










KEY LEARNING



Definition



- A mixed-occupancy condition occurs where two or more distinct occupancy classifications are determined to exist in the same building.
- Under such circumstances, the designer has available several different methodologies in Section 508 to address the mixed-occupancy building.
- Compliance with at least one of the methods is mandatory.

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Use vs. Occupancy

- "Use" and "Occupancy" are terms that differ in meaning and application within the IBC.
- "Use" describes the activity that occurs within the space, room or building.
 - "Use" is seldom utilized in the IBC as the scoping mechanism.
 - Examples include occupant load calculation and incidental uses.
- "Occupancy" describes the specific classification a "use" is assigned when applying the code to a space, room or building.
 - Almost all code provisions with application only to a limited number of situations are regulated by "Occupancy".
 - Primary examples include allowable height and area, fire protection features and means of egress requirements.






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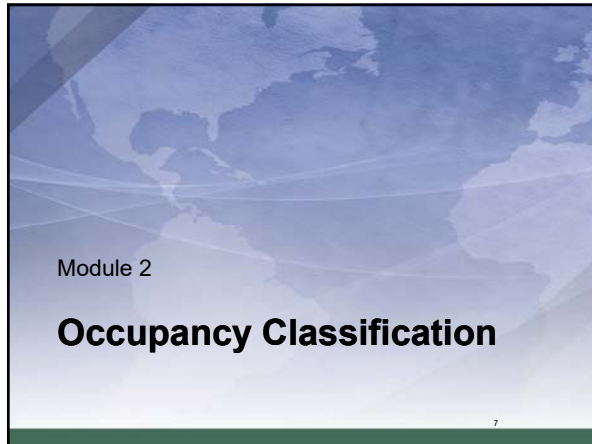
General Provisions

Section 508.1

- Three options established in Section 508 to address mixed-occupancy buildings include:
 - Accessory Occupancies.
 - Nonseparated Occupancies.
 - Separated Occupancies.
- Methods for determining maximum allowable size, height and area and separations are identified for each option.
- One of the three options must be applied to a mixed-occupancy condition.





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**Classification of Occupancies
Section 302**


- Classification is essential to the proper application of the IBC.
- Structure to be classified according to the function or functions for which it is intended.
- Buildings to be classified prior to the application of Section 508 regulating mixed-occupancy conditions.



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**Classification of Occupancies
Section 302**


- Chapter 3 provides an extensive listing of various uses and their corresponding occupancy classifications.
- There are many special cases and exceptions.
- Unsure of classification? Ask for more information.
- If two or more distinct occupancy groups are present, the provisions of Section 508 will apply.



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General Provisions
Section 302.1


- Structures are classified into one or more occupancies in accordance with their intended uses.
- If the use is not specifically identified in Chapter 3, it must be classified with the occupancy it most nearly resembles.



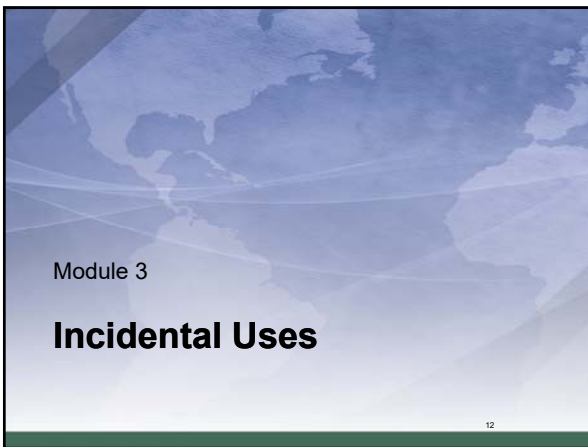
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Occupancy Classification Overview

- Multiple uses do not necessarily create multiple occupancies.
- General occupancy classification is intended to include related support areas such as corridors, stairways, restrooms, mechanical equipment rooms, small storage areas, etc.
- Support areas of higher hazard are often regulated as incidental uses.



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Module 3

Incidental Uses

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FOR EXAMPLE

Incidental Uses Classification

- Occupancy classification is consistent with the general classification of the area of the building in which the incidental use is located.

