

Advanced Studies of the IBC



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Instructor



Bill Clayton, CBO

- Designer/ builder 15+ years
- Combination Inspector 34+ years
- Plans examiner 30+ years
- 22 ICBO/ICC/FEMA/State of Colorado & California certifications
- IEBG Committee 2009 & 2012
- IBC General Committee 2015
- 10+ years CBO
- 9+ years as Consultant and instructor for CCC/Shums Coda Associates & 7+ years contract ICC Instructor
- Author of Firestopping, Joint Systems and Dampers for ICC based on the 2024 I

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Class Summary


- Advanced review of Chapters 3, 4, 5, & 10
- Mixed occupancies, unlimited area buildings, Health Care and hazardous occupancies.
- Often overlooked requirements of chapter 7 and 10
- Assembly MOE

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302.1 Occupancy classification



- Everything starts here.
- Occupancy classification is the formal designation of the primary purpose of the building, structure or portion thereof.
- Structures shall be classified into one or more of the occupancy groups listed in this section based on the nature of the hazards and risks to building occupants generally associated with the intended purpose of the building or structure.

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Use and Occupancy Classification


- The objective of the assignment of use and occupancy classification is to identify the primary uses of buildings and facilities, and portions of buildings and facilities, and to identify risk factors associated with these uses, in order to facilitate design and construction in accordance with other provisions of this code.



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Determination of Use



- The principal purpose or function of the building or facility
- The hazard-related risk(s) to the users of the building or facility.

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Occupancy Classification

- Nature of Hazard
- Number of Occupants
- Length of Occupancy
- Sleeping Characteristics
- Familiarity
- Vulnerability
- Relationships



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Assembly Group A



- Assembly Group A-1
 - Fixed seating, viewing of the performing arts or motion pictures
- Assembly Group A-2
 - Food and/or drink consumption
- Assembly Group A-3
 - Worship, recreation or amusement and other assembly uses
- Assembly Group A-4
 - Viewing of **indoor sporting** events and activities with spectator seating
- Assembly Group A-5
 - **Viewing outdoor** activities

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Group A

- 303.1.1 Small buildings and tenant spaces with an occupant load of less than 50 shall be classified as a group B Occupancy
- 303.1.2 Small assembly spaces with an occupant load of less than 50 persons or less than 750 SF and accessory to another use or occupancy shall be classified as B or part of the primary occupancy
- 303.1.3 Associated with an E occupancy is not a separate occupancy
- 303.1.4 Religious educational rooms accessory to a place of worship and auditoriums of less than 100 occupants are not a separate occupancy

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Business Group B 304

- Business Group B occupancy includes, among others, the use of a building or structure, or a portion thereof, for office, professional or service-type transactions, including storage of records and accounts.
- Education over 12th grade
- Training and skill development not in a school or academic program are group B. (Martial arts, gymnastics and similar) where not classified as group A (50 or more occupants).
- Food processing establishments and commercial kitchens no associated with a restaurant or cafeteria and not more than 2500 SF

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Educational Group E 305



- Educational Group E occupancy includes, among others, the use of a building or structure, or a portion thereof, by six or more persons at any one time for educational purposes through the 12th grade.
 - Accessory religious educational rooms and religious auditoriums, occupant < 100, an A-3 occupancy

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Factory Industrial Group F 306

- Assembling, disassembling, fabricating, finishing, manufacturing, packaging, repair or processing operations that are not classified as a Group H hazardous or a Group S storage occupancy.
- Food processing and commercial kitchens more than 2500 SF
- Energy storage Systems
- Beverages over 16% abv.
- F-1 Moderate-Hazard
- F-2 Low-Hazard

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High-Hazard Group H 307




- No longer includes distilleries conforming to the IFC or storage of barrels and casks conforming to the IFC
- Group H-1
 - Contain materials that pose a detonation hazard
- Group H-2 Structures
 - Contain materials that present a deflagration hazard or a hazard from accelerated burning
- Group H-3 Structures
 - Contain materials that readily support combustion or present a physical hazard
- Group H-4 Structures
 - Contain materials that are health hazards
- Group H-5 Structures
 - Semiconductor fabrication facilities and comparable research and development areas

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Institutional Group I 308




- Group I-1
 - Include buildings, structures or portions thereof for more than 16 persons, excluding staff, who reside on a 24-hour basis in a supervised environment and receive custodial care. Buildings of Group I-1 shall be classified as one of the occupancy conditions specified in Section 308.3.1 or 308.3.2.
- Group I-2
 - Buildings and structures used for medical care on a 24-hour basis for more than five persons who are incapable of self-preservation.

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Institutional Group I 308

- Group I-3 Structures
 - buildings and structures that are inhabited by more than five persons who are under restraint or security. A Group I-3 facility is occupied by persons who are generally incapable of self-preservation due to security measures not under the occupants control.
- Group I-4 Structures
 - buildings and structures occupied by more than five persons of any age who receive custodial care for fewer than 24 hours per day by persons other than parents or guardians, relatives by blood, marriage or adoption, and in a place other than the home of the person cared for.



- Group I has subcategories for conditions I-1 and I-2 & I-3 has conditions 1 thru 5--- read carefully

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Group I conditions

- Group I-1
- Condition 1:
 - All persons receiving custodial care without any assistance are capable of self evacuation
- Condition 2:
 - If there are any persons receiving custodial care who require limited verbal or physical assistance while responding to an emergency situation to complete building evacuation

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Group I conditions

- Group I-2
- Condition 1:
 - Facilities that provide nursing and medical care but do not provide emergency care, surgery, obstetrics or in-patient stabilization units for psychiatric or detoxification including nursing homes and foster care facilities
- Condition 2:
 - Includes facilities that provide nursing and medical care and could provide emergency care, surgery, obstetrics or in-patient stabilization units for psychiatric or detoxification including hospitals

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Mercantile Group M 309



- Buildings and structures or a portion thereof, for the display and sale of merchandise, and involves stocks of goods, wares or merchandise incidental to such purposes and accessible to the public. Motor fueling dispensing facilities must comply with 406.7

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Residential Group R 310

- Residential Group R-1
 - Occupants are primarily transient in nature
Some facilities are used as a residence...what defines that?
- Residential Group R-2
 - More than two dwelling units where the occupants are primarily permanent in nature





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Residential Group R 310

- Residential Group R-3
 - Residential occupancies where the occupants are primarily permanent
 - Buildings do not contain more than two dwelling units
 - Adult facilities for five or fewer persons of any age for less than 24 hours.
 - Child care facilities for five or fewer persons of any age for less than 24 hours.
 - Congregate living facilities with 16 or fewer occupants
- Residential Group R-4
 - Residential Care/Assisted Living Facilities including more than five but not more than 16 occupants, excluding staff.
 - This occupancy group has Condition 1 and 2—read carefully.




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Storage Group S 311

- The use of a building or structure, or a portion thereof, for storage that is not classed as a hazardous occupancy
 - Moderate Hazard S-1
 - Motor Vehicle Repair Garages
 - Beverage storage over 16% abv.
 - Low Hazard S-2
 - Public Parking Structures (see 406.4, .5 and .6)
 - Beverages up to 16% abv



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Utility Group U 312



- Accessory character and miscellaneous structures not classified in any specific occupancy
- Shall be constructed, equipped and maintained to conform to the requirements of this code commensurate with the fire and life hazard incidental to their occupancy.
- Private parking garages and carports
- Residential aircraft hangers accessory to one or two family dwellings

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History of Types of Construction

- 1905 Building Code
 - Thickness of Brick Walls based on occupancy and height.
 - Fireproof Construction
 - Noncombustible materials
 - Non-Fireproof Construction



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History of Types of Construction

- 1927 Uniform Building Code
 - Type I Buildings
 - Fire-Resistive
 - Type II Buildings
 - Heavy Timber Constructions
 - Type III Buildings
 - Ordinary Masonry
 - Type IV Buildings
 - Metal Frame
 - Type V Buildings
 - Wood Frame



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History of Types of Construction

- 1997 Uniform Building Code
 - Type I Fire Resistive
 - Type II Fire Resistive
 - Type II One-Hour
 - Type II Non-Rated
 - Type III One-Hour
 - Type III Non-Rated
 - Type IV Heavy Timber
 - Type V One-Hour
 - Type V Non-Rated



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How is Type Construction Determined?

- Designer?
- Materials?
- Allowable Area ?
- Allowable Height?



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602.1.1 Minimum Requirements



- A building or portion thereof shall not be required to conform to the details of a type of construction higher than that type, which meets the minimum requirements based on occupancy even though certain features of such a building actually conform to a higher type of construction.
- Remember the building construction type determines the type of construction not the materials.


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703.3.1 Noncombustible Materials

- Exception:
- Materials having a structural base of noncombustible material as determined in accordance with ASTM E136, or with ASTM E2652 using the acceptance criteria prescribed by ASTM E136, with a surfacing of not more than 0.125 inch in thickness having a flame spread index not greater than 50 when tested in accordance with ASTM E84 or UL 723 shall be acceptable as noncombustible.



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Combustible Materials Permitted 603

1. Fire-retardant-treated wood shall be permitted in 27 conditions and locations



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Combustible Materials Permitted 603

- 21. Sprayed fire-resistant materials and intumescent and mastic fire-resistant coatings, determined on the basis of fire-resistance tests in accordance with Section 703.2 and installed in accordance with Section 1705.5 and 1705.16, respectively.



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Combustible Materials Permitted 603

- 24. Materials allowed in the concealed spaces of buildings of Type I and II construction in accordance with Section 718.5.
 - Combustible materials in accordance with Section 603.
 - Combustible materials exposed within plenums complying with Section 602 of the IMC.
 - Class A interior finish materials classified in accordance with Section 803.
 - Combustible piping within partitions or shaft enclosures installed in accordance with the provisions of this code.
 - Combustible piping within concealed ceiling spaces installed in accordance with the IMC and the IPC.
 - Combustible insulation and covering on pipe and tubing, installed in concealed spaces other than plenums, complying with Section 720.7.

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Combustible Materials Permitted 603

- 25. Materials exposed within plenums complying with Section 602 of the IMC.



