires a "1" hour rated wall

Exterior Walls: Opening Protection, Section 704.8

Based on Fire Separation Distance

- Create a balance:
  - ALLOWABLE AREA of Openings
  - FIRE PROTECTION Provided

Table 704.8
Maximum Area of Exterior Wall Openings

<table>
<thead>
<tr>
<th>FIRE SEPARATION DISTANCE (feet)</th>
<th>CLASSIFICATION OF OPENING</th>
<th>0 to 3</th>
<th>&gt;3 to 5</th>
<th>&gt; 5 to 10</th>
<th>&gt; 10 to 15</th>
<th>&gt; 15 to 20</th>
<th>&gt; 20 to 25</th>
<th>&gt; 25 to 30</th>
<th>&gt;30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unprotected</td>
<td>NP</td>
<td>NP</td>
<td>10%</td>
<td>15%</td>
<td>25%</td>
<td>45%</td>
<td>75%</td>
<td>NL</td>
<td>NL</td>
</tr>
<tr>
<td>Protected</td>
<td>NP</td>
<td>15%</td>
<td>25%</td>
<td>45%</td>
<td>75%</td>
<td>NL</td>
<td>NL</td>
<td>NL</td>
<td>NL</td>
</tr>
</tbody>
</table>

Exterior Walls
Unprotected Opening Example

- FSD >5' <10' = 10% allowable unprotected openings
- 100 sq. ft. permitted; 80 sq. ft. proposed

Exterior Walls
Protected and Unprotected Openings

- Where both unprotected and protected openings proposed at a story, combined area at each story shall comply with:

\[
\frac{A}{a} + \frac{A_u}{a_u} \leq 1.0
\]

- A = Actual area protected openings (or \(A_e\))
- a = Allowable area protected openings (T.704.8)
- \(A_u\) = Actual area unprotected openings
- \(a_u\) = Allowable area unprotected openings (T.704.8)
Lesson 5 – Location on the Property

Exterior Walls

Opening Example

- FSD > 5' < 10' = 10% allowable unprotected openings
- 100 sq. ft. permitted, 110 sq. ft. proposed

Exterior Walls

Correction of the Violation

- Change the Door to a Protected Opening

\[
\frac{A}{B} + \frac{A_u}{a_u} \leq 1.0
\]

Exterior Wall Openings

Modification for Sprinklers, Section 704.8.1

- Buildings equipped with NFPA 13 Sprinkler
  - Other than H-1, H-2 or H-3
- Allowable UNPROTECTED OPENING shall be the same as TABULAR LIMITS for PROTECTED OPENINGS

Dangerous occupancies

Chapter 4 Contents

- Covered Mall
- High Rise
- Atriums
- Underground
- Vehicle related
- I-2 Medical
- I-3 Detention
- Projection Rooms
- Stages and Platforms
- Special Amusement
- Aircraft related
- Combustible Storage
- Hazardous Materials
- Group H Occupancies
- Flammable Finishes
- Drying Rooms
- Organic Coatings
- Group I-1, R-1, R-2, R-3
- Hydrogen Cutoff Rooms

Group H Occupancies

415.3 Fire Separation Distance

- Group H-2 or H-3
  - not less than 25% of the perimeter wall of the occupancy shall be an exterior wall

Group H Occupancies

415.3.1 Minimum Distance to Lot Line

- ONLY for Group H
  - Measure from occupancy wall, even when they are interior to the structure
  - Measure to lot line, including public way
Lesson 5 – Location on the Property

Group H Occupancies
415.3 Location on Property

- 415.3.1 Items 1 – 4
  - Provide specific minimum distance based on the H use
- Additional Qualifiers:
  - Explosives and Table 415.3.1
  - Detached Buildings and Table 415.3.2

Explosives, Table 415.3.1
Minimum Separation Distance

- Applicable for H-1, H-2 and H-3
- Based on Quantity (pounds) of TNT
- Terminology:
  - Inhabited Building
  - Barricaded
  - Unbarricaded
  - Magazine

Detached Buildings
Table 415.3.2

- Materials Listed … on Table 415.3.2
  - Match up with categories of H-1, H-2 and H-3
  - H-5 is not excluded
- When these quantities are Exceeded
  - Detached Building is Required
  - Distances per Table 415.3.1

Group H-1 Occupancies
415.4 Special Provisions

- Single use building
- One story in height
- No basement or Crawl Space
- Suitable Roof

Group H-2 and H-3
415.5 Special Provisions

- Where required in Detached Building
  - Single use building
  - One story in height
  - No basement or crawl space
- Containing Water Reactive materials
  - Resistant to water penetration

Summary: Location on Property
Preventing Exterior Fire Spread

Issues and Concerns:
- Fire Separation Distance
  - Lot Lines and Imaginary Property Lines
- Exterior Wall Construction
  - Fire RESISTANCE Ratings from Chapter 6
- Openings in the Exterior Wall
  - Fire PROTECTION Ratings from Chapter 7
Passive Fire Protection Concepts

Maintain Structural Integrity
Restrict the Spread of a Fire

In this Section …
How Passive Protection is Achieved

• What is FIRE RESISTANCE and how is it established?
• What types of fire-resistance RATED ASSEMBLIES are there?
• Why and how are COMPARTMENTS created, and what are they called?
• How are GAPS and OPENINGS treated to maintain the protection of the compartment?

703.2 Fire-resistance Ratings
Determination of Fire Resistance

• TESTED ASSEMBLY per ASTM E 119

• Be Aware … 703.3, Alternate methods for determining fire resistance
  – Documented in approved sources
  – Prescriptive in section 720
  – Calculated per section 721
  – Engineering analysis based on comparison to E 119

ASTM E-119
Test procedure: Wall and Floor Assemblies

Schematic of Wall Furnace
1 - furnace
2 - flue
3 - observation ports
4 - gas burners
5 - thermocouple tubes
6 - loading jacks
7 - restraining frame
8 - specimen

Schematic of Floor Furnace
1 - furnace
2 - flue
3 - gas burners
4 - observation ports
5 - restraining frame
6 - thermocouple tubes
7 - specimen

703.3 Fire Resistance
Alternative Method 1

• Documented in approved sources
Lesson 6 – Passive Fire Protection

Detour from Fire-resistance

- Safety Issues and Interior Finish materials
  - The rapid spread of fire
  - Contribution of fuel to the fire

- Test Standards
  - ASTM E-84 Surface Burning Characteristics
    - Walls and Ceilings
  - NFPA 253 Critical Radiant Flux
    - Floors

Chapter 8: Interior Finishes

Section 803 Wall and Ceiling Finishes

- ASTM E-84, The “Steiner Tunnel Test”
- Look at Table 803.5

<table>
<thead>
<tr>
<th>Flame Spread Rating</th>
<th>Class</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>Flame Spread 0-25 Smoke Developed 0-450</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>Flame Spread 26-75 Smoke Developed 0-450</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>Flame Spread 76-200 Smoke Developed 0-450</td>
</tr>
</tbody>
</table>

Chapter 8: Interior Finishes

Section 803.6 Textiles

- Woven, Nonwoven, Napped, Tufted, Loop ed or similar and Carpet

- Where used as Wall Coverings
  - Class A Flame Spread and Sprinklered
  - OR Tested per NFPA 265 (Room Corner Test)

Chapter 8: Interior Finishes

Section 804 Interior Floor Finish

- 804 applies to finishes OTHER THAN …
  - Traditional finishes not comprised of fibers
- Tested for Critical Radiant Flux (CRF)
  - Class I = 0.45 w/sq. cm
  - Class II = 0.22 w/sq. cm
- 804.4.1 Minimum critical radiant flux

Important Details of Fire Separation Assemblies

- MATERIALS of Construction
- Fire Resistance RATING
- Where does it start and where does it end - CONTINUITY

When “other” parts of the code require a fire resistance rated element … Chapter 7 tells us how to build it so it works!
Lesson 6 – Passive Fire Protection

General Rules

**Differences will be noted as appropriate**

- **Supporting Construction:**
  - The supporting construction shall be protected to afford the required fire-resistance rating of the element supported
- **Materials allowed**
  - As permitted by the type of construction

Openings:
Openings in ______ shall be protected in accordance with 715

Penetrations:
Penetrations through ______ shall comply with Section 712

Joints:
Joints made in or between ______ shall comply with 713

Duct and Air Transfer Openings:
Penetrations by duct and air transfer openings shall comply with 712 and 716

Categories of Fire Separation Assemblies

- **Fire Wall** - creates separate BUILDINGS
- **Fire Barrier** - may be horizontal or vertical
- **Shaft Enclosure** – story to story
- **Fire Partition** - vertical only
- **Smoke Barrier** - smoke containment membrane
- **Smoke Partition** – wall assembly to limit smoke movement
- **Horizontal Assemblies** - where floor or roof require rating

Fire Wall: Purpose and Application

- Highest level of Fire Rated Assembly in the Building Code
- Generally NOT REQUIRED but provides a design option
- Creates MULTIPLE BUILDINGS within a single structure

**Student Research**

- Find the Details for Fire Walls. What Code Section?
- DON’T ALWAYS BELIEVE ME! Find the TEXT that tells us a Fire Wall creates separate buildings!
- What is a Party Wall?