The diagram shows two scenarios. On the left, a 'Group E High School' contains a 'Group E Chemistry Classroom'. A note indicates it is 'Separated or Protected per Table 509'. On the right, a 'Group R-1 Hotel' contains a '220 square feet Group R-1 Laundry Room', also noted as 'Separated or Protected per Table 509'. Logos for IBC and Learning Center are at the bottom.

REFER TO

Incidental Uses Table 509

ROOM OR AREA	SEPARATION AND/OR PROTECTION
Paint 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 12 psi and 10 horsepower	1 hour or provide automatic sprinkler system
Refrigerant machinery rooms	1 hour or provide automatic sprinkler system
Hydrogen fuel gas 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 provide 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
In Group E 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 100 square feet	1 hour or provide automatic sprinkler system
In Group I-2, laundry rooms over 100 square feet	1 hour
Group I-3 toilets 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 10 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 100 square feet	1 hour
Stationary storage battery systems having an energy capacity greater than the threshold quantity specified in Table 1206.2 of the International Fire Code	1 hour in Group B, F, M, S and U occupancies; 2 hours in Group A, E, I and R occupancies
Electrical insulations and transformers	See Sections 110.26 through 110.34 and Section 430.4 through 430.48 or NFPA 70 for protection and separation requirements.

Logos for IBC and Learning Center are at the bottom.


Module 4

Foundations of the IBC for Mixed Occupancies

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Application of Mixed-Occupancy Provisions

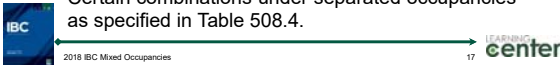
- Proper application of mixed-occupancy provisions rely on full understanding of:
 - Occupancy classification (Chapter 3).
 - Allowable building height (Chapter 5).
 - Allowable building area (Chapter 5).
 - Fire protection features (Chapter 9).
 - Construction of fire-resistant separations (Chapter 7).



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Fire-resistance-rated Separations Scope

- Section 508 specifies requirements.
 - If required, Fire Barriers per 707, Horizontal assemblies per 711, or both.
- Not required for:
 - Accessory occupancies.
 - Nonseparated occupancies.
 - Certain combinations under separated occupancies.
- Required for:
 - Group H occupancies in mixed-occupancy buildings.
 - Certain combinations under separated occupancies as specified in Table 508.4.



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Module 5

Application of the Mixed Occupancy Methods



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Mixed Occupancies: Overview
Section 508.1

- There are four key components that regulate mixed-occupancy buildings:
 - Occupancy classification (includes fire protection).
 - Allowable height.
 - Allowable area.
 - Separation.
- The three mixed-occupancy options differ from each other based on one or more of these four components.



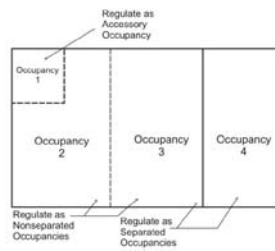
Application of Three Options
Section 508.1

- Section 508.1 mandates that one of the three options must be applied where a mixed occupancy exists.
 - Determination of the option depends on the owner/designer.
 - Building function.
 - Construction costs.
 - Design flexibility.
 - Compliance with at least one of the three options to be verified by building official.





Use of Multiple Options
Section 508.1

- Owner/designer may choose to use more than one option within same building.
- Under separated occupancies option, relationship between multiple pairs of occupancies should be individually analyzed.

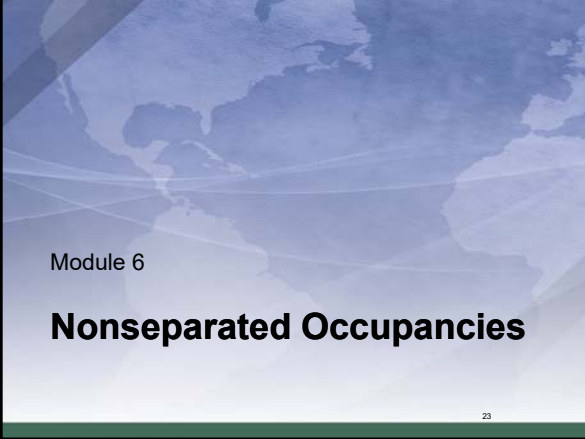


**Conditions Where Not Applicable
Section 508.1, Exceptions**

- There are three conditions under which the provisions of Section 508 do not apply:
 - Occupancies regulated under the special provisions height and area provisions of Section 510.
 - Group H-1, H-2 and H-3 occupancies where required to be in a detached building by Table 415.6.2.
 - Uses within live/work units in accordance with Section 419 (not considered as separate occupancies).

