OFFICE OF STATE FIRE MARSHAL
NC DEPARTMENT OF INSURANCE

## 2025 NCBIA Winter Code Seminars

# Significant Changes to the 2024 North Carolina Building Codes

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NCBIA



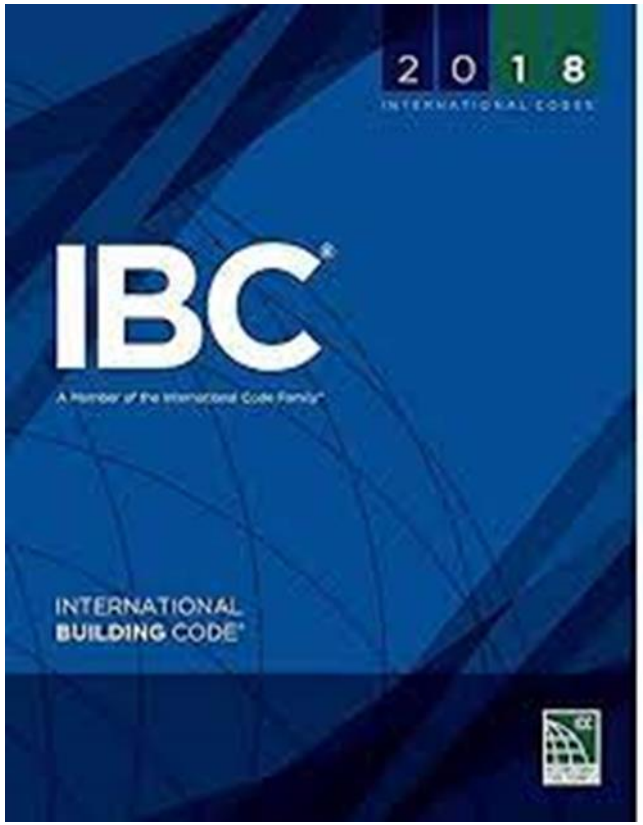


OSFM

# Introduction

- B.S. in Civil Engineering and Master of Civil Engineering from NC State University (Structural Engineering Concentration)
- 4.5 years with NC DOI / NC OSFM Engineering Department
- Started as the Chief Residential Code Consultant in 2020
- Chief Building Code Consultant since 2021
- Chief Code Consultant - 2024 Nov
- Representing NC OSFM for the 2027 ICC (IRC – B) Code Development Committee Group B

# 2024 North Carolina Building Code

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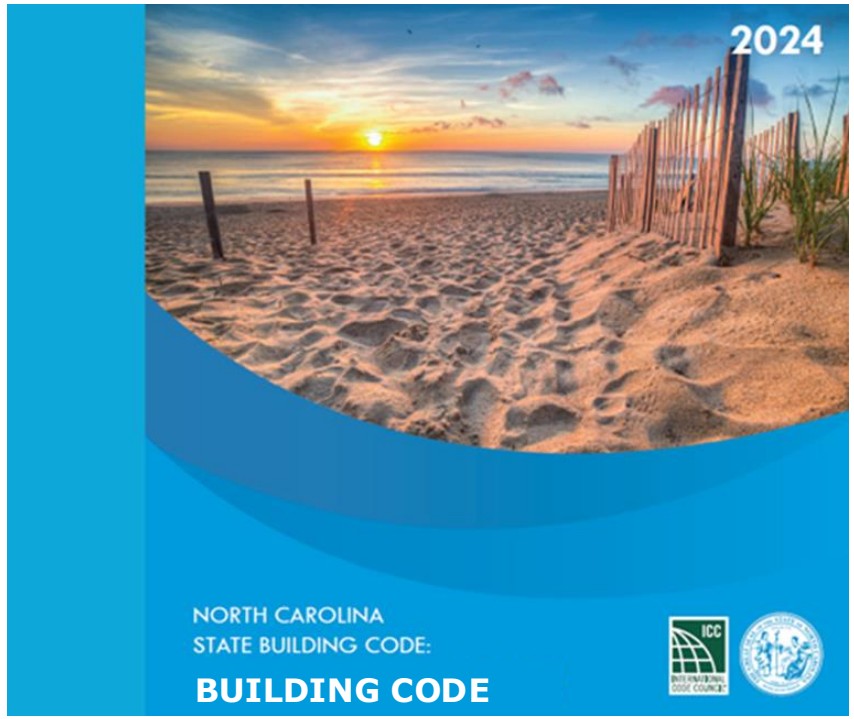
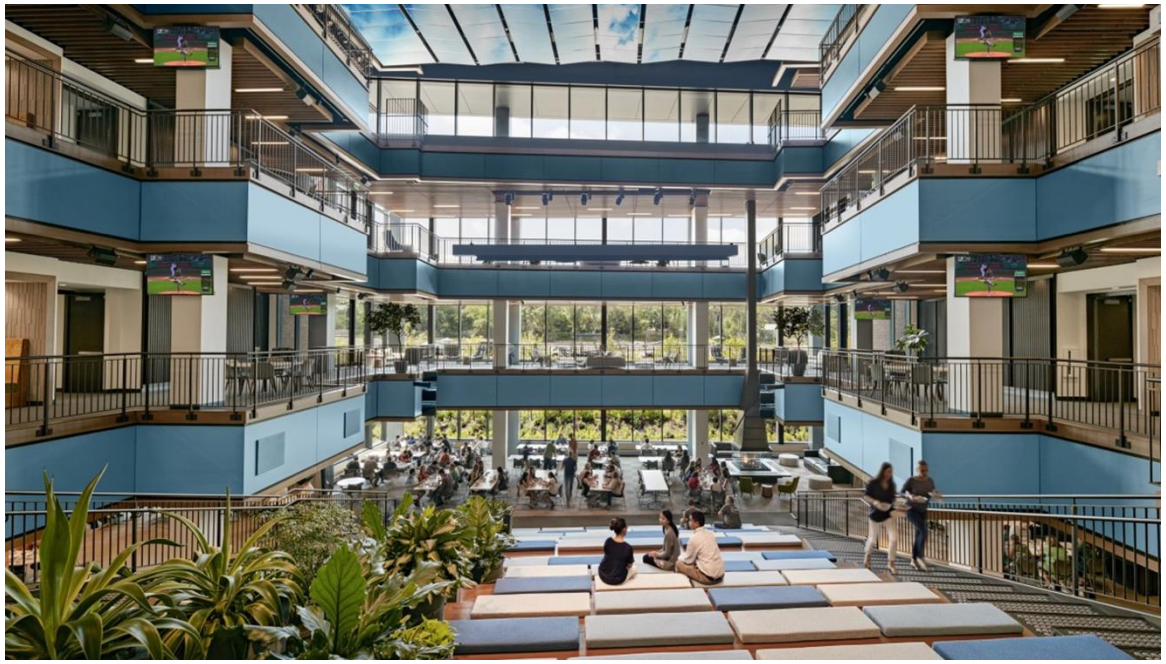



**Effective Date: July 1st 2025**

# 202 Definition of Atrium

**ATRIUM.** A vertical space that is closed at the top, connecting two or more stories in Group I-2 and I-3 occupancies or three or more stories in all other occupancies.