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Combustible Materials Permitted 603

- 26. Wall construction of freezers and coolers of less than 1,000 square feet, in size, lined on both sides with noncombustible materials and the building is protected throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.



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Combustible Materials Permitted 603

- 27. Wood nailers for parapet flashing and roof cants.

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Combustible Materials Permitted 603

- Ducts in accordance with IMC
- Combustible piping in accordance with IMC and IPC
- Electrical wiring methods with combustible insulation, tubing, raceways and related components in accordance with IBC



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603.1.2 Piping

- The use of combustible piping materials shall be permitted where installed in accordance with the limitations of the IMC and the IPC.



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603.1.3 Electrical

- The use of electrical wiring methods with combustible insulation, tubing, raceways and related components shall be permitted where installed in accordance with the limitations of this code.



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Multiple Types of Construction in a single building?

- Must be separate buildings separated by a fire wall constructed in accordance with 706..



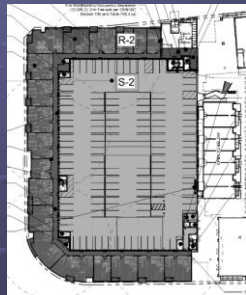
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705.3 Buildings on the same lot

- Exception 2
- Where an S-2 parking garage of Construction Type I or IIA is erected on the same lot as a Group R-2 building, and there is no fire separation distance between these buildings, then the adjoining exterior walls between the buildings are permitted to have occupant use openings in accordance with Section 706.8.
- However, opening protectives in such openings shall only be required in the exterior wall of the S-2 parking garage, not in the exterior wall openings in the R-2 building, and these opening protectives in the exterior wall of the S-2 parking garage shall be not less than 1 1/2-hour fire protection rating.



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Mixed Uses and Occupancies

- Non-Separated Occupancies
- Separated Occupancies
- Accessory Occupancies
- Incidental uses(509)
- Special Provisions
- Fire Wall Separation



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Mixed-occupancy, one-story buildings - 506.2.2

- The allowable area of a mixed-occupancy building with no more than one story above grade plane shall be determined in accordance with the applicable provisions of Section 508.1 based on Equation 5-1 for each applicable occupancy.
 - Nonseparated occupancies
 - Separated occupancies



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Equation 5-1

$$A_a = A_t + (NS \times I_f)$$

- A_a = Allowable building area per story
- A_t = Tabular building area per story in accordance with Table 506.2
- NS = Tabular allowable area factor in accordance with Table 506.2 for nonsprinklered building
- I_f = Area increase factor due to frontage (506.2)

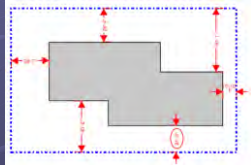
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506.3.2 Minimum frontage distance

- The frontage increase shall be based on the smallest public way or open space that is 20 feet or greater, and the percentage of building perimeter having a minimum 20 feet public way or open space.



Perimeter with > 20' yard = 364'
Total Perimeter = 406'
364/406 = 90%
Smallest Yard = 21' 3"

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506.3.3 Amount of increase

- The area factor increase based on frontage shall be determined in accordance with Table 506.3.3.

PERCENTAGE OF BUILDING PERIMETER	OPEN SPACE (feet)			
	0 to less than 20	20 to less than 25	25 to less than 30	30 or greater
0 to less than 25	0	0	0	0
25 to less than 50	0	0.17	0.21	0.25
50 to less than 75	0	0.33	0.42	0.50
75 to 100	0	0.50	0.63	0.75

90% Building Perimeter
Yard Dimension = 21' 3"
Frontage Increase = 50%

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Non-Separated Occupancies 508.3



- Classify each occupancy
- Code requirements apply to each portion based on the classification of the space
- Most restrictive provisions of 403 and Chapter 9 apply to entire building
- Allowable area and height based on most restrictive allowances for the occupancy groups
- No separation required except some H occupancies and dwelling and sleeping units

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Separated Occupancies 508.4

- Classify each occupancy
- Sum of the ratios calculated for each story
- Occupancy limited in height based on Table 503
- Occupancies separated per Table 508.4



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Combination Mixed Occupancy

- Section 508.1
 - Where a building contains more than one occupancy group, the building or portion thereof shall comply with the applicable provisions of Section 508.2, 508.3 or 508.4, or a combination of these sections.



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Mixed-occupancy, multistory buildings 506.2.4

Group R-2	
Group R-2	
Group B	Group A-2
Group M	Group B

- For buildings with more than three stories above grade plane, the total building area shall be such that the aggregate sum of the ratios of the actual area of each story divided by the allowable area of such stories, determined in accordance with Equation 5-3 based on the applicable provisions of Section 508.1, shall not exceed three.

- Equation 5-3
- $A_3 = [A_1 + (NS \times I_p)]$

Type VA Construction, sprinklered, Nonseparated Occ.

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Mixed-occupancy, multistory buildings 506.2.4

Floor	Occupancy	Actual Area	Allowable Area	Ratio
First	M	25,000	42,000	0.60
Second	A-2	25,000	35,400	0.71
Third	R-2	25,000	36,000	0.69
Fourth	R-2	20,000	36,000	0.69

$$0.60 + 0.71 + 0.69 + 0.69 = 2.69 < 3$$

No yard increase used

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Problem

Apartments 25,000 sq. ft.	Retail 25,000 sq. ft.
Offices 25,000 sq. ft.	Restaurant(s) 25,000 sq. ft.

- Given:
 - One-story
 - Mixed use as shown
 - Type IIA Construction
 - Fully Sprinklered
 - No yards or open space
- Determine Compliance

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Problem (cont.)

Apartments 25,000 sq. ft.	Retail 25,000 sq. ft.
Offices 25,000 sq. ft.	Restaurant(s) 25,000 sq. ft.

Occ.	Actual Area	A _s	Ratio
R-2	25,000	96,000	0.26
B	25,000	150,000	0.17
M	25,000	86,000	0.29
A-2	25,000	62,000	0.40
Total	100,000		1.12 > 1

Now What?

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Special Provisions 510.1

- The provisions in this section shall permit the use of special conditions that are exempt from, or modify, the specific requirements of this chapter regarding the allowable heights and areas of buildings based on the occupancy classification and type of construction, provided the special condition complies with the provisions specified in this section for such condition and other applicable requirements of this code.
- The provisions of Sections 509.2 through 509.8 are to be considered independent and separate from each other.



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Platform/Podium Buildings 510.2

- A building shall be considered as separate and distinct buildings for the purpose of determining area limitations, continuity of fire walls, limitation of number of stories and type of construction where all of the following conditions are met:



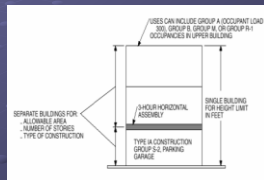
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Horizontal Building Separation Allowance 510.2

- The buildings are separated with a horizontal assembly having a minimum 3-hour fire-resistance rating. Where vertical offsets are provided as part of a horizontal assembly, the structure supporting the vertical offset shall have a fire-resistance rating of not less than 3 hours.
- The building below the horizontal assembly is of Type IA construction.



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Horizontal Building Separation Allowance 510.2

3. Shaft, stairway, ramp and escalator enclosures through the horizontal assembly shall have not less than a 2-hour fire-resistance rating with opening protectives in accordance with Section 715.4.

Exception: Where the enclosure walls below the horizontal assembly have not less than a 3-hour fire-resistance rating with opening protectives in accordance with Section 715.4, the enclosure walls extending above the horizontal assembly shall be permitted to have a 1-hour fire-resistance rating, provided:

1. The building above the horizontal assembly is not required to be of Type I construction;
2. The enclosure connects less than four stories; and
3. The enclosure opening protectives above the horizontal assembly have a minimum 1-hour fire protection rating.

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Horizontal Building Separation Allowance 510.2

4. Interior exit stairways located within the Type IA building are permitted to be of combustible materials where the following requirements are met:

- 4.1. The building above the Type IA building is of Type III, IV, or V construction.
- 4.2. The stairway located in the Type IA building is enclosed by 3-hour fire-resistance-rated construction with opening protectives in accordance with Section 716.

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Horizontal Building Separation Allowance 510.2

5. The building or buildings above the horizontal assembly shall be permitted to have multiple Group A occupancy uses, each with an occupant load of less than 300, or Group B, M, R or S occupancies.

R-2
R-2
R-2
A-3 <300, B & M
S-2

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Horizontal Building Separation Allowance 510.2

- 5. The building below the horizontal assembly shall be protected throughout by an approved automatic sprinkler system in accordance with Section 903.3.1.1, and shall be permitted to be any occupancy allowed by this code except Group H.



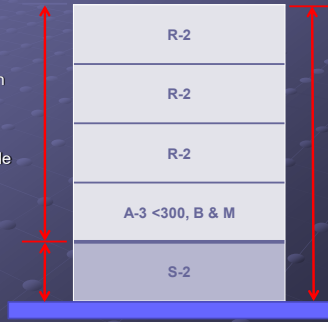
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Horizontal Building Separation Allowance 510.2

- 6. The maximum building height in feet shall not exceed the limits set forth in Section 504.3 for the building having the smaller allowable height as measured from the grade plane.

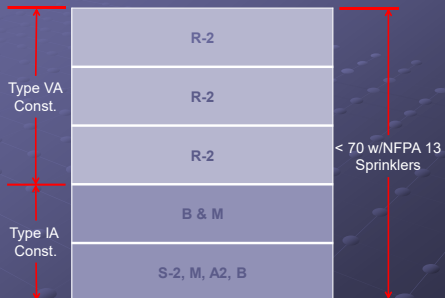


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Podium Example



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Unlimited Area Buildings 507.3

- Non-sprinklered Building
 - The area of a one-story, Group F-2 or S-2 building is not be limited when building is surrounded and adjoined by public ways or yards not less than 60 feet in width.