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Module 6

Nonseparated Occupancies

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**Nonseparated Occupancies
Overview**

- "Nonseparated occupancies" method considers most restrictive requirements for fire protection and allowable height/area for occupancies involved
- This method beneficial to designer due to:
 - No requirement to separate occupancies
 - Flexibility allowed by application of "worst-case" approach to fire protection and building size.
- No requirements for a fire-resistance-rated separation between adjacent occupancies.
- Nonseparated occupancies method is most common of methods utilized.

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Nonseparated Occupancies Section 508.3

No physical or fire-resistive separation required.

Occupancy 1 Occupancy 2

- Minimum type of construction based upon the most restrictive allowable heights and areas of Occupancies 1 and 2.
- Most restrictive fire protection requirements of Chapter 9 for Occupancies 1 and 2 applied to entire building.

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Nonseparated Occupancies: Classifications – Section 508.3.1

- Occupancy classification based on the general provisions of Section 302.1.
- Individually classified based on the use of space.
- Most restrictive applicable provisions of Chapter 9 regulating fire-protection systems apply to the total nonseparated occupancy area, not just the specific individual occupancy, and typically address:
 - Automatic sprinkler systems.
 - Fire alarm systems.

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Nonseparated Occupancies: Fire Protection – Section 508.3.1

Example

Nonseparated Occupancies

Group B Office Suite
5,000 sq. ft.


Group E Day Care Facility
3,000 sq. ft.

- Manual fire alarm system required in Group E occupancy by Section 907.2.3 required throughout entire building.

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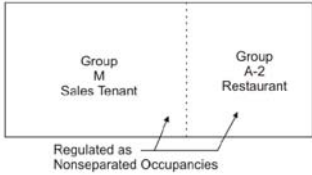
Nonseparated Occupancies: Allowable Area and Height – Section 508.3.2

- The maximum allowable height and area of building is based on the most restrictive allowances for the occupancy groups under consideration.
- The most restrictive allowable area is applied to the entire building.
- Same limitation is applied to the building's height.




Nonseparated Occupancies: Allowable Area and Height – Section 508.3.2

Example: Building is to be multistory, fully sprinklered and of Type VB construction. Frontage increase of 30 percent available. 1st story contains Group M and A-2 occupancies as shown with Group B occupancy above.




For SI: 1 square foot = 0.0929 m².



Nonseparated Occupancies: Allowable Area and Height – Section 508.3.2

	Group M	Group A-2	Group B
Allowable Area (square feet)	29,700	19,800	29,700
Allowable Height (number of stories)	2	2	3

Result: Building is limited to 2 stories and 19,800 sf per story to comply with Nonseparated Occupancies method



Nonseparated Occupancies: Separations - Section 508.3.3

- Application of this option will result in no physical or fire-resistance-rated separation between the nonseparated occupancies.

Plan View

Elevation

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Nonseparated Occupancies Section 508.3.3, Exceptions

- Group H-2, H-3, H-4 and H-5 occupancies must be separated from all other occupancies per Section 508.4 (separated occupancies).
- Group I-1, R-1, R-2 and R-3 dwelling units and sleeping units must be separated from each other and from all other occupancies contiguous to them per Section 420.

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KEY LEARNING

Nonseparated Occupancies: A Four-Step Process

- Determine the occupancies present in the building.
- Determine the maximum allowable height and area for each occupancy. Apply the most restrictive to the entire building.
- Apply the most restrictive fire protection requirements of Chapter 9 to the entire building.
- Apply all other code requirements to each portion of the building based on the occupancy classification of that portion.