# 202 Definition of Change of Occupancy

**CHANGE OF OCCUPANCY**. Either of the following shall be considered as a change of occupancy where this code requires a greater degree of safety, accessibility, structural strength, fire protection, means of egress, ventilation or sanitation than is existing in the current building or structure:

1. Any change in the occupancy classification of a building or structure.

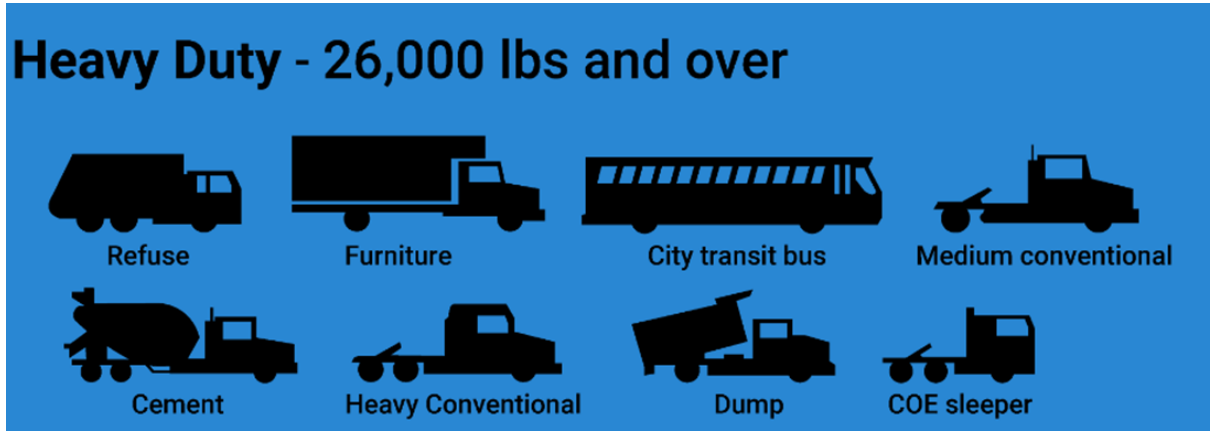
2. Any change in the purpose of, or a change in the level of activity within, a building or structure.

# 202 Definition of Commercial Motor Vehicle

**COMMERCIAL MOTOR VEHICLE.** A motor vehicle used to transport passengers or property where the motor vehicle meets one of the following:

1. Has a gross vehicle weight rating of 26,001 pounds (11,794 kg) or more; or

2. Is designed to transport 16 or more passengers, including the driver.




**903.2.10.1 Commercial parking garages.** An *automatic sprinkler system* shall be provided throughout buildings used for storage of commercial motor vehicles where the *fire area* exceeds 5,000 square feet (464 $m^2$).

# 202 Definition of Greenhouse

**GREENHOUSE.** A structure or thermally isolated area of a building not exempted by N.C.G.S. 143-138(b4) that maintains a specialized sunlit environment used for and essential to the cultivation, protection or maintenance of plants.

# 202 Definition of Penthouse

**PENTHOUSE.** An enclosed, unoccupied rooftop structure used for sheltering mechanical and electrical equipment, tanks, elevators and related machinery, stairways, and vertical shaft openings.

# 202 Definition of Puzzle Room

**PUZZLE ROOM.** A puzzle room is a type of special amusement area in which occupants are encouraged to solve a challenge to escape from a room or series of rooms.

# 302.1 Classification of Outdoor Areas

**302.1 Occupancy classification**. 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 specified 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. An area, room or space that is intended to be occupied at different times for different purposes shall comply with all applicable requirements associated with such potential multipurpose. Structures containing multiple occupancy groups shall comply with Section 508. Where a structure is proposed for a purpose that is not specified in this section, such structure shall be classified in the occupancy it most nearly resembles based on the fire safety and relative hazard. Occupied roofs shall be classified in the group that the occupancy most nearly resembles, according to the fire safety and relative hazard, and shall comply with Section 503.1.4.

# 303.4 Assembly Use of Greenhouses Classification

**303.4 Assembly Group A-3.**

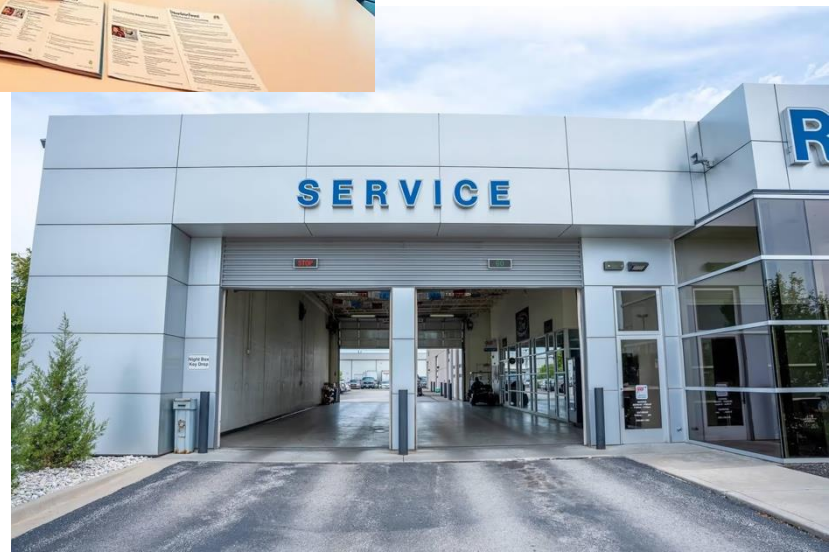
Greenhouses for the conservation and exhibition of plants that provide public access

Examples: Botanical gardens, municipal parks

# 304.1 Group B Occupancy Classification

**304.1 Business Group B.**

Motor vehicle showrooms, including vehicle service check-in areas



# 306.2 Group F-1 Occupancy Classification

**306.2 Moderate-hazard factory industrial, Group F-1.**

Energy storage systems (ESS) in dedicated use buildings

Processing and extraction facilities

# 307.1.1 Uses other than Group H

18. Distilling or brewing of beverages conforming to the requirements of the International Fire Code.

19. The storage of beer, distilled spirits and wines in barrels and casks conforming to the requirements of the International Fire Code.

# 309.1 Mercantile Use of Greenhouses Classification

**309.1 Mercantile Group M.**

Greenhouses for display and sale of plants that provide public access.

Examples: Retail Stores, Home improvement Centers.

# 310.3, 310.4 Classification of Congregate Living Facilities

**310.3 Residential Group R-2.**

Congregate living facilities (nontransient) with more than 16 occupants

- Boarding houses (nontransient)
- Convents
- Dormitories
- Fraternities and sororities
- Monasteries

**310.4 Residential Group R-3.**

Congregate living facilities (nontransient) with 16 or fewer occupants

- Boarding houses (nontransient)
- Convents
- Dormitories
- Fraternities and sororities
- Monasteries

# 310.4.1 Care Facilities within a Dwelling

**310.4.1 Care facilities within a dwelling.** Deleted.

See North Carolina Residential Code Section R332.

2018 NCBC Section:

428.2 Residential Care Homes

428.3 Licensed Small Residential Care Facilities

428.4 Small Non-Ambulatory Care Facilities

**MOVED to NCRC**

# 311.1.1 Classification of Accessory Storage Spaces

**311.1.1 Accessory storage spaces.** A room or space used for storage purposes that is ~~less than 100 square feet (9.3 m2) in area and~~ accessory to another occupancy shall be classified as part of that occupancy.

**Table 509.1

| | |
|---|---|
| In ambulatory care facilities or Group I-2 occupancies, storage rooms greater than 100 square feet | 1 hour |

# 311.2 Classification of Self-Service Storage Facilities

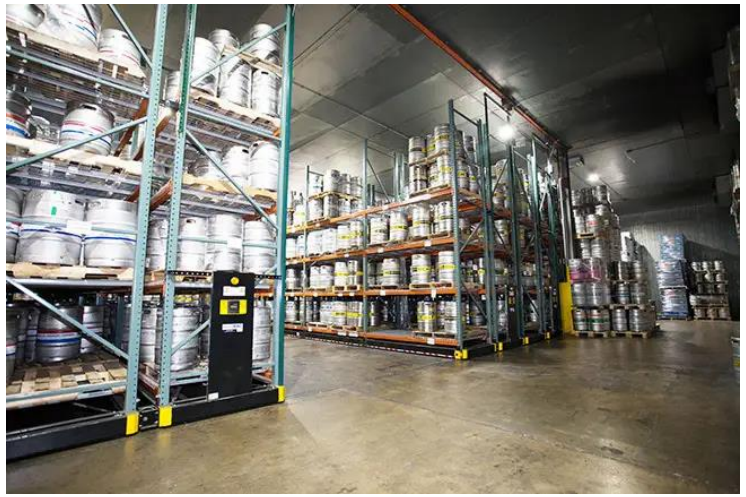
**311.2 Moderate-hazard storage, Group S-1.**

Self-service storage facility (mini-storage)


# 311.2, 311.3 Alcoholic Beverage Storage

**311.2 Moderate-hazard storage, Group S-1.**

Beverages over 16-percent alcohol content



**311.3 Moderate-hazard storage, Group S-2.**

Beverages up to and including 16-percent alcohol


# 312.1 Classification of Group U Structures

**312.1 General.**

Communication equipment structures with a gross floor area of less than 1,500 square feet (139 m2)

Fences and ground signs more than 7 feet (2134 mm) in height

# 312.1.1 Classification of Agricultural Greenhouses

**312.1.1 Greenhouses.** Greenhouses not classified as another occupancy shall be classified as Use Group U.

# 404.1 Scope of Atrium Provisions

**404.1 General.** The provisions of Sections 404.1 through 404.11 shall apply to buildings containing atriums. Atriums are not permitted in buildings or structures classified as Group H.

