Course Description

- This seminar addresses the provisions of the 2018 International Building Code® (IBC®) regarding the use of fire and smoke separations.

Objectives

- Upon completion, you will be better able to:
  1. Identify the general types of fire and smoke separations.
  2. Identify those specific components that make up fire and smoke separations.
  3. Determine where separations are required.
  4. Determine where separations are permitted as alternatives to other requirements.
Course Overview

- Module 1 – Fire and Smoke Protection Concepts
- Module 2 – Types of Fire and Smoke Separations
- Module 3 – Fire and Smoke Separation Components
- Module 4 – Fire and Smoke Separation Locations

Fire and Smoke Protection Concepts

- IBC uses fire and smoke assemblies and protectives for a variety of purposes:
  - Structural integrity maintenance.
  - Fire spread limitation.
  - Means of egress protection.
  - Radiant heat (exposure) protection.
  - Smoke movement restriction.
Structural Integrity

- Larger and/or high-hazard occupancy buildings require specified fire-resistance levels for structural members.
- IBC Chapter 6 “Type of Construction.”

Structural Fire Resistance

- Structural fire resistance intended to protect structural integrity of building elements during fires.
- Elements include:
  - Structural frame members.
  - Bearing walls.
  - Floor construction.
  - Roof construction.

Fire Spread Limitation

- Multiple conditions utilize fire-resistant separations to limit fire spread.
  - Complete and partial fire separations either mandated, or provided as an alternative, to address a variety of issues: generally hazardous occupancy or operations.
  - Vertical and/or horizontal separations typically require opening protectives and other components to achieve full separation.
Egress Protection

- Fire-resistance-rated and/or smoke-resistant construction is often mandated.
  - “Exit” portion of the means of egress is typically where such protection must be afforded.
  - Means of egress fire protection allows extended travel in large areas or multistory buildings.

Radiant Heat Protection

- To prevent building-to-building fire spread due to radiant heat transfer.
  - Fire-resistance-rated exterior walls required based on proximity to lot lines and other buildings on the same site.
  - Fire separation distance

Smoke Movement Restriction

- Smoke-resistant construction often mandated where occupants incapable of self preservation and protect-in-place methods are employed.
  - Institutional occupancies
    - Hospitals, nursing homes
    - Prisons, jails, reformatories
  - Other conditions require separation that includes both smoke- and fire-resistance.
Fire Protection Concepts

- List the IBC’s five primary protection concepts for fire- and smoke-resistant construction:
  - Structural integrity maintenance.
  - Fire spread limitation.
  - Means of egress protection.
  - Radiant heat (exposure) protection.
  - Smoke movement restriction.

Fire and Smoke Separation Types

Fire-resistance-rated Separations

- IBC has variety of fire-resistance-rated separation "types".
- Each unique separation type serves a distinct purpose as reflected in its design details.
Fire-resistance-rated Separations

- Fire walls.
- Fire barriers.
- Fire partitions.
- Smoke barriers.
- Exterior walls.
- Horizontal assemblies.

Fire Walls

- Most complex and protective fire separation.
  - Typically selected by the designer to provide an alternative solution to code compliance, fire wall creates separate buildings in the same structure.
    - Oversize buildings
    - Incompatible use separations
  - A fire wall at the lot line between two adjacent buildings is permitted where a party wall was once required.
  - Fire walls required to be 2-, 3- or 4-hour assemblies.
Fire Barriers

- Most common means of separating portions of a building with fire-resistance-rated construction.
- Used under both mandatory and optional conditions, fire barriers divide a building into separate areas for a variety of purposes where full separation is desired.
- Are “vertical” assemblies.
- *Fire barriers* must be 1-, 2-, 3- or 4-hour assemblies.

Fire Partitions

- Required where a limited degree of fire and smoke protection is warranted.
- Typical in locations where separation is important in the initial stages of building evacuation.
- *Fire partitions* are required to be minimum 1-hour assemblies
  - Allowances for ½-hour assemblies under specified conditions.

Smoke Barriers

- Mandated where a high degree of both fire and smoke protection is desired.
- Used to create refuge compartments that allow occupants to safely await assistance or rescue.
- Must be minimum 1-hour assemblies while also providing a high degree of smoke resistance.
Exterior Walls

- Rated exterior walls provide separation from internal or external fires.
- Also often provide for the protection of outdoor exit travel.
- Must be minimum 1-, 2- or 3-hour assemblies if within fire separation distance.

Horizontal Assemblies

- Typically used with fire-resistance-rated wall assemblies to provide compartmentation in multistory buildings.
- In most cases, the ceiling and floor work together, as well as independently, to provide the intended separation.
- Required to be minimum ½-, 1-, 2-, 3-, or 4-hour fire-resistance-rated assemblies.

Smoke-resistant Separations

- In addition to the use of smoke barriers, the IBC also recognizes smoke partitions as a means to resist the passage of smoke.
- Smoke partitions required where smoke movement of is a concern; however, fire is not primary consideration.
- Smoke partitions are not required to have a fire-resistance rating.
Prescriptive Separations

- Mandated where limited degree of separation is desired. (IBC Table 721.1)
  - Not required to be tested and listed assemblies, these separation elements adequately serve a specific need.

- Applications include:
  - Gypsum board.
  - Nonrated floor construction.
  - Construction capable of restricting smoke migration.