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Unlimited Area Buildings 507.4

- Sprinklered, one-story
 - The area of a Group B, F, M or S building no more than one story above grade plane, or a Group A-4 building no more than one story above grade plane of other than Type V construction, shall not be limited when the building is provided with an automatic sprinkler system throughout in accordance with Section 903.3.1.1 and is surrounded and adjoined by public ways or yards not less than 60 feet in width.
 - Exceptions:
 - Type I & II construction w/rack storage not limited in height, with no public access and must conform to 507.4, 903.3.1.1 & Chapter 32 of IFC
 - Sprinklers not required in indoor participant sports w/exit doors directly to outside and fire alarm system



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Other Unlimited Areas 507.7 - 507.11

- 507.8- High-hazard use groups
- 507.9 Group H-5 Occupancies
- 507.10 - Aircraft paint hanger
- 507.11 - Group E buildings
- 507.12 – Sprinklered motion picture theaters of Type II construction
- 507.13 – Covered mall buildings and anchor stores.




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Unlimited Area Buildings Challenges

- Super Large Buildings
 - Exit Access Travel Distance
 - Fire Department Access
 - Standpipe locations



60' Yards

1,000,000 sq. ft. Distribution Center Fully Sprinklered

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Unlimited Area Buildings Challenges

- Shopping Centers
 - Multiple Properties



60' Streets on all sides
All buildings Sprinklered

Wal Mart Shopping

A-2 Shopping Bank

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Unlimited Area Buildings Challenges

- Mixed Unlimited Area Buildings ?



Charter School

Moving And Storage Company

Fully Sprinklered
60' Yards on all sides

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Special Detailed Requirements Based On Use And Occupancy Chapter 4—28 categories



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422 Ambulatory Care Facility

- Classified as a Group B Occupancy.
- Creates a mini-hospital
- Higher protection than doctor's office



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202 Definitions

- AMBULATORY CARE FACILITY
- Buildings or portions thereof used to provide medical, surgical, psychiatric, nursing or similar care on a less than 24-hour basis to persons who are rendered incapable of self-preservation by the services provided or staff has accepted responsibility for care recipients already incapable.



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Definitions



- CLINIC, OUTPATIENT
- Buildings or portions thereof used to provide medical care on less than a 24-hour basis to persons who are not rendered incapable of self-preservation by the services provided.

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Definitions

- INCAPABLE OF SELF-PRESERVATION
- Persons who, because of age, physical limitations, mental limitations, chemical dependency or medical treatment, cannot respond as an individual to an emergency situation.



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422.2
Separation



- Ambulatory care facilities where the potential for four or more care recipients are to be incapable of self-preservation at any time, whether rendered incapable by staff or staff accepted responsibility for a care recipient already incapable, shall be separated from adjacent spaces, corridors or tenants with a fire partition installed in accordance with Section 708.

• (One Hr. Wall, 45 Min. Openings)

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422.3 Smoke compartments

- Where the aggregate area of one or more ambulatory care facilities is greater than 10,000 square feet on one story, the story shall be provided with a smoke barrier to subdivide the story into no fewer than two smoke compartments.
- The area of any one such smoke compartment shall be not greater than 22,500 square feet



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202 Definition

- **SMOKE COMPARTMENT**
- A space within a building enclosed by smoke barriers on all sides, including the top and bottom.
- Smoke barriers are one-hour rated so we have concerns with penetrations and smoke leakage



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422.3 Smoke compartments

- The distance of travel from any point in a smoke compartment to a smoke barrier door shall be not greater than 200 feet.
- The smoke barrier shall be installed in accordance with Section 709 with the exception that smoke barriers shall be continuous from outside wall to an outside wall, a floor to a floor, or from a smoke barrier to a smoke barrier or a combination thereof.
- (1 Hr. Wall, 20 min. openings)



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407 Group I-2



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407.2 Corridors continuity and separation

• Corridors in occupancies in Group I-2 shall be continuous to the exits and shall be separated from other areas in accordance with Section 407.3 except spaces conforming to Sections 407.2.1 through 407.2.4.



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407.2.1 Waiting and similar areas



• Waiting areas, public-use areas or group meeting spaces constructed as required for corridors shall be permitted to be open to a corridor, only where all of the following criteria are met:

1. The spaces are not occupied as care recipient's sleeping rooms, treatment rooms, incidental uses in accordance with Section 509, or hazardous uses.
2. The open space is protected by an automatic fire detection system installed in accordance with Section 907.

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407.2.1
Waiting and similar areas



3. The corridors onto which the spaces open, in the same smoke compartment, are protected by an automatic fire detection system installed in accordance with Section 907, or the smoke compartment in which the spaces are located is equipped throughout with quick-response sprinklers in accordance with Section 903.3.2.
4. The space is arranged so as not to obstruct access to the required exits.

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407.2.2
Care providers' stations

- Spaces for care providers', supervisory staff, doctors' and nurses' charting, communications and related clerical areas shall be permitted to be open to the corridor, where such spaces are constructed as required for corridors.



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407.2.5
Nursing home housing units

1. The walls and ceilings of the space are constructed as required for corridors.
2. The spaces are not occupied as resident sleeping rooms, treatment rooms, incidental uses in accordance with Section 509, or hazardous uses.
3. The open space is protected by an automatic fire detection system installed in accordance with Section 907.



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407.2.6 Nursing home cooking facilities

- In Group I-2, Condition 1, occupancies, rooms or spaces that contain a cooking facility with domestic cooking appliances shall be permitted to be open to the corridor where all of the following criteria are met:
 - The number of care recipients housed in the smoke compartment shall not be greater than 30.
 - The number of care recipients served by the cooking facility shall not be greater than 30.
 - Not more than one cooking facility area shall be permitted in a smoke compartment.



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407.2.6 Nursing home cooking facilities

- The types of domestic cooking appliances permitted shall be limited to ovens, cooktops, ranges, warmers and microwaves.
- The corridor shall be a clearly identified space delineated by construction or floor pattern, material or color.
- The space containing the domestic cooking facility shall be arranged so as not to obstruct access to the required exit.
- The cooking appliance shall comply with Section 407.2.7.



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407.2.7 Domestic cooking appliances.

- In Group I-2 occupancies, installation of cooking appliances used in domestic cooking facilities shall comply with all of the following:
 - The types of cooking appliances permitted shall be limited to ovens, cooktops, ranges, warmers and microwaves.
 - Domestic cooking hoods installed and constructed in accordance with Section 505 of the International Mechanical Code shall be provided over cooktops and ranges.



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**407.2.7
Domestic cooking appliances.**

- 3. Cooktops and ranges shall be protected in accordance with Section 904.14.
- 4. A shut-off for the fuel and electrical power supply to the cooking equipment shall be provided in a location to which only staff has access.
- 5. A timer shall be provided that automatically deactivates the cooking appliances within a period of not more than 120 minutes.
- 6. A portable fire extinguisher shall be provided. Installation shall be in accordance with Section 906, and the extinguisher shall be located within a 30-foot distance of travel from each domestic cooking appliance.



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**407.2.7
Domestic cooking appliances.**

- Exceptions:
- 1. Cooktops and ranges located within smoke compartments with no patient sleeping or patient care areas are not required to comply with this section.
- 2. Cooktops and ranges used for care recipient training or nutritional counseling are not required to comply with Item 3 of this section.

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**Corridor wall construction
407.3**

- Corridor walls shall be constructed as smoke partitions in accordance with Section 710.
- Smoke partitions are not required to have a fire rating unless required elsewhere in the code.



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407.3.1 Corridor doors

- Corridor doors, other than those in a wall required to be rated by Section 509.4 (incidental uses) or for the enclosure of a vertical opening or an exit, shall not have a required fire protection rating and shall not be required to be equipped with self-closing or automatic-closing devices, but shall provide an effective barrier to limit the transfer of smoke and shall be equipped with positive latching.
- Roller latches are not permitted.
- Other doors shall conform to Section 716.



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407.3.1.1 Door construction

- Doors in corridors not required to have a fire protection rating shall comply with the following:
 1. Solid doors shall have close-fitting operational tolerances, head and jamb stops.
 2. Dutch-style doors shall have an astragal, rabbet or bevel at the meeting edges of the upper and lower door sections. Both the upper and lower door sections shall have latching hardware. Dutch-style doors shall have hardware that connects the upper and lower sections to function as a single leaf.
 3. To provide makeup air for exhaust systems in accordance with Section 1020.7, Exception 1, doors are permitted to have louvers or to have a clearance between the bottom of the door and the floor surface that is 2/3 inch maximum.

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407.4 Means of egress



- Group I-2 occupancies shall be provided with means of egress complying with Chapter 10 and Sections 407.4.1 through 407.4.4. The fire safety and evacuation plans provided in accordance with Section 1002.2 shall identify the building components necessary to support a defend-in-place emergency response in accordance with Sections 403 and 404 of the IFC.

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Direct access to a corridor

407.4.1



• Habitable rooms in Group I-2 occupancies shall have an exit access door leading directly to a corridor.

• Exceptions:

1. Rooms with exit doors opening directly to the outside at ground level.
2. Rooms arranged as care suites complying with Section 407.4.4

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407.4.1.1 Locking devices

• Locking devices that restrict access to a care recipient's room from the corridor and that are operable only by staff from the corridor side shall not restrict the means of egress from the care recipient's room.



• Exceptions:

1. This section shall not apply to rooms in psychiatric treatment and similar care areas.
2. Locking arrangements in accordance with Section 1010.2.14.

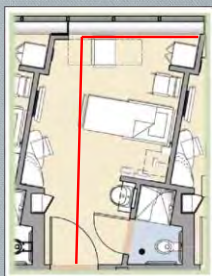
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Distance of Travel

407.4.2



• The distance of travel between any point in a Group I-2 occupancy sleeping room, not located in a care suite, and an exit access door in that room shall be not greater than 50 feet

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**407.4.3
Projections in nursing home corridors**

• In Group I-2, Condition 1, occupancies, where the corridor width is a minimum of 96 inches, projections shall be permitted for furniture where all of the following criteria are met:

- 1. The furniture is attached to the floor or to the wall.
- 2. The furniture does not reduce the clear width of the corridor to less than 72 inches except where other encroachments are permitted in accordance with Section 1005.7.