Fire Wall 702 Definition

A fire-resistance rated wall having protected openings, that restricts the spread of fire and extends continuously from the foundation to or through the roof, with sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall.
Lesson 6 – Passive Fire Protection

**Masonry Fire Wall**

**Structural Stability**

- Self Supporting
- Structural Independence on either side
  - “Fire cuts”

**Fire Wall**

**Technical Requirements**

- 705.3 Fire wall materials shall be NONCOMBUSTIBLE
  - except for Type V buildings
- Table 705.4 Minimum FIRE RESISTANCE ratings based on use group:
  - Groups A, B, E, H-4, I, R-1, R-2 and U (See footnote a)
    - 3-hour (Types I/III/IV)
    - 2-hour (Types II/V)
  - Groups F-1, H-3, H-5, M and S-1
    - 3-hour
  - H-1 and H-2
    - 4-hour
  - F-2, S-2, R-3 and R-4
    - 2-hour

**Fire Walls**

**705.5 Horizontal Continuity**

- Exterior Wall to Exterior Wall
- Extend 18”

**Fire Walls**

**705.6 Vertical Continuity**

- GENERAL RULE: Continuous from the Foundation to at least 30” above either Roof
- Called a PARAPET Wall
- NOTE: There are many exceptions

**Fire Barrier**

**702 Definition**

A fire-resistance-rated wall assembly of materials designed to restrict the spread of fire in which continuity is maintained.
### Lesson 6 – Passive Fire Protection

#### Fire Barriers

**706.5 Continuity must be provided …**

- **Deck to Deck**
  - Do not terminate at the ceiling
- **Securely attach at top and bottom.**
- **Extend continuously through concealed spaces.**
- **Fireblock within fire barrier at each floor level.**
- **Fire Rate Supporting construction.**

#### Shaft Enclosure

**Definitions: 702**

**Shaft**

An enclosed space extending through one or more stories of a building, connecting vertical openings in successive floors, or floors and roof.

**Shaft Enclosure**

The walls of construction forming the boundaries of a shaft.

#### Shaft Enclosure Required

**Section 707.2**

- **Rule #1**
  - Required for ALL openings and penetrations through floor/ceiling and roof/ceiling assemblies.
- **Rule #2**
  - Check the Exceptions
  - 13 exceptions listed in 707.2

#### Shaft Enclosures 707.2

**Exception #2: Escalators or Stairways**

- Enclosure not required if …
  - Building is SPRINKLERED
  - Opening is not part of the MEANS OF EGRESS
- Opening must be protected
  - NFPA 13 method
  - OR … Power Operated Shutter protection

#### Shaft Enclosures

**Technical Details**

- **§707.4 Fire-resistance Rating**
  - 2-hour when connecting 4 stories or more
  - 1-hour connecting less than 4 stories
  - Not less than the floor assembly (up to 2-hour)
- **§708.1 Where Required: To Separate …**
  - Dwelling units
  - Sleeping units in Group R-1 hotel, R-2 and I-1
  - Tenant spaces in covered malls
  - Corridor walls
  - Elevator lobby
  - Residential aircraft hangers

#### Fire Partition

**702 Definition**

A vertical assembly of materials designed to restrict the spread of fire in which openings are protected.
Lesson 6 – Passive Fire Protection

Fire Partition Details

§708.3 Fire-resistance Rating

- One hour Fire-resistance Rating
- Exceptions:
  - Corridor walls per Table 1017.1
  - 1/2-hour at dwelling unit and guest room separations in sprinklered Types IIB, IIB, and VB

Fire Partitions

708.4 Continuity

- Details similar to a Fire Barrier. Differences shown in italics.
  - Deck to Deck OR to Rated Ceiling
  - Securely attach, top and bottom
  - Extend through concealed spaces, EXCEPT where it stops at Rated Ceiling
  - If combustible construction, fireblock/draftstop concealed space above partition
  - Fire rate supporting construction same as fire partition EXCEPT tenant/sleeping unit separations and corridors in Types IIB, IIB, and VB.
- There are several exceptions.

Compartments for Fire and Life Safety

Compartments that keep the fire and smoke in, and Compartments that keep the fire and smoke out!

COMPARTMENTS and CONTAINMENT

- Building Height and Area
- FIRE AREA
- CONTROL AREA
- Smoke Compartment
- Egress Components
- Spaces with additional fuel and/or ignition sources

To Create the Compartment …

Provide Fire Resistant Construction

- Exterior Wall
- Fire Wall
- Fire Barrier
- Shaft Enclosure
- Fire Partition
- Smoke Barrier
- Smoke Partition
- Horizontal Assemblies

The KEY to this Topic

Compartments for Fire Safety

- Understand the need for a compartment
- Check the details for each feature individually
- Recognize that everything revolves around containment of fire and/or smoke
Lesson 6 – Passive Fire Protection

**Definition 702.1: Fire Area**
The aggregate floor area enclosed and bounded by FIRE WALLS, FIRE BARRIERS, EXTERIOR WALLS and fire resistance RATED HORIZONTAL ASSEMBLIES of a building.

**FIRE AREAS created with FIRE BARRIERS or HORIZONTAL ASSEMBLIES**

706.3.9 **Fire areas.** ...separating a SINGLE OCCUPANCY into different fire areas ... Table 706.3.9.

<table>
<thead>
<tr>
<th>OCCUPANCY GROUP</th>
<th>FIRE-RESISTANCE RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-1, H-2</td>
<td>4</td>
</tr>
<tr>
<td>F-1, H-3, S-1</td>
<td>3</td>
</tr>
<tr>
<td>A, B, E, F-2, H-4, H-5, I, M, R, S-2</td>
<td>2</td>
</tr>
<tr>
<td>U</td>
<td>1</td>
</tr>
</tbody>
</table>

**Table 508.3.3 Separation of Mixed Occupancies (portion)**

<table>
<thead>
<tr>
<th>Occupancy</th>
<th>A&lt;sup&gt;1&lt;/sup&gt;</th>
<th>E&lt;sup&gt;1&lt;/sup&gt;</th>
<th>I&lt;sup&gt;1&lt;/sup&gt;</th>
<th>R&lt;sup&gt;1&lt;/sup&gt;</th>
<th>B&lt;sup&gt;2&lt;/sup&gt;</th>
<th>F-1, S-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>NS</td>
<td>NS</td>
<td>S</td>
<td>NS</td>
<td>S</td>
<td>NS</td>
</tr>
<tr>
<td>NS</td>
<td>S</td>
<td>NS</td>
<td>S</td>
<td>NS</td>
<td>S</td>
<td>NS</td>
</tr>
<tr>
<td>NS</td>
<td>NS</td>
<td>S</td>
<td>NS</td>
<td>S</td>
<td>NS</td>
<td>S</td>
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<tr>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>S</td>
<td>NS</td>
<td>S</td>
<td>NS</td>
</tr>
<tr>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>S</td>
<td>NS</td>
<td>S</td>
<td>NS</td>
</tr>
</tbody>
</table>

Example:
Mixed Group A and Group E
NO rated separation for separated mixed use 2 hour separation need to create separate FIRE AREAS

**Regulation of Hazardous Materials**

**Control Area: Definition 307.2**
Spaces within a building where quantities of HAZARDOUS MATERIALS not exceeding the maximum allowable quantities per control area are stored, dispensed, used or handled. See also the definition of "Outdoor control area" in the Fire Code of New York State.