Separation Types

1. Horizontal assemblies required to be minimum ½-, 1-, 2-, 3-, or 4-hour fire-resistance-rated assemblies.
   - TRUE

2. A smoke partition must have a fire resistance rating of __ hours.

3. All exterior walls are required to be minimum 1-, 2- or 3-hour fire-resistance-rated assemblies.
   - FALSE

4. Fire walls must have a minimum fire resistance rating of __ hours.

5. Exterior walls, if within the fire separation distance, must have a rating of __ 1, __ ½, or __ 3 hours.

6. IBC Table 721.1 allows the use of prescriptive materials in lieu of listed assemblies.
Components of Fire and Smoke Separations

Module 3

Vertical Elements

- A variety of different walls and partition assemblies are established in the IBC to provide varying degrees of fire and/or smoke separation.

- In addition to vertical assemblies that are tested and listed as fire-resistance-rated, modified assemblies and prescriptive-based separation elements are selectively addressed throughout the code. Table 721.1

Vertical Elements

- Wall assemblies such as fire walls, fire barriers, fire partitions, smoke barriers and exterior walls must be provided with fire-resistance ratings as determined in accordance with ASTM E119 or UL 263, or meet prescriptive specifications.

- Required fire-resistance ratings vary and are required based on the intended purpose of the separation.
Vertical Elements

- Partial assemblies based on listed assemblies are also recognized in limited applications, typically where the potential hazard is assumed to exist only on one side of the separation element.
  - Control rooms
  - Areas of Refuge
  - Incidental spaces
  - Shaft enclosures
  - And more

Horizontal Elements

- Horizontal assemblies are also tested and listed assemblies that resist the spread of fire vertically.
- Fire-resistance-rated floors and floor/ceiling assemblies can provide varying degrees of fire-resistance.
- Non-rated horizontal elements also provide a significant level of separation and are regulated under a variety of conditions. (See 714.5 Penetrations and 717.6.3 Ducts)

Vertical/Horizontal Combination

- Vertical and horizontal elements used to completely separate one area from another.
Doors

- Openings require protection as part of the overall package of fire and/or smoke protection.
  - In most cases, fire-protection-rated door assemblies are mandated in fire-separation assemblies.
  - Table 716.1(2) provides the required ratings and markings for most conditions.
    - In some cases they are also individually identified based on the specific separation.

- In a few cases, a prescriptive means of door protection is mandated.
  - For example, a solid-wood or honeycomb core doors of a specified thickness might be established as the minimum required door.

- At times, the code does not regulate door assemblies in a fire rated assembly.
  - The most common examples are:
    - Fire-resistance-rated exterior walls where opening protection is not required
    - Loadbearing walls protected per Table 601

Windows

- Windows are typically regulated in the same manner as doors.
  - Fire-protection-rated glazing.
  - Fire-resistance-rated glazing.
  - Fire-resistance-rated glazing is regulated in much the same manner as fire-resistance-rated wall assemblies.
Windows

Fire-resistance-rated glazing is regulated in much the same manner as fire-resistance-rated wall assemblies, including testing in accordance with **ASTM E 119** or **UL 263**.

There are situations in the code where nonrated glazing is permitted in fire/smoke separation walls, such as:

- where security glazing is needed - **Group I-3**,
- where smoke is the only concern - corridor walls in **Group I-2**, or
- where fire-resistance-rated exterior walls are permitted with unprotected openings.

Penetrations

- Penetrations must typically be protected by **firestop systems** rated to the same level as the element penetrated.
  - Through penetration of Membrane Penetration systems
- Prescriptive methods of penetration protection are also established.
  - **steel pipe penetrations** - protect annular space with concrete, grout or mortar
Joints

- Fire-resistant joint systems are REQUIRED where joints occur in separation walls requiring opening protection.

Air Movement

- Fire dampers, smoke dampers, combination dampers, ceiling radiation dampers and corridor dampers are selectively required in ducts and air openings in separation elements.
- Dampers may be omitted in a variety of situations where their use has been determined to be unnecessary.
- Non-rated floor assemblies may still require protection of duct penetrations (Section 717.6.3)

Components

1. All fire resistive assemblies must be listed in accordance with ASTM E119 or UL 263. **FALSE**
2. Horizontal fire resistive elements include all of the following except:
   - d) Fire walls
Components

3. Name two circumstances where non-rated glazing may be installed in separation walls.
   1. where security glazing is needed,
   2. where smoke is the only concern, or
   3. where fire-resistance-rated exterior walls are permitted with unprotected opening: TRUE

4. In many cases, the IBC uses both vertical and horizontal elements in order to completely separate one area from another. T or F

5. Fire-resistant joint systems are mandated where joints occur in separation walls requiring opening protection. TRUE
Building Height & Area – 503.1

- Use of fire wall now limited to only the determination of permissible types of construction, based upon allowable building height and area.
- Designer option
- Fire wall no longer permitted as means to create separate, smaller buildings for other purposes of the code.

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Building Size, Use and Components

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Building Height & Area – 503.1

Plan View

Building "A" Group B
V8 construction
9,000 sq ft
2 stories
14 ft
(nonsprinklered)

Building "B" Group B
IIB construction
23,000 sq ft
3 stories
55 ft
(nonsprinklered)

Fire wall complying with Section 706

Both buildings "A" and "B" considered separate buildings for purposes of allowable height and area.

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Footnote: 1 foot = 0.3048 meters, 1 square foot = 0.093 m².
Fire Wall Application for Building Height and Area – Example #1

Area “C”
Group A-3
4,000 sq. ft.

Area “B”
Group M
10,000 sq. ft.

Area “C”
Group B
15,000 sq. ft.

Fire Wall

Fire Wall Application for Building Height and Area – Example #2

Area “A”
Group A-3
4,000 sq. ft.

Area “B”
Group M
10,000 sq. ft.

Area “C”
Group B
15,000 sq. ft.