Exception: Vertical openings that comply with Sections 712.1.1 through 712.1.3, and Sections 712.1.9 through 712.1.14.

# 404.5 Smoke Control in Atriums

404.5 Smoke control. A smoke control system shall be installed in accordance with Section 909.

Exceptions:

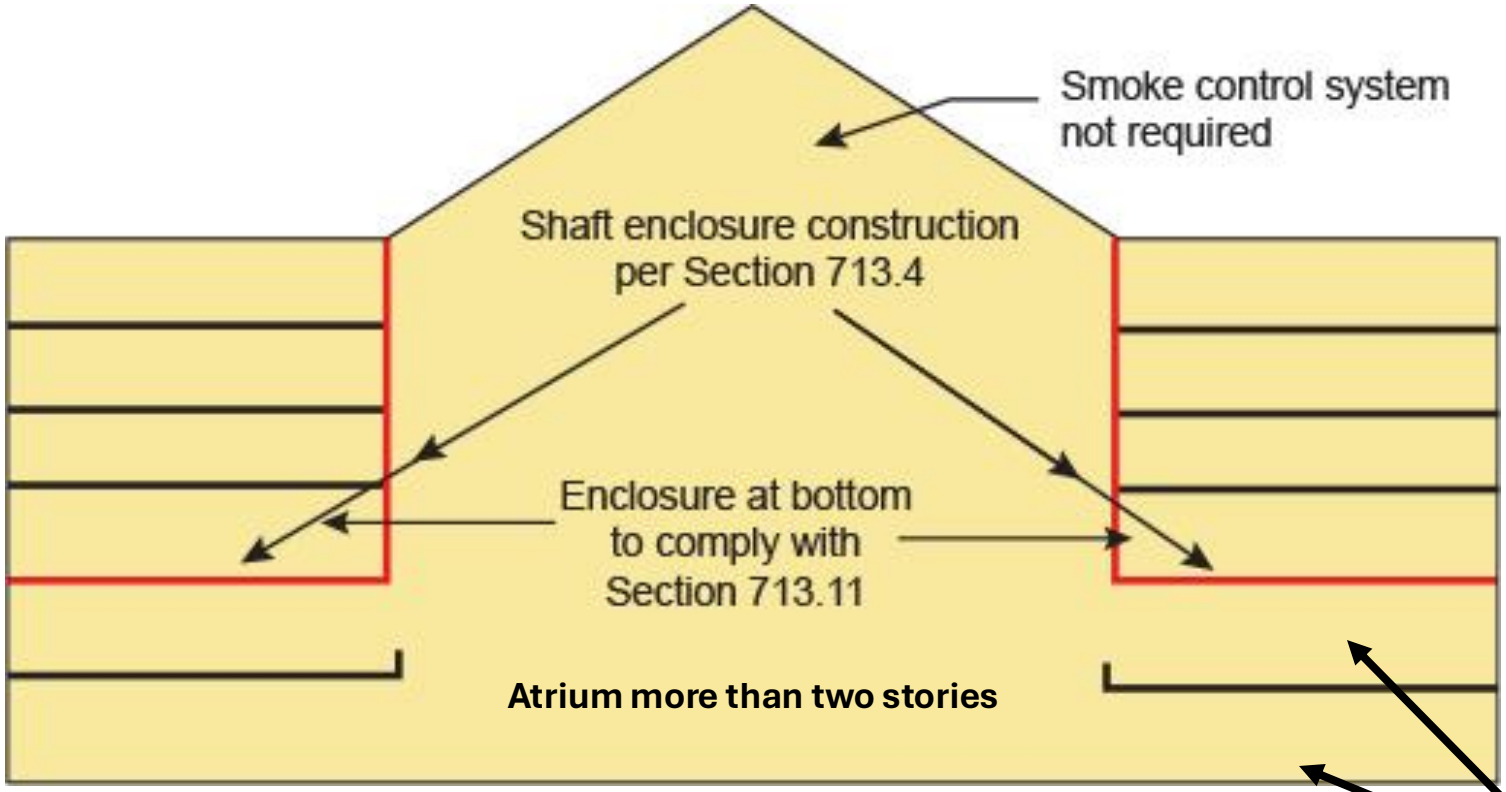
1. In other than Group I-2, and Group I-1, Condition 2, smoke control is not required for atriums that connect only two stories.

2. A smoke control system is not required for atriums connecting more than two stories when all of the following are met:

- 2.1. Only the two lowest stories shall be permitted to be open to the atrium.
- 2.2. All stories above the lowest two stories shall be separated from the atrium in accordance with the provisions for a shaft in Section 713.4.

# 404.5 Smoke Control in Atriums

Section 404.5 Smoke Control Exception #2




**713.4 – Fire resistance rating for shaft**
**713.11 – Enclosure at the bottom**

**Two LOWEST stories are permitted to be open to the Atrium**

# 404.6 Enclosure of Atriums

**404.6 Enclosure of atriums.**

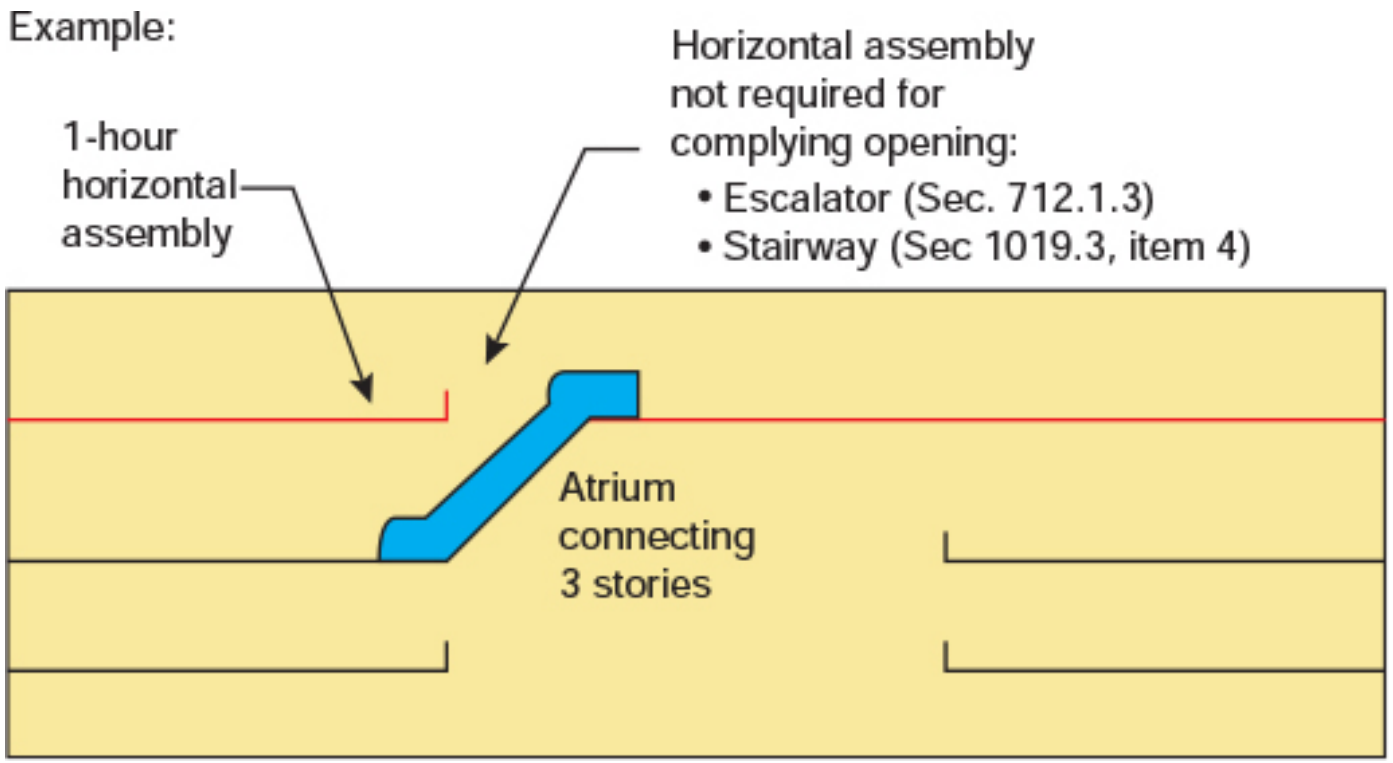
**Exceptions:**

5. A horizontal assembly is not required between the atrium and openings for escalators complying with Section 712.1.3.

6. A horizontal assembly is not required between the atrium and openings for exit access stairways and ramps complying with Item 4 of Section 1019.3.