**Tables 307.1(1) and (2)**
Sample from Table 1

<table>
<thead>
<tr>
<th>Material</th>
<th>Class</th>
<th>Group if Quantity Exceeded</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combustible Fiber</td>
<td>Loose Baled&lt;sup&gt;1&lt;/sup&gt;</td>
<td>H-3 H-3</td>
<td>Solid pound (cubic ft.) Liquid gallons (pounds)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(100) (1,000) N/A</td>
</tr>
<tr>
<td>Flammable Liquid&lt;sup&gt;2&lt;/sup&gt;</td>
<td>IIA and III C</td>
<td>H-2 or H-3</td>
<td>NA</td>
</tr>
</tbody>
</table>
Lesson 6 – Passive Fire Protection

414.2 Control Areas

Specific Details

- Separated by Fire Barrier and Horizontal Assemblies
- Quantity percentage per Table 414.2
- Maximum Number per Table 414.2.2
- Fire Resistance per Table 414.2.2
  - Minimum 2 hour Floor Construction including support
  - Exception may allow 1 hour

<table>
<thead>
<tr>
<th>FLOOR LEVEL</th>
<th>PERCENTAGE OF THE MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA</th>
<th>NUMBER OF CONTROL AREAS PER FLOOR</th>
<th>FIRE-RESISTANCE RATING FOR FIRE BARRIERS IN HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above grade plane</td>
<td>5, 7, 9</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Below grade plane</td>
<td>1, 2, 3, 4, 5, 7, 10</td>
<td>1</td>
<td>Not Allowed</td>
</tr>
</tbody>
</table>

Maintaining the Integrity of Fire Resistant Assemblies

Penetrations, Section 712

Protection for Fire-resistance Rated Assemblies

What is a PENETRATION

- Examples include:
  - Holes for pipes, conduit, wire, ducts, etc.
- 2 Categories:
  - Through-Penetration
    - Passes through entire assembly
  - Membrane Penetration
    - Opening in 1 side of assembly

Fire-resistance Rated Walls

§712.3.1 Through penetrations. Through penetrations of fire-resistance-rated walls shall comply with §712.3.1.1 or §712.3.1.2.

- Penetration protection is part of the ASTM E-119 tested assembly
- Protection provided by a tested Firestop System

Through Penetrations

Firestop Systems: ASTM E 814

- Appropriate for Walls and Horizontal Assemblies
- Test replicates ASTM E 119 on a small scale
Wall Penetrations
712.3.2 Membrane Protection Details

- Exception #1: Steel electrical boxes
  - Not exceeding 16 sq. in.
  - 100 square inch of box per 100 square foot of wall
  - Separated on opposite sides of the wall

- Exception #2: Listed electrical boxes

Horizontal Assemblies
712.4.1.2 Membrane penetrations. Penetrations of membranes …shall comply with Section 712.4.1.1.1 or 712.4.1.1.2.

- Penetration protection is part of the ASTM E-119 tested assembly
- Protection provided by a tested Firestop System

Membrane Penetration
Components tested per ASTM E 119

- UL Design No. P513
- 1 ½ hour assembly

Item #12: Damper …held open with a fusible link (Bearing the UL Listing Mark)
Item #13: Fixture (Bearing the UL Listing Mark)
Item #14: Fixture Protection – Wallboard, Gypsum

Terminology
OPENING PROTECTIVE

Assembly of materials and accessories, including frames and hardware, installed in a wall, partition, floor, ceiling or roof opening to prevent, resist or retard the passage of fire, flame, excessive heat or hot gases.

Section 715 Opening Protectives organization
715.1 …(when) required by other sections …
715.2 Fire-resistance-rated Glazing
715.3 Alternative methods for Fire Protection Ratings
715.4 Fire Door and Shutter assemblies
715.5 Fire-protection-rated Glazing

Opening Protective
Swing Type Fire Door Assembly

FIRE DOOR ASSEMBLY
Any combination of a fire door, frame, hardware, and other accessories that together provide a specific degree of fire protection to the opening.

- Tested Assembly OR an Assembly of Tested Components

Opening Protectives
Door and Frame Labels

- Labeled at the Factory – NOT at the Job Site
Lesson 6 – Passive Fire Protection

Opening Protective Components of the Assembly

- Self Closing or Automatic Closing
- Latch required

Opening Protective Rolling Fire Shutter

Passive Fire Protection Determination of Fire Resistance

Horizontal Shutter

Service Counter Fire Door

Opening Protective Minimum Fire Protection Ratings

- 715.4 Fire door and shutter assemblies
  - Installed per NFPA 80
  - Minimum rating per Table 715.4 (next slide)

Table 715.4 Fire Door and Fire Shutter Fire Protection Ratings

<table>
<thead>
<tr>
<th>TYPE OF ASSEMBLY</th>
<th>REQUIRED ASSEMBLY RATING (hours)</th>
<th>FIRE DOOR AND FIRE SHUTTER ASSEMBLY RATING (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire walls and fire barriers having a required fire-resistance rating greater than 1 hour</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1 1/2</td>
</tr>
<tr>
<td>Fire barriers having a required fire-resistance rating of 1 hour:</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Shaft, exit enclosure and exit passageway walls</td>
<td>1 1/2</td>
<td></td>
</tr>
<tr>
<td>Other fire barriers</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Fire partitions:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corridor walls</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Other fire partitions</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Exterior walls</td>
<td>1 1/2</td>
<td></td>
</tr>
<tr>
<td>Smoke barriers</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Opening Protective Fire Door with Glazing

- Glazing Permitted in MOST Fire Door Assemblies
- Glazing Installed on the Job Site

Opening Protective Glazing Materials

- Categories of Glazing Materials
  - Wired glass
    - No longer allowed in areas subject to human impact
  - Fire-protection rated
  - Fire-resistance rated (ASTM E-119)
- Bear a label or be otherwise identified
Lesson 6 – Passive Fire Protection

Opening Protectives

Glazing Materials

• 715.4 Fire door and shutter assemblies.

715.4.6.3.1 Identification. For fire-protection-rated GLAZING, the label shall bear the following four-part identification:

- D: Glazing meets fire-resistance
- H or NH: Hose Stream / No Hose Stream test
- T or NT: Temperature Rise/No Temperature Rise protection
- XXX: Fire Protection Rating in minutes

Ducts and Air Transfer Openings

Introduction, Section 716

Ducts and Air Transfer Openings

• Rule Number 1: If it penetrates a Fire-resistance Rated Assembly, provide the appropriate damper

• Rule Number 2: If there is an exception and a damper is not required, fire stop around the duct

Ducts & Air Transfer Openings

Types of dampers

• Fire damper
• Smoke damper
• Ceiling radiation damper
• Combination fire/smoke damper

Dampers

Section 716.5 Where Required

• Fire Wall – fire damper
• Fire Barrier – fire damper
• Shaft Enclosure – fire and smoke damper
  - Ducts not allowed to penetrate exit enclosure
• Fire Partitions – fire damper
• Corridors – smoke damper*
• Smoke Barrier – smoke damper

Summary: Passive Fire Protection

• Based on FIRE RESISTANCE
• Vertical and Horizontal ASSEMBLIES with FIRE RESISTANCE RATINGS
• COMPARTMENTS for life safety and property protection
• Maintain the INTEGRITY by protecting openings, penetrations and joints
Lesson 7 – Active Fire Protection

In this portion of the course …

• Describe the different types of equipment and systems used in Fire Safe Design
  – What they are
  – Why it’s important
  – How they work
• Locate the applicable information within the Code