No Fire Barrier Wall

706.1.1 Party Walls – Exception #2

- Required use of a party wall (fire wall) at the lot line between two adjacent buildings where there is joint service between the buildings is no longer required where:
  1. The aggregate height and area of the portions of the building located on both sides of the lot line do not exceed the maximum allowed, and
  2. Dedicated easements and contractual agreements that allow either owner access to the other portion of the building to maintain fire and safety systems are provided to the building official.
Building Height & Area – 706.1.1

- Fire walls nor party walls, are required to be used on lot lines dividing a building for ownership purposes.

Fire Wall Ratings – Table 706.4

- Rating requirements based on the buildings’ construction type(s) and occupancy classification(s).

<table>
<thead>
<tr>
<th>GROUP</th>
<th>FIRE-RESISTANCE RATING (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, B, E, H-4, L, R-1, R-2, U</td>
<td>3b</td>
</tr>
<tr>
<td>F-1, H-7, H-5, M, S-1</td>
<td>3</td>
</tr>
<tr>
<td>H-1, H-2</td>
<td>4b</td>
</tr>
<tr>
<td>F-2, S-2, R-3, R-4</td>
<td>2</td>
</tr>
</tbody>
</table>

- In Type H or V construction, walls shall be permitted to have a 2-hour fire-resistance rating.
- For Group H-1, H-2 or H-3 buildings, also see Sections 415.7 and 415.8.

Fire Walls

- Provide variety of other alternative solutions to the designer:
  - Multiple types of construction.
  - Reduction/elimination of fire protection features.
  - In IFC, fire walls may be used to reduce fire flow requirements.
Separated Occupancies – 508.4.4.1

- In a mixed-occupancy building, fire barriers and/or horizontal assemblies are utilized under the separated occupancies method.

- Table 508.4 establishes the minimum required fire-resistance for pairs of incompatible occupancies.

Separated Occupancies – Table 508.4

| OCCUPANCY | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
| F1, F2, F3 | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| H1        | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| H2, H3, H4 | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N |

Incidental Uses – 509.4.1

- Where an incidental use as listed on Table 509 is present, it must selectively be separated from other portions of the building by fire barrier and/or horizontal assembly as established by Table 509.

- In some cases, an alternative method of protection is permitted by the table.
### Incidental Uses – Table 509

<table>
<thead>
<tr>
<th>GROUP Use</th>
<th>Required Time (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furnace room where any piece of equipment is over 400,000 Btu per hour input</td>
<td>1 hour or provide automatic sprinkler system</td>
</tr>
<tr>
<td>Rooms with boilers where the largest piece of equipment is over 15 psi and 10 horsepower</td>
<td>1 hour or provide automatic sprinkler system</td>
</tr>
<tr>
<td>Refrigerant machinery room</td>
<td>1 hour or provide automatic sprinkler system</td>
</tr>
<tr>
<td>Hydrogen fuel gas rooms, not classified as Group H</td>
<td>1 hour in Group B, F, M, S and U occupancies; 2 hours in Group A, E, I and R occupancies</td>
</tr>
<tr>
<td>Incinerator rooms</td>
<td>2 hours and provide automatic sprinkler system</td>
</tr>
<tr>
<td>Paint shops, not classified as Group H, located in occupancies other than Group H</td>
<td>2 hours; or 1 hour and provide automatic sprinkler system</td>
</tr>
<tr>
<td>In Group E occupancies, laboratories and vocational shops not classified as Group H</td>
<td>1 hour or provide automatic sprinkler system</td>
</tr>
<tr>
<td>In Group I-2 occupancies, laboratories not classified as Group H</td>
<td>1 hour and provide automatic sprinkler system</td>
</tr>
<tr>
<td>In ambulatory care facilities, laboratories not classified as Group H</td>
<td>1 hour or provide automatic sprinkler system</td>
</tr>
<tr>
<td>Laundry rooms over 100 square feet</td>
<td>1 hour or provide automatic sprinkler system</td>
</tr>
<tr>
<td>Group I-3 cells and Group I-2 patient rooms equipped with padded surfaces</td>
<td>1 hour</td>
</tr>
<tr>
<td>In Group I-2, physical plant maintenance shops</td>
<td>1 hour</td>
</tr>
<tr>
<td>In ambulatory care facilities or Group I-2 occupancies, waste and linen collection rooms with containers that have an aggregate volume of 10 cubic feet or greater</td>
<td>1 hour</td>
</tr>
<tr>
<td>In other than ambulatory care facilities and Group I-2 occupancies, waste and linen collection rooms over 100 square feet</td>
<td>1 hour or provide automatic sprinkler system</td>
</tr>
<tr>
<td>In ambulatory care facilities or Group I-2 occupancies, storage rooms greater than 100 square feet</td>
<td>1 hour</td>
</tr>
<tr>
<td>Stationary storage battery systems having an energy capacity greater than the threshold quantity specified in Table 1206.2 of the International Fire Code</td>
<td>1 hour in Group B, F, M, S and U occupancies; 2 hours in Group A, E, I and R occupancies</td>
</tr>
</tbody>
</table>

### Incidental Uses – 509.4.2

- Where Table 509 permits sprinkler protection without a fire barrier, incidental uses must be separated by construction capable of resisting the passage of smoke.

- Doors/air openings regulated for smoke resistance.

### Incidental Uses – 509.4.2

- Fire-resistance-rated – fire-resisting or fire-retarding integrity assembly
- Walk to be constructed to resist passage of smoke
- Walk to external escape doors
- Stairs: 
  - self-closing or automatic-closing by smoke
  - have no air transfer openings
  - have no recesses under stair

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Horizontal Building Separation
Section 510.2, #1

- Where separate and distinct buildings are created **one above the other**, the buildings shall be separated with a minimum 3-hour horizontal **assembly**.
- Podium/platform construction
- When separated and compliant with several other conditions, buildings can be regulated independently for allowable area and number of stories, and fire wall continuity.