# 404.6 Enclosure of Atriums

404.6 Enclosure of atriums. Exceptions: 5 & 6




**712.1.3 Escalator openings**

- **Building is fully sprinklered, and**
- **Limited opening size with draft curtain and closely spaced sprinkler, or**
- **approved shutters**

**1019.3 item #4 Exit access stairways**

- **Building is fully sprinklered, and**
- **Limited opening size with draft curtain and closely spaced sprinkler**

# 406.1 Motor Vehicle- Related Occupancies

**406.1 General.** All motor-vehicle-related occupancies shall comply with Section 406.2. Private garages and carports shall also comply with Section 406.3. Open public parking garages shall also comply with Sections 406.4 and 406.5. Enclosed public parking garages shall also comply with Sections 406.4 and 406.6. Motor fuel-dispensing facilities shall also comply with Section 406.7. Repair garages shall also comply with Section 406.8.

Section 406.2 applicable to all motor-vehicle-related occupancies.

- Automatic garage door openers and vehicular gates
- Clear height of vehicle and pedestrian traffic areas
- Accessible parking spaces
- Floor surfaces
- Sleeping rooms
- Fuel dispensing
- Electric vehicle charging stations
- Mixed occupancies and separation
- Equipment and appliances
- Elevation of ignition sources

# 411.5 Puzzle Rooms

**411.5 Puzzle room exiting.** Puzzle room exiting shall comply with one of the following:

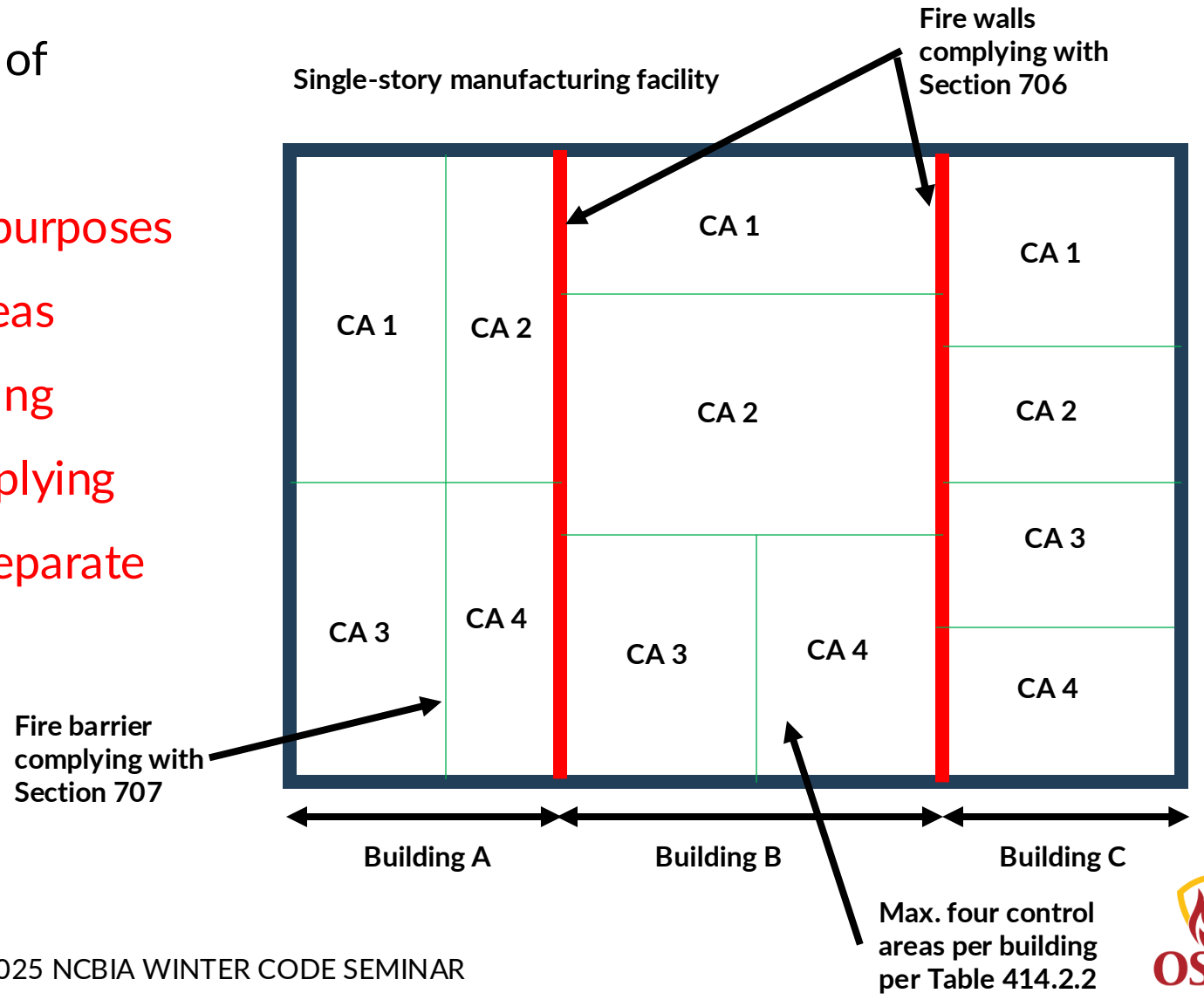
1. Exiting in accordance with Chapter 10.

2. An alternative design approved by the building official.

3. Exits shall be open and readily available upon activation by the automatic fire alarm system, automatic sprinkler system, and a manual control at a constantly attended location.

# 414.2.3 Fire Wall Use for Control Areas

**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.



# 424 Play Structures

424.1 General. Play structures installed inside all occupancies covered by this code that exceed 10 feet (3048 mm) in height or 150 square feet (14 m2) in area shall comply with Sections 424.2 through 424.5.

424.5 Area limits. Play structures shall be not greater than 600 square feet (56 m2) in area, unless a special investigation, acceptable to the building official, has demonstrated adequate fire safety.

424.5.1 Design. Play structures exceeding 600 square feet (56 m2) in area or 10 feet (3048 mm) in height shall be designed in accordance with Chapter 16.

# 427 Medical Gas Systems

**427.1 General.** Medical gases at health care related facilities intended for patient or veterinary care shall comply with Sections 427.2 through 427.2.3 in addition to requirements of Chapter 53 of the International Fire Code.

**427.2 Interior supply location.**

**427.2.1 One-hour exterior room.**

**427.2.2 One-hour interior room.**

**427.2.3 Gas cabinets.**

# 428 Higher Education Laboratories

**HIGHER EDUCATION LABORATORY**. Laboratories in Group B occupancies used for educational purposes above the 12th grade. Storage, use and handling of chemicals in such laboratories shall be limited to purposes related to testing, analysis, teaching, research or developmental activities on a nonproduction basis.

Chapter 38 in Fire Code

# 503.1.4 Occupied Roof Allowances

**503.1.4 Occupied roofs.** A roof level or portion thereof shall be permitted to be used as an occupied roof provided the occupancy of the roof is an occupancy that is permitted by Table 504.4 for the story immediately below the roof. The area of the occupied roofs shall not be included in the building area as regulated by Section 506. An occupied roof shall not be included in the building height or number of stories as regulated by Section 504, provided that the penthouses and other enclosed rooftop structures comply with Section 1511.

