

2012 IBC Use of Fire and Smoke Separations

2012 IBC Use of Fire and Smoke Separations

Based on the 2012 International Building Code,® IBC®



Course Description

- This seminar addresses the provisions of the 2012 International Building Code® (IBC®) regarding the use of fire and smoke separations.



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Objectives

- Upon completion, participants 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



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Course Overview

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



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Module 1

Fire and Smoke Protection Concepts



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Concepts of Fire and Smoke Protection

- IBC uses fire and smoke assemblies and protectives for a variety of purposes
 - Structural integrity
 - Limitation of fire spread
 - Protection of exitways
 - Radiant heat exposure
 - Restriction of smoke movement



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Structural Integrity

- Under fire conditions, larger buildings and/or buildings contain high-hazard occupancies, selectively require specified levels of fire-resistance for structural members
- IBC Chapter 6 regulates structural integrity through process of classification by “Type of Construction”



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Structural Fire Resistance

- Structural fire-resistance is intended to protect the structural integrity of building elements during fire conditions. Such elements include:
 - Structural frame members.
 - Bearing walls.
 - Floor construction.
 - Roof construction.



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Limitation of Fire Spread

- Multiple conditions throughout the IBC utilize fire-resistive separations as a means to limit the spread of fire.
- Complete fire or partial fire separations are either mandated, or provided as an alternative, to address a variety of issues.
- Vertical and/or horizontal separations typically require opening protectives and other components to achieve full separation.



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Protection of Exitways

- As means of egress systems become more complex, fire-resistance-rated and/or smoke-resistant construction is often mandated.
- The “exit” portion of the means of egress is typically where such protection must be afforded.
- Fire protection of exitways allows for extended travel in large area or multi-story buildings.



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Radiant Heat Exposure

- As a means to address the spread of fire from building to building due to radiant heat transfer, fire-resistance-rated exterior walls are required based upon proximity to lot lines and other buildings on the same site.
- Concept of “fire separation distance” applied to regulate exterior wall fire-resistance and opening prohibition/protection



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Restriction of Smoke Movement

- Various conditions are addressed in the IBC where the primary consideration is smoke-resistance.
- Other conditions require a separation that includes both smoke-resistance and fire-resistance
- Smoke-resistant construction is often mandated where occupants are incapable of self-preservation and protect-in-place methods are in place.



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Module 2

Types of Fire and Smoke Separations



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Fire-resistance-rated Separations

- There are a number of diverse types of fire-resistance-rated separations established in the IBC.
- Each unique type of separation serves a distinct purpose as reflected in the details applicable to the wall or horizontal assembly.



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Fire-resistance-rated Separations

- The following fire-resistance-rated assemblies are selectively required by the IBC or can be provided as an alternative to compliance:
 - Fire walls
 - Fire barriers
 - Fire partitions
 - Smoke barriers
 - Exterior walls
 - Horizontal assemblies



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Fire Walls

- A fire wall is the most complex and protective form of fire separation.
- Typically selected for use by the designer to provide an alternative solution, a fire wall creates separate buildings in the same structure.
- Fire walls are selectively required to be 2-, 3- or 4-hour assemblies.



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Fire Barriers

- A fire barrier is the most common means of separating portions of a building.
- 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.
- Fire barriers are selectively required to be 1-, 2-, 3- or 4-hour assemblies.



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Fire Partitions

- A fire partition is required by the IBC where a limited degree of fire and smoke protection is warranted.
- The use of fire partitions is typical in locations where separation is important in the initial stages of building evacuation.
- Fire partitions are required to be minimum 1-hour assemblies, with allowances for ½-hour assemblies under specified conditions.



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Smoke Barriers

- A smoke barrier is mandated where a high degree of both fire and smoke protection is desired.
- Smoke barriers typically are used to create refuge compartments that allow occupants to safely await assistance.
- Smoke barriers are required to be minimum 1-hour assemblies while also providing a high degree of smoke resistance.



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Exterior Walls

- Exterior walls provide separation from both internal fires and external fires.
- While commonly fire-resistance-rated due to the wall's proximity to a lot line, exterior walls also often provide for the protection of outdoor exit travel.
- Exterior walls are selectively required to be minimum 1-, 2- or 3-hour fire-resistance-rated assemblies.



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Horizontal Assemblies

- Horizontal assemblies are typically used together with fire-resistance-rated wall assemblies to provide complete compartmentation in multi-story buildings.
- In most cases, the ceiling and floor work together, as well as independently, to provide the intended separation.
- Horizontal assemblies are selectively required to be minimum ½-, 1-, 2-, 3-, or 4-hour fire-resistance-rated assemblies.



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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 are required in those locations the movement of smoke is a concern, however fire is not a consideration.
- Smoke partitions are not required to have a fire-resistance rating.



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Prescriptive Separations

- Prescriptive separations are also mandated in those cases where a limited degree of separation is desired
- Although not required to be a tested and listed assembly, these separation elements adequately serve a specific need, including:
 - Gypsum board
 - Wired glass
 - Non-rated floor construction
 - Construction capable of restricting smoke transfer



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Module 3

Components of Fire and Smoke Separations



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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.



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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.
- The required fire-resistance ratings vary throughout the IBC and are selectively identified based upon the intended purpose of the vertical separation.



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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.
- Prescriptive separation elements are also occasionally mandated, where a specific material is identified as the minimum level of separation required.



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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.



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Vertical/Horizontal Combination

- In many cases, the IBC uses both vertical and horizontal elements in order to completely separate one area from another.
- The use of multiple elements allows for a complete separation that will restrict the spread of fire, smoke and gasses from the area of fire origin.



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Doors

- Typically, doors require protection as part of the overall package of fire and/or smoke protection.
- In most cases, door assemblies requiring a fire-protection rating are mandated in fire separation assemblies.
- Although Table 716.5 provides the required ratings and markings for most conditions, in some cases they are also individually identified based on the specific separation.



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Doors

- In a few cases, a prescriptive means of door protection is mandated.
 - For example, a solid-wood or honeycomb-steel door of a specified thickness might be established as the minimum required door.
- At times, the code does not regulate door assemblies in a fire separation element.
 - The most common example is where fire-resistance-rated exterior walls are located where opening protection is not required.