Chapter 9: Table of Contents

Building Code
- §901 General
- §902 Definitions
- §903 Automatic Sprinkler Systems
- §904 Alternative Automatic Fire-Extinguishing Systems
- §905 Standpipe Systems
- §906 Portable Fire Extinguishers
- §907 Fire Alarm and Detection Systems
- §908 Emergency Alarm Systems
- §909 Smoke Control Systems
- §910 Smoke and Heat Vents
- §911 Fire Command Center
- §912 Fire Department Connections

Fire Code
- §F901 General
- §F902 Definitions
- §F903 Automatic Sprinkler Systems
- §F904 Alternative Automatic Fire-Extinguishing Systems
- §F905 Standpipe Systems
- §F906 Portable Fire Extinguishers
- §F907 Fire Alarm and Detection Systems
- §F908 Emergency Alarm Systems
- §F909 Smoke Control Systems
- §F910 Smoke and Heat Vents
- §F911 Explosion Control
- §F912 Fire Department Connections
- §F913 Fire Pumps
- §F914 Fire Protection based on Special Detailed Requirements of Use and Occupancy

General Organization

• Each section specific to fire protection feature
• Requirements for installation the same as the building code
• Maintenance requirements added in the fire code

Organization Example

§903 Sprinkler Systems

• 903.1 General requirements
• 903.2 Where required
• 903.3 Installation requirements
• 903.4 Monitoring and Alarms
• 903.5 Testing and maintenance
• 903.6 Existing buildings

The specific topics in this series include …

• Portable Fire Extinguishers
• Fire Alarm and Detection Systems
• Fire Suppression Equipment
Lesson 7 – Active Fire Protection

Code Research

• Find the requirements for Fire Extinguishers in the Building Code.
• Find the requirements for Fire Extinguishers in the Fire Code.

Portable Fire Extinguishers

Section 906

906.1 Where required by this section
1. In NEW and EXISTING Group ...
And as required by Table 906.1

<table>
<thead>
<tr>
<th>SECTION</th>
<th>SUBJECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>303.5</td>
<td>Asphalt kettles</td>
</tr>
<tr>
<td>307.4</td>
<td>Open burning</td>
</tr>
<tr>
<td>308.4</td>
<td>Open flames</td>
</tr>
</tbody>
</table>

Portable Fire Extinguishers

Section 906

• §906.2 General
  – Selected, installed and maintained … this section and NFPA 10
• §906.3 Size and Distribution
  – Selected and placed
• §906.4 Cooking grease fires
• §906.5 through §906.10 Installation Details

NFPA 10 Chapters

• General Requirements
  – Classifications and Hazards
• Selection of Extinguishers
• Installation of Extinguishers
• Inspection, Maintenance and Recharging
• Hydrostatic Testing

Fire Alarm and Detection Systems

Chapter 9
Building Code of New York State
Fire Code of New York State

Contents of Section 907

<table>
<thead>
<tr>
<th>Building Code</th>
<th>Fire Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>§907.1 General</td>
<td>§907.1 General</td>
</tr>
<tr>
<td>§907.2 Where Required</td>
<td>§907.2 Where Required - New</td>
</tr>
<tr>
<td>§907.3 Fire Alarm Boxes</td>
<td>§907.3 Where Required - Existing</td>
</tr>
<tr>
<td>§907.4 Power Supply Etc.</td>
<td>§907.4 Fire Alarm Boxes</td>
</tr>
<tr>
<td>§907.5 Power Supply Etc.</td>
<td>§907.5 Power Supply Etc.</td>
</tr>
</tbody>
</table>
Lesson 7 – Active Fire Protection

Definition

FIRE ALARM SYSTEM
A system … consisting of components and circuits arranged to monitor and announce the status of fire alarm (device) or supervisory signal-initiating devices and to initiate the appropriate response to those signals.

What is an Alarm System?

• It starts with an INITIATING DEVICE
  MANUAL FIRE ALARM BOX

What is an Alarm System?

• AUTOMATIC Initiating Devices
  – Smoke
  – Heat
  – Flame
  – Gas Sensing

What is an Alarm System?

• It ends with a NOTIFICATION APPLIANCE
  AUDIBLE ALARM NOTIFICATION APPLIANCE
  VISIBLE ALARM NOTIFICATION APPLIANCE

What is an Alarm System?

• It is Coordinated by the FIRE ALARM CONTROL UNIT
  – Monitor the components and circuits
  – Annunciate the status
  – Activate the appropriate response
  • This is the basic LOCAL ALARM SYSTEM

Local Protective System

This basic configuration monitors and notifies the “PROTECTED PREMISES”
Supervisory Service

*In addition to the local protection*

- Turn to: 901.6 in the Building Code

- **What is a SUPERVISORY SERVICE?**
  It monitors the LOCAL system and notifies response personnel at a SUPERVISORY STATION in accordance with NFPA 72

Central Station Service

Protected Property #1  
Protected Property #2  
Protected Property #3

Telephone Exchange

Primary Power Supply  
Central Station Alarm Console  
Connection to Fire, Police, EMS

Protected Property #1  
Protected Property #2  
Protected Property #3

Proprietary Service

Building #1  
Building #2  
Building #3

Principal Power Supply  
Proprietary Alarm Console  
Connection to Fire, Police, EMS

Principal Power Supply  
Remote Station Control Unit  
Alarm  
Annunciator

Remote Station Service

Protected Property #1  
Protected Property #3

Telephone Exchange

Principal Power Supply  
Backup Power Supply  
Alarm

Supervisory Service is Required

- **Building Code 901.6 (NOT in the Fire Code)**
  - Automatic sprinkler systems, except:
    - Systems in one- and two-family dwellings
    - Systems serving less than 20 sprinklers
  - Fire alarm systems, except:
    - Single- and multiple-station smoke alarms
    - Smoke detectors in Group I-3 occupancies
  - Group H fire protection systems, with an exception

Fire Alarm and Detection Systems

907.2 Where required

- An approved ... shall be provided
  - Manual Fire Alarm System
  - Automatic Fire Detection System
  - Automatic Heat Detection System

- **BUT ...**
  *The automatic fire detectors shall be SMOKE DETECTORS.*
  - Conditions may dictate other detection methods
Lesson 7 – Active Fire Protection

Fire Alarm and Detection Systems

907.2 Where required

- Based on OCCUPANCY – look in 907.2
  - Groups listed alphabetically
  - The type of system addresses the needs posed by the occupancy
  - Additional required locations based on special use or occupancy at the end of 907.2

Definition 902.1

SMOKE ALARM

A single- or multiple-station alarm responsive to smoke and not connected to a system

Code Search

- Find the Requirements for SMOKE ALARMS
  - Use either the Building Code or the Fire Code. Your choice.

SECTION 610 CARBON MONOXIDE ALARMS

- 610.3 (Where) Required locations.
  - Organization by Use and Occupancy
    - One-family:
      - New, after 1/1/08
      - Existing, built prior to 1/1/08
    - Two-family, Townhouse, Condo and Coop (as above)
    - B& B, Groups E, I-2, I-4, and R’s (as above)
    - Group I-1 (as above)

SECTION 610 CARBON MONOXIDE ALARMS

EXAMPLE:

- Two Family, Townhouse, Condo and Coop
  - Constructed on or after January 1, 2008.
    - Every story with a sleeping area
    - Each story with a CO source
  - Buildings constructed prior to January 1, 2008
    - Lowest story with a sleeping area
  - Device located within 15’ of sleeping area

- 610.4 New Carbon Monoxide source.
  - Adding a furnace, or wood stove, etc.
  - Building to be evaluated as if NEW for alarm locations
  - Allows DETECTORS in lieu of ALARMS
**SECTION 610**
**CARBON MONOXIDE ALARMS**

- 610.5 Power source.
  - Hardwired, battery backup
    - With some exceptions

- 610.6.1 Interconnected
  - Except when battery power is acceptable

**Fire Suppression Systems**

Automatic Sprinkler Systems
Alternative Systems
Standpipe Systems

**MYTHS AND FACTS ABOUT AUTOMATIC FIRE SPRINKLERS**

Myth 1: “Water damage from a sprinkler system will be more extensive than fire damage.”
Myth 2: “When a fire occurs, every sprinkler head goes off.”
Myth 3: “A smoke detector provides enough protection.”
Myth 4: “Sprinklers are designed to protect property, but are not effective for life safety.”

