

ICC 2019
LAS VEGAS
NEVADA

**2018 IBC Use of Fire and
Smoke Separations**

Based on the 2018 *International Building Code*® (IBC®)

ICC LEARNING center
INTERNATIONAL CODE COUNCIL

ICC INTERNATIONAL CODE COUNCIL®

Course Description


ICC INTERNATIONAL CODE COUNCIL®


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

Objectives


ICC INTERNATIONAL CODE COUNCIL®

- 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



Module 1

Fire and Smoke Protection Concepts



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.

ICC 2019 LAS VEGAS NEVADA

Module 2

Fire and Smoke Separation Types

ICC INTERNATIONAL CODE COUNCIL

Fire-resistance-rated Separations

ICC INTERNATIONAL CODE COUNCIL




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

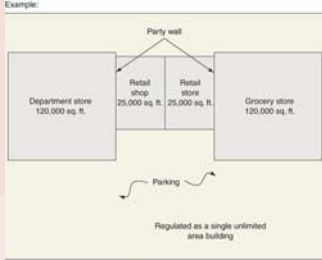
Fire Walls


ICC INTERNATIONAL CODE COUNCIL

- 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 Walls – 706.1.1, Exception 2 


Example:






Module 3

Components of Fire and Smoke Separations



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/Horizontal Combination

Fire Separation Distance
2-hour
1-hour

Apartment Group R-2
Day care Group E
None
Restaurant Group A-2

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

Elevation View: Type IIIA, A/S


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.

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**.

Window / Door Test FIRE PROTECTIVE NFPA 257/252	Wall Test FIRE RESISTIVE ASTM E119/NFPA 263
Contains flame and smoke 45 minutes and under	Contains flame and smoke AND blocks radiant heat for applications over 45 minutes

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



Module 4

Fire and Smoke Separation Locations



Separation Locations 

- Building Size, Use and Components
- Means of Egress
- Fire Limitation Features
- Special Building Types
- Special Occupancies and Uses
- Special Building Features
- Hazardous Uses

Building Size, Use and Components

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

Fire wall provided solely for determination of allowable height and area (type of construction)


Building Height & Area – 503.1

Building "A"	Building "B"
Group B	Group B
VB construction	IIB construction
9,000 sq ft	23,000 sq ft
2 stories	3 stories
40 ft	55 ft
(nonsprinklered)	(nonsprinklered)


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

Fire wall complying with Section 706

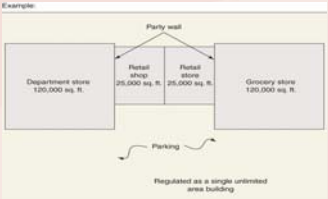
For SI: 1 foot = 304.8 mm, 1 square foot = 0.093 m².


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:
 - 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
 - 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).

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 415.7 and 415.8.

Separated Occupancies – Table 508.4

ICC INTERNATIONAL CODE COUNCIL®

OCCUPANCY	REQUIRED SEPARATION OF OCCUPANCIES (HOURS)																		
	A, E	I-1, I-3, I-4	I-2	R	F-1, F-2, U	S	M, S-1	H-1	H-2	H-3, H-4	H-5	M, S-2, U	M, S-1	S					
A, E	N	N	2	2	NP	1	2	N	1	1	2	NP	NP	3	4	2	3	2	NP
I-1, I-3, I-4	---	N	N	2	NP	1	NP	1	2	1	2	NP	NP	3	NP	2	NP	2	NP
I-2	---	---	N	N	2	NP	2	NP	2	NP	NP	NP	3	NP	2	NP	2	NP	
R	---	---	---	N	N	I ^a	2 ^a	1	2	NP	NP	3	NP	2	NP	2	NP	2	NP
F-2, S-2, U	---	---	---	---	N	N	I ^a	2 ^a	NP	NP	3	4	2	3	2	NP	2	NP	
M, S-1, M, S-1	---	---	---	---	---	N	N	NP	NP	2	3	1	2	1	NP	NP	NP	NP	
H-1	---	---	---	---	---	---	---	N	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	
H-2	---	---	---	---	---	---	---	---	N	NP	1	1	NP	1	NP	1	NP	1	NP

S Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.1.1.1.