# 503.1.4 Occupied Roof Allowances

**503.1.4 Occupied roofs.**

**Exceptions:**

1. The occupancy located on an occupied roof shall not be limited to the occupancies allowed on the story immediately below the roof where the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 and occupant notification in accordance with Sections 907.5.2.1 and 907.5.2.3 is provided in the area of the occupied roof. Emergency voice/alarm communication system notification per Section 907.5.2.2 shall also be provided in the area of the occupied roof where such system is required elsewhere in the building.

# 503.1.4 Occupied Roof Allowances

Example:
If building of Type VA construction,
Group B: 4 stories max. (S)
Group A-3: 3 stories max. (S)

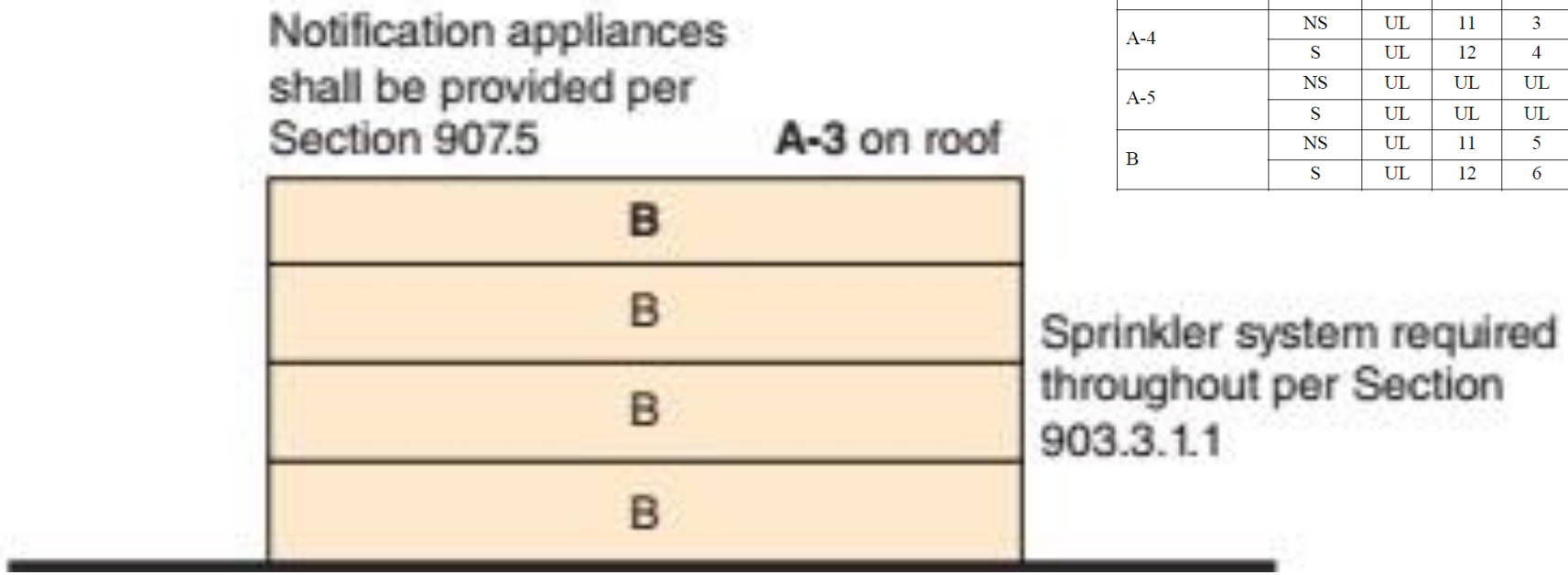



TABLE 504.4
ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE[a, b]

| OCCUPANCY CLASSIFICATION | See Footnotes | TYPE OF CONSTRUCTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Type I | | Type II | | Type III | | Type IV | | | | Type V | |
| | | A | B | A | B | A | B | A | B | C | HT | A | B |
| A-1 | NS | UL | 5 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 |
| | S | UL | 6 | 4 | 3 | 4 | 3 | 9 | 6 | 4 | 4 | 3 | 2 |
| A-2 | NS | UL | 11 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 |
| | S | UL | 12 | 4 | 3 | 4 | 3 | 18 | 12 | 6 | 4 | 3 | 2 |
| A-3 | NS | UL | 11 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 |
| | S | UL | 12 | 4 | 3 | 4 | 3 | 18 | 12 | 6 | 4 | 3 | 2 |
| A-4 | NS | UL | 11 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 |
| | S | UL | 12 | 4 | 3 | 4 | 3 | 18 | 12 | 6 | 4 | 3 | 2 |
| A-5 | NS | UL | UL | UL | UL | UL | UL | 1 | 1 | 1 | UL | UL | UL |
| | S | UL | UL | UL | UL | UL | UL | UL | UL | UL | UL | UL | UL |
| B | NS | UL | 11 | 5 | 3 | 5 | 3 | 5 | 5 | 5 | 5 | 3 | 2 |
| | S | UL | 12 | 6 | 4 | 6 | 4 | 18 | 12 | 9 | 6 | 4 | 3 |

# 503.1.4 Occupied Roof Allowances

**503.1.4 Occupied roofs.**

**Exceptions:**

2. Assembly occupancies shall be permitted on roofs of open parking spaces of Type I or Type II construction, in accordance with the exception to Section 903.2.1.6.

# 503.1.4 Allowable Height and Area of Occupied Roofs

**503.1.4.1 Enclosures over occupied roof areas.** Elements or structures enclosing the occupied roof areas shall not extend more than 48 inches (1220 mm) above the surface of the occupied roof.

**Exception:** Penthouses constructed in accordance with Section 1511.2 and towers, domes, spires and cupolas constructed in accordance with Section 1511.5.

# 503.1.4 Occupied Roof Allowances

Another Story

Another Story

NOT Another Story - Penthouse

# Table 504.3 Allowable Height in Feet

**TABLE 504.3**
**ALLOWABLE BUILDING HEIGHT IN FEET ABOVE GRADE PLANE[a]**

| OCCUPANCY CLASSIFICATION | See Footnotes | TYPE OF CONSTRUCTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Type I | | Type II | | Type III | | Type IV | | | | Type V | |
| | | A | B | A | B | A | B | A | B | C | HT | A | B |
| A, B, E, F, M, S, U[i] | NS[b] | UL | 160 | 65 | 55 | 65 | 55 | 65 | 65 | 65 | 65 | 50 | 40 |
| | S | UL | 180 | 85 | 75 | 85 | 75 | 270 | 180 | 85 | 85 | 70 | 60 |
| H-1, H-2, H-3, H-5 | NS[c, d] | UL | 160 | 65 | 55 | 65 | 55 | 120 | 90 | 65 | 65 | 50 | 40 |
| | S | | | | | | | | | | | | |
| H-4 | NS[c, d] | UL | 160 | 65 | 55 | 65 | 55 | 65 | 65 | 65 | 65 | 50 | 40 |
| | S | UL | 180 | 85 | 75 | 85 | 75 | 140 | 100 | 85 | 85 | 70 | 60 |
| I-1 Condition 1, I-3 | NS[d, e] | UL | 160 | 65 | 55 | 65 | 55 | 65 | 65 | 65 | 65 | 50 | 40 |
| | S | UL | 180 | 85 | 75 | 85 | 75 | 180 | 120 | 85 | 85 | 70 | 60 |
| I-1 Condition 2, I-2 | NS[d, e, f] | UL | 160 | 65 | 55 | 65 | 55 | 65 | 65 | 65 | 65 | 50 | 40 |
| | S | UL | 180 | 85 | | | | | | | | | |
| I-4 | NS[d, g] | UL | 160 | 65 | 55 | 65 | 55 | 65 | 65 | 65 | 65 | 50 | 40 |
| | S | UL | 180 | 85 | 75 | 85 | 75 | 180 | 120 | 85 | 85 | 70 | 60 |
| R[h] | NS[d] | UL | 160 | 65 | 55 | 65 | 55 | 65 | 65 | 65 | 65 | 50 | 40 |
| | S13D | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 50 | 40 |
| | S13R | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| | S | UL | 180 | 85 | 75 | 85 | 75 | 270 | 180 | 85 | 85 | 70 | 60 |