**How does a Sprinkler System Work?**

- This is a HEAT ACTUATED valve
- Connected to a WATER SUPPLY

Imagine a few pipes along the way...

- If a FIRE occurs, the HEAT RISES
  - When sufficient heat rises to the SPRINKLER HEAD
  - ... the valve OPENS
Lesson 7 – Active Fire Protection

How does a Sprinkler System Work?

- When the VALVE OPENS, the WATER COOLS the FIRE

In this section …

- Describe the 4 basic types of Sprinkler Systems
- For a list of occupancies, determine whether a Sprinkler System is required
- Identify 4 types, and 3 classes of Standpipe Systems
- Determine Standpipe requirements for a multi-story building

Types of Sprinkler Systems

Types of Sprinkler Systems
- Wet Pipe

Types of Sprinkler Systems
- Dry Pipe

Types of Sprinkler Systems
- Pre-Action

Types of Sprinkler Systems
- Deluge
Lesson 7 – Active Fire Protection

System Components
Sprinkler Operation

- Fusible link
- Liquid filled glass bulb

System Components
Sprinkler Characteristics

- Temperature Rating
- Thermal Sensitivity and Response

System Components
Sprinkler Characteristics

- Orientation and Appearance

Concealed Sprinklers

- Concealed Head / White Cover Plate
- Concealed Head / Brass Cover Plate

Piping Terminology and Components

- FEEDER MAIN from the WATER SUPPLY
- Vertical sections are RISERS
- CROSS MAINS are horizontal and feed BRANCH LINES
- Entire system is supported by HANGERS and CLAMPS

System Components
Piping and Fittings

BlazeMaster
Lesson 7 – Active Fire Protection

Sprinkler Riser Components

System Components
Indicating Control Valve

Outside Stem and Yoke (OS&Y)
Post Indicating

System Components
Fire Department Connection

System Components
Alarm Devices

• Flow switch
• Water motor gong
• Tamper switch

READ the Code Carefully ???

“903.2.10 Windowless stories in all occupancies.

• This is only a TITLE – You must read and follow directions
• Sprinkler required in specific situations whether the building is windowless or not!!!

Sprinkler Systems Required
§903.2.10.3 Buildings over 30’ in Height

Buildings with a floor level, with 30 or more occupants, located 30 feet above the lowest level of fire department vehicle access

• Exceptions:
  – Airport Control Towers
  – Open Parking Structures
  – Occupancies in Group F-2
Lesson 7 – Active Fire Protection

Sprinkler Systems Required

Is a Sprinkler System required in a Detached SINGLE FAMILY Dwelling ???

Sprinkler Systems Required

§903.2.13 Other Required Systems

• In ADDITION to the rest of 903.2
• Specific Buildings and Areas based on the USE
• Coordinates with other sections of the Building Code and with the Fire Code
• Table 903.2.13

Fire Sprinkler Systems

§903.3.1 Installation Standards

• 903.3.1.1 NFPA 13
• 903.3.1.2 NFPA 13R
  – Where allowed in Group R
• 903.3.1.3 NFPA 13D
  – Where allowed in One- and Two Family Dwellings

Section 904

Alternative Extinguishing Systems

• 904.1 General requirements
• 904.2 Where required
• 904.3 Installation
• 904.4 Inspection and Testing
• 904.5 - 904.10 Types of agents
• 904.11 Commercial Cooking Systems

Section 905

Standpipe Systems

• NFPA 14 is the Installation Standard

Standpipe Terminology

Types of Systems

• Automatic Dry Standpipe
• Automatic Wet Standpipe
• Manual Dry Standpipe
• Manual Wet Standpipe
Lesson 7 – Active Fire Protection

Standpipe Terminology

Class of System

- **Class I**
  - For trained personnel
- **Class II**
  - Primarily for occupants
- **Class III**
  - Combination

Standpipe Systems

Organization of Section 905

- When is a Standpipe required?
  - 905.3.1 through 905.3.6
- IF required, how are hose connection locations determined?
  - 905.4 Class I connection
  - 905.5 Class II connection
  - 905.6 Class III connection

Student Activity

Appendix page 21

- If the Corning Tower were constructed today, would a Standpipe system be required?
- If so, what are the important details?
  - System type and locations

Summary: Active Fire Protection

- Chapter 9 is Fire Protection Systems
  - Building Code and the Fire Code
- Fire Tetrahedron and the Principles of Combustion
- Alarm and Detection
  - Detect, Notify, Annunciate and Monitor
- 4 basic types of Sprinkler Systems
- 3 Class of Standpipe Systems
- NFPA provides the Referenced Standards
Recognition of the Fire Service in Fire Safe Design

A balanced approach to effective protection

In this lesson …

Chapter 5, Fire Code of New York State

- Applicable to all buildings, structures and premises
  - Individual sections specify applicability
- Addresses such items as:
  - Fire Apparatus Access Roads
  - Premises Identification
  - Key Boxes
  - Hazards to Fire Fighters
  - Fire Protection Water Supplies

Fire Service and Fire Safe Design

Chapter 5

§501.1 Scope
Fire service features for buildings, structures and premises shall comply with this chapter.

501.3 Construction documents
501.4 Timing of installation

Fire Apparatus Access Road

Section 503

Definition 502.1
FIRE APPARATUS ACCESS ROAD. A road that provides fire apparatus access from a fire station to a facility, building or portion thereof. This is a general term inclusive of all other terms such as fire lane, public street, private street, parking lot lane and access roadway.

Fire Apparatus Access Road

Section 503.1.1

- Required for new and relocated buildings
- Extend to within 150'
  “…measured by an approved route around the exterior…”

Fire Apparatus Access Road

Section 503.1.1 Exceptions

- 150 feet permitted to be 300’ where:
  - Building is sprinklered
- Access roads NOT required for:
  - Properly conditions prohibits closer access, Building is sprinklered
  - Detached one- and two-family dwellings or not more than two Group R-3
  - Group U
**Lesson 8 – Fire Service and Fire Safe Design**

**SECTION 503**

**FIRE APPARATUS ACCESS ROADS**

**503.2 Specifications.** Fire apparatus access roads shall be installed and arranged in accordance with Sections 503.2.1 through 503.2.7.

- Dimensions
- Surface
- Dead Ends
- Refer to Appendix D for details

**APPENDIX D**

**FIRE APPARATUS ACCESS ROADS**

Referenced topics:
- Access and Loading
  - Hereafter constructed
  - Asphalt, concrete or other approved surface
  - 75,000 pounds

**APPENDIX D**

**FIRE APPARATUS ACCESS ROADS**

Referenced topics:
- Access and Loading
- Access Road with a Hydrant
- Minimum Specifications
- 26’ width when there is a hydrant
- Maximum 10% grade unless otherwise approved

**MINIMUM CLEARANCE AROUND A FIRE HYDRANT**

<table>
<thead>
<tr>
<th>LENGTH (ft)</th>
<th>WIDTH (ft)</th>
<th>TURNDOWNS REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-50</td>
<td>20</td>
<td>None required</td>
</tr>
<tr>
<td>51-100</td>
<td>20</td>
<td>120-foot dimensioned 60-foot “V” or 90-foot dimensioned 60-foot in accordance with Figure D103.1</td>
</tr>
<tr>
<td>101-150</td>
<td>20</td>
<td>120-foot dimensioned 60-foot “V” or 90-foot dimensioned 60-foot in accordance with Figure D103.1</td>
</tr>
<tr>
<td>Over 150</td>
<td>20</td>
<td>Special approval required</td>
</tr>
</tbody>
</table>

**Acceptable Turnarounds**

Dead end in excess of 150’

- 120° HAMMERHEAD
- ACCEPTABLE ALTERNATIVE TO 120° HAMMERHEAD

- 90° DIAMETER CUL-DE-SAC
- ACCEPTABLE ALTERNATIVE TO 120° HAMMERHEAD

**APPENDIX D**

**FIRE APPARATUS ACCESS ROADS**

Referenced topics:
- Access and Loading
- Access Road with a Hydrant
- Dead Ends
- Aerial Fire Apparatus Access Roads
  - Buildings exceeding 30’ above LLFDA
  - No overhead obstructions
  - 26’ minimum width
  - Located from 15’ to 30’ and parallel
### Lesson 8 – Fire Service and Fire Safe Design