NP No separation requirement.

I^a Not permitted.

a. See Section 402.

b. The required separation from areas used only for private or pleasure vehicles shall be reduced by 1 hour but not to be less than 1 hour.

c. See Section 408.3.2.

d. Separation is not required between occupancies of the same classification.

e. See Section 422.2 for ambulatory care facilities.

f. Occupancy separations that serve to define the area levels established in Chapter 9 for requiring fire protection systems shall also comply with Section 707.3.3 and Table 707.3.3 in accordance with Section 903.7.

g. Any occupancy requirements herein unless otherwise specified are for general occupancies. Occupancies that require fire protection systems shall comply with Section 707.3.3 and Table 707.3.3 in accordance with Section 903.7.

h. See Section 408.3.4.

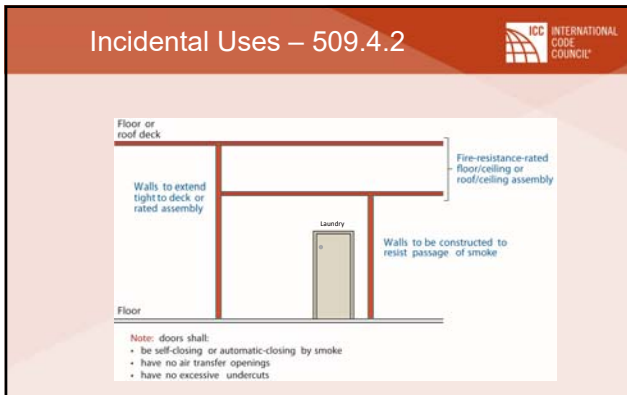
i. Separations in text required between occupancies of the same classification.

j. See Section 422.2 for ambulatory care facilities.

Incidental Uses – Table 509

ICC INTERNATIONAL CODE COUNCIL®

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 gal and 10 horsepower	1 hour or provide automatic sprinkler system
Refrigerant machinery room	1 hour or provide automatic sprinkler system
Hydrogen fuel gas rooms, not classified as Group H	1 hour in Group R, U, M, S and I occupancies 2 hours in Group A, E, and F occupancies
Recreational rooms	2 hours and provide automatic sprinkler system
Floor shops, not classified as Group H, located in occupancies other than Group H	2 hours, or 1 hour and provide automatic sprinkler system
In Group I occupancies, laboratories and vocational shops not classified as Group H	1 hour or provide automatic sprinkler system
In Group I-2 occupancies, laboratories not classified as Group H	1 hour and provide automatic sprinkler system
In ambulatory care facilities, laboratories not classified as Group H	1 hour or provide automatic sprinkler system
Laundry rooms over 300 square feet	1 hour or provide automatic sprinkler system
In Group I-2, laundry rooms over 300 square feet	2 hours
Group I-2 cells and Group I-2 patient rooms equipped with padded surfaces	1 hour
In Group I-2, physical plant maintenance shops	1 hour
In ambulatory care facilities or Group I-2 occupancies, waste and linen collection rooms with containers that have an aggregate volume of 20 cubic feet or greater	1 hour
In other than ambulatory care facilities and Group I-2 occupancies, waste and linen collection rooms over 100 square feet	1 hour or provide automatic sprinkler system
In ambulatory care facilities or Group I-2 occupancies, storage rooms greater than 300 square feet	1 hour
Recreational storage rooms having an energy capacity greater than the threshold quantity specified in Table 1306.2 of the International Fire Code	1 hour in Group R, U, M, S and I occupancies 2 hours in Group A, E, and F occupancies
Electrical installations and transformers	See Sections 110.28 through 110.34 and Sections 408.8 through 408.46 of NFPA 70 for protection and separation