# Table 504.4 Allowable Number of Stories

**TABLE 504.4**
**ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE[a, b]**

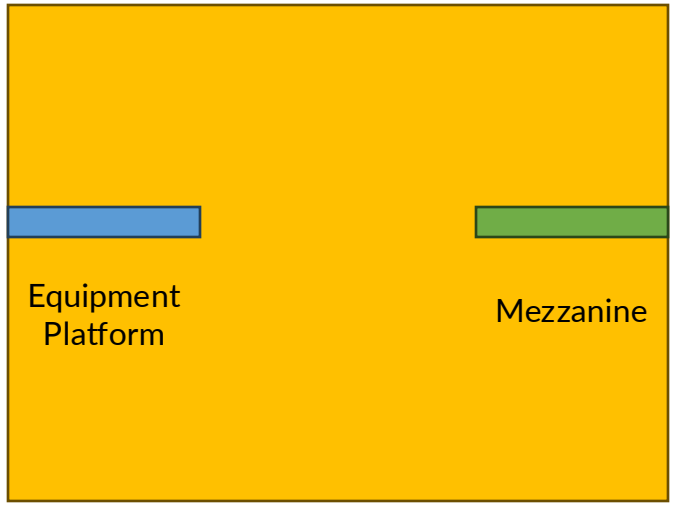
| OCCUPANCY CLASSIFICATION | See Footnotes | TYPE OF CONSTRUCTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Type I | | Type II | | Type III | | Type IV | | | | Type V | |
| | | A | B | A | B | A | B | A | B | C | HT | A | B |
| A-1 | NS | UL | 5 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 |
| | S | UL | 6 | 4 | 3 | 4 | 3 | 9 | 6 | 4 | 4 | 3 | 2 |
| A-2 | NS | UL | 11 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 |
| | S | UL | 12 | 4 | 3 | 4 | 3 | 18 | 12 | 6 | 4 | 3 | 2 |
| A-3 | NS | UL | 11 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 |
| | S | UL | 12 | 4 | 3 | 4 | 3 | 18 | 12 | 6 | 4 | 3 | 2 |
| S-1 | NS | UL | 11 | 4 | 2 | 3 | 2 | 4 | 4 | 4 | 4 | 3 | 1 |
| | S | UL | 12 | 5 | 4 | 4 | 4 | 10 | 7 | 5 | 5 | 4 | 2 |
| S-2 | NS | UL | 11 | 5 | 3 | 4 | 3 | 4 | 4 | 4 | 5 | 4 | 2 |
| | S | UL | 12 | 6 | 4 | 5 | 4 | 12 | 8 | 5 | 6 | 5 | 3 |

# 505.2.1.1 Mezzanine and Equipment Platform Area Limitations

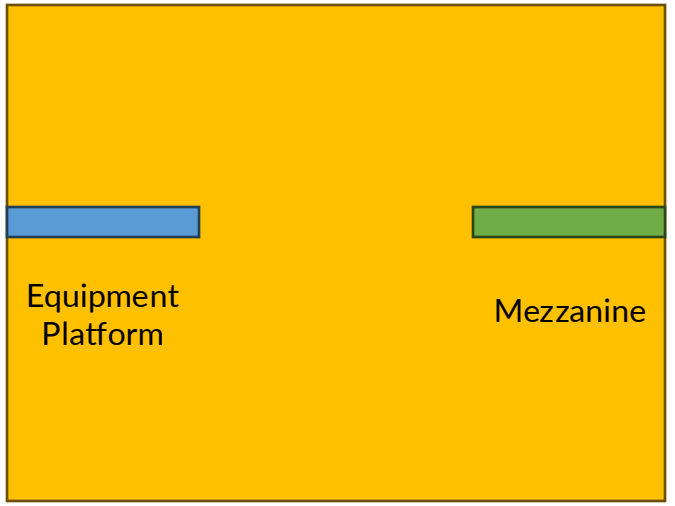
**505.2.1.1 Aggregate area of mezzanines and equipment platforms.** Where a room contains both a mezzanine and an equipment platform, the aggregate area of the two raised floor levels shall be not greater than two-thirds of the floor area of that room or space in which they are located. The area of the mezzanine shall not exceed the area determined in accordance with Section 505.2.1.

**505.3.1 Area limitation.** The aggregate area of all equipment platforms within a room shall be not greater than two-thirds of the area of the room in which they are located. Where an equipment platform is located in the same room as a mezzanine, the area of the mezzanine shall be determined by Section 505.2.1 and the combined aggregate area of the equipment platforms and mezzanines shall be not greater than two-thirds of the room in which they are located. The area of the mezzanine shall not exceed the area determined in accordance with Section 505.2.1.

# 505.2.1.1 Mezzanine and Equipment Platform Area Limitations




2018 NCBC
Say 24,000 sq. ft.
2/3 aggregate area allowed
16,000 sq.ft. allowed
No limitation Mezzanine area




2024 NCBC
Say 24,000 sq ft.
2/3 aggregate area allowed
16,000 sqft allowed
Mezzanine max = 1/3 = 8000 sq.ft.

# Table 506.2 Allowable Building Area

**TABLE 506.2**
**ALLOWABLE AREA FACTOR ($A_t$ = NS, S1, S13R, S13D or SM, as applicable) IN SQUARE FEET[a, b]**

| OCCUPANCY CLASSIFICATION | SEE FOOTNOTES | TYPE OF CONSTRUCTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Type I | | Type II | | Type III | | Type IV | | | | Type V | |
| | | A | B | A | B | A | B | A | B | C | HT | A | B |
| A-1 | NS | UL | UL | 15,500 | 8,500 | 14,000 | 8,500 | 45,000 | 30,000 | 18,750 | 15,000 | 11,500 | 5,500 |
| | S1 | UL | UL | 62,000 | 34,000 | 56,000 | 34,000 | 180,000 | 120,000 | 75,000 | 60,000 | 46,000 | 22,000 |
| | SM | UL | UL | 46,500 | 25,500 | 42,000 | 25,500 | 135,000 | 90,000 | 56,250 | 45,000 | 34,500 | 16,500 |
| A-2 | NS | UL | UL | 15,500 | 9,500 | 14,000 | 9,500 | 45,000 | 30,000 | 18,750 | 15,000 | 11,500 | 6,000 |
| | S1 | UL | UL | 62,000 | 38,000 | 56,000 | 38,000 | 180,000 | 120,000 | 75,000 | 60,000 | 46,000 | 24,000 |
| | SM | UL | UL | 46,500 | 28,500 | 42,000 | 28,500 | 135,000 | 90,000 | 56,250 | 45,000 | 34,500 | 18,000 |
| A-3 | NS | UL | UL | 15,500 | 9,500 | 14,000 | 9,500 | 45,000 | 30,000 | 18,750 | 15,000 | 11,500 | 6,000 |
| | S1 | UL | UL | 62,000 | 38,000 | 56,000 | 38,000 | 180,000 | 120,000 | 75,000 | 60,000 | 46,000 | 24,000 |
| | SM | UL | UL | 46,500 | 28,500 | 42,000 | 28,500 | 135,000 | 90,000 | 56,250 | 45,000 | 34,500 | 18,000 |

# Table 506.2, Note I Allowable Area of Type VB Greenhouses

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| U | NS[i] | UL | 35,500 | 19,000 | 8,500 | 14,000 | 8,500 | 54,000 | 36,000 | 22,500 | 18,000 | 9,000 | 5,500 |
| | S1 | UL | 142,000 | 76,000 | 34,000 | 56,000 | 34,000 | 216,000 | 144,000 | 90,000 | 72,000 | 36,000 | 22,000 |
| | SM | UL | 106,500 | 57,000 | 25,500 | 42,000 | 25,500 | 162,000 | 108,000 | 67,500 | 54,000 | 27,000 | 16,500 |

i. The maximum allowable area for a single-story nonsprinklered Group U greenhouse is permitted to be 9,000 square feet, or the allowable area shall be permitted to comply with Table C102.1 of Appendix C.

# 506.3.2 Allowable Area Frontage Increase

506.3.3 Amount of increase. The area factor increase based on frontage shall be determined in accordance with ~~Equation 5-5:~~Table 506.3.3.