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Windows

- Windows are typically regulated in the same manner as doors.
- In addition to fire-protection-rated glazing, fire-resistance-rated glazing is also addressed.
 - Fire-resistance-rated glazing is regulated in much the same manner as fire-resistance-rated wall assemblies.



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Windows

- There are situations in the code where nonrated glazing is permitted in separation walls, such as where security glazing is needed, where smoke is the only concern, or where fire-resistance-rated exterior walls are permitted with unprotected openings.



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Penetrations and Joints

- Penetrations of separation elements must typically be protected by firestop systems rated to the same level as the element penetrated.
- Prescriptive methods of penetration protection are also established.
- Fire-resistant joint systems are mandated where joints occur in separation walls requiring opening protection.



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Air Movement

- Fire dampers, smoke dampers, combination dampers and ceiling radiation 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.



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Module 4

Fire and Smoke Separation Locations



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Separation Locations

- Building Size, Use and Components
- Exitways
- Fire Protection Features
- Special Building Types
- Special Occupancies and Uses
- Special Building Features
- Hazardous Uses



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Building Size, Use and Components



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Building Height and Area Section 503.1

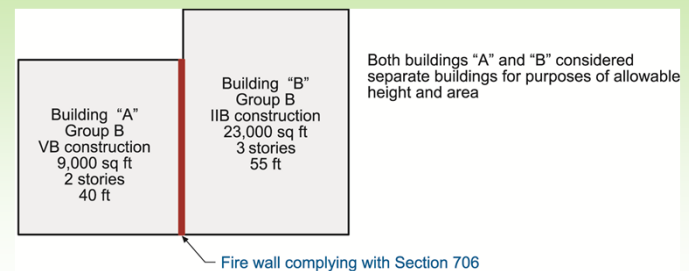
- Each portion of a building separated by a *fire wall* shall be considered a separate building.
- The use of a fire wall is selectively determined by the designer as a means to reduce building size, thus increasing the available types of construction.



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Building Height and Area Section 503.1



For SI: 1 foot = 304.8 mm, 1 square foot = 0.093 m².



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Fire Wall Fire-resistance Ratings Table 706.4

- The required minimum rating of a fire wall is based on the buildings' type(s) of construction and occupancy classification(s).

TABLE 706.4
FIRE WALL FIRE-RESISTANCE RATINGS

GROUP	FIRE-RESISTANCE RATING (hours)
A, B, E, H-4, I, R-1, R-2, U	3 ^a
F-1, H-3 ^b , H-5, M, S-1	3
H-1, H-2	4 ^b
F-2, S-2, R-3, R-4	2

a. In Type II or V construction, walls shall be permitted to have a 2-hour fire-resistance rating.
b. For Group H-1, H-2 or H-3 buildings, also see Sections 415.6 and 415.7.



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Fire Walls

- The use of a fire wall also provides a variety of other alternative solutions to the designer, such as:
 - Multiple types of construction
 - Reduction/elimination of fire protection features
- Fire walls are also selectively required by other provisions of the code.



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Separated Occupancies Section 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



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Separated Occupancies Table 508.4

OCCUPANCY	A, E	I-1, I-3, I-4		I-2	R ^a	F-2, S-2 ^b , U		B, F-1, M, S-1		H-1	H-2	H-3, H-4		H-5					
	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS			
A, E	N	N	1	2	2	NP	1	2	N	1	2	NP	NP	3	4	2	3	2	N
I-1, I-3, I-4	—	—	N	N	2	NP	1	NP	1	2	1	2	NP	NP	3	NP	2	NP	2
I-2	—	—	—	—	N	N	2	NP	2	NP	2	NP	NP	NP	3	NP	2	NP	2
R ^a	—	—	—	—	—	N	N	1 ^c	2 ^c	1	2	NP	NP	3	NP	2	NP	2	N
F-2, S-2 ^b , U	—	—	—	—	—	—	N	N	1	2	NP	NP	3	4	2	3	2	NP	2
B, F-1, M, S-1	—	—	—	—	—	—	—	N	N	NP	NP	2	3	1	2	1	N	NP	—
H-1	—	—	—	—	—	—	—	—	—	N	NP	NP	NP	NP	NP	NP	NP	NP	—
H-2	—	—	—	—	—	—	—	—	—	—	N	NP	NP	NP	NP	1	NP	1	NP
H-3, H-4	—	—	—	—	—	—	—	—	—	—	—	—	—	1 ^c	NP	1	NP	1	NP
H-5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	N	NP	—

S = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1.
NS = Buildings not equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1.
N = No separation requirement.
NP = Not permitted.
a. See Section 420.
b. The required separation from areas used only for private or pleasure vehicles shall be reduced by 1 hour but to not less than 1 hour.
c. See Section 406.3.4.
d. Separation is not required between occupancies of the same classification.



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Incidental Uses Section 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.



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Incidental Uses Table 509

TABLE 509 INCIDENTAL USES	
ROOM OR AREA	SEPARATION AND/OR PROTECTION
Furnace room where any piece of equipment is over 400,000 Btu per hour input	1 hour or provide automatic sprinkler system
Rooms with boilers where the largest piece of equipment is over 15 psi and 10 horsepower	1 hour or provide automatic sprinkler system
Refrigerant machinery room	1 hour or provide automatic sprinkler system
Hydrogen cutoff rooms, not classified as Group H	1 hour in Group B, F, M, S and U occupancies; 2 hours in Group A, E, I and R occupancies.
Incinerator rooms	2 hours and automatic sprinkler system
Paint shops, not classified as Group H, located in occupancies other than Group I	2 hours; or 1 hour and provide automatic sprinkler system
Laboratories and vocational shops, not classified as Group H, located in a Group I or I-2 occupancy	1 hour or provide automatic sprinkler system
Laundry rooms over 100 square feet	1 hour or provide automatic sprinkler system
Group I-3 cells equipped with padded surfaces	1 hour
Waste and linen collection rooms located in either Group I-2 occupancies or ambulatory care facilities	1 hour
Waste and linen collection rooms over 100 square feet	1 hour or provide automatic sprinkler system
Stationary storage battery systems having a liquid electrolyte capacity of more than 50 gallons for flooded lead-acid, nickel cadmium or VRLA, or more than 1,000 pounds for lithium-ion and lithium metal polymer used for facility standby power, emergency power or uninterruptible power supplies	1 hour in Group B, F, M, S and U occupancies; 2 hours in Group A, E, I and R occupancies.