Horizontal Building Separation
Allowance Section 510.2, #1
“Platform” or “Podium” Building

Horizontal Separation- 510.2
Type IIIA Group R-1 and R-2 Buildings – 510.5

- Increase to 6 stories and 75 feet
- 2-hour separations ≤ 3,000 ft²

Basement
3-hour separation

Plan View

Type IIA Group R-1 and R-2 Buildings - 510.6

- Where special height increases are applied for Type IIA Group R-1 and R-2 buildings, minimum 2-hour fire walls are required to segregate the exits.
- Allows nine stories and 100 feet.

Type IIA Group R-1 and R-2 Buildings– 510.6

- 9 stories, 100 feet
- 1 ½-hour
- ≥ 50 feet
Open Parking Beneath Groups A, I, B, M and R – 510.7.1

- Where special height and area allowances are permitted for open parking garages below Group A, I, B, M and R occupancies, means of egress for the upper occupancy shall be separated from the parking by minimum 2-hour fire barriers.

Group B or M with Group S-2 Open Parking Garage – 510.8, #1 and #7

- Where a Group B or M occupancy is located above an open parking garage and considered as separate buildings for type of construction purposes, in addition to other requirements, the buildings must be separated by a minimum 2-hour horizontal assembly.
Buildings on Same Lot – 503.1.2

- Where two or more buildings are located on the same lot, they shall be regulated as separate buildings, or as portions of a single building.
- If regulated as separate buildings, the opposing exterior walls must be evaluated based on fire separation distance.

Assuming nonsprinklered buildings, aggregate area is limited to 9,000 sf and allowable height is limited to 2 stories as both buildings must be regulated as Type VB construction.

Exterior Walls – 705.5

- For separation purposes, exterior walls near lot lines, or other buildings on the same lot, are required to be fire-resistance-rated as set forth in Table 602.
- The primary concern is radiant heat transfer from one building to another.
Exterior Walls – Table 602

<table>
<thead>
<tr>
<th>Fire Separation Distance (in ft)</th>
<th>Type of Occupancy</th>
<th>Group H</th>
<th>Group F-1, M, S-1</th>
<th>Group A, B, E, F-2, I, R, S-2, U</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 5</td>
<td>All</td>
<td>3</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>5 &lt; D ≤ 30</td>
<td>IA, IB</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>10 &lt; D ≤ 30</td>
<td>IIB, VB</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>D &gt; 30</td>
<td>Others</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

For SI: 1 foot = 304.8 mm.

a. Load-bearing exterior walls shall also comply with the fire-resistance rating of Table 601.
b. See Section 706.1 for party walls.
c. Open parking garages complying with Section 406 shall not be required to have a fire-resistance rating.
d. The fire-resistance rating of an exterior wall is determined based upon the fire separation distance of the exterior wall and the story in which the wall is located.
e. See Section 415.6 for special requirements for Group H occupancies.
f. See Section 412.3.1 for special requirements for Group S aircraft hangars.
g. Where Table 705.8 permits nonbearing exterior walls with unlimited area of unprotected openings, the required fire-resistance rating for the exterior walls is 0 hours.
h. For a building containing only a Group U occupancy private garage or carport, the exterior wall shall not be required to have a fire-resistance rating where the fire separation distance is 5 feet (1523 mm) or greater.
i. For a Group R-3 building of Type II-B or Type V-B construction, the exterior wall shall not be required to have a fire-resistance rating where the fire separation distance is 5 feet (1523 mm) or greater.

Exterior Walls – 705.5

- The required fire-resistance rating of exterior walls with a fire-separation distance of more than 10 feet shall be rated for exposure from fire from the inside.
- The required fire-resistance rating of exterior walls with a fire-separation distance of less than or equal to 10 feet shall be rated for exposure from fire from both sides.
Exterior Walls
Section 705.5

- The required fire-resistance rating of exterior walls with a fire separation distance of more than 10 feet shall be rated for exposure from fire from the inside.
- Where the fire separation distance is 10 feet or less, the wall shall be rated for exposure to fire from both sides.

Shaft Enclosures – 713

- Shaft enclosures are a permissible method of protecting openings and penetrations through floor/ceiling and roof/ceiling assemblies.
- Shaft enclosures shall be constructed as fire barriers and/or horizontal assemblies.

Shaft Enclosure Fire Ratings – 713.4

- Shaft enclosures shall have a minimum fire-resistance rating of:
  - 2 hours where connecting 4 or more stories.
  - 1 hour where connecting 3 or fewer stories.
  - 2 hours where penetrating a floor assembly of two or more hours.
Chute Access and Discharge Rooms – 713.13.3 and 713.13.4

- waste and linen chutes access openings must be located in rooms or compartments enclosed by not less than 1-hour fire barriers and/or horizontal assemblies.
- Discharge rooms shall be separated from the remainder of the building by fire barriers and/or horizontal assemblies having a rating equal to the shaft enclosure.

Hoistway Opening Protection – 3006.3, #1 and #2

- Where elevator lobbies are required, they shall be constructed with fire partitions.
- Where the building is fully sprinklered, smoke partitions may be used to separate the elevator lobby at each floor.

Building Use, Size & Components

1. The required fire-resistance rating of exterior walls with a fire-separation distance of more than 10 feet shall be rated for exposure from fire from the inside and outside. **TRUE**

2. Where special height increases are applied for Type IIA Group R-1 and R-2 buildings to allow nine story buildings, minimum 2-hour fire walls are required to segregate the exits.
Exit Access Stairways – 1019.3

- Exit access stairways to be enclosed by shaft enclosures (fire barriers) having a minimum fire-resistance ratings in accordance with Section 713:
  - 2-hour serving 4 stories or more.
  - 1-hour serving 2 or 3 stories.