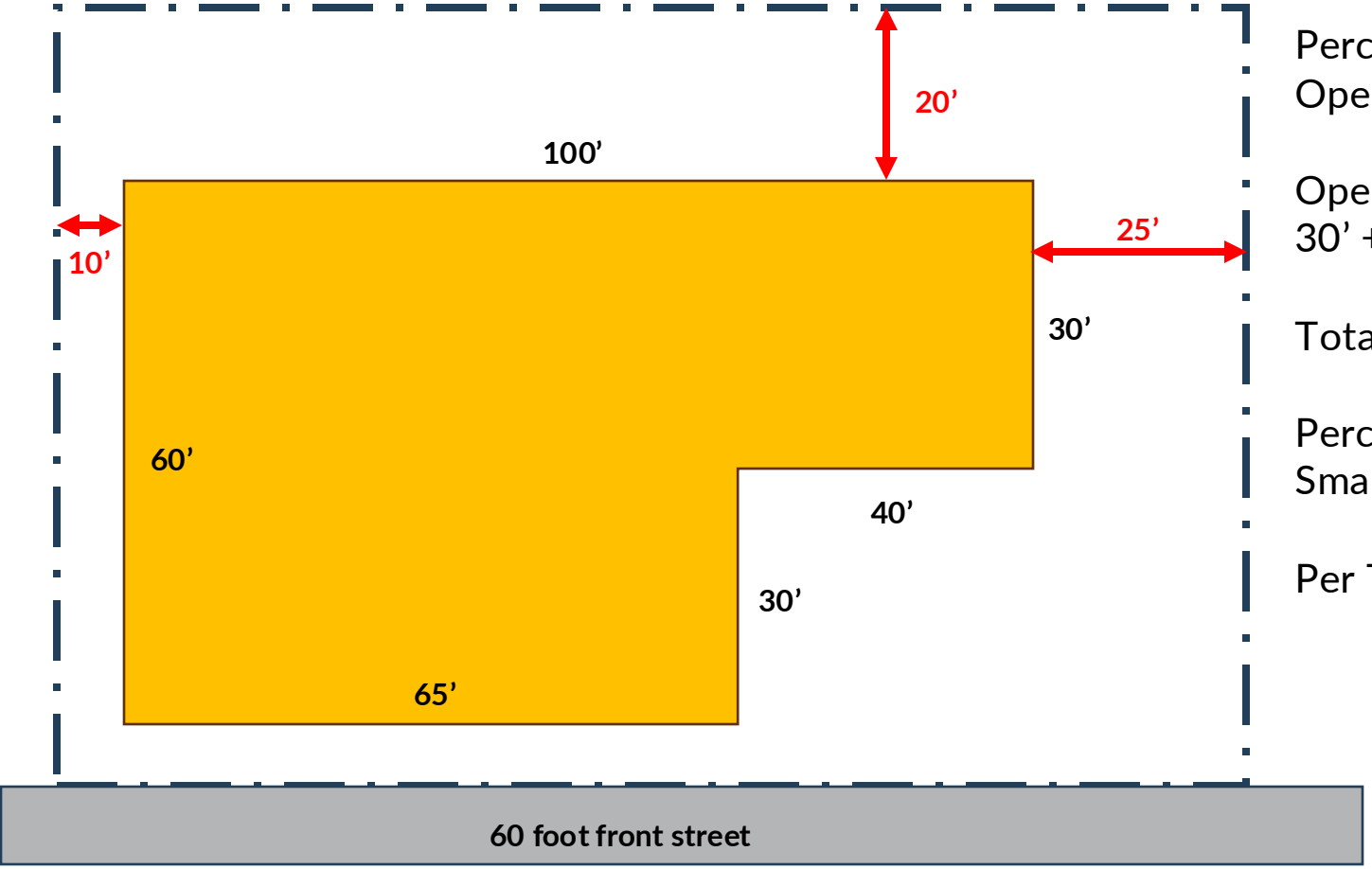
~~$I_f = [F/P - 0.25]W/30$ (Equation 5-5)~~

The frontage increase shall be based on the smallest public way or open space that is 20 feet (6096 mm) or greater, and the percentage of building perimeter having a minimum 20 feet (6096 mm) public way or open space.

**TABLE 506.3.3**
**FRONTAGE INCREASE FACTOR**

| 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 |

# 506.3.2 Allowable Area Frontage Increase




Percentage of Perimeter =
Open space that is 20 feet or greater / Total Perimeter

Open space that is 20 feet or great = ( 100’ + 30’ + 40 ‘ + 30’ + 65’) = 265’

Total Perimeter = 325’

Percentage of Perimeter = 265’/325’ = 81.5%
Smallest Open space of 20 feet or more = 20 feet

Per Table 506.3.3 = Frontage Increase Factor = 0.5

# 508.4.1, Table 508.4 Separated Occupancies vs. Fire Area Separations

**508.4.1 Occupancy classification**. Separated occupancies shall be individually classified in accordance with Section 302.1. Each separated space shall comply with this code based on the occupancy classification of that portion of the building. The most restrictive provisions of Chapter 9 that apply to the separate occupancies shall apply to the total nonfire-barrier-separated occupancy areas. Occupancy separations that serve to define fire area limits established in Chapter 9 for requiring a fire protection system shall also comply with Section 901.7.

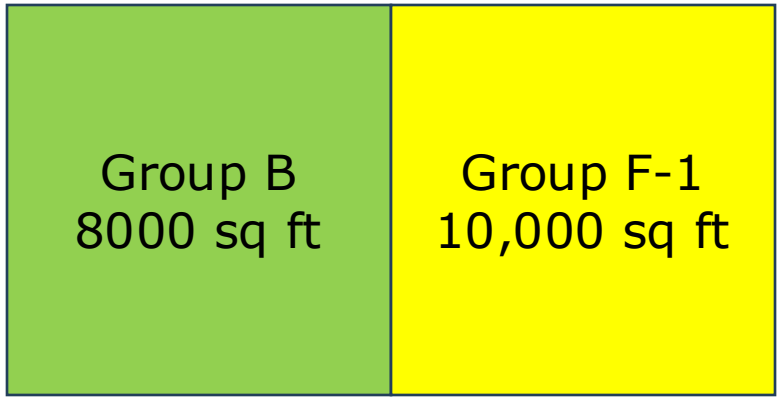
# Table 508.4 Separated Occupancies

**TABLE 508.4**
**REQUIRED SEPARATION OF OCCUPANCIES (HOURS)[f]**

| OCCUPANCY | A, E | | I-1[a], I-3, I-4 | | I-2 | | R[a] | | F-2, S-2[b], U | | B[e], F-1, M,S-1 | | H-1 | | H-2 | | H-3, H-4 | | H-5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | S | NS | S | NS | S | NS | S | NS | S | NS | S | NS | S | NS | S | NS | S | NS | S | NS |
| A, E | N | N | 1 | 2 | 2 | NP | 1 | 2 | N | 1 | 1 | 2 | NP | NP | 3 | 4 | 2 | 3 | 2 | NP |
| I-1[a], I-3, I-4 | 1 | 2 | N | N | 2 | NP | 1 | NP | 1 | 2 | 1 | 2 | NP | NP | 3 | NP | 2 | NP | 2 | NP |
| I-2 | 2 | NP | 2 | NP | N | N | 2 | NP | 2 | NP | 2 | NP | NP | NP | 3 | NP | 2 | NP | 2 | NP |
| R[a] | 1 | 2 | 1 | NP | 2 | NP | N | N | 1[c] | 2[c] | 1 | 2 | NP | NP | 3 | NP | 2 | NP | 2 | NP |
| F-2, S-2[b], U | N | 1 | 1 | 2 | 2 | NP | 1[c] | 2[c] | N | N | 1 | 2 | NP | NP | 3 | 4 | 2 | 3 | 2 | NP |
| B[e], F-1, M, S-1 | 1 | 2 | 1 | 2 | 2 | NP | 1 | 2 | 1 | 2 | N | N | NP | NP | 2 | 3 | 1 | 2 | 1 | NP |
| H-1 | NP | NP | NP | NP | NP | NP | NP | NP | NP | NP | NP | NP | N | NP | NP | NP | NP | NP | NP | NP |
| H-2 | 3 | 4 | 3 | NP | 3 | NP | 3 | NP | 3 | 4 | 2 | 3 | NP | NP | N | NP | 1 | NP | 1 | NP |
| H-3, H-4 | 2 | 3 | 2 | NP | 2 | NP | 2 | NP | 2 | 3 | 1 | 2 | NP | NP | 1 | NP | 1[d] | NP | 1 | NP |
| H-5 | 2 | NP | 2 | NP | 2 | NP | 2 | NP | 2 | NP | 1 | NP | NP | NP | 1 | NP | 1 | NP | N | NP |

S = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1.
NS = Buildings not equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1.
N = No separation requirement.
NP = Not Permitted.