For SI: 1 square foot = 0.0929 m²; 1 pound per square inch (psi) = 6.894 kPa; 1 British thermal unit (Btu) per hour = 0.293 watts; 1 horsepower = 746 watts; 1 gallon = 3.785 L.



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Group R-1 and R-2 Buildings of Type IIA or IIIA Construction Sections 510.5 and 510.6

- Where special height increases are applied for Group R-1 and R-2 buildings of Types IIA or IIIA construction, minimum 2-hour *fire walls* are required to:
 - Subdivide the floor area of Type IIA buildings into floor areas no more than 3,000 sf in area.
 - Segregate the exits in buildings of Type IIIA construction.



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Open Parking Beneath Groups A, I, B, M and R Section 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*.



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Horizontal Building Separation Allowance Section 510.2, #1

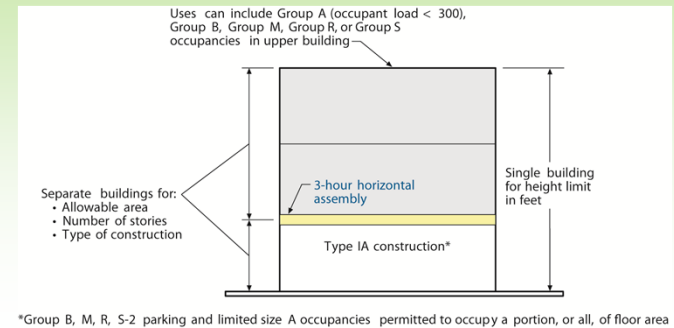
- Where separate and distinct buildings are created one above the other, the buildings shall be separated with a minimum 3-hour *horizontal assembly*.
- When separated and compliant with several other conditions, buildings can be regulated independently for allowable area and number of stories, and fire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



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Horizontal Building Separation Allowance Section 510.2, #1



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

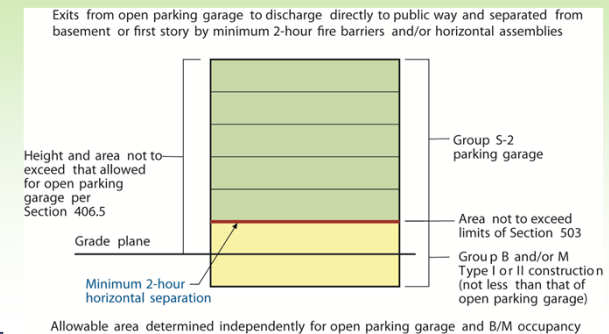
- Where a Group B or M occupancy is located above an open parking garage and considered as separate buildings for type of construction purposes, in addition to other requirements, the buildings must be separated by a minimum 2-hour *horizontal assembly*.



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



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Buildings on the Same Lot Section 503.1.2

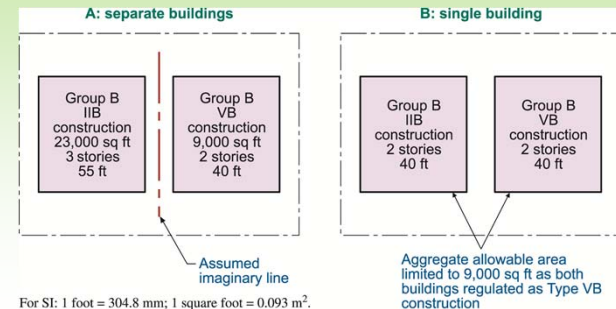
- Where two or more buildings are located on the same lot, they shall be regulated as separate buildings, or as portions of a single building.
- If regulated as separate buildings, the opposing *exterior walls* must be evaluated based upon fire separation distance.



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Buildings on the Same Lot Section 503.1.2



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Incidental Uses Section 509.4.2

- Where Table 509 permits automatic sprinkler protection without a fire barrier, the incidental uses must be separated from the remainder of the building by *construction capable of resisting the passage of smoke*.
- Doors and air openings are also regulated to maintain the smoke-resistance.



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Incidental Uses Table 509

TABLE 509 INCIDENTAL USES	
ROOM OR AREA	SEPARATION AND/OR PROTECTION
Furnace room where any piece of equipment is over 400,000 Btu per hour input	1 hour or provide automatic sprinkler system
Rooms with boilers where the largest piece of equipment is over 15 psi and 10 horsepower	1 hour or provide automatic sprinkler system
Refrigerant machinery room	1 hour or provide automatic sprinkler system
Hydrogen cutoff rooms, not classified as Group H	1 hour in Group B, F, M, S and U occupancies; 2 hours in Group A, E, I and R occupancies.
Incinerator rooms	2 hours and automatic sprinkler system
Paint shops, not classified as Group H, located in occupancies other than Group F	2 hours; or 1 hour and provide automatic sprinkler system
Laboratories and vocational shops, not classified as Group H, located in a Group E or I-2 occupancy	1 hour or provide automatic sprinkler system
Laundry rooms over 100 square feet	1 hour or provide automatic sprinkler system
Group F-3 cells equipped with padded surfaces	1 hour
Waste and linen collection rooms located in either Group I-2 occupancies or ambulatory care facilities	1 hour
Waste and linen collection rooms over 100 square feet	1 hour or provide automatic sprinkler system
Stationary storage battery systems having a liquid electrolyte capacity of more than 50 gallons for flooded lead-acid, nickel cadmium or VRLA; or more than 1,000 pounds for lithium-ion and lithium metal polymer used for facility standby power, emergency power or uninterruptible power supplies	1 hour in Group B, F, M, S and U occupancies; 2 hours in Group A, E, I and R occupancies.