#### Additional Items in Chapter 5
*Applicable to new and existing premises*

- Section 504 Required Access  
  - Walkways, doors and stairways  
- Section 505 Premises Identification  
  - Address numbers  
  - Street signs  
- Section 506 Key Boxes  
- Section 507 Hazards to Fire Fighters

#### SECTION 505  
PREMISES IDENTIFICATION

**505.3 Buildings Utilizing Truss-Type Construction**
- Identified for responders  
- Title 19 NYCRR Part 1264 reprinted in Appendix H

---

#### 19 NYCRR Part 1264  
Identification of Buildings Utilizing Truss Type Construction

**1264.1 Introduction.** Section 382-a of the Executive Law provides that commercial and industrial buildings and structures that utilize truss type construction shall be marked …
- Enforcement by local government  
- $50 fee prior to the issuance of a building permit  
- Definition: Series of triangles

---

#### 19 NYCRR Part 1264  
Identification of Buildings Utilizing Truss Type Construction

**6” circle, ½” letter stroke**
- Reflective white background  
- Reflective red letters

**Information**
- Type of Construction  
- Floor, Roof, or Both

---

#### 19 NYCRR Part 1264  
Identification of Buildings Utilizing Truss Type Construction

- Location details  
  - Exterior Doors  
    - Entrance, exit and roof access stairways  
    - Attached to door, sidelight or adjacent to the door jamb  
  - Series of doors  
  - At each end  
  - Fire Department Connections  
  - Specifications:  
    - Horizontally within 12”  
    - Vertical 42” to 60” above walking surface
Lesson 8 – Fire Service and Fire Safe Design

Fire Protection Water Supply

508.1 Required water supply
- Shall be provided to premises hereafter constructed ...
- Supply MUST be capable of supplying the required fire flow
- “Fire flow” is the amount of water available for firefighting

Fire Protection Water Supply

508.1 Required Water Supply Exceptions

- Exception:
  - Detached One- and Two-family Dwelling
    - NOT required in AREAS WITHOUT FIXED FIRE PROTECTION WATER SUPPLIES

Fire Protection Water Supply

508.2 Type of Water Supply

- Approved supply consists of:
  - Reservoirs
  - Pressure tanks and Elevated tanks
  - Water mains
  - Other fixed systems capable of providing the required fire flow
- Exception: Allows a Rural Water Supply as provided in NFPA 1142

Fire Protection Water Supply

508.5 Fire Hydrant Systems

- Applicable to “NEW” construction
  Where a location on a newly constructed fire apparatus access road is more than 400 feet (122 m) from a hydrant ...
  - on-site fire hydrants and mains shall be provided.
- Exceptions (next slide)

Fire Protection Water Supply

508.5 Fire Hydrant Systems

- 600 feet allowed for:
  - Group R-3 and U
  - Sprinklered Building
- One – Two-family Detached
  - 1000 feet or other Approved fire protection
- Rural Water Supply distance must be approved

Fire Command Center

Section 509

Where required by other sections ... and in all buildings classified as high-rise
- Location approved by the Fire Department
- Separated by 1-hour fire barrier
- Minimum size 96 SF
- Comply with NFPA 72
- Contain the features listed in 509.1
§511 Emergency Vehicle Access for Detached One- and Two-family Dwellings

• 511.2 Driveways. Driveways shall be provided when an exit door … is located more than 300 (45,720 mm) from a fire apparatus access road …
  – Details and Specifications
    • 12' unobstructed width
    • Turnaround needed if dead end > 500'
    • Turnouts every 500' or less
    • Strength and all weather stability
    • Acceptable grade and turning radius
  • 4 or more Buildings - meet 503.1.1

Summary

• Fire Safe Design relies on Balanced Protection
• Fire Service can respond in ways that equipment cannot
• The code is written to assist and protect the responders as well as the building occupants
Lesson 9 – Means of Egress

Chapter 10
Means of Egress

Determining the Required Number and Width of Exits

MEANS OF EGRESS

A CONTINUOUS and UNOBSTRUCTED path of vertical and horizontal egress travel from any point in a building or structure to a public way.

Consists of three separate and distinct parts: EXIT ACCESS, EXIT, and EXIT DISCHARGE...

EXIT ACCESS

- From any occupied space to an exit

EXIT

- Protected path of travel
- Exits include:
  - Exterior doors at grade
  - Exit enclosures
  - Exit passageways
  - Exterior stairs/ramps
  - Horizontal exits

EXIT DISCHARGE

- From the end of the exit to a public way

SECTION 1003
GENERAL MEANS OF EGRESS

1003.1 Applicability

... Sections 1003 through 1013 shall apply to all three elements of the means of egress system, in addition to those specific requirements for the exit access, the exit and the exit discharge detailed elsewhere in this chapter.
Lesson 9 – Means of Egress

Chapter 10: Means of Egress
Chapter Reorganization/ Renumbering

Fundamental Requirements
System design Components

1003 General Means of Egress
1004 Occupant Load
1005 Egress Width
1006 Means of Egress Illumination
1007 Accessible Means of Egress
1008 Doors, Gates and Turnstiles
1009 Stairways and Handrails
1010 Ramps
1011 Exit Signs
1012 Handrails
1013 Guards

Chapter 10: Means of Egress
Chapter Reorganization/ Renumbering

1014 Exit Access
1015 Exit and Exit Access Doorways
1016 Exit Access Travel Distance
1017 Corridors

Exits

1018 Exits
1019 Number of Exits and Continuity
1020 Vertical Exit Enclosures
1021 Exit Passageways
1022 Horizontal Exits
1023 Exterior Exit Ramps and Stairways

Exit Discharge

1024 Exit Discharge

Job #1: Verification of Exits in New Construction.

Our job is to ensure that a new building has enough exiting for the number of people that will occupy the building.

- Confirm the DESIGN OCCUPANT LOAD
- Verify that the proposed WIDTH OF EGRESS COMPONENTS is adequate
- Ensure that the building provides the required NUMBER OF EXITS (Later in this series)

1004 Occupant Load

1004 Design Occupant Load ...

1004.1 Design occupant load. ... the number of occupants ... shall be determined in accordance with this section.

- Include all occupants egressing through a space
- Areas without fixed seats use Table 1004.1.1

30 + (10 + 10 + 5) = 55 Design Occupant Load
Design Occupant Load 1004.1
Table 1004.1.1 (portion)

MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT

<table>
<thead>
<tr>
<th>Function of Space</th>
<th>FLOOR AREA IN SQ. FT./PERSON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airport terminal</td>
<td>20 gross</td>
</tr>
<tr>
<td>Baggage Claim</td>
<td>300 gross</td>
</tr>
<tr>
<td>Baggage handling</td>
<td>100 gross</td>
</tr>
<tr>
<td>Concourse</td>
<td>15 gross</td>
</tr>
<tr>
<td>Waiting Area</td>
<td></td>
</tr>
<tr>
<td>Assembly</td>
<td></td>
</tr>
<tr>
<td>Assembly with fixed seats</td>
<td>See Section 1004.7</td>
</tr>
<tr>
<td>Gaming floors (keno, slots, etc.)</td>
<td>11 gross</td>
</tr>
</tbody>
</table>

Design Occupant Load 1004.1
1004.7 Fixed Seating

1004.7 Fixed seating. ... determined by the number of fixed seats...
- Bleacher type seating
- Both seating

Design Occupant Load 1004.1
Table 1004.1.1 (portion)

MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT

<table>
<thead>
<tr>
<th>Function of Space</th>
<th>FLOOR AREA IN SQ. FT./PERSON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assembly with fixed seats</td>
<td>See 1004.7</td>
</tr>
<tr>
<td>Assembly without fixed seats</td>
<td></td>
</tr>
<tr>
<td>Concentrated (chairs only)</td>
<td>7 net</td>
</tr>
<tr>
<td>Standing space</td>
<td>5 net</td>
</tr>
<tr>
<td>Un-concentrated (tables &amp; chairs)</td>
<td>15 net</td>
</tr>
</tbody>
</table>