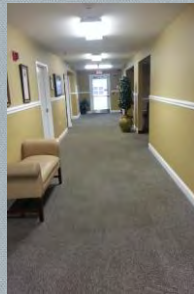
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**407.4.3
Projections in nursing home corridors**

- 3. The furniture is positioned on only one side of the corridor.
- 4. Each arrangement of furniture is 50 square feet maximum in area.
- 5. Furniture arrangements are separated by 10 feet minimum.
- 6. Placement of furniture is considered as part of the fire and safety plans in accordance with Section 1002.2.



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**407.5.1
Smoke compartment size**

• Stories shall be divided into smoke compartments with an area of not more than 22,500 square feet in Group I-2 occupancies.

• Two Exceptions



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**407.5.1
Smoke compartment size**



- 1. A smoke compartment in Group I-2, Condition 2 is permitted to have an area of not more than 40,000 square feet provided that all patient sleeping rooms within that smoke compartment are configured for single patient occupancy and any suite within the smoke compartment complies with Section 407.4.4.

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**407.5.1
Smoke compartment size**



- 2. A smoke compartment in Group I-2, Condition 2 without patient sleeping rooms is permitted to have an area of not more than 40,000 square feet.

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**407.5.2
Exit access travel distance**

- The distance of travel from any point in a smoke compartment to a smoke barrier door shall be not greater than 200 feet.



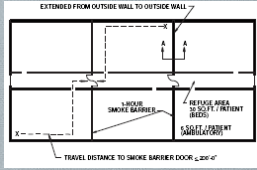
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Refuge Area

407.5.3



- Refuge areas shall be provided within each smoke compartment.
- The size of the refuge area shall accommodate the occupants and care recipients from the adjoining smoke compartment.
- Where a smoke compartment is adjoined by two or more smoke compartments, the minimum area of the refuge area shall accommodate the largest occupant load of the adjoining compartments.

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Refuge Area

407.5.3

- The size of the refuge area shall provide the following:
 1. Not less than 30 net square feet for each care recipient confined to bed or litter.
 2. Not less than 6 square feet for each ambulatory care recipient not confined to bed or litter and for other occupants.
- Areas or spaces permitted to be included in the calculation of refuge area are corridors, sleeping areas, treatment rooms, lounge or dining areas and other low-hazard areas.



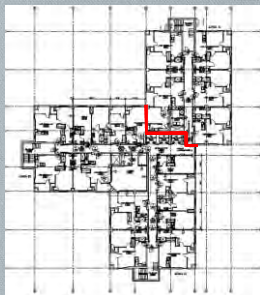
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407.5.4

Independent egress



- A means of egress shall be provided from each smoke compartment created by smoke barriers without having to return through the smoke compartment from which means of egress originated.
- Smoke compartments that do not contain an exit shall be provided with direct access to not less than two adjacent smoke compartments.

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Material safety data sheets

- MSDS:
 - Provides basic information
 - May give you info for something to look up on HMEC
 - Tells of specific dangers for handling
 - View it as just another piece of information along with labels
 - It may not give you everything or anything you need



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TABLE 307.1(1)
MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIALS POSING A PHYSICAL HAZARD^{1, 2, 3, 4, 5}

MATERIAL	CLASS	GROUP WHEN THE MAXIMUM ALLOWABLE QUANTITY IS EXCEEDED	STORAGE ⁶			USE-CLOSED SYSTEMS ⁸			USE-OPEN SYSTEMS ⁹	
			Solid pounds (invol. level)	Liquid gallons (invol. level)	Gas cubic feet at STP	Solid pounds (invol. level)	Liquid gallons (invol. level)	Gas cubic feet at STP	Solid pounds (invol. level)	Liquid gallons (invol. level)
Compressible dust	NA	H-2	See 1000 L	NA	NA	See 1000 L	NA	NA	See 1000 L	NA
Compressible heavy	Loose	H-3	(100) (1,000)	NA	NA	(100) (1,000)	NA	NA	(20) (200)	NA
Compressible liquid ^{2,1}	H	H-2 or H-3	125 ^{1,4}	NA	NA	125 ^{1,4}	NA	NA	10 ¹	NA
	NA	H-2 or H-3	300 ^{1,4}	NA	NA	300 ^{1,4}	NA	NA	30 ¹	NA
	III	NA	13,200 ^{1,4}	NA	NA	13,200 ^{1,4}	NA	NA	3,300 ¹	NA
Consumer fireworks	1-4.0	H-3	125 ^{1,4}	NA	NA	NA	NA	NA	NA	NA
Organic flammable	NA	H-2	NA	450 ^{1,4}	NA	NA	447 ^{1,4}	NA	NA	12 ¹
Organic inert	NA	H-3	NA	NA	NL	NA	NL	NA	NA	NA
Organic oxidizing	NA	H-3	NA	447 ^{1,4}	NA	NA	447 ^{1,4}	NA	NA	10 ¹
Explosives	Division 1.1	H-1	1 ^{1,2}	1 ^{1,2}	NA	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}
	Division 1.2	H-1	1 ^{1,2}	1 ^{1,2}	NA	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}
	Division 1.3	H-1 & H-2	1 ^{1,2}	1 ^{1,2}	NA	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}
	Division 1.4	H-3	50 ^{1,3}	50 ^{1,3}	NA	50 ^{1,3}	50 ^{1,3}	NA	NA	NA
	Division 1.4B	H-3	125 ^{1,4}	NA	NA	NA	NA	NA	NA	NA
	Division 1.5	H-1	1 ^{1,2}	1 ^{1,2}	NA	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}
Flammable gas	Gaseous	H-2	NA	NA	1,000 ^{1,4}	NA	NA	1,000 ^{1,4}	NA	NA
	Liquefied	H-2	150 ^{1,4}	NA	NA	150 ^{1,4}	NA	NA	NA	NA
Flammable liquid	II and III	H-2	NA	NA	NA	NA	NA	NA	NA	10 ¹
	II and III	H-2 or H-3	125 ^{1,4}	NA	NA	125 ^{1,4}	NA	NA	NA	30 ¹
Flammable liquid (noncombustible)	NA, II, III	H-2 or H-3	NA	120 ^{1,4}	NA	NA	120 ^{1,4}	NA	NA	30 ^{1,1}

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TABLE 307.1(1)—continued
MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIALS POSING A PHYSICAL HAZARD^{1, 2, 3, 4, 5}

MATERIAL	CLASS	GROUP WHEN THE MAXIMUM ALLOWABLE QUANTITY IS EXCEEDED	STORAGE ⁶			USE-CLOSED SYSTEMS ⁸			USE-OPEN SYSTEMS ⁹	
			Solid pounds (invol. level)	Liquid gallons (invol. level)	Gas cubic feet at STP	Solid pounds (invol. level)	Liquid gallons (invol. level)	Gas cubic feet at STP	Solid pounds (invol. level)	Liquid gallons (invol. level)
Flammable solid	NA	H-3	125 ^{1,4}	NA	NA	125 ^{1,4}	NA	NA	25 ¹	NA
Inert gas	Gaseous	NA	NA	NA	NL	NA	NA	NL	NA	NA
	Liquefied	NA	NA	NA	NL	NA	NA	NL	NA	NA
Organic peroxide	LD	H-1	1 ^{1,2}	1 ^{1,2}	NA	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}
	I	H-2	1 ^{1,2}	1 ^{1,2}	NA	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}
	II	H-3	10 ^{1,3}	10 ^{1,3}	NA	10 ^{1,3}	10 ^{1,3}	NA	10 ^{1,3}	10 ^{1,3}
	III	H-3	50 ^{1,3}	50 ^{1,3}	NA	50 ^{1,3}	50 ^{1,3}	NA	50 ^{1,3}	50 ^{1,3}
	IV	NA	125 ^{1,4}	125 ^{1,4}	NA	125 ^{1,4}	125 ^{1,4}	NA	NA	NA
Oxidizer	1	H-1	1 ^{1,2}	1 ^{1,2}	NA	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}
	2	H-2 or H-3	1 ^{1,2}	1 ^{1,2}	NA	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}
	3	H-3	250 ^{1,3}	250 ^{1,3}	NA	250 ^{1,3}	250 ^{1,3}	NA	NA	NA
Oxidizing gas	Gaseous	H-2	4,000 ^{1,4}	4,000 ^{1,4}	1,500 ^{1,4}	NA	1,500 ^{1,4}	1,500 ^{1,4}	NA	NA
	Liquefied	H-3	NA	1,100 ^{1,4}	NA	NA	1,100 ^{1,4}	NA	NA	NA
Pyrophoric	NA	H-2	1 ^{1,2}	1 ^{1,2}	NA	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}
	NA	H-1	1 ^{1,2}	1 ^{1,2}	NA	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}
Unstable (reactive)	1	H-1 or H-2	1 ^{1,2}	1 ^{1,2}	NA	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}
	2	H-3	10 ^{1,3}	10 ^{1,3}	NA	10 ^{1,3}	10 ^{1,3}	NA	NA	NA
	3	NA	125 ^{1,4}	125 ^{1,4}	NA	125 ^{1,4}	125 ^{1,4}	NA	NA	NA
Water reactive	1	H-2	1 ^{1,2}	1 ^{1,2}	NA	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}	0.25 ^{1,2}
	2	H-3	10 ^{1,3}	10 ^{1,3}	NA	10 ^{1,3}	10 ^{1,3}	NA	NA	NA
	3	NA	125 ^{1,4}	125 ^{1,4}	NA	125 ^{1,4}	125 ^{1,4}	NA	NA	NA

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footnote “e”; what makes an approved cabinet or can?

- Cabinets are allowed for liquids, solids, gas bottles
- Liquids in cabinets in IFC 5704.3.2
- Gas bottles in cabinets in IFC 5003.8.6



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Footnote “e”; what is a safety can?

- Safety Cans: IFC 5003.9.10
- Must be metal and meet UL 30 to increase amounts
- May be non-metallic and meet UL 1313 if not increasing amounts



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Footnote “e”; what is a day box?

- DAY BOX.
A portable magazine designed to hold explosive materials and constructed in accordance with the requirements for a Type 3 magazine as defined and classified in Chapter 56 of the IFC.