Horizontal Separation- 510.2

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

Buildings on Same Lot – 503.1.2

Exterior Walls – Table 602







TABLE 602 FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE ^{a, b, c}				
FIRE SEPARATION DISTANCE - X (feet)	TYPE OF CONSTRUCTION	OCCUPANCY GROUP H ^d	OCCUPANCY GROUP F-1, M, S-1 ^e	OCCUPANCY GROUP A, B, E, F-2, L, R ^f ; S-2, U ^g
X < 5 ^h	All	3	2	1
5 ≤ X < 30	IA	3	2	1
	Others	2	1	1
10 ≤ X < 30	IA, IB	2	1	1 ⁱ
	III, VB	1	0	0
	Others	1	1	1 ⁱ
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 of Table 601.
 b. See Section 706.2.1 for party walls.
 c. Open parking garages complying with Section 409 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. For special requirements for Group H occupancies, see Section 414.4.
 f. For special requirements for Group S occupancies, see Section 412.3.1.
 g. Where Table 703.2 permits enclosing exterior walls with unobstructed 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 (1524 mm) or greater.
 i. For a Group R-3 building of Type II 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 (1524 mm) or greater.




Means of Egress







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!

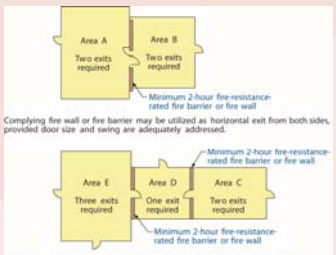
Interior Exit Stairways and Ramps – 1023.2 

- 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.

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 – 1026.4 



Minimum 2-hour fire-resistance-rated fire barrier or fire wall

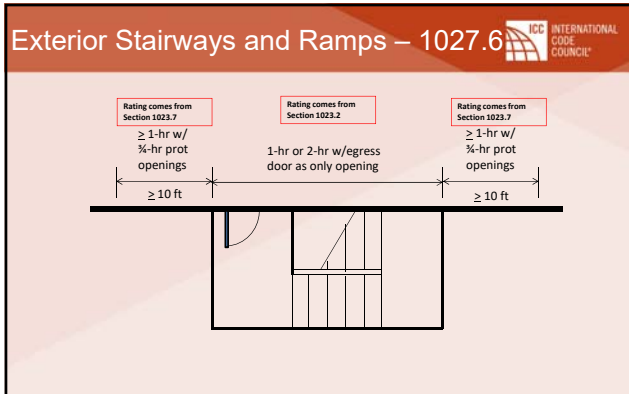
Complying fire wall or fire barrier may be utilized as horizontal exit from both sides, provided door size and rating are adequately addressed.

Minimum 2-hour fire-resistance-rated fire barrier or fire wall

Minimum 2-hour fire-resistance-rated fire barrier or fire wall

When two or more exits are required, not more than one-half the total number of exits and one half of the exit width may be horizontal exits.

Horizontal exit shall not serve as the only exit from an area.



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.

The diagram shows a grandstand or bleacher structure with a space underneath. A 1-hour fire barrier is shown separating the space from the structure above. The space is labeled as 'Space used for any purpose other than:'

- Ticket booths < 100 sf
- Toilet rooms
- Accessory areas < 1000 sf and sprinklered

Corridor Construction – Table 1020.1

OCCUPANCY	OCCUPANT LOAD SERVED BY CORRIDOR	REQUIRED FIRE-RESISTANCE RATING (hours)	
		Without sprinkler system	With sprinkler systems ^a
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 30	Not Permitted	0.5/ ^b
I-2 ^c	All	Not Permitted	0
I-1, I-3	All	Not Permitted	1 ^d
I-4	All	1	0

^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 Building 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 building equipped throughout with an automatic sprinkler system in accordance with Section 603.3.3.1.1. See Section 903.2.2 for occupancies where automatic sprinkler systems are permitted in accordance with Section 903.3.1.3.

Corridor Continuity – 1020.6

The diagram illustrates a building's exit path. It shows a '250 ft limit (sprinklered bldg) to enclosed exit' in red. An 'Exit Access Stairway (open)' is shown with a '250 ft limit (all the way down) to exit discharge'. An 'Interior Exit Stairway (enclosed)' is also shown. Labels include 'Exit access corridor', 'Public way', and 'Exit discharge'. A note states: 'Note: unenclosed stairs have certain limitations (see latest Code)'. The ICC International Code Council logo is in the top right.