For SI: 1 square foot = 0.0929 m²; 1 pound per square inch (psi) = 6.9 kPa; 1 British thermal unit (Btu) per hour = 0.293 watts; 1 horsepower = 746 watts; 1 gallon = 3.785 L.

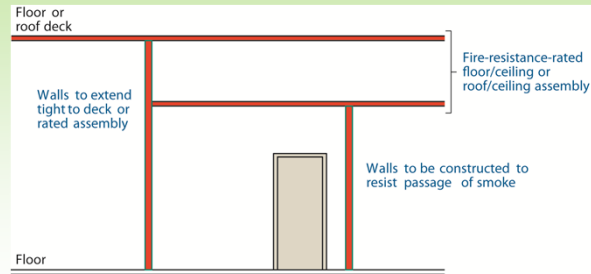


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Incidental Uses Section 509.4.2



Note: doors shall:

- be self-closing or automatic-closing by smoke
- have no air transfer openings
- have no excessive undercuts



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Exterior Walls Section 705.5

- For separation purposes, *exterior walls* in close proximity to 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 the transfer of radiant heat from a building involved in a fire event to another adjacent building.



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Exterior Walls Table 602

TABLE 602
FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE^{a, b}

FIRE SEPARATION DISTANCE = X (feet)	TYPE OF CONSTRUCTION	OCCUPANCY GROUP I ^c	OCCUPANCY GROUP F-1, M, S-1 ^d	OCCUPANCY GROUP A, B, E, F-2, I, R, S-2 ^e , U ^f
X < 5 ^g	All	3	2	1
5 ≤ X < 10	IA Others	3 2	2 1	1 1
10 ≤ X < 30	IA, IB IIB, VB Others	2 1 1	1 0 1	1 ^h 0 1 ^h
X ≥ 30	All	0	0	0

For SI: 1 foot = 304.8 mm.

a. Load-bearing exterior walls shall also comply with the fire-resistance rating requirements of Table 601.

b. For special requirements for Group U occupancies, see Section 406.3.

c. See Section 706.1.1 for party walls.

d. Open parking garages complying with Section 406 shall not be required to have a fire-resistance rating.

e. 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.

f. For special requirements for Group H occupancies, see Section 415.5.

g. For special requirements for Group S aircraft hangars, see Section 412.4.1.

h. 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.



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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.

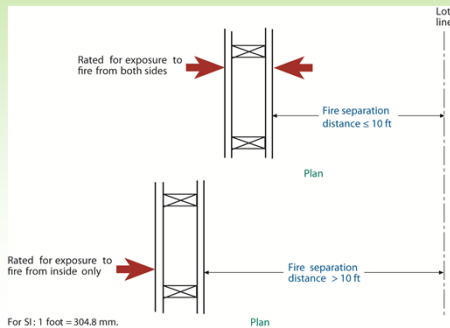


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Exterior Walls Section 705.5



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Shaft Enclosures Section 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*.

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Shaft Enclosure Fire Ratings Section 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

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Chute Access Rooms Section 713.13.3

- Access openings for refuse, recycling and laundry chutes shall be located in rooms or compartments enclosed by not less than 1-hour *fire barriers and/or horizontal assemblies*.
- Termination 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.

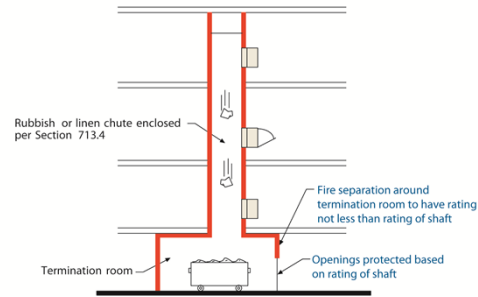
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Chute Access Rooms Section 713.13.3

Automatic sprinkler system required. Section 903.2.1 1.2 requires the installation of sprinkler heads in the terminal room, at the top of the chute, and at alternate floors when a chute extends through three or more floors.



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Elevator Lobbies Section 713.14.1

- 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.



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Exitways



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Exit Access Stairways Section 1009.3.1

- Exit access stairways to be enclosed by *fire barriers* at:
 - Minimum 2-hour serving 4 stories or more
 - Minimum 1-hour serving less than 3 stories
- Section 1009.3 sets forth 10 exceptions that eliminate the required enclosure



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Exit Access Ramps Section 1009.9.3

- Exit access ramps are required to be enclosed with *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.



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Interior Exit Stairways and Ramps Section 1022.2

- 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



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Extension of Interior Exit Stairways and Ramps Section 1022.3.1

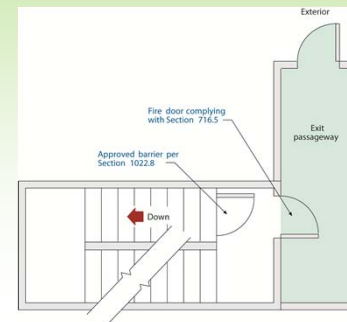
- A horizontal extension of an interior exit stairways or ramp, where required, shall be by an exit passageway constructed with *fire barriers and/or horizontal assemblies*.
- The exit passageway shall have a minimum fire-resistance rating equal to that of the connected interior exit stairway or ramp.



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Extension of Interior Exit Stairways and Ramps Section 1022.3.1



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Smokeproof Enclosures and Pressurized Stairways and Ramps Section 1022.10.1

- Where required for high-rise buildings or underground buildings, smokeproof enclosures and pressurized stairways are permitted to be extended by an exit passageway.
- *Fire barriers and/or horizontal assemblies* shall have a minimum 2-hour fire-resistance rating.



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Exit Passageways Section 1023.3

- 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.