- There are eight exceptions to this requirement!

Exit Access Ramps – 1019.3

- Exit access ramps are required to be enclosed with shaft enclosures (fire barriers) under the same conditions as for exit access stairways.
  - Due to the limited use of ramps connecting 3 or more stories, the application of this provision is very limited.
Interior Exit Stairways and Ramps – 1023.2

- Enclosures for interior exit stairways and ramps shall be fire barriers and/or horizontal assemblies, with a minimum rating of:
  - 2 hours where connecting 4 or more stories.
  - 1 hour where connecting 3 or fewer stories.
- The enclosure shall have a fire-resistance rating not less than the floor assembly penetrated, but need not exceed 2 hours.

Extension of Interior Exit Stairways and Ramps – 1023.3.1

- A horizontal extension of an interior exit stairway or ramp, where required, shall be by an exit passageway constructed with fire barriers and/or horizontal assemblies.
- The exit passageway shall have a minimum fire-resistance rating equal or greater to that of the connected interior exit stairway or ramp.
- There shall be a fire door assembly between the exit passageway and exit stairway.

Extension of Interior Exit Stairways and Ramps
Section 1023.3.1

- A horizontal extension of an interior exit stairways or ramp, where required, shall be by an exit passageway constructed with fire barriers and/or horizontal assemblies.
- The exit passageway shall have a minimum fire-resistance rating equal or greater to that of the connected interior exit stairway or ramp.

There shall be a fire door assembly between the exit passageway and exit stairway.
Smokeproof Enclosures and Pressurized Stairways and Ramps – 1023.11.1

- Where required for high-rise buildings, underground buildings or aircraft-related occupancies, smokeproof enclosures and pressurized stairways may be extended by an exit passageway.
- Fire barriers and/or horizontal assemblies must have a minimum 2-hour fire-resistance rating.

Exit Passageways – 1024.3

- Exit passageways, where provided, shall be enclosed by fire barriers and/or horizontal assemblies with a minimum 1-hour fire-resistance rating.
- The rating cannot be less than that required for any connected interior exit stairway or ramp.

Horizontal Exits – 1026.2

- Horizontal exits, where provided, shall be constructed with fire walls, or by fire barriers with a minimum 2-hour fire-resistance rating.
- The separation shall extend vertically through the entire building unless floor assemblies have a minimum 2-hour fire-resistance rating.
- A horizontal exit creates refuge areas such that smoke protectives are also required.
Horizontal Exits – 1026.4

Exterior exit stairways and ramps shall be separated from the interior of the building consistent with the protection required for interior exit stairways and ramps.

- Fire barrier construction is required for those exterior walls adjacent to the exterior stairway or ramp.

Exterior Exit Stairways and Ramps – 1027.6

- Exterior exit stairways and ramps shall be separated from the interior of the building consistent with the protection required for interior exit stairways and ramps.
- Fire barrier construction is required for those exterior walls adjacent to the exterior stairway or ramp.

Exterior Stairways and Ramps – 1027.6

- Exterior exit stairways and ramps shall be separated from the interior of the building consistent with the protection required for interior exit stairways and ramps.
- Fire barrier construction is required for those exterior walls adjacent to the exterior stairway or ramp.
Spaces under Grandstands and Bleachers – 1029.1.1.1

- Usable spaces must be separated from grandstands and bleachers above by minimum 1-hour fire barriers and/or horizontal assemblies.
- Not apply to:
  - toilet rooms
  - small ticket booths
  - Accessory area < 1000 sf.

Corridors – 1020.1

- Corridors shall be fire-resistance rated in accordance with Table 1020.1.
- Corridor walls are required to be constructed as fire partitions.
- Where interrupted by a lobby, foyer or reception area, the fire partition protection shall extend behind such spaces.

Corridor Construction – Table 1020.1

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>OCCUPANT LOAD SERVED BY CORRIDOR</th>
<th>REQUIRED FIRE-RESISTANCE RATING（hours）</th>
<th>WITH INTEGRATED SMOKE CONTROL SYSTEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-1, H-2, H-3</td>
<td>All - Not Permitted</td>
<td>1</td>
<td>Without sprinkler system</td>
</tr>
<tr>
<td>H-4, H-5</td>
<td>Greater than 30 - Not Permitted</td>
<td>1</td>
<td>Without sprinkler system</td>
</tr>
<tr>
<td>A, B, C, D, E, F, M, S, U</td>
<td>Greater than 30</td>
<td>1</td>
<td>Without sprinkler system</td>
</tr>
<tr>
<td>R</td>
<td>Greater than 30</td>
<td>0.5</td>
<td>Without sprinkler system</td>
</tr>
<tr>
<td>I-1, I-3</td>
<td>All - Not Permitted</td>
<td>0</td>
<td>Without sprinkler system</td>
</tr>
<tr>
<td>I-2, I-4</td>
<td>All</td>
<td>1</td>
<td>Without sprinkler system</td>
</tr>
</tbody>
</table>

a. For requirements for occupancies in Group I-2, see Sections 407.2 and 407.3.
b. For reduction in the fire-resistance rating for occupancies in Group I-3, see Section 408.8.
c. Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 where allowed.
d. Group R-3 and R-4 buildings equipped throughout with an automatic sprinkler system in accordance with Section 603.3.1.3. See Section 903.2.8 for occupancies where automatic sprinkler systems are permitted in accordance with Section 903.3.1.
Corridor Continuity – 1020.6

Fire resistance continuous from point of entry to an exit and not interrupted by intervening rooms …

Exception:
Where interrupted by a lobby, foyer or reception area, the fire partition protection shall extend behind such spaces.