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**Multiple hazards
307.8**

- Buildings and structures containing a material or materials representing hazards that are classified in one or more of Groups H-1, H-2, H-3 and H-4 shall conform to the code requirements for each of the occupancies so classified.
- Example: Anhydrous Ammonia
 - Flammable gas; H-2 if over exempt amounts
 - Corrosive so also H-4
- Requirements of both occupancies must be followed

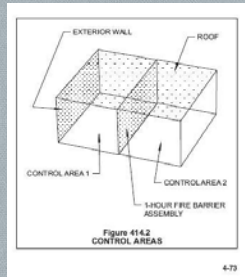
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**hazardous materials
414.2 control Areas**

- The control area can be the whole building, the whole floor or the whole room or rooms.
- Separated by fire barriers or horizontal assemblies
- Floors & supporting construction must be 2 hr rated
- Exceptions for 1 hr in Type IIA, IIIA, VA sprinkled buildings of 3 stories or less

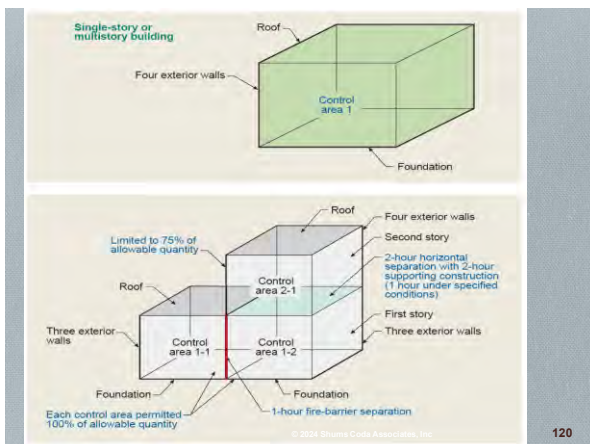


IBC Commentary

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Construction Requirements

414.2.1

- Control areas shall be separated from each other by fire barriers or horizontal assemblies, or both.



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Control Areas

Table 414.2.2

(F) TABLE 414.2.2
DESIGN AND NUMBER OF CONTROL AREAS

STORY	PERCENTAGE OF THE MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA ^a	NUMBER OF CONTROL AREAS PER STORY	FIRE RESISTANCE RATING FOR FIRE BARRIERS IN HOURS ^b
Above grade: plane	Higher than 9	1	2
	7-9	2	2
	6	2	2
	5	2	2
	4	2	2
	3	2	1
	2	3	1
Below grade: plane	1	4	1
	75	3	1
	50	2	1
	Lower than 2	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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414.2.3 Number

- The maximum number of control areas within a building shall be in accordance with Table 414.2.2.
- For the purposes of determining the number of control areas within a building, each portion of a building separated by one or more fire walls complying with Section 706 shall be considered a separate building.

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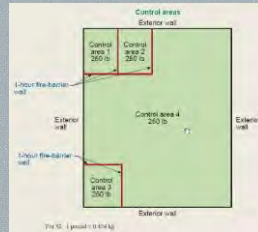
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Fire Resistance Ratings

414.2.4

• The required fire-resistance rating for fire barriers shall be in accordance with Table 414.2.2. The floor assembly of the control area and the construction supporting the floor of the control area shall have a minimum 2-hour fire-resistance rating .



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Fire Resistance Ratings

414.2.4

• Exceptions: The floor assembly of the control area and the construction supporting the floor of the control area are allowed to be 1-hour fire-resistance-rated in buildings of Types IIA, IIIA and VA construction, provided that both of the following conditions exist:

- 1. The building is equipped throughout with an automatic sprinkler system in accordance NFPA 13; and
- 2. The building is three stories or less above grade plane .

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Hazardous Materials in Groups M and S

414.2.5

• Hazardous materials located in Group M and Group S occupancies shall be in accordance with Sections 414.2.5.1 through 414.2.5.3.



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414.2.5.1 Nonflammable solids and nonflammable and noncombustible liquids

The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials permitted within a single control area of a Group M display and storage area, a Group S storage area or an outdoor control area is permitted to exceed the maximum allowable quantities per control area specified in Tables 307.1(1) and 307.1(2) without classifying the building or use as a Group H occupancy, provided that the materials are displayed and stored in accordance with the IFC and quantities do not exceed the maximum allowable specified in Table 414.2.5(1).



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Hazardous Materials in Groups M and S 414.2.5

(TABLE 414.2.5(1))
MAXIMUM ALLOWABLE QUANTITY PER INDOOR AND OUTDOOR CONTROL AREA IN GROUP M AND S OCCUPANCIES
NONFLAMMABLE SOLIDS AND NONFLAMMABLE AND NONCOMBUSTIBLE LIQUIDS^{1,2}

CONDITION	MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA			
	Materials ³	Class	Net weight (pounds)	Quantity (gallons)
A. Health-hazard materials—corrosive and noncorrosive acids and liquids				
1. Corrosives ⁴	Not Applicable		9,750	975
2. Highly toxics	Not Applicable		20 ⁵	2 ⁶
3. Toxics ⁴	Not Applicable		1,000	100
B. Physical-hazard materials—nonflammable and noncombustible acids and liquids				
1. Oxidizers ⁷	1	Not Allowed	Not Allowed	Not Allowed
	2	1,350 ⁸	115	115
	3	2,250 ⁸	225	225
	4	18,000 ⁸	1,800 ⁸	1,800 ⁸
2. Unstable (reactives) ⁹	1	Not Allowed	Not Allowed	Not Allowed
	2	350	35	35
	3	1,150	115	115
	4	Not Limited	Not Limited	Not Limited
A. Water reactives	1 ¹⁰	500	50	50
	2 ¹⁰	1,150	115	115
	3	Not Limited	Not Limited	Not Limited

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414.2.5.2 Flammable and combustible liquids

In Group M occupancy wholesale and retail sales uses, indoor storage of flammable and combustible liquids shall not exceed the maximum allowable quantities per control area as indicated in Table 414.2.5(2), provided that the materials are displayed and stored in accordance with the IFC.



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415.7 Special provisions for Group H-1 occupancies.

- Located in buildings used for no other purpose
- No more than one story, & no basements
- No crawl spaces or other under floor spaces
- Roofs shall be lightweight const. and have thermal insulation to prevent sensitive material from reaching decomposition temp.
- Bldgs. containing materials that are both physical and health hazards and exceed MAQ shall meet requirements of both H1 & H4.

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Means of Egress Chapter 10

- Chapter 10 provides the general criteria for designing the MOE established as the primary method for protection of people by allowing timely and safe evacuation of a building or relocation to another protected area of a building.
- This works in conjunction with type of construction and chapter 5 requirements for the size of a building and chapter 3 for uses of a building.

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Past Experience

- | | |
|--|--|
| <ul style="list-style-type: none"> • Cocoanut Grove <ul style="list-style-type: none"> • November 28, 1942 • 492 fatalities • Maze of rooms and passageways • Blocked and locked exit doors • No emergency lighting • Swing of doors against egress path | <ul style="list-style-type: none"> • Beverly Hills Supper Club Fire <ul style="list-style-type: none"> • May 28, 1977 • 164 Fatalities • Maintenance of egress • Concealed, combustible spaces • Overcrowding <ul style="list-style-type: none"> • Double the calculated occupant load • Egress capacity not adequate • Interior Finishes |
|--|--|

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Past experience

- MGM Fire
 - November 21, 1980
 - 85 fatalities, 700 injured
 - Stairwell filled with smoke
- Station Fire
 - February 20, 2003
 - 100 fatalities
 - Interior finishes
 - High spread of fire



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Means of Egress Philosophy

• A safe means to allow the occupant of a building to egress the building in a safe, timely and orderly manner.



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Means of Egress Philosophy

- Give the occupants alternative paths of travel to a place of safety to avoid fire
- Shelter occupants from fire and smoke
- Accommodate all occupants of the structure
- Provide a clear, unobstructed, well marked and illuminated path under the control of the user without special tools, effort, knowledge or keys



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1006.2.2.4 Electrical rooms



The location and number of exit or exit access doorways shall be provided for electrical rooms in accordance with Section 110.26 of [NEPA 70](#) for electrical equipment rated 1,000 volts or less, and Section 110.33 of [NFPA 70](#) for electrical equipment rated over 1,000 volts. Panic hardware shall be provided where required in accordance with [Section 1010.2.8.2](#)

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Means of Egress Design

- Determine Egress Widths
- Occupant Load/Egress Width Factor



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MOE

- Means of egress is made up of three distinct pieces
- Exit Access
- Exit
- Exit discharge

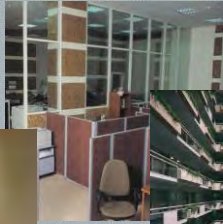
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Exit Access Components

- Aisles
- Corridors
- Egress Balconies



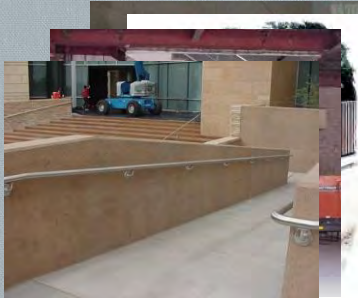
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Exits

- Doors
- Gates
- Stairways
- Ramps



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Exit discharge

- Exit door and pathway to public way



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Delayed Egress

1010.2.13

- Delayed egress locking systems shall be permitted to be installed on doors serving the following occupancies in buildings that are equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or an approved automatic smoke or heat detection system installed in accordance with Section 907.



- 1. Group B, F, I, M, R, S and U occupancies.
- 2. Group E classrooms with an occupant load of less than 50.

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Delayed Egress

1010.2.13.1

Exception:

- In courtrooms in Group A-3 and B occupancies, delayed egress locking systems shall be permitted to be installed on exit or exit access doors, other than the main exit or exit access door, in buildings that are equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.