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Horizontal Exits Section 1023.3

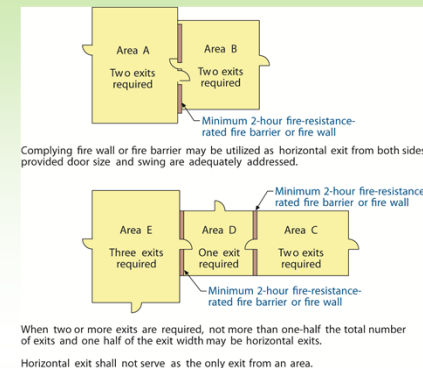
- Horizontal exits, where provided, shall be constructed with *fire walls*, or by *fire barriers* with a minimum 2-hour fire-resistance rating.
 - The separation shall extend vertically through the entire building unless *floor assemblies* have a minimum 2-hour fire-resistance rating.
- A horizontal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



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Horizontal Exits Section 1023.3



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Exterior Stairways and Ramps Section 1026.6

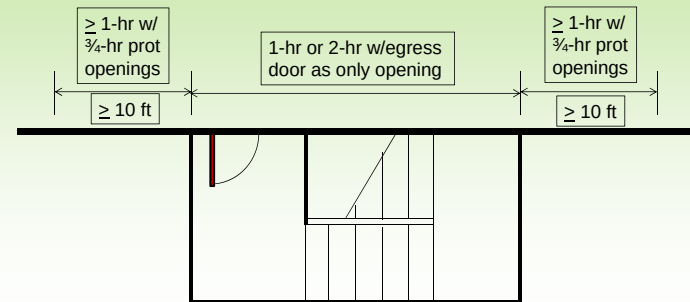
- Exterior stairways and ramps shall be separated from the interior of the building consistent with the protection required for interior exit stairways and ramps.
 - Fire barrier construction is required for those exterior walls adjacent to the exterior stairway or ramp.



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Exterior Stairways and Ramps Section 1026.6



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Spaces under Grandstands and Bleachers Section 1028.1.1.1

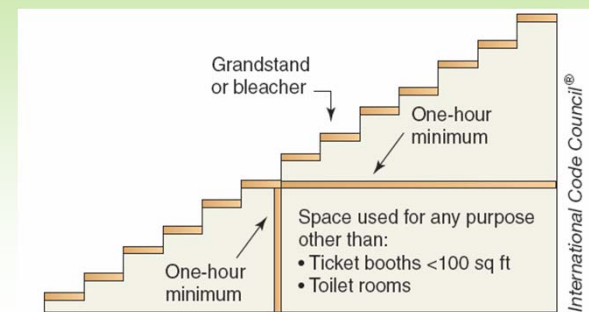
- Usable spaces must be separated from grandstands and bleachers above by minimum 1-hour *fire barriers and/or horizontal assemblies*.
 - Not required for toilet rooms and small ticket booths.



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Spaces under Grandstands and Bleachers Section 1028.1.1.1



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Corridors Section 1018.1

- Corridors shall be fire-resistance-rated in accordance with Table 1018.1.
- 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.



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Corridor Construction Table 1018.1

TABLE 1018.1 CORRIDOR FIRE-RESISTANCE RATING			
OCCUPANCY	OCCUPANT LOAD SERVED BY CORRIDOR	REQUIRED FIRE-RESISTANCE RATING (hours)	
		Without sprinkler system	With sprinkler system ^c
H-1, H-2, H-3	All	Not Permitted	1
H-4, H-5	Greater than 30	Not Permitted	1
A, B, E, F, M, S, U	Greater than 30	1	0
R	Greater than 10	Not Permitted	0.5
I-2 ^a , I-4	All	Not Permitted	0
I-1, I-3	All	Not Permitted	1 ^b

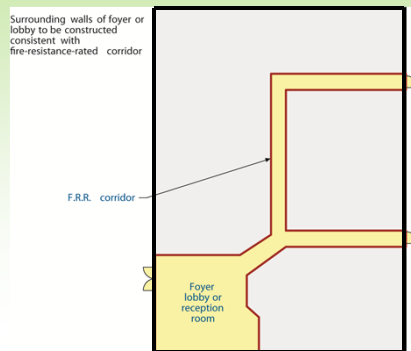
- a. For requirements for occupancies in Group I-2, see Sections 407.2 and 407.3.
b. For a reduction in the *fire-resistance rating* for occupancies in Group I-3, see Section 408.8.
c. Buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2 where allowed.



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Corridor Continuity Section 1018.1



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Egress Balconies Section 1019.2

- 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.



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Areas of Refuge Section 1007.6.2

- 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.



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Exterior Area for Assisted Rescue Section 1007.7.4

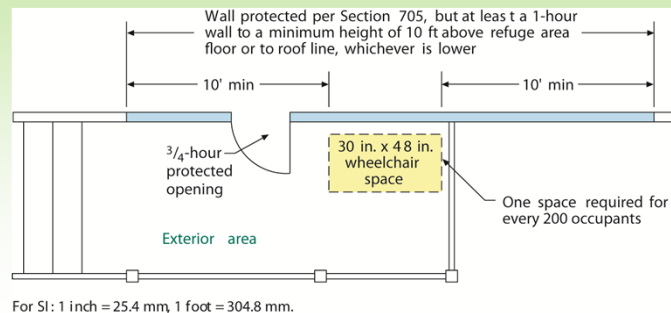
- *Exterior walls* separating an exterior area for assisted rescue from the interior of the building shall have a minimum fire-resistance rating of 1-hour, rated for exposure from the interior.



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Exterior Area for Assisted Rescue Section 1007.7.4



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Egress Courts Section 1027.4.2

- 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, and
 - serves an occupant load less than 10, and
 - serves other than a Group R-3 occupancy.



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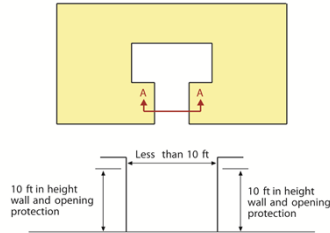
88

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Egress Courts Section 1027.4.2

When an egress court serving an occupant load of 10 or more is less than 10 feet in width:

- The court walls shall be protected up to 10 feet by a minimum of 1-hour fire-resistance-rated construction
- Openings in the court walls shall be protected by assemblies having a minimum $\frac{3}{4}$ -hour fire-protection rating



For SI: 1 foot = 304.8 mm.

Section A-A

2012 IBC Use of Fire and Smoke Separations

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Enclosures under Interior Stairways Section 1009.9.3

- 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.