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

The diagram shows an exterior area for assisted rescue. It features a '1-HR fire-resistant construction' wall. 'Maneuvering clearance ICC A117.1' is indicated. 'Provide signs - Sections 1009.9 & 1009.11' and '30" x 48" Wheelchair space Section 1007.6.1' are noted. Other labels include '18" MIN CLEARANCE BETWEEN HANDRAILS', '18" MIN PER ALLOWED PROTRUSIONS IN ICC A117.1', and 'GUARD RAILS SECTION 1009.3'. The ICC International Code Council logo is in the top right.

Egress Courts – 1028.4.2

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 3/4-hour fire-protection rating.

Section A-A

For 5/8: 1 foot = 304.8 mm.

Interior Exit Discharge – 1028.1, Exception 1

1.1 Maximum of 50 percent of free and unobstructed egress.

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 unobstructed and all rooms and portions of the level having access to the egress path shall be separated 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 5% length of overall diagonal of building, whichever is less.

ICC 2019 LAS VEGAS NEVADA

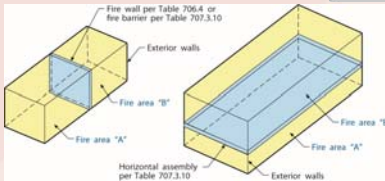
Fire Limitation Features

ICC INTERNATIONAL CODE COUNCIL

Fire Areas – 901.7



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



Fire wall per Table 706.4 or fire barrier per Table 707.3.10


Exterior walls

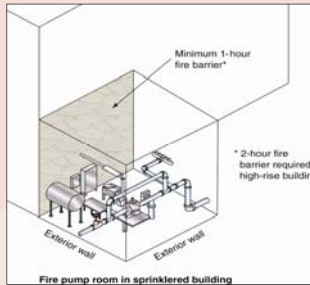
Fire area "B"

Fire area "A"

Horizontal assembly per Table 707.3.10

Fire Pump Rooms – 913.2.1





Minimum 1-hour fire barrier*

* 2-hour fire barrier required if high-rise building


Exterior wall

Exterior wall

Fire pump room in sprinklered building




Special Building Types




Mall Separations – 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.
- 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*.
- 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.

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

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*.

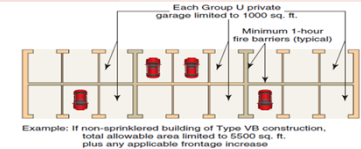


Special Occupancies and Uses



Private Garage Buildings – 406.3.1

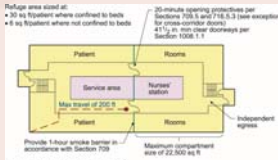
- Multiple 1,000-square-foot private garages are permitted within the same structure where each private garage is separated by minimum 1-hour *fire barriers*, *horizontal assemblies*, or both.



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

Smoke partitions per Section 710

Waiting area permitted to be open to corridor where complying with Section 407.2.1

Gift shop or 500 sq ft

Corridor

Cans providers' station

Waiting area

Corridor doors:

- Need no fire-protection rating
- Shall limit smoke
- Need not be self-closing or automatic-closing
- Shall have positive latching

For SI: 1 square foot = 0.093 sqm

Aircraft Hangar Fire Areas – 412.4.6.2

Minimum 1-hour fire barrier

Storage

Maintenance shop

Offices

Floor area to be considered as fire area in application of Table 412.4.6

Aircraft hangar fire area

Ambulatory Care Facilities—422

Smoke compartment

Smoke barrier per Section 710

Fire partitions required where four or more partitions are capable of self-protection

Different tenant space

Smoke compartment

Maximum floor area of 22,500 sq ft

Maximum floor area of 22,500 sq ft

Where smoke barrier is required:

- Travel to smoke barrier door limited to 200 ft
- Refuge areas required based on 30 ft to open noncombustible