Design Occupant Load 1004.1
EXIT: Example

S-2 Warehouse Occupancy

40,000 SF
1 story

1004 Occupant Load
Increased Occupant Load 1004.2

... occupant load ... is permitted to be increased from that number established for the occupancies in Table 1004.1.1...
- All other code requirements are met
- Maximum density one occupant per 7 SF
- Floor plans (diagrams) may be required

Design Occupant Load
Posting of Occupant Load 1004.3

- Every room or space that is an assembly occupancy
  - Reminder: Accessory rooms or spaces for less than 50 people are considered as part of the primary occupancy
- Conspicuously posted
- Maintained by the Owner
Lesson 9 – Means of Egress

System Design Requirements

- 1004.4 Multiple Levels
  - Compute exits for each floor individually
  - No decrease in direction of travel
- 1004.5 Egress Convergence
  - Convergence from above and below
  - Sum of the 2 floors
- 1004.9 Multiple Occupancies
  - More stringent condition applies

Minimum Egress Width 1005

- Determine the TOTAL WIDTH REQUIRED based on:
  - Occupant load
  - Factor from Table 1005.1
- Loss of One Exit shall not reduce capacity more than 50%

Table 1005.1

Egress Width per Occupant Served

- Occupant Load x Factor = Minimum Width

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>WITH MEANS OF EGRESS</th>
<th>WITHOUT MEANS OF EGRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Staircase (inches per occupant)</td>
<td>Other egress components (inches per occupant)</td>
</tr>
<tr>
<td>40,000 SF</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>2 - 44&quot; Doors</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Minimum Width 50% Rule

- OK
  - The loss of any single exit will not result in the less than ½ of the required width remaining

- Not permitted
  - Loss of single exit could result in less than ½ of required width remaining

S-2 Warehouse Occupancy

- 40,000 SF
- 1 story
- 2 - 44" Doors
Lesson 9 – Means of Egress

Minimum Width 50% Rule

OK

Although double doors give greater than 1/2 of available width, not less than 1/2 of required width would still remain.

Egress Width Section 1005.2

- Doors opening into the path of egress travel

Egress Width 1008.1.1 Size of Doors

- Minimum 32” (with exceptions)
- Measured with door at 90°

Student Activity: Appendix page 23

1004.4 Multiple Levels
1004.5 Egress Convergence

GIVEN:
- 4 Story, Non-sprinklered Office Building
- Occupants from each level into enclosure as indicated
- First floor has independent exit without entering stair enclosure

Chapter 10 Means of Egress

Fundamental Requirements and Components
Lesson 9 – Means of Egress

In this session ... Details

- Design Requirements
  - 1006 Egress Illumination
  - 1007 Accessible Means of Egress
- Exit Components
  - 1008 Doors, Gates and Turnstiles
  - 1009 Stairways
  - 1010 Ramps
  - 1011 Exit Signs
  - 1012 Handrails
  - 1013 Guards

Egress Illumination 1006

- Illuminated at all times that the space is occupied
  - Includes exit discharge
- Emergency Power required as follows:
  - Where 2 means of egress are required
  - Locations
    - Corridors, passageways and aisles
    - Exit stairways and Interior discharge elements
    - Discharge areas adjacent to the building

What Is ... Emergency Power?

- Types
  - Emergency
  - Standby
- Requirement for Egress Illumination?
  - 90 minute duration
  - Source specified
  - Section [F]604 and the Building Code

Emergency Power Sources

- Unit Equipment
- Storage Battery
- Generator Set
- Uninterruptible Power Supplies

Egress Doors 1008
Egress Component Details

- 1008.1.1 Size of doors
  - Not less than 32” CLEAR
  - Maximum 48” swinging door
  - Hospitals minimum 41.5”
  - 80” height
- 1008.1.2 Door swing
  - Side hinged
  - In direction of egress travel (50 or more people or high-hazard occupancy)

SECTION 1008
DOORS, GATES AND TURNSTILES

- 1008.1.8 Door operations
  - Readily openable without key, tool or special knowledge
- 1008.1.8.3 Locks and Latches
  - Permitted to PREVENT operation of door ...
    - Detention or restraint
    - Some Main exterior doors
    - Door pair with Automatic Flush Bolts
    - Dwelling or Sleeping Unit
Lesson 9 – Means of Egress

Hardware Terminology

- Bolt Locks
  - Flush Bolts
  - Surface Bolt
  - Automatic Flush Bolt

Dead Bolt – double key cylinder

Automatic Flush Bolts

Flush Bolts

SECTION 1008
DOORS, GATES AND TURNSTILES

- 1008.1.8.5 Unlatching
  - No more the ONE operation

  Exceptions:
  - Detention or restraint
  - Where manual bolts are allowed (1008.1.8.4)
  - Some Main exterior doors
  - Doors with Automatic Flush Bolts (1008.1.8.3)
  - Dwelling or Sleeping Unit

Hardware Terminology

- Residential additional devices
  - Dead bolt
    - Single vs. double cylinder
  - Night latch
  - Security chain

Dead Bolts

Night Latch

Security Chain

What’s Wrong with this Picture?

Double security lock with inside handle which can be locked from the inside with the turn of a key

What’s Right with this Picture!

This lock is engineered so a turn of the knob simultaneously retracts both bolt and latch for emergency exit.

PANIC and FIRE EXIT HARDWARE
Egress Component Details

Definitions?
- See 1002
- 1008.1.9 Where required:
  - Group A and E with occupant load 50 or more
  - Group H
  - ONLY required on doors with a LOCK OR LATCH
Lesson 9 – Means of Egress

Stairways 1009
Egress Component Details

- Minimum Dimensions
  - Width 44”, or 36” if less than 50 people
  - Headroom, 80”

What Is … Exit Sign?

§1011 Exit Signs

- Where required
  - Exit and exit access doors
  - Access to exits where direction of travel is not immediately visible

- Located
  - Visible from any direction
  - Within 100’ in an exit access corridor

1012 Handrails

1012.1 Where required. Handrails for stairways and ramps shall be ...

- Handrail height
- Intermediate handrail
- Graspability
- Continuity
- Handrail extensions
- Clearance
- Projections
- Intermediate rail (stairs)

1013 Guards

- Locations more than 30” above grade
- Not less than 42” high
- Opening limitations

Chapter 10
Means of Egress

Exit Access, Exit and Exit Discharge
Public Assembly
Emergency Escape and Rescue Openings
Lesson 9 – Means of Egress

1014 through 1017
Exit Access

- Important Topics
  - Are there Alternatives
  - Access Path of Travel
  - Components

Exit Access – Path of Travel
1014.2 Intervening Spaces

- Egress SHALL NOT pass through intervening spaces
  - EXCEPT when ...
    - Spaces are accessory, AND
    - Not high hazard, AND
    - Discernible path to an exit

- Egress SHALL NOT pass through:
  - Kitchens, storerooms, closets ...
  - A room that can be lock to prevent egress
  - Sleeping areas, toilet rooms or bathrooms

Exit Access – Path of Travel
1014.2.1 Multiple Tenants

- Egress from ...
  - Tenant Space, Dwelling Unit or Sleeping Unit
- Shall not pass through ...
  - Adjacent Tenant Space, Dwelling Unit or Sleeping Unit
  - Exception: Means of egress shall not be prohibited through adjoining tenant space where ...

Exit Access – Path of Travel Egress Through Adjoining Tenant Space

- < 10% Access from larger tenant
- Discernable Path of Egress Travel
- < 10% Can’t lock
- Major Tenant Space
  - Egress NOT through smaller tenant

Exit Access – Provide Alternatives
Design Requirements 1014.3

- Watsa ... "COMMON PATH OF TRAVEL"

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.
Lesson 9 – Means of Egress

Exit Access – Provide Alternatives
Design Requirements 1014.3

- 1014.3 Common path of egress travel
  - H-1, H-2 and H-3 limited to 25’
  - Other occupancies allowed up to 75’
- Exceptions may allow 100’
  - B, F and S occupancy with sprinkler
  - B and S tenant space, max 30 people
  - Group I-3
  - R-2 up to 125’

Exit Access – Provide Alternatives
Design Requirements 1015.1 Item #1.