---

Egress Balconies – 1021.2

- Exterior egress balconies shall be separated from the interior of the building by fire partitions and openings as required for corridors.
- Separation is not required where two specified conditions are met:
  - Two available stairways, and,
  - Dead-ends do not pass unprotected opening
Areas of Refuge – 1009.6.4

- Each area of refuge in an accessible means of egress shall be separated from the remainder of the story by a smoke barrier or horizontal exit.
- Areas of refuge must be designed to minimize the intrusion of smoke.

Exterior Area for Assisted Rescue – 1009.7.2

- Exterior walls separating an exterior area for assisted rescue from the interior of the building shall have a minimum fire-resistance rating of 1-hour, rated for exposure from the interior.
- Wall rating and opening protective not required where building fully sprinklered.
Egress Courts – 1028.4.2

- Exterior walls adjacent to an egress court shall have a minimum 1-hour fire-resistance rating for at least 10 feet above the walking surface where the court is less than 10 feet in width.
- Exceptions, Egress court that:
  - serves an occupant load less than 10, and
  - serves other than a Group R-3 occupancy.

Enclosures under Interior Stairways – 1011.7.3

- Walls and soffits within enclosed usable spaces under enclosed and unenclosed interior stairways shall be protected by minimum 1-hour fire-resistance-rated construction, or the rating of the enclosure, whichever is greater.
Enclosures under Residential Interior Stairways 1011.7.3, Exception

- Spaces under stairways serving an individual Group R-2 or R-3 dwelling unit are required, at a minimum, to be protected on the enclosed side of the stairway with minimum ½-inch gypsum board.

Enclosures under Exterior Stairways – 1011.7.4

- No enclosed usable space is permitted under an exterior exit stairway unless it is completely enclosed in 1-hour fire-resistance-rated construction.

Interior Exit Discharge – 1028.1, Exception 1.2

- Where an interior exit stairway is permitted to egress through a discharge level lobby or similar space, as one condition the discharge level must be separated from areas below by construction conforming to the fire-resistance rating of the enclosure.
Interior Exit Discharge – 1028.1, Exception 1

1.1 Interior Exit Discharge – 1028.1, Exception 1

1.2 Entire area of level shall be separated from areas below by construction equivalent to the stair enclosure.

1.3 Egress path from exit stairway to discharge shall be sprinklered and all rooms and portions of the level having access to the egress path shall be sprinkled or separated from the egress path by construction equivalent to the stair enclosure.

1.4 Distance between exit access stair and exit discharge door shall be at least 30’ or ¼ length of overall diagonal of building, whichever is less.

Interior Exit Discharge – 1028.1, Exception 2.3

2.3 Discharge level must be separated from areas below by construction conforming to the fire-resistance rating of the enclosure.

Fire Limitation Features
Fire Areas – 901.7

- Many of the sprinkler thresholds are based on size of fire area
- Where buildings are divided into fire areas so as not to exceed the limits of Section 903 for requiring an automatic sprinkler system, the fire areas shall be separated by fire barriers and/or horizontal assemblies having a minimum fire-resistance rating as set forth in Table 707.3.10.

Fire Areas – 901.7

- The use of a fire wall to create separate, smaller buildings also creates smaller fire areas as well.
- Therefore, fire areas can be established by use of:
  - Fire Wall
  - Fire Barrier
  - Horizontal Assembly
  - Or a combination of the above

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Smokeproof Enclosures – 909.20.2

- A smokeproof enclosure shall be separated from the remainder of the building by minimum 2-hour fire barriers and/or horizontal assemblies.
- In addition, the vestibule must be separated from the stairway by minimum 2-hour fire barriers and/or horizontal assemblies.

Stair Pressurization Alternative – 909.20.6.1

- Smokeproof enclosure ventilation systems shall be isolated from the remainder of the building by minimum 2-hour fire barriers and/or horizontal assemblies.
- Protection shall be provided for equipment, control wiring, power wiring and ductwork.

Fire Command Center – 911.1.2

- Fire command centers, where required, shall be separated from the remainder of the building by minimum 1-hour fire barriers and/or horizontal assemblies.
Fire Pump Rooms – 913.2.1

- Fire pumps shall be located in rooms separated from all other portions of the building by minimum 2-hour fire barriers and/or horizontal assemblies.

- In other than high-rise buildings, where the building is fully sprinklered, the fire barriers and/or horizontal assemblies must have a minimum 1-hour fire-resistance rating.

---

Fire Alarm Systems in Group R Occupancies – 907.2.8.1 & 907.2.9.1

- In select Group R occupancies not exceeding 2-stories, an otherwise-mandated fire alarm system may not be required where the units are separated from each other and the public and common areas by minimum 1-hour fire partitions.

- Other conditions must also be met.
Smoke Control Systems – 909.5

- Where construction elements are used as a part of a smoke control system, smoke barriers shall be provided.
- The maximum allowable leakage area is to be calculated and reviewed for compliance.

Special Building Types

Mall/Anchor Building Separation – 402.4.2.2

- An anchor building shall be separated from a covered or open mall building by a fire wall.
- Where the anchor building is 3 stories or less, minimum 2-hour fire barriers are permitted.
Mall/Parking Garage Separation – 402.4.2.3

- An attached parking garage shall be separated from a covered mall building, open mall building or anchor building by a minimum 2-hour fire barrier and/or horizontal assembly.

Mall Tenant Separations – 402.4.2.1

- Each tenant space within a mall building shall be separate from other tenant spaces by a fire partition.
- No separation wall is required between the tenant space and the mall.