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Separated Occupancies Overview

- “Separated occupancies” method uses a balanced approach to regulating mixed occupancy conditions.
- This method is typically applied where nonseparated occupancies method is impractical, undesirable or unavailable.
- Separated occupancies method to be applied where Group H-2, H-3, H-4 and H-5 occupancies are present.

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Separated Occupancies Section 508.4

- Separated occupancies is the only one of the three options where a fire-resistance-rated occupancy separation is required under certain mixed-occupancy conditions.
- Table 508.4 is referenced to determine the degree of fire resistance that is mandated for separations.
- Separations may not be required where occupancies are considered to be of same level of hazard.

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Separated Occupancies: Occupancy Classifications - Section 508.4.1

Fully Sprinklered Building

- Group A-2 portion to be regulated by Group A-2 requirements.
- Group M portion to be regulated by Group M requirements.

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Separated Occupancies: Allowable Area - Section 508.4.2

- When a mixed-occupancy building is regulated under the provisions of Section 508.4 for separated occupancies, the unity formula is used in the determination of allowable area.
- Compliance for allowable area can only be achieved where the sum of the ratios of actual floor area divided by allowable floor areas for each of the occupancies involved does not exceed 1.

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Separated Occupancies: Allowable Area - Section 508.4.2

- The formula can be expressed as:

$$\frac{a_1}{A_1} + \frac{a_2}{A_2} + \frac{a_3}{A_3} + \dots \leq 1.0$$
 - a_1, a_2 and a_3 represent the actual floor areas for the individual occupancies.
 - A_1, A_2 and A_3 represent the maximum allowable areas for the same respective occupancies.
- Calculation applied regardless of any required separation.
- Applicable frontage increase for entire building applied to each of the occupancies.
- Sprinkler increase applied on a "per occupancy" basis.

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**Separated Occupancies:
Allowable Height - Section 508.4.3**

- Each individual occupancy in a multiple-story, mixed-occupancy building is regulated for height independently based on Section 503.1.
- Maximum height for each occupancy is limited by the type of construction in Section 503.1.
 - Measured from the grade plane.
 - If a building has an automatic sprinkler system, an increase of one story and 20 feet is selectively available as reflected in Tables 504.3 and 504.4.
- Based on type of construction.

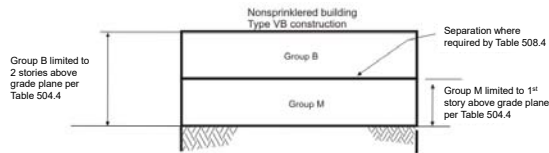


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**Separated Occupancies:
Allowable Height - Section 508.4.3**

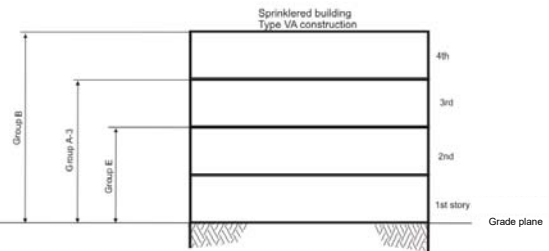


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**Separated Occupancies:
Allowable Height - Section 508.4.3**




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**Separated Occupancies:
Separations – Section 508.4.4**

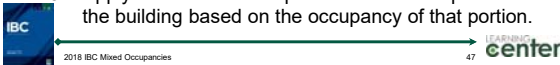
- The requirements for a fire-resistance-rated separation between adjacent occupancies vary.
- The requirements are established in Table 508.4.
- Fire barriers and horizontal assemblies are to be utilized in the complete separation of adjacent occupancies with different levels of hazard.
- Table 508.4 allows for some occupancy pairs to be adjacent with no required fire-resistive or physical separation.



KEY LEARNING


**Separated Occupancies:
A Five-Step Process**

1. Determine the various occupancies that occur within the building.
2. Determine the minimum required fire-resistance rating between adjacent occupancies.
3. Verify that the building does not exceed the maximum allowable area for the type of construction involved.
4. Verify that the locations of the occupancies do not exceed their maximum allowable height based on the building's type of construction.
5. Apply all other code requirements to each portion of the building based on the occupancy of that portion.