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1010.2.13.1

Delayed egress locking system

- The delayed egress locking system shall be installed and operated in accordance with all of the following:



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1010.2.13.1

Delayed egress locking system

1. The delay electronics of the delayed egress locking system shall deactivate upon actuation of the automatic sprinkler system or automatic fire detection system, allowing immediate, free egress.
2. The delay electronics of the delayed egress locking system shall deactivate upon loss of power controlling the lock or lock mechanism, allowing immediate free egress.
3. The delayed egress locking system shall have the capability of being deactivated at the fire command center and other approved locations.



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1010.2.13.1

Delayed egress locking system

4. An attempt to egress shall initiate an irreversible process that shall allow such egress in not more than 15 seconds when a physical effort to exit is applied to the egress side door hardware for not more than 3 seconds. Initiation of the irreversible process shall activate an audible signal in the vicinity of the door. Once the delay electronics have been deactivated, rearming the delay electronics shall be by manual means only.



Exception: Where approved, a delay of not more than 30 seconds is permitted on a delayed egress door.

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1010.2.13.1

Delayed egress locking system

5. The egress path from any point shall not pass through more than one delayed egress locking system.
6. Two Exceptions




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1010.2.13.1
Delayed egress locking system

- 7. Emergency lighting shall be provided on the egress side of the door.
- 8. The delayed egress locking system units shall be listed in accordance with UL 294.




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Controlled egress doors in Groups I-1 and I-2 - 1010.2.14

- * Electric locking systems, including electro-mechanical locking systems and electromechanical locking systems, shall be permitted to be locked in the means of egress in Group I-1 or I-2 occupancies where the clinical needs of persons receiving care require their containment.
- * Controlled egress doors shall be permitted in such occupancies where the building is equipped throughout with an automatic sprinkler system or an approved automatic smoke or heat detection system, provided that the doors are installed and operate in accordance with all of the following:



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Controlled egress doors in Groups I-1 and I-2 - 1010.2.14

1. The doors unlock upon actuation of the automatic sprinkler system or automatic smoke detection system.
2. The doors unlock upon loss of power controlling the lock or lock mechanism.
3. The door locks shall have the capability of being unlocked by a signal from the fire command center, a nursing station or other approved location. The switch shall directly break power to the lock. A building occupant shall not be required to pass through more than one door equipped with a special egress lock before entering an exit.
4. The door locks shall have the capability of being unlocked by a signal from the fire command center, a nursing station or other approved location. The switch shall directly break power to the lock. A building occupant shall not be required to pass through more than one door equipped with a special egress lock before entering an exit.
5. The procedures for the operation(s) of the unlocking system shall be described and approved as part of the emergency planning and preparedness required by Chapter 4 of the IFC.
6. All clinical staff shall have the keys, codes or other means necessary to operate the locking devices.
7. Emergency lighting shall be provided at the door.
8. The door locking system units shall be listed in accordance with UL 294.


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Controlled egress doors in Group I-2 and I-3
1010.2.4

• Exceptions:


1. Items 1 through 4 shall not apply to doors to areas occupied by persons who, because of clinical needs, require restraint or containment as part of the function of a psychiatric treatment area.
2. Items 1 through 4 shall not apply to doors to areas where a listed egress control system is utilized to reduce the risk of child abduction from nursery and obstetric areas of a Group I-2 hospital.



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Revolving Doors
1010.3.1




• Revolving doors shall comply with the following:

1. Revolving doors shall comply with BHMA A156.27 and shall be installed in accordance with the manufacturer's instructions.
2. Each revolving door shall be capable of breakout in accordance with BHMA A156.27 and shall provide an aggregate width of not less than 36 inches.
3. A revolving door shall not be located within 10 feet of the foot of or top of stairs or escalators. A dispersal area shall be provided between the stairs or escalators and the revolving doors.

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Revolving Doors
1010.3.1



4. The revolutions per minute (rpm) for a revolving door shall not exceed the maximum rpm as specified in BHMA A156.27. Manual revolving doors shall comply with Table 1010.3.1(1). Automatic or power-operated revolving doors shall comply with Table 1010.3.1(2).
5. An emergency stop switch shall be provided near each entry point of power or automatic operated revolving doors within 48 inches of the door and between 34 inches and 48 inches above the floor. The activation area of the emergency stop switch button shall be not less than 1 inch (25 mm) in diameter and shall be red.

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Egress Component

1010.3.1.1

- Shall comply with Section 1010.3.1 and:
 1. Revolving doors shall not be given credit for more than 50 percent of the required egress capacity.
 2. Each revolving door shall be credited with no more than a 50-person capacity.
 3. Each revolving door shall provide for egress in accordance with BHMA A156.27 with a breakout force of not more than 130 pounds



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Other Than Egress Component 1010.3.1.2



- A revolving door used as other than a component of a means of egress shall comply with Section 1010.3.1.
- The breakout force of a revolving door not used as a component of a means of egress shall not be more than 180 pounds

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1010.1.3.2 Exception

- Exception: A breakout force in excess of 180 pounds is permitted if the breakout force is reduced to not more than 130 pounds when not less than one of the following conditions is satisfied:
 1. There is a power failure or power is removed to the device holding the door wings in position.
 2. There is an actuation of the automatic sprinkler system where such system is provided.
 3. There is an actuation of a smoke detection system which is installed in accordance with Section 907 to provide coverage in areas within the building which are within 75 feet of the revolving doors.
 4. There is an actuation of a manual control switch, in an approved location and clearly defined, which reduces the holding force to below the 130-pound force level.

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Power Operated Doors

1010.3.2

- Where means of egress doors are operated or assisted by power, the design shall be such that in the event of power failure, the door is capable of being opened manually to permit means of egress travel or closed where necessary to safeguard means of egress.



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Revolving Doors

1010.3.1

- Revolving doors shall comply with the following:
 1. Revolving doors shall comply with BHMA A156.27 and shall be installed in accordance with the manufacturer's instructions.
 2. Each revolving door shall be capable of breakout in accordance with BHMA A156.27 and shall provide an aggregate width of not less than 36 inches.
 3. A revolving door shall not be located within 10 feet of the foot of or top of stairs or escalators. A dispersal area shall be provided between the stairs or escalators and the revolving doors.



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Revolving Doors

1010.3.1

4. The revolutions per minute (rpm) for a revolving door shall not exceed the maximum rpm as specified in BHMA A156.27. Manual revolving doors shall comply with Table 1010.3.1(1). Automatic or power-operated revolving doors shall comply with Table 1010.3.1(2).
5. An emergency stop switch shall be provided near each entry point of power or automatic operated revolving doors within 48 inches of the door and between 34 inches and 48 inches above the floor. The activation area of the emergency stop switch button shall be not less than 1 inch (25 mm) in diameter and shall be red.



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Revolving Door Speeds
Table 1010.3.1(1)

TABLE 1010.3.1(1) MAXIMUM DOOR SPEED MANUAL REVOLVING DOORS	
REVOLVING DOOR MAXIMUM NOMINAL DIAMETER (FT-IN)	MAXIMUM ALLOWABLE REVOLVING DOOR SPEED (RPM)
6-0	12
7-0	11
8-0	10
9-0	9
10-0	8

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Revolving Doors
1010.3.1

- 6. Each revolving door shall have a side-hinged swinging door that complies with Section 1010.1 in the same wall and within 10 feet of the revolving door.
- 7. Revolving doors shall not be part of an accessible route required by Section 1009 and Chapter 11.



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Egress Component
1010.3.1.1

- Shall comply with Section 1010.3.1 and:
 1. Revolving doors shall not be given credit for more than 50 percent of the required egress capacity.
 2. Each revolving door shall be credited with no more than a 50-person capacity.
 3. Each revolving door shall provide for egress in accordance with BHMA A156.27 with a breakout force of not more than 130 pounds



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Other Than Egress Component 1010.3.1.2



- A revolving door used as other than a component of a means of egress shall comply with Section 1010.3.1.
- The breakout force of a revolving door not used as a component of a means of egress shall not be more than 180 pounds

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Stairways - 1011



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Definitions

- **INTERIOR EXIT STAIRWAY.** An exit component that serves to meet one or more means of egress design requirements, such as required number of exits or exit access travel distance, and provides for a protected path of egress travel to the exit discharge or public way.



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Definitions

- **EXIT ACCESS STAIRWAY.** A stairway within the exit access portion of the means of egress system.

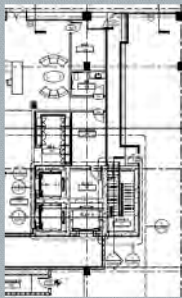


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Interior exit stairways
1023.1



- Interior exit stairways and ramps shall be enclosed and lead directly to the exterior of the building or shall be extended to the exterior of the building with an exit passageway conforming to the requirements of Section 1024, except as permitted in Section 1028.2.
- An interior exit stairway or ramp shall not be used for any purpose other than as a means of egress and a circulation path.

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1023.2
Construction

- Enclosures for interior exit stairways and ramps shall be constructed as fire barriers in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 711, or both.
- < 4 stories – 1 hour FRR
- ≥ 4 stories – 2 hour FRR

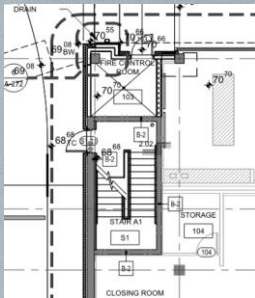


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**1023.3
Termination**



- Interior exit stairways and ramps shall terminate at an exit discharge or a public way.
- Exception: A combination of interior exit stairways, interior exit ramps and exit passageways, constructed in accordance with Sections 1023.2, 1023.3.1 and 1024, respectively, and forming a continuous protected enclosure, shall be permitted to extend an interior exit stairway or ramp to the exit discharge or a public way.

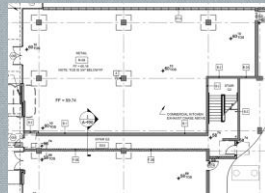
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**1023.3.1
Extension**

- Where interior exit stairways and ramps are extended to an exit discharge or a public way by an exit passageway, the interior exit stairway and ramp shall be separated from the exit passageway by a fire barrier constructed in accordance with Section 707 or a horizontal assembly constructed in accordance with Section 711, or both.
- The fire-resistance rating shall be not less than that required for the interior exit stairway and ramp.