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Enclosures under Residential Interior Stairways Section 1009.9.3, 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 $\frac{1}{2}$ -inch gypsum board.

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Enclosures under Exterior Stairways Section 1009.9.4

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

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Interior Exit Discharge Section 1027.1, Exception 1

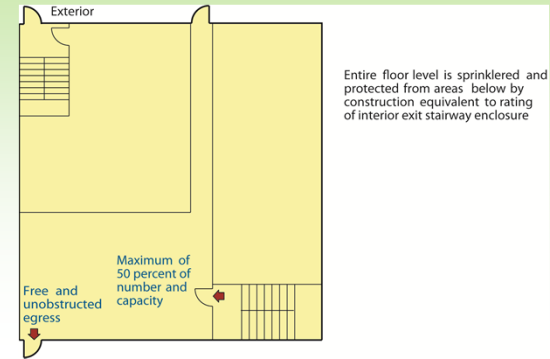
- Where an interior exit stairway is permitted to egress through a discharge level lobby or similar space, as one condition the discharge level must be separated from areas below by *construction conforming to the fire-resistance rating of the enclosure*.



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Interior Exit Discharge Section 1027.1, Exception 1



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Interior Exit Discharge Section 1027.1, Exception 2

- Where an interior exit stairway is permitted to egress through a discharge level vestibule, as one condition the discharge level must be separated from areas below by construction conforming to the fire-resistance rating of the enclosure.



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Interior Exit Discharge Section 1027.1, Exception 2

- In addition, the vestibule must be separated from the remainder of the level of exit discharge by *construction equivalent to approved wired glass in steel frames*.

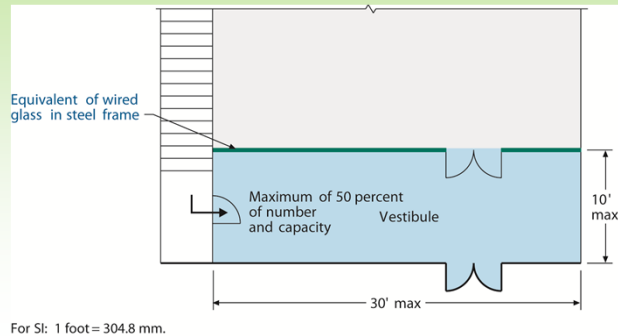


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Interior Exit Discharge Section 1027.1, Exception 2



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Fire Protection Features



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Fire Areas Section 901.7

- 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.



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Fire Areas Section 901.7

- Because many of the sprinkler provisions regulate protection based upon conditions within the building, the use of a *fire wall* to create separate, smaller buildings selectively creates conditions where the threshold requiring sprinkler protection is not exceeded.



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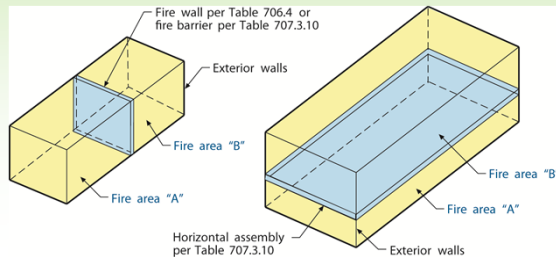
100

2012 IBC Use of Fire and Smoke Separations

Fire Areas Section 901.7

TABLE 707.3.10
FIRE-RESISTANCE RATING REQUIREMENTS FOR FIRE
BARRIER ASSEMBLIES OR HORIZONTAL ASSEMBLIES
BETWEEN FIRE AREAS

OCCUPANCY GROUP	FIRE-RESISTANCE RATING (hours)
H-1, H-2	4
F-1, H-3, S-1	3
A, B, E, F-2, H-4, H-5, I, M, R, S-2	2
U	1



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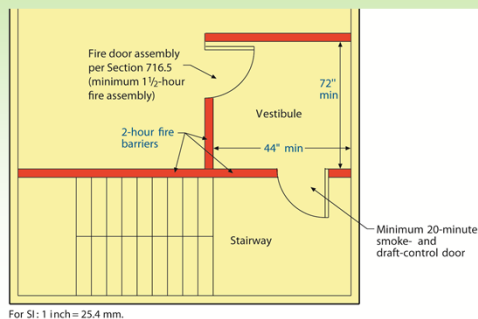
Smokeproof Enclosures Section 909.20.2

- 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*.

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Smokeproof Enclosures Section 909.20.2



2012 IBC Use of Fire and Smoke Separations

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Stair Pressurization Alternative Section 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.

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2012 IBC Use of Fire and Smoke Separations

Fire Command Center Section 911.1.2

- Fire command centers, when required, shall be separated from the remainder of the building by minimum 1-hour *fire barriers and/or horizontal assemblies*.



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Fire Pump Rooms Section 913.2.1

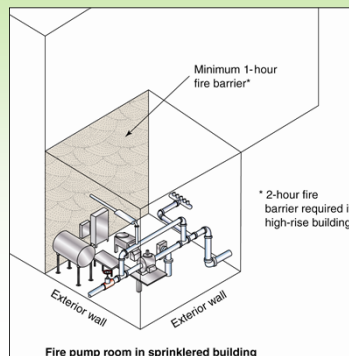
- Fire pumps shall be located in rooms separated from all other portions of the building by minimum 2-hour *fire barriers and/or horizontal assemblies*.
 - In other than high-rise buildings, where the building is fully sprinklered, the *fire barriers and/or horizontal assemblies* must have a minimum 1-hour fire-resistance rating.



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Fire Pump Rooms Section 913.2.1



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Fire Alarm Systems in Group R Occupancies Section 907.2

- In select Group R occupancies, 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.



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Smoke Control Systems Section 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.



2012 IBC Use of Fire and Smoke Separations

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Special Building Types



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Mall/Anchor Building Separation Section 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



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Mall/Parking Garage Separation Section 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*.



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Mall Exit Passageways Section 402.8.6.1

- Service areas fronting on exit passageways in a mall building may open directly into the passageways provided they are separated by minimum 1-hour *fire barriers and/or horizontal assemblies*.
 - Such areas include mechanical rooms, electrical rooms and service elevators.