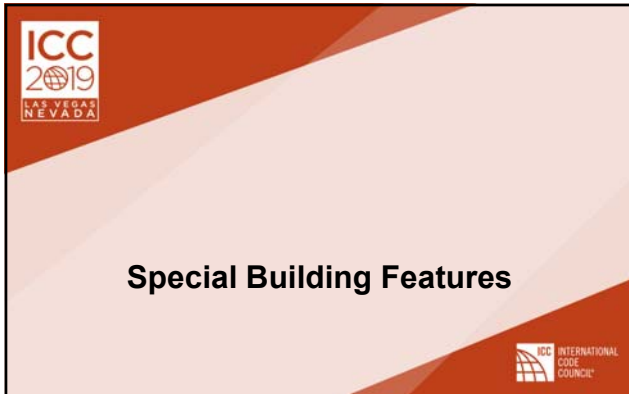
Smoke barrier per Section 710 required on story where facility exceeds 10,000 sq ft

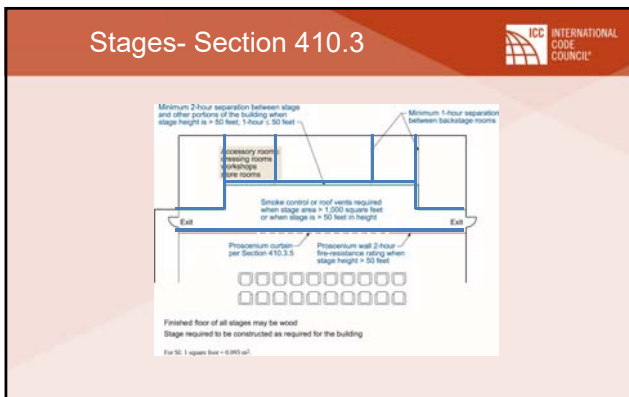
ACT tenant space

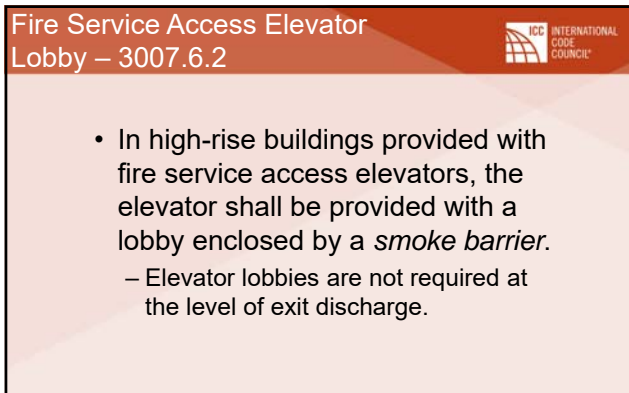
Different tenant space

Facility to be sprinklered where (Section 903.2.2):

- Four or more persons are incapable of self-protection, or
- Any person incapable of self-protection are located at other than level of exit discharge
- Manual fire alarm systems required (Section 907.2.2.1)
- Alarm bases not required where building is fully sprinklered and notification appliances activate upon sprinkler water flow










Hazardous Uses




Control Areas – Table 414.2.2




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
Higher than 9	5	1	2
3-9	5	2	2
6	12.5	2	2
5	12.5	2	2
Above grade plane:			
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 307.3(1) and 307.3(2), with all increases allowed in the notes to these tables.
b. Separation shall include fire barriers and horizontal assemblies as necessary to provide separation from other portions of the building.

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*.



International Code Council is a Registered Provider with The American Institute of Architects Continuing Education Systems. Credit earned on completion of this program will be reported to CES Records for AIA members. Certificates of Completion for non-AIA members are available on request.

This program is registered with the AIA/CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product. Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.



Copyright Materials



This presentation is protected by US and International Copyright laws. Reproduction, distribution, display and use of the presentation without written permission of the speaker is prohibited.

© International Code Council 2018



Thank you for participating!



To schedule a seminar, contact:
The Learning Center™
1-888-ICC-SAFE (422-7233) Ext. 33821
or
E-mail: learn@iccsafe.org