Module 8

Accessory Occupancies



Accessory Occupancies Overview

- “Accessory occupancies” method is only applicable where support occupancies are relatively small compared to major occupancy.
- This method beneficial to designer due to:
 - No requirement to separate accessory occupancies from major occupancy.
 - In determination of allowable building area, allowable area based considering accessory occupancy as part of major occupancy.
- Accessory occupancies method has limited application.






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KEY LEARNING

Accessory Occupancies Section 508.2



- Must be subsidiary to the main occupancy of the building or to a portion of the building.
 - Examples of occupancies that may be considered as subsidiary to the main occupancy:
 - Group A-2 employee lunchroom within a Group S-1 warehouse.
 - Group A-3 training room in a Group B office building.
 - Group M showroom within a Group F-1 manufacturing building.
 - Group R-3 manager’s dwelling unit within a Group S-1 self-storage facility.

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Accessory Occupancies: Occupancy Classification - Section 508.2.1

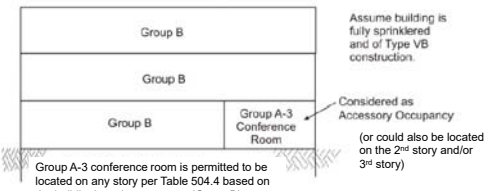
- Must be assigned to an occupancy group established in Chapter 3 based on unique characteristics.
- The spaces of the building considered as accessory occupancies must meet all code requirements applicable to the specific accessory occupancy classification, not that of the main occupancy, including:
 - Means of egress requirements.
 - Fire protection requirements.

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Accessory Occupancies: Allowable Building Height - Section 508.2.2

- Allowable height and number of stories are limited to that set forth in Section 504 for the main occupancy.



Group A-3 conference room is permitted to be located on any story per Table 504.4 based on the building's main occupancy (Group B).

Assume building is fully sprinklered and of Type VB construction.

Considered as Accessory Occupancy (or could also be located on the 2nd story and/or 3rd story)

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Accessory Occupancies: Allowable Building Area - Section 508.2.3

- Allowable area of building is based on the main occupancy.
- Combined area of the main occupancy and accessory occupancy cannot exceed that permitted by Section 503.1 for the main occupancy.

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Accessory Occupancies: Allowable Building Area - Section 508.2.3

- Limited to 10 percent of the floor area of the story located.
 - When more than one accessory occupancy is under consideration, the aggregate area of such occupancies are used to determine compliance.
- Floor area cannot exceed the tabular values for nonsprinklered buildings established by Table 506.2 for each accessory occupancy.

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Accessory Occupancies: Section 508.2.4, Exceptions

- Group H-2, H-3, H-4 and H-5 occupancies to be separated from all other occupancies per Section 508.4 (separated occupancies).
- Group I-1, R-1, R-2 and R-3 dwelling units and sleeping units to be separated from each other and from accessory occupancies contiguous to them per Section 420.



KEY LEARNING

Accessory Occupancies: A Seven-Step Process

1. Determine the various occupancy classifications that are found within the building.
2. Verify that any occupancy group under consideration as an accessory occupancy is subsidiary to the major occupancy of the building.
3. Verify that the floor area of the accessory occupancy does not exceed 10 percent of the floor area of the story in which it is located.

 IBC Learning Center logo with page number 56. The logo includes the IBC logo on the left and the Learning Center logo on the right, with a double-headed arrow between them. Below the arrow, it says "2018 IBC Mixed Occupancies" and "56".


KEY LEARNING

Accessory Occupancies: A Seven-Step Process

4. Verify that the floor area of the accessory occupancy does not exceed the tabular values for nonsprinklered buildings set forth in Table 506.2 for the building's type of construction.
5. Limit the building's floor area to the allowable floor area based on the allowable area for the main occupancy.



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KEY LEARNING



Accessory Occupancies: A Seven-Step Process

6. Limit the maximum allowable height of the occupancy based on Section 504.
7. Apply all other code requirements to each portion of the building based on the individual occupancy classification of the space.