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Mall Tenant Separations Section 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.



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Standby Power Protection in High-rise Buildings Section 403.4.8.1

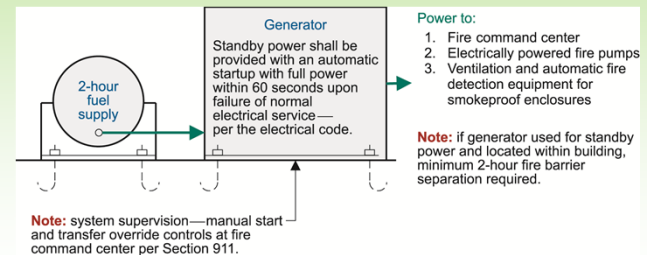
- If a generator within the building is used for standby power in a high-rise building, it shall be located in a separate room enclosed with minimum 2-hour *fire barriers and/or horizontal assemblies*.



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Standby Power Protection in High-rise Buildings Section 403.4.8.1



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Atrium Sprinkler Protection Section 404.3, Exception 1

- The sprinkler required for a building containing an atrium is not required for those areas adjacent 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 Section 404.6

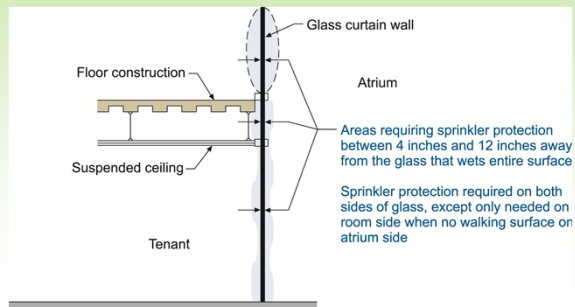
- Atrium spaces shall be separated from adjacent spaces by a minimum 1-hour *fire barrier and/or horizontal assembly*.
 - The 1-hour separation is not required under one of three exceptions, including where glazing is protected by an automatic sprinkler system.



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Atrium Separation Section 404.6, Exception 1



For SI: 1 inch = 25.4 mm.

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Underground Building Compartmentation Section 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*.



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Special Occupancies and Uses



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Private Garage Buildings Section 406.3.2

- Multiple 3,000-square-foot private garages are permitted within the same structure where each area is separated by complying *fire walls*.



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Garage Dwelling Separations Section 406.3.4, Exception 1

- A private garage shall be separated from the dwelling unit by minimum *½-inch gypsum board on the garage side*.
- Garages with habitable rooms above shall be separated by not less than *5/8-inch Type X gypsum board*.



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Group I-2 Smoke Compartments Section 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*.

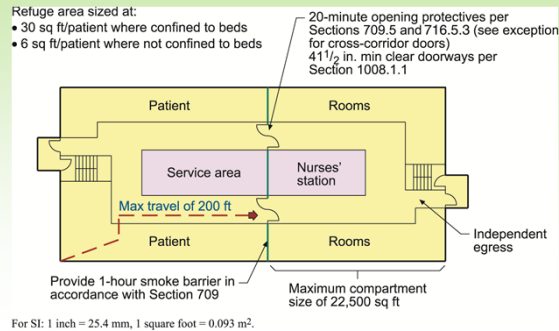


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Group I-2 Smoke Compartments Section 407.5



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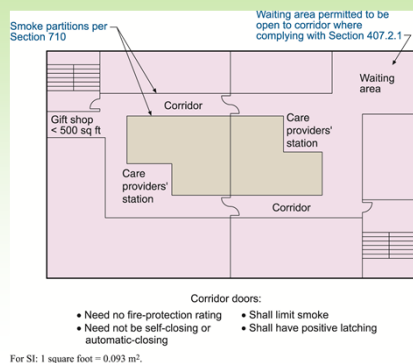
Group I-2 Corridors Section 407.3

- 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.

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Group I-2 Corridors Section 407.3

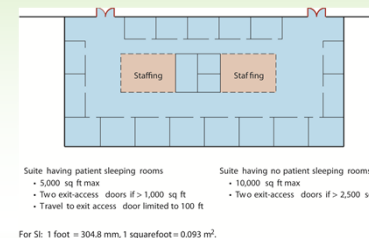


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Group I-2 Care Suites Section 407.4.3.2

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



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Group I-3 Smoke Compartments Section 408.6

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



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Group I-3 Interior Exit Stairways Section 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.



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Group I-3 Subdivision of Resident Housing Areas Section 408.8

- In Occupancy Conditions 3 and 4, each sleeping area shall be separated from adjacent common spaces by a *smoke-tight partition*.
- In Occupancy Condition 5, each sleeping area shall be separated from adjacent sleeping areas, corridors and common areas by *smoke-tight partitions*.



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Aircraft Hangar Fire Areas Section 412.4.6.2

- When determining the fire suppression requirements for aircraft hangars, established fire areas shall be separated by minimum 2-hour *fire walls*.



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Aircraft Hangar Fire Areas Section 412.4.6.2

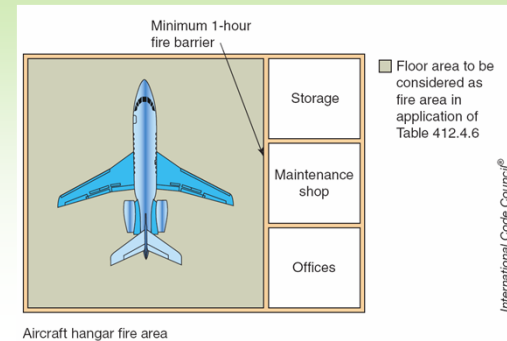
- Support areas, such as offices, shops and storage rooms, which are separated from the aircraft servicing area by minimum 1-hour *fire barriers* are not required to be included in the determination of fire area size.



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Aircraft Hangar Fire Areas Section 412.4.6.2



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Aircraft Hangar Heating Equipment Section 412.4.4

- Heating equipment in an aircraft hangar shall be placed in a separate room separated by minimum 2-hour *fire barriers and/or horizontal assemblies*.