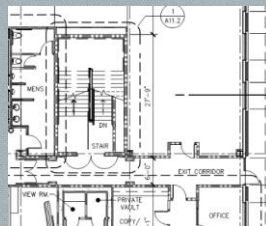
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**1023.3.1
Extension**

- A fire door assembly complying with Section 716.5 shall be installed in the fire barrier to provide a means of egress from the interior exit stairway and ramp to the exit passageway. Openings in the fire barrier other than the fire door assembly are prohibited. Penetrations of the fire barrier are prohibited.



- 3 Exceptions

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Exit access stairways
1019.3

- 1. Exit access stairways and ramps that serve or atmospherically communicate between only two adjacent stories. Such interconnected stories shall not be open to other stories.



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1024.1
Exit passageways

- Exit passageways serving as an exit component in a means of egress system shall comply with the requirements of this section.
- An exit passageway shall not be used for any purpose other than as a means of egress and a circulation path.



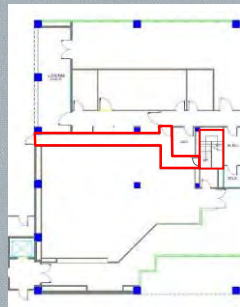
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Exit Passageways
202

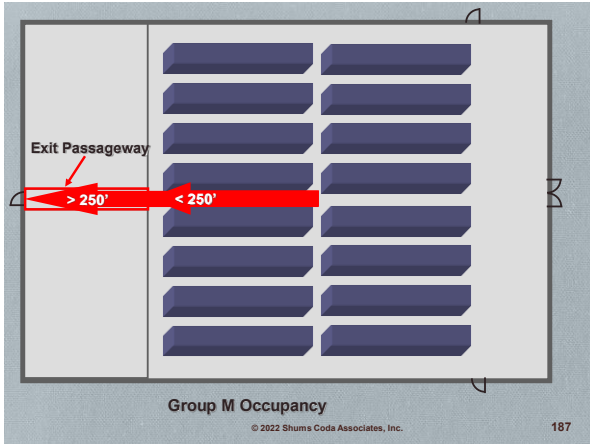
- An exit component that is separated from all other interior spaces of a building or structure by fire-resistance-rated construction and opening protectives, and provides for a protected path of egress travel in a horizontal direction to the exit discharge or the public way.



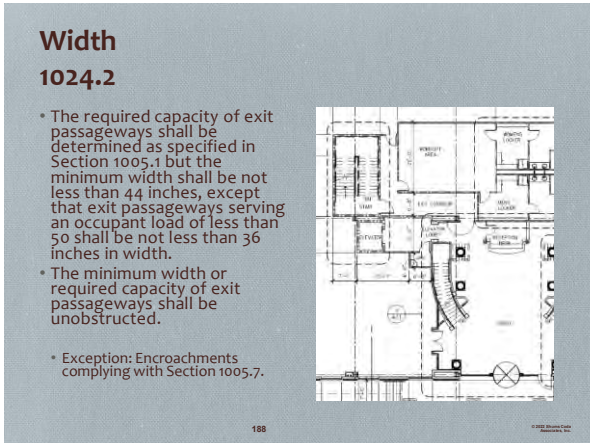
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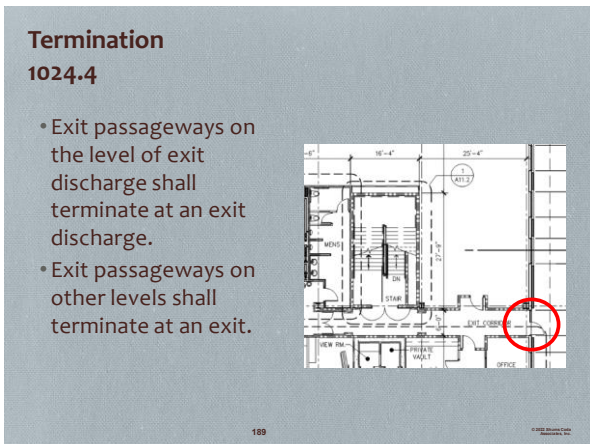
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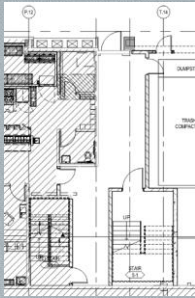
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Openings And Penetrations

1024.5



- Where an interior exit stairway or ramp is extended to an exit discharge or a public way by an exit passageway, the exit passageway shall also comply with Section 1023.3.1.
- Elevators shall not open into an exit passageway.

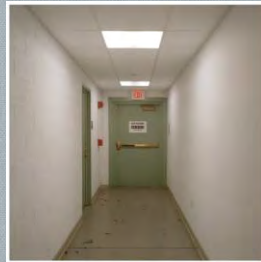
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1024.6 Penetrations

- Penetrations into or through an exit passageway are prohibited except for the following:
 1. Equipment and ductwork necessary for independent ventilation or pressurization.
 2. Fire protection systems.
 3. Security systems.
 4. Two-way communication systems.
 5. Electrical raceway for fire department communication.
 6. Electrical raceway serving the exit passageway and terminating at a steel box not exceeding 16 square inches.



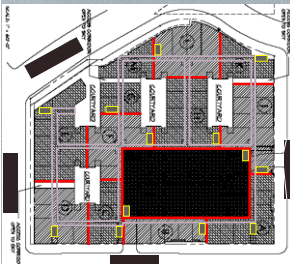
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Horizontal Exits

1026



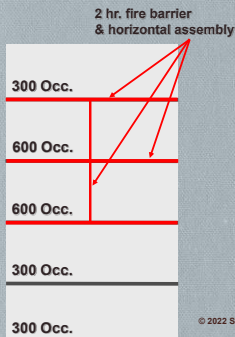
- Horizontal exits serving as an exit in a means of egress system shall comply with the requirements of this section.
- A horizontal exit shall not serve as the only exit from a portion of a building, and where two or more exits are required, not more than one-half of the total number of exits total exit minimum width or required capacity shall be horizontal exits.

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Separation 1026.2



- The separation between buildings or areas of refuge connected by a horizontal exit shall be provided by a fire wall or a fire barrier having a fire-resistance rating of not less than 2 hours.
- Opening protectives in horizontal exit walls shall also comply with Section 716.
- Duct and air transfer openings in a fire wall or fire barrier that serves as a horizontal exit shall also comply with Section 717.
- The horizontal exit separation shall extend vertically through all levels of the building unless floor assemblies have a fire-resistance rating of not less than 2 hours with no unprotected openings.

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Luminous Egress Path Markings 1025.1



Retroactive in IFC!

- Approved luminous egress path markings delineating the exit path shall be provided in high rise buildings of Groups A, B, E, I-1, M and R-1.
- Exceptions:
Not required on the level of exit discharge in lobbies that serve as part of the exit path in accordance with Section 1028.2, Exception 1.

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Markings within Exit Enclosures 1025.2

- Floor Mounted
 - Placed within 4" of the wall
- Wall Mounted
 - Placed within 4" of the floor
- Transition
 - ?



Not Compliant!

- Stair landings and other floor areas within exit enclosures, with the exception of the sides of steps, shall be provided with solid and continuous demarcation lines on the floor or on the walls or a combination of both.
- The stripes shall be 1 to 2 inches wide with interruptions not exceeding 4 inches.

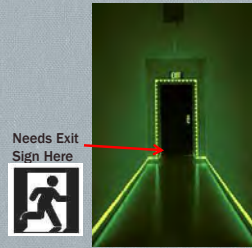
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Markings within Exit Enclosures 1025.2

- Obstacles
 - Located below 78" and extending out more than 4" must be marked
- Doors
 - Hardware
 - Frame
 - Low level exit sign per NFPA 170 (18" above floor)



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Exit Discharge 1028.2



- Exits shall discharge directly to the exterior of the building.
- The exit discharge shall be at grade or shall provide direct access to grade.
- The exit discharge shall not reenter a building.
- The combined use of Exceptions 1 and 2 below shall not exceed 50 percent of the number and capacity of the required exits .

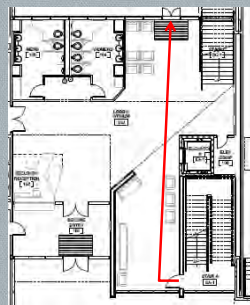
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Exit Discharge 1028.2 Exceptions

1. Not more than 50 percent of the number and minimum width or capacity of interior exit stairways and ramps is permitted to egress through areas, including atriums, on the level of exit discharge provided all of the following are met:
 1. Discharge of interior exit stairways and ramps shall be provided with a free and unobstructed path of travel to an exterior exit door and such exit is readily visible and identifiable from the point of termination of the enclosure.

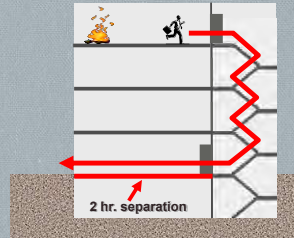


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Exit Discharge 1028.2 Exceptions

- 2. The entire area of the level of exit discharge is separated from areas below by construction conforming to the fire-resistance rating for the enclosure.



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Access to Public Way 1028.5

- The exit discharge shall provide a direct and unobstructed access to a public way.

Exception:

- Where access to a public way cannot be provided, a safe dispersal area shall be provided where all of the following are met:

1. Sized to accommodate not less than 5 square feet for each person.
2. Located on the same property not less than 50 feet away from the building.
3. Shall be permanently maintained and identified as a safe dispersal area.
4. Shall be provided with a safe and unobstructed path of travel from the building.



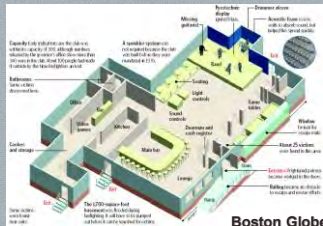
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Assembly Main Exit 1030.2

- A building, room or space used for assembly purposes that has an occupant load of greater than 300 and is provided with a main exit, that main exit shall be of sufficient capacity to accommodate not less than one-half of the occupant load, but such capacity shall be not less than the total required capacity of all means of egress leading to the exit.