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Module 9

Allowable Height and Area for Multiple-story Buildings

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Mixed Occupancies: Allowable Height and Area for Multistory Buildings

- Application of Section 508 for mixed-occupancy is consistent for both single-story and multiple-story buildings.
- Multiple-story, mixed-occupancy building:
 - All three options available.
 - Evaluation of the mixed-occupancy conditions is expanded.
 - Each story evaluated individually for compliance.

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Nonseparated Occupancies

- The maximum allowable height and area of the building will be based on the most restrictive allowances for the occupancies under consideration.
- General height and area limitations of Chapter 5 will apply.

The diagram shows a four-story building. A vertical bracket on the left side of the building is labeled "Building height limited to most restrictive of occupancies involved". To the right of the building, a label reads "Area of each story and entire building limited to most restrictive of occupancies involved".

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Separated Occupancies

- An occupancy shall not be located higher than permitted by Tables 504.3 and 504.4.
- A variation of the unity formula of Section 508.4.2 that is applied on a per-story basis is applied to the total building.

The diagram shows a four-story building. A vertical bracket on the left side of the building is labeled "Building height limited to most restrictive of occupancies involved". To the right of the building, a label reads "Area of each story and entire building limited to most restrictive of occupancies involved".

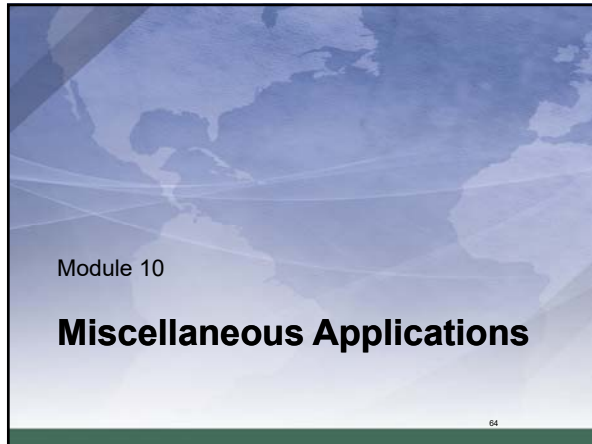
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Separated Occupancies Section 506.2.4

- Where "separated occupancies" building is 3 stories or less in height, if each story complies, then the building complies.
- Where "separated occupancies" building is 4 or more stories in height, then each story must comply for allowable area and entire building must comply.
 - Sum of ratios for all stories above grade plane not to exceed 3.0.

The diagram shows a four-story building. A vertical bracket on the left side of the building is labeled "Building height limited to most restrictive of occupancies involved". To the right of the building, a label reads "Area of each story and entire building limited to most restrictive of occupancies involved".

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QUESTION: Accessory Occupancies and Tenant Spaces

- Should accessory occupancy provisions to be applied on a tenant-by-tenant basis? Or to the entire building?

Tenant Space 1 10,000 sq. ft. Group M	Tenant Space 2 5,000 sq. ft. Group A-2	Tenant Space 3 10,000 sq. ft. total Group B 8,000 sq. ft. Group S-1 2,000 sq. ft.
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For SI: 1 square foot = 0.0929 m².

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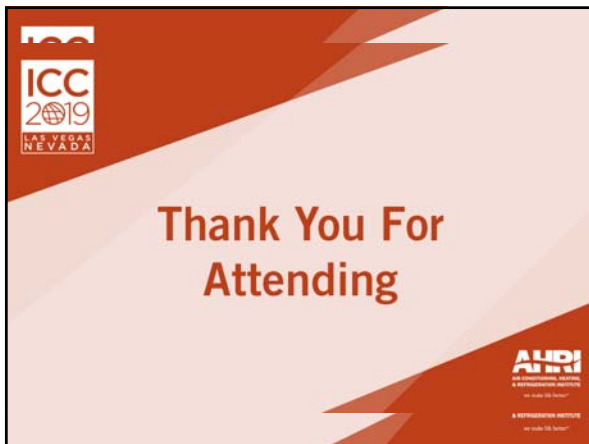
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