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Residential Aircraft Hangar Separation Section 412.5.1

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



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Residential Unit Wall Separations Section 420.2

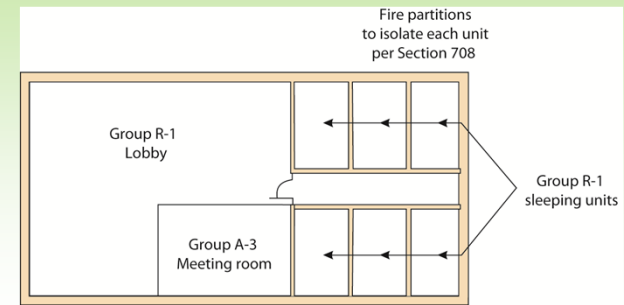
- In Group I-1, R-1, R-2 and R-3 occupancies, walls separating dwelling and sleeping units in the same building, as well as separating such units from other occupancies in the building, shall be constructed as *fire partitions*.



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Residential Unit Wall Separations Section 420.2



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Residential Unit Floor Separations Section 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*.



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Ambulatory Care Facilities Separations Section 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*.



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Ambulatory Care Facilities Smoke Compartments Section 422.3

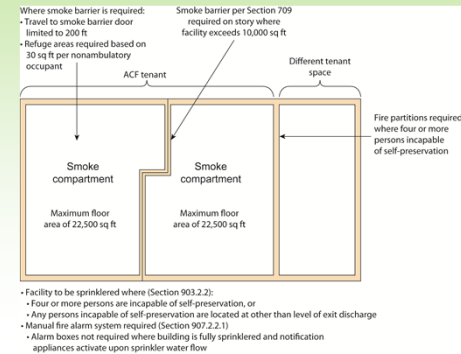
- Where the aggregate area of one or more ambulatory care facilities exceeds 10,000 square feet, *smoke barriers* are required to create smoke compartments.
- No individual compartment is permitted to exceed 22,500 square feet.



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Ambulatory Care Facilities Section 422



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Special Building Features



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Stage Proscenium Wall Section 410.3.4

- 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.



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Stage Support Areas Separation Section 410.5.1

- 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



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Stage Support Areas Separation Section 410.5.2

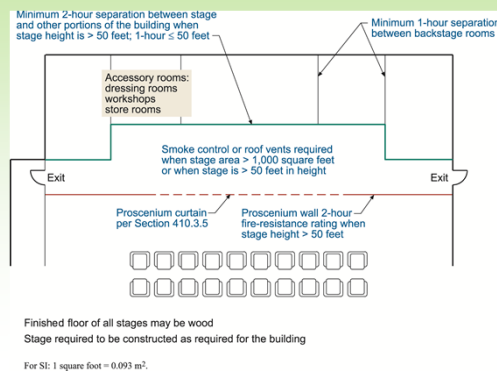
- Support areas, such as dressing rooms, workshops and storerooms, shall be separated from each other by *fire barriers and/or horizontal assemblies*.
 - Minimum 1-hour separation required



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Stages Section 410.3



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Platform Construction Section 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*.



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2012 IBC Use of Fire and Smoke Separations

Elevator Machine Rooms Section 3006.4

- 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.



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Fire Service Access Elevator Lobby Section 3007.7.2

- 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.



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Occupant Evacuation Elevator Lobby Section 3008.7.2

- 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.



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Pedestrian Walkways Section 3104.5

- Pedestrian walkways shall be separated from the interior of the attached buildings by minimum 2-hour *fire barriers and/or horizontal assemblies*.
 - Multiple exceptions permit alternative methods of addressing the walkway/building connections, including the use of a *tempered, wired or laminated glass wall*.



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Tunnels Section 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*.



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Hazardous Uses



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Combustible Storage Section 413

- Attic, under-floor and concealed spaces used for storage of combustible materials must be protected on the storage side as required for 1-hour *fire-resistance-rated construction*.
 - Not required for sprinklered spaces or in Group R-3 and U occupancies



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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.
- The floors assemblies separating control area shall be minimum 2-hour *horizontal assemblies*.
 - Exception permits 1-hour assemblies under specified conditions.



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Control Areas Table 414.2.2

[F] TABLE 414.2.2 DESIGN AND NUMBER OF CONTROL AREAS				
FLOOR LEVEL		PERCENTAGE OF THE MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA ^a	NUMBER OF CONTROL AREAS PER FLOOR	FIRE-RESISTANCE RATING FOR FIRE BARRIERS IN HOURS ^b
Above grade plane	Higher than 9	5	1	2
	7-9	5	2	2
	6	12.5	2	2
	5	12.5	2	2
	4	12.5	2	2
	3	50	2	1
	2	75	3	1
	1	100	4	1
Below grade plane	1	75	3	1
	2	50	2	1
	Lower than 2	Not Allowed	Not Allowed	Not Allowed

a. Percentages shall be of the maximum allowable quantity per control area shown in Tables 307.1(1) and 307.1(2), with all increases allowed in the notes to those tables.

b. Separation shall include fire barriers and horizontal assemblies as necessary to provide separation from other portions of the building.



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Grinding Rooms Section 415.8.1.2

- 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 upon the floor area of the room:
 - 2 hours, where 3,000 square feet or less
 - 4 hours, where over 3,000 square feet



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Group H-2 and H-3 Gas Rooms Section 415.9.2

- Where Group H-2 or H-3 gas rooms are provided, they shall be separated from other areas by minimum 1-hour *fire barriers and/or horizontal assemblies*.



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Highly Toxic Solids and Liquids Section 415.9.4

- 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*.



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Group H-5 Fabrication Areas Section 415.10.1.2

- Fabrication areas in Group H-5 occupancies shall be separated from each other, from corridors and from other parts of the building by minimum 1-hour *fire barriers and/or horizontal assemblies*.



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Flammable Finish Spray Rooms Section 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*.



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Manufacturing of Organic Coatings Section 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



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Hydrogen Cutoff Rooms Section 421

- Hydrogen cutoff rooms shall be separated from other areas of the building by not less than 1-hour *fire barriers and/or horizontal assemblies*:



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