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Assembly Main Exit

1030.2

- Group A occupancy -
- Main exit shall front on not less than one street or an unoccupied space of not less than 10 feet in width that adjoins a street or public way.
- In a building, room or space used for assembly purposes where there is not a well-defined main exit or where multiple main exits are provided, exits shall be permitted to be distributed around the perimeter of the building provided that the total capacity of egress is not less than 100 percent of the required capacity.



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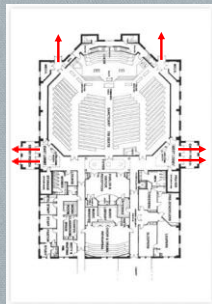
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Assembly Other Exits

1030.3

- In addition to having access to a main exit, each level in a building used for assembly purposes having an occupant load greater than 300 and provided with a main exit, shall be provided with additional means of egress that shall provide an egress capacity for not less than one-half of the total occupant load served by that level and shall comply with Section 1007.1.



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Travel Distance 1030.7 Exceptions

- 3. In facilities with open-air assembly seating of Type I or II construction, the total exit access travel distance shall not be limited.



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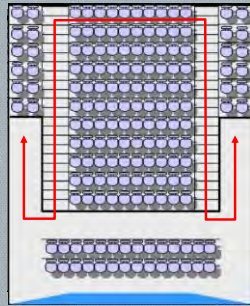
Common Path Of Travel

1030.8

- The common path of egress travel shall not exceed 30 feet from any seat to a point where an occupant has a choice of two paths of egress travel to two exits.

Exceptions:

- For areas serving less than 50 occupants, the common path of egress travel shall not exceed 75 feet.
- For smoke-protected or open air assembly seating, the common path of egress travel shall not exceed 50 feet.



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1030.12.2

Outdoor conditions

- Outdoor aisles, stepped aisles and ramped aisles and outdoor approaches to aisles, stepped aisles and ramped aisles shall be designed so that water will not accumulate on the walking surface.



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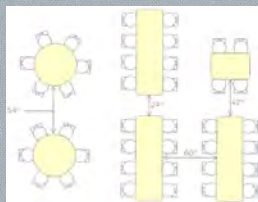
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1030.13.1

Seating at tables

- Where seating is located at a table or counter and is adjacent to an aisle or aisle accessway, the measurement of required clear width of the aisle or aisle accessway shall be made to a line 19 inches away from and parallel to the edge of the table or counter.
- The 19-inch distance shall be measured perpendicular to the side of the table or counter.
- In the case of other side boundaries for aisles or aisle accessways, the clear width shall be measured to walls, edges of seating and tread edges.



- Exception for fixed seating

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1030.13.1.1 - Aisle accessway capacity and width for seating at tables

- Aisle accessways serving arrangements of seating at tables or counters shall comply with the capacity requirements of Section 1005.1 but shall not have less than 12 inches of width plus 1/2 inch of width for each additional 1 foot, or fraction thereof, beyond 12 feet of aisle accessway length measured from the center of the seat farthest from an aisle.
- Exception: Portions of an aisle accessway having a length not exceeding 6 feet and used by a total of not more than four persons.



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1030.13.1.2 - Seating at table aisle accessway length

- The length of travel along the aisle accessway shall not exceed 30 feet from any seat to the point where a person has a choice of two or more paths of egress travel to separate exits.



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1030.14.1.2 Landings

- Ramped aisles shall have landings in accordance with Sections 1012.6 through 1012.6.5. Landings for ramped aisles shall be permitted to overlap required aisles or cross aisles.



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1030.14.2
Stepped aisles

- Aisles with a slope exceeding one unit vertical in eight units horizontal (12.5-percent slope) shall consist of a series of risers and treads that extends across the full width of aisles and complies with Sections 1030.14.2.1 through 1030.14.2.4.



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Seat Stability
1030.15

- In a building, room or space used for assembly purposes, the seats shall be securely fastened to the floor.
- Exceptions:
 1. In a building, room or space used for assembly purposes or portions thereof without ramped or tiered floors for seating and with 200 or fewer seats, the seats shall not be required to be fastened to the floor.



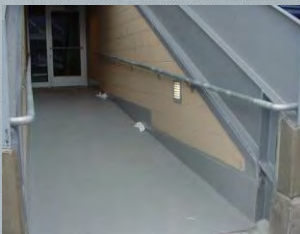
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Handrails
1030.16

- Ramped aisles having a slope exceeding one unit vertical in 15 units horizontal (6.7% slope) and stepped aisles shall be provided with handrails in compliance with Section 1014 located either at one or both sides of the aisle or within the aisle width.



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Handrails

1030.16

- Where stepped aisles have seating on one side and the aisle width is 74 inches or greater, two handrails are required.
- Where two handrails are required, one of the handrails shall be within 30 inches horizontally of the stepped aisle.



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Handrails

1030.16

Exceptions:

1. Handrails are not required for ramped aisles with seating on both sides.
2. Handrails are not required where, at the side of the aisle, there is a guard with a top surface that complies with the graspability requirements of handrails in accordance with Section 1014.3.
3. Handrail extensions are not required at the top and bottom of stepped aisles and ramped aisles to permit crossovers within the aisles.



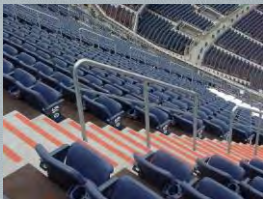
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Discontinuous handrails

1030.16.1



- Where there is seating on both sides of the aisle, the mid-aisle handrails shall be discontinuous. Where a stepped aisle is required to have two handrails, the mid-aisle handrails shall be discontinuous.
- Gaps or breaks shall be provided at intervals not exceeding five rows to facilitate access to seating and to permit crossing from one side of the aisle to the other.
- These gaps or breaks shall have a clear width of not less than 22 inches and not greater than 36 inches, measured horizontally, and the mid-aisle handrail shall have rounded terminations or bends.

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Handrail Termination

1030.16.2

- Handrails located on the side of stepped aisles shall return to a wall, guard or the walking surface or shall be continuous to the handrail of an adjacent stepped aisle flight.



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1030.16.3

Mid-aisle termination

- Mid-aisle handrails shall not extend beyond the lowest riser and shall terminate within 18 inches, measured horizontally, from the lowest riser.
- Handrail extensions are not required.
- Exception: Mid-aisle handrails shall be permitted to extend beyond the lowest riser where the handrail extensions do not obstruct the width of the cross aisle.



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Assembly guards

1030.17

- Guards adjacent to seating in a building, room or space used for assembly purposes shall be provided where required by Section 1015 and shall be constructed in accordance with Section 1015 except where provided in accordance with Sections 1030.17.1 through 1030.17.4.



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1030.17.1
Perimeter guards

- Perimeter guards shall be provided where the footboards or walking surface of seating facilities are more than 30 inches above the floor or grade below.
- Where the seatboards are adjacent to the perimeter, guard height shall be 42 inches high minimum, measured from the seatboard.



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1030.17.1
Perimeter guards

- Where the seats are self-rising, guard height shall be 42 inches high minimum, measured from the floor surface. Where there is an aisle between the seating and the perimeter, the guard height shall be measured in accordance with Section 1015.2.
- Exceptions:
 1. Guards that impact sightlines shall be permitted to comply with Section 1030.17.3.
 2. Bleachers, grandstands and folding and telescopic seating shall not be required to have perimeter guards where the seating is located adjacent to a wall and the space between the wall and the seating is less than 4 inches.



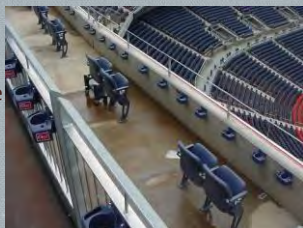
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Cross aisles
1030.17.2

- Cross aisles located more than 30 inches above the floor or grade below shall have guards in accordance with Section 1015.



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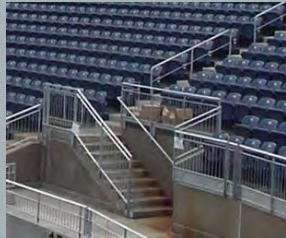
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Cross aisles

1030.17.1

- Where an elevation change of 30 inches or less occurs between a cross aisle and the adjacent floor or grade below, guards not less than 26 inches above the aisle floor shall be provided.
- Exception: Where the backs of seats on the front of the cross aisle project 24 inches or more above the adjacent floor of the aisle, a guard need not be provided.



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Sightline-Constrained Guard Heights

1030.17.3

- Unless subject to the requirements of Section 1030.17.4, a fascia or railing system in accordance with the guard requirements of Section 1015 and having a minimum height of 26 inches shall be provided where the floor or footboard elevation is more than 30 inches above the floor or grade below and the fascia or railing would otherwise interfere with the sightlines of immediately adjacent seating.



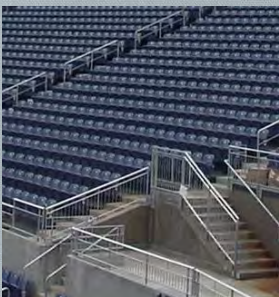
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Guards At The End Of Aisles 1030.17.4

- A fascia or railing system complying with the guard requirements of Section 1015 shall be provided for the full width of the aisle where the foot of the aisle is more than 30 inches above the floor or grade below.

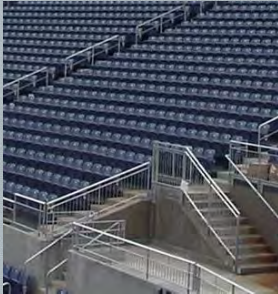


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Guards At The End Of Aisles 1030.17.4



- The fascia or railing shall be a minimum of 36 inches high and shall provide a minimum 42 inches measured diagonally between the top of the rail and the nosing of the nearest tread.

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Bill Clayton, CBO
Shums Coda Associates, Inc.

4610 S Ulster, Suite 150
Denver, CO 80237

Ph. 303-400-6564
Fax 303-693-0630

www.shumscoda.com
Bill.Clayton@shumscoda.com



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