- Each space shall have 2 EXITS or 2 EXIT ACCESS DOORS

Exit Access – Path of Travel
TRAVEL DISTANCE Measurement

Exit Access - Path of Travel
Travel Distance not exceed Table 1016.1

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>NOT SPRINKLERED</th>
<th>SPRINKLERED</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, E, F-1, I-1, M, R, S-1</td>
<td>200</td>
<td>250</td>
</tr>
<tr>
<td>B</td>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td>F-2, S-2, U</td>
<td>300</td>
<td>400</td>
</tr>
<tr>
<td>H-1</td>
<td>NP</td>
<td>75</td>
</tr>
<tr>
<td>H-2</td>
<td>NP</td>
<td>100</td>
</tr>
<tr>
<td>H-3</td>
<td>NP</td>
<td>150</td>
</tr>
<tr>
<td>H-4</td>
<td>NP</td>
<td>175</td>
</tr>
<tr>
<td>H-5</td>
<td>NP</td>
<td>200</td>
</tr>
<tr>
<td>I-2, I-3, I-4</td>
<td>150</td>
<td>200</td>
</tr>
</tbody>
</table>

Exit Access
CORRIDORS

- Shall be rated per Table 1017.1
- Fire Partitions

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>OCCUPANT LOAD SERVED BY CORRIDOR</th>
<th>REQUIRED FIRE-RESISTANCE RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-1, H-2, H-3</td>
<td>NP</td>
<td>6</td>
</tr>
<tr>
<td>H-4, H-5</td>
<td>Greater than 30</td>
<td>NP</td>
</tr>
<tr>
<td>A, B, E, F, M, S, U</td>
<td>Greater than 30</td>
<td>1</td>
</tr>
<tr>
<td>R</td>
<td>Greater than 10</td>
<td>NP</td>
</tr>
<tr>
<td>I-2, I-4</td>
<td>All</td>
<td>NP</td>
</tr>
<tr>
<td>I-1, I-3</td>
<td>All</td>
<td>NP</td>
</tr>
</tbody>
</table>

Exit Access – Provide Alternatives
Design Requirements 1014.3

- Common path of egress travel
  - H-1, H-2 and H-3 limited to 25’
  - Other occupancies allowed up to 75’
- Exceptions may allow 100’
  - B, F and S occupancy with sprinkler
  - B and S tenant space, max 30 people
  - Group I-3
  - R-2 up to 125’
Lesson 9 – Means of Egress

Exit Access

1017.3 **DEAD END CORRIDORS**

**Description:**
A portion of a corridor in which the travel to an exit is in one direction only.

- Limited to 20’ in length with **EXCEPTIONS.**

---

1018 through 1023 Exits

- **Important Topics**
  - Sufficient Number
  - Provide a Protected Path of Travel

---

Minimum Number of Exits

1019.1

- **Every Floor Area**
- **Table 1019.1**

<table>
<thead>
<tr>
<th>OCCUPANT LOAD (persons per story)</th>
<th>NUMBER (per story)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 500</td>
<td>2</td>
</tr>
<tr>
<td>501 – 1000</td>
<td>3</td>
</tr>
<tr>
<td>More than 1000</td>
<td>4</td>
</tr>
</tbody>
</table>

---

Exit Definition

1002.1

**Exits include ...**
- Exterior exit DOORS at grade
- ENCLOSURES for interior stairs and ramps
- Exit PASSAGEWAYS
- EXTERIOR stairs/ramps
- HORIZONTAL exits

**Details to follow ....**

---

Buildings with One Exit

1019.2

- **Table 1019.2**
- R-3 as applicable
- Single level buildings provided the space complies as in 1015.1

---

1020 Vertical EXIT ENCLOSURES

**A Protected Path of Travel**

- Interior Stairways and Ramps
- Enclosed by Fire Barriers
  - 4 or more stories, 2 hour rated
  - Less than 4 stories, 1 hour rated
  - The number of stories INCLUDES basements

---
Lesson 9 – Means of Egress

1020.1.7 SMOKEPROOF Enclosures
A Protected Path of Travel

§902 Definition from the Building Code

An exit stairway designed and constructed so that the movement of the products of combustion produced by a fire occurring in any part of the building into the enclosure is limited.

1021 EXIT PASSAGEWAY
A Protected Path of Travel

- Minimum width 44”, or 36” if occupant load less than 50
- Minimum 1 hour Fire Barrier enclosure, 2 hour if extending a 2 hour enclosure

1021 Exit Passageway
A Protected Path of Travel

- Extend a Stairway
- Travel Distance

Exit Passageway extends Enclosed Stairway

Tenant A

Tenant B

Tenant B storage area

Travel Distance exceeded for “B”

1022 Horizontal Exits
A Protected Path of Travel

- Not allowed for Group I-2
- Maximum 6 stories, 75’ height
- Open on at least One Side
  - 35 SF open area
- Protected from Interior Spaces

1023 Exterior Exit Ramps and Stairways
A Protected Path of Travel

- Not allowed for Group I-2
- Maximum 6 stories, 75’ height
- Open on at least One Side
  - 35 SF open area
- Protected from Interior Spaces

1024 Exit Discharge
The final component of the Means of Egress

- 1024.1
- General Rule
  - Exits Discharge Direct to Exterior
Lesson 9 – Means of Egress

1024 Exit Discharge
Not directly to the Exterior

- 1024.1
- Exceptions 1
  - 50% Rule - Number and Capacity
  - Through level of Discharge

1023 Exit Discharge
Not directly to the Exterior

- 1024.1
- Exception 2
  - 50% Rule - Number and Capacity
  - Through a Vestibule

1024 Exit Discharge
Access to a Public Way

- 1024.6 Access to a Public Way
  - Direct and Unobstructed
  - Exception: Safe Dispersal Area
    - At least 5 SF/person
    - On the same property away from the building
    - 150% of building height, but not less than 50 feet
    - Permanently maintained and identified
    - Safe path of travel from the building
    - Voice communication

1025 Assembly
1025.3 Assembly Other Exits

- Minimum Number of Exits

<table>
<thead>
<tr>
<th>Number of People</th>
<th>Number of Exits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 349</td>
<td>2 Exits</td>
</tr>
<tr>
<td>350 to 700 people</td>
<td>3 Exits</td>
</tr>
<tr>
<td>More than 700</td>
<td>4 Exits</td>
</tr>
</tbody>
</table>

1025 Assembly
1024.6 Means of Egress Width

Clear width of Aisles and other Means of Egress

- 1025.6.1 Without SMOKE PROTECTED SEATING
- 1025.6.2 Smoke-protected seating
- 1025.6.3 Outdoor smoke-protected assembly

EMERGENCY ESCAPE AND RESCUE
Sections 1026

Definition:

"An operable window, door or other similar device that provides for a means of escape and access for rescue in the event of an emergency."

In ADDITION to the Means of Egress
Lesson 9 – Means of Egress

Emergency Escape and Rescue
Sections 1026.1 and 1026.2

- Group R and Group I-1
- Every sleeping room below the 4th floor
- Basements
  - At least one
  - Basements with sleeping rooms
    - Opening needed from each sleeping room
    - No additional opening from the remaining basement area

Emergency Escape and Rescue
Sections 1026.1 Exceptions 1 and 2

Openings are NOT required:
- Sprinklered buildings (other than R-3)
- Sleeping rooms to corridor with exits in opposite directions (other than R-3)

Emergency Escape and Rescue
Sections 1026.1 Exceptions 6 and 7

Openings are NOT required:
- Sleeping Rooms or Basements which have door directly to the Exterior
- Basement with no habitable space and 200 SF or less – opening not required

Summary
Chapter 10 Means of Egress

- Design Occupant Load
  - Square Footage or Actual Number
- Sufficient Exit Width
- Minimum Number of Exits
- 3 Components
  - Exit Access
  - Exit
  - Exit Discharge