Standby Power Protection in High-rise Buildings – 403.4.8.1

- If a generator within the building is used for standby power in a high-rise building, it shall located in a separate room enclosed with minimum 2-hour fire barriers and/or horizontal assemblies.
**Atrium Sprinkler Protection**  
Section 404.3, Exception 1

- Sprinklers are required throughout a building containing an atrium.

**EXCEPTION #1:** Sprinkler protection is not required for areas adjacent to and above the atrium space provided that portion is separated from the atrium by minimum 2-hour fire barriers and/or horizontal assemblies.

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**Atrium Separation – 404.6**

- Atrium spaces shall be separated from adjacent spaces by a minimum 1-hour fire barrier and/or horizontal assembly.
  - The 1-hour separation is not required under one of three exceptions,
    1. Where glazed enclosure is protected by an automatic sprinkler system,
    2. ¾-hour glass block is utilized, or
    3. Open to not more than 3 stories

---

**Atrium Separation – 404.6, Exception 1**
Underground Building Compartmentation – 405.4

- A building with a floor level more than 60 feet below the lowest discharge level must be divided into at least two compartments, created through the use of smoke barriers.
- Elevators that serve more than one compartment shall be provided with an elevator lobby separated from each compartment by a smoke barrier.

Special Occupancies and Uses

Private Garage Buildings – 406.3.1

- Multiple 1,000-square-foot private garages are permitted within the same structure where each private garage is separated by minimum 1-hour fire barriers, horizontal assemblies, or both.
Garage Dwelling Separations – 406.3.4.1

- A private garage shall be separated from the dwelling unit by minimum \( \frac{1}{2} \)-inch gypsum board on the garage side.
- Garages with habitable rooms above shall be separated by not less than \( \frac{5}{8} \)-inch Type X gypsum board.

Group I-2 Smoke Compartments – 407.5

- Every story in a Group I-2 occupancy* where persons receive care or those having an occupant load of 50 or more shall be divided into at least two smoke compartments by smoke barriers.

*24-hour care for 5 or more who are incapable of self-preservation.

Group I-2 Corridors – 407.3

- Corridor walls in a Group I-2 occupancy shall be constructed as smoke partitions.
- Waiting areas and similar spaces constructed as required for corridors are permitted to be open to the corridor.
- Doors require no closing device but shall be positive latching and limit smoke
Group I-2 Corridors – 407.3

Group I-2 Corridors – 407.3

Group I-2 Care Suites – 407.4.4.2

- Care suites shall be separated from other portions of the building by *smoke partitions*.

Group I-3 Smoke Compartments – 408.6

- Every story in a Group I-3 occupancy shall be divided into at least two smoke compartments by *smoke barriers* when:
  - used by residents for sleeping or
  - those stories having an occupant load of 50 or more

*Prisons, jails, correctional facilities where persons are under restraint or security.*
Group I-3 Subdivision of Resident Housing Areas – 408.8

- In Occupancy Conditions 3 and 4*, each sleeping area shall be separated from adjacent common spaces by a smoke-tight partition where distance of travel from sleeping area to corridor exceeds 50 feet.

*3 = free movement in smoke zone, 4 = free movement is restricted but occupants can be released remotely

Group I-3 Interior Exit Stairways – 408.3.8

- One interior exit stairway in each building is permitted to have glazing installed in doors and walls at each landing providing access to the stairway.
  - The total glazing is limited to 5,000 square inches per floor level.
  - Sprinkler protection is required to wet the glazing completely.

Aircraft Hangar Fire Areas – 412.3.6.2

- When determining the fire suppression requirements for aircraft hangars, established fire areas shall be separated by minimum 2-hour fire walls.
Aircraft Hangar Fire Areas – 412.3.6.2

- Support areas, such as offices, shops and storage rooms, which are separated from the aircraft servicing area by minimum 1-hour fire barriers are not required to be included in the determination of fire area size.

Aircraft Hangar Heating Equipment – 412.3.4

- Heating equipment in an aircraft hangar shall be:
  - placed in a separate room and
  - separated by minimum 2-hour fire barriers and/or horizontal assemblies.
Residential Aircraft Hangar Separation – 412.4.1

- An aircraft hangar attached to a dwelling must be separated by a minimum 1-hour fire barrier.

Residential Unit Wall Separations – 420.2

- In Group I-1*, R-1, R-2 and R-3, R-4, walls separating dwelling and sleeping units in the same building, as well as separating such units from other occupancies in the building, shall be constructed as fire partitions.
- **Note:** If designed as separated mixed-use the separation shall be a fire barrier between occupancies

*Congregate care for more than 16 residents on 24 hour basis: assisted living, group homes, alcohol and drug centers.

Residential Unit Floor Separations – 420.3

- In Group I-1, R-1, R-2 and R-3 occupancies, floor assemblies separating dwelling and sleeping units in the same building, as well as separating such units from other occupancies in the building, shall be constructed as horizontal assemblies.
Ambulatory Care Facilities Separation – 422.2

- Ambulatory care facilities where there are 4 or more individuals incapable of self-preservation shall be separated from adjacent spaces, corridors and tenants by fire partitions.

Ambulatory Care Facilities Smoke Compartments – 422.3

- Where the aggregate area of one or more ambulatory care facilities exceeds 10,000 square feet, smoke barriers are required to create smoke compartments.
- No individual compartment is permitted to exceed 22,500 square feet.
1. Which walls are required to have a fire-resistance rating?
   All walls, except exterior and separating Group A-3 from lobby
2. What minimum type of wall is required? FIRE PARTITION
3. What fire-resistance rating is required? 1

Special Building Features

Where the stage height exceeds 50 feet, all portions of the stage shall be separated from the seating area by a proscenium wall with a minimum 2-hour rating, extending from the foundation to the roof (fundamentally a fire barrier).
- Proscenium opening to be protected by a fire curtain or other acceptable method.
Stage Support Areas Separation – 410.4.1

- The stage shall be separated from support areas, such as dressing rooms, workshops and storerooms, by fire barriers and/or horizontal assemblies.
  - Minimum 2-hour separation required for stage heights exceeding 50 feet.
  - Minimum 1-hour separation required for stage heights of 50 feet or less.

Stage Support Areas Separation – 410.5.2

- Support areas, such as dressing rooms, workshops and storerooms, shall be separated from each other by fire barriers and/or horizontal assemblies.
  - Minimum 1-hour separation required.

Stages Section 410.3

Minimum 2-hour separation between exits and playing surfaces of the building. Minimum 1-hour separation between playing surface and wall.
**Platform Construction – 410.4**

- Where space beneath a permanent platform is used for storage, or any other purpose other than equipment, plumbing or wiring, the floor assembly shall be at least one-hour construction.

**Elevator Machine Rooms – 3005.4**

- Elevator machine rooms and spaces shall be enclosed with fire barriers and/or horizontal assemblies.
  - The fire-resistance rating shall be not less than the required rating of the hoistway enclosure served by the machinery.

**Fire Service Access Elevator Lobby – 3007.6.2**

- In high-rise buildings provided with fire service access elevators, the elevator shall be provided with a lobby enclosed by a smoke barrier.
  - Elevator lobbies are not required at the level of exit discharge.
**Occupant Evacuation Elevator Lobby – 3008.6.2**

- In high-rise buildings provided with occupant evacuation elevators, the elevator shall be provided with a lobby enclosed by a *smoke barrier*.
- Elevator lobbies are not required at the level of exit discharge.

**Pedestrian Walkways – 3104.5**

- Pedestrian walkways shall be separated from the interior of the attached buildings by minimum 2-hour fire barriers and/or horizontal assemblies.
- An alternate separation method addresses the walkway/building connections, including the use of a tempered, wired or laminated glass wall.

**Tunnels – 3104.10**

- Separation between a tunneled walkway and the building to which it is connected shall be not less than 2-hour fire-resistant construction.
Hazardous Uses

Combustible Storage
Section 413

- Attic, under-floor and concealed spaces used for storage of combustible materials shall be:
  - protected on the storage side as required for 1-hour fire-resistance-rated construction and
  - Openings protected by self-closing non-combustible or 1 1/2" thick solid wood core door

EXCEPTIONS: fire-resistance construction nor open protectives required in:
- 1. sprinklered spaces
- 2. Group R-3 and U occupancies

Control Areas – 414.2.4

- Where control areas are provided for the use or storage of hazardous materials, they shall be separated by fire barriers in accordance with Table 414.2.2.
- The floor assemblies separating control areas shall be minimum 2-hour horizontal assemblies.
  - Exception permits 1-hour assemblies under specified conditions.
Control Areas - Section 414.2.4

- Where control areas are provided for the use or storage of hazardous materials, they shall be separated by fire barriers in accordance with Table 414.2.2: (1- or 2-hour)

- The floor assemblies separating control areas shall be minimum 2-hour horizontal assemblies. (this includes supporting construction)
  - Exception for IIA, IIIA and VA construction permits 1-hour assemblies under specified conditions.

Control Areas – Table 414.2.2

<table>
<thead>
<tr>
<th>Above floor</th>
<th>Below floor</th>
<th>Separation Type</th>
<th>Length (ft)</th>
<th>Width (ft)</th>
<th>Fire Rating</th>
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<tbody>
<tr>
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<td>5</td>
<td>Non-Loadbearing</td>
<td>4</td>
<td>4</td>
<td>Not Required</td>
</tr>
<tr>
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<td>5</td>
<td>Non-Loadbearing</td>
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<td>4</td>
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<tr>
<td>5</td>
<td>5</td>
<td>Non-Loadbearing</td>
<td>4</td>
<td>4</td>
<td>Not Required</td>
</tr>
</tbody>
</table>

Grinding Rooms – 426.1.2

- Rooms used for grinding or other operations that produce combustible dusts shall be enclosed with fire barriers and/or horizontal assemblies.

- The required fire-resistance rating is based on the floor area of the room:
  - 2 hours, where 3,000 square feet or less.
  - 4 hours, where more than 3,000 square feet.
Group H-3 and H-4 Gas Rooms – 415.10.2

- Where Group H-3 or H-4 gas rooms are provided, they shall be separated from other areas by minimum 1-hour fire barriers and/or horizontal assemblies.

Highly Toxic Solids and Liquids – 415.10.4

- Where highly toxic solids and liquids are not stored in approved hazardous materials storage cabinets, they shall be isolated from other hazardous material storage by minimum 1-hour fire barriers and/or horizontal assemblies.

Group H-5 Fabrication Areas – 415.11.1.2

- Fabrication areas in Group H-5 occupancies shall be separated from:
  1. each other,
  2. from corridors and
  3. from other parts of the building by minimum 1-hour fire barriers and/or horizontal assemblies.
Flammable Finish Spray Rooms – 416.2

- In buildings used for the application of flammable finishes, spray rooms shall be enclosed with minimum 1-hour fire barriers and/or horizontal assemblies.

Manufacturing of Organic Coatings – 418

- In buildings used for the manufacture of organic coatings, a variety of fire separations are required using fire barriers and/or horizontal assemblies:
  - Storage areas for flammable and combustible liquid tanks: 2 hours
  - Nitrocellulose storage rooms: 2 hours
  - Storage rooms for finished products that are flammable or combustible liquids: 2 hours

Final Reflection

- What? What happened and what was observed in the training?
- So what? What did you learn? What difference did this training make?
- Now what? How will you do things differently back on the job as a result of this training?
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