# Table 508.4 Separated Occupancies




Per Table 508.4 Separation is not required between Group B and Group F-1

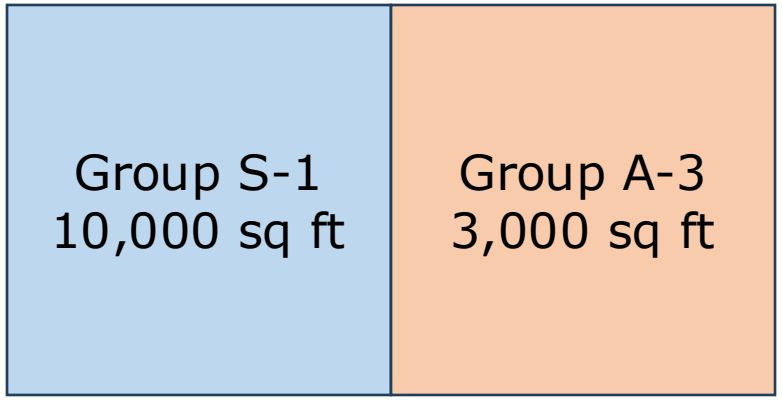
To exempt an automatic sprinkler system, a separation is required between occupancies to limit the Group F-1 fire area from exceeding 12,000 square feet. (18,000 sq.ft. > 12,000 sq.ft.)

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

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

Per Table 707.3.10, a minimum 3-hour fire-resistance-rated fire barrier is required to exempt the sprinkler system.

# Table 508.4 Separated Occupancies




Per Table 508.4, 2 hours separation is required between Group S-1 and Group A-3

To exempt an automatic sprinkler system, a separation is required between occupancies to limit the Group S-1 or A-3 fire area from exceeding 12,000 square feet. (13,000 sq.ft. > 12,000 sq.ft.)

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

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

Per Table 707.3.10, a minimum 3-hour fire-resistance-rated fire barrier is required to exempt the sprinkler system.

# 508.5 Live/Work Units

**508.5 Live/work units.** A live/work unit shall comply with Sections 508.5 through 508.5.11.

Relocated from the special use provisions of Chapter 4 to the mixed occupancy provisions of Section 508, with no change to the technical requirements.

# Table 509.1 Storage Battery Systems as Incidental Uses

**TABLE 509.1**

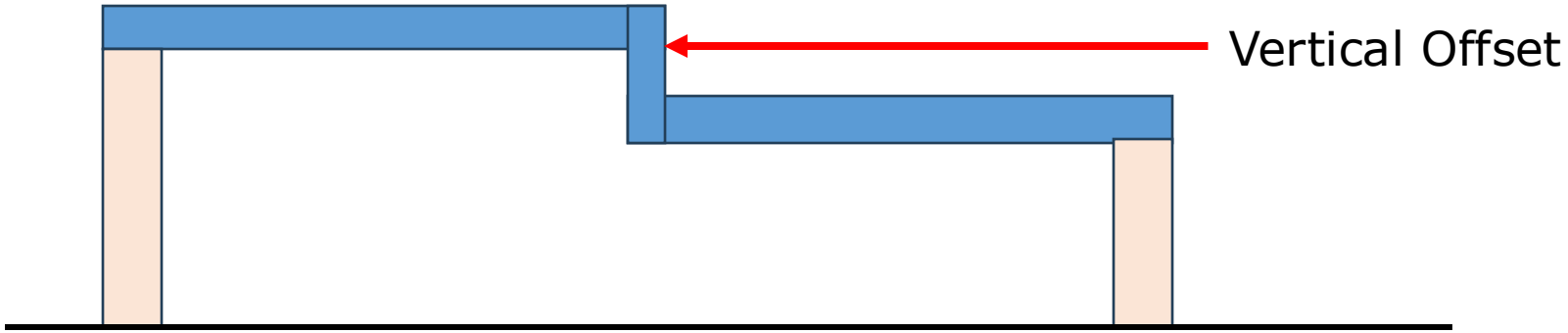
| | |
|---|---|
| Electrical installations and transformers | See Sections 110.26 through 110.34 and Sections 450.8 through 450.48 of NFPA 70 for protection and separation requirements. |

# 510.2 Vertical Offset in Podium Buildings

**510.2 Horizontal building separation allowance.**

1. The buildings are separated with a horizontal assembly having a fire-resistance rating of not less than 3 hours. Where vertical offsets are provided as part of a horizontal assembly, the vertical offset and the structure supporting the vertical offset shall have a fire-resistance rating of not less than 3 hours.

2. The building below, including the horizontal assembly is of Type IA construction.



# 510.2 Stairway Construction in Podium Buildings

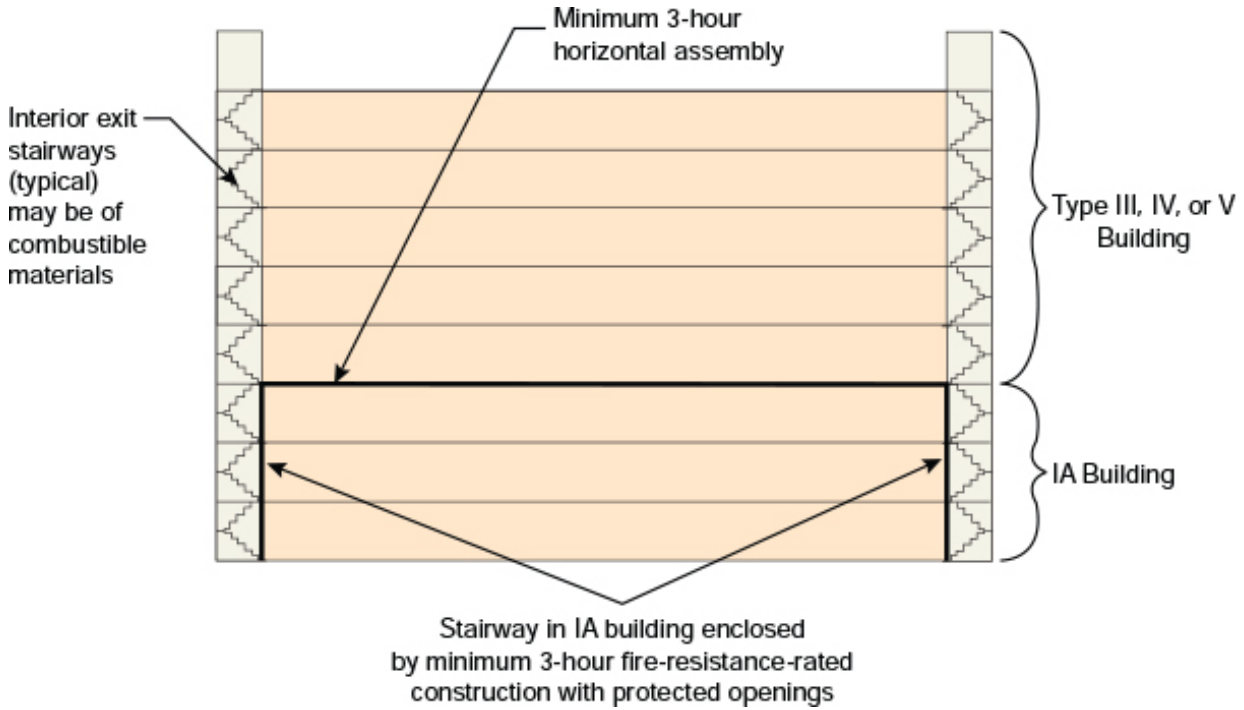
**510.2 Horizontal building separation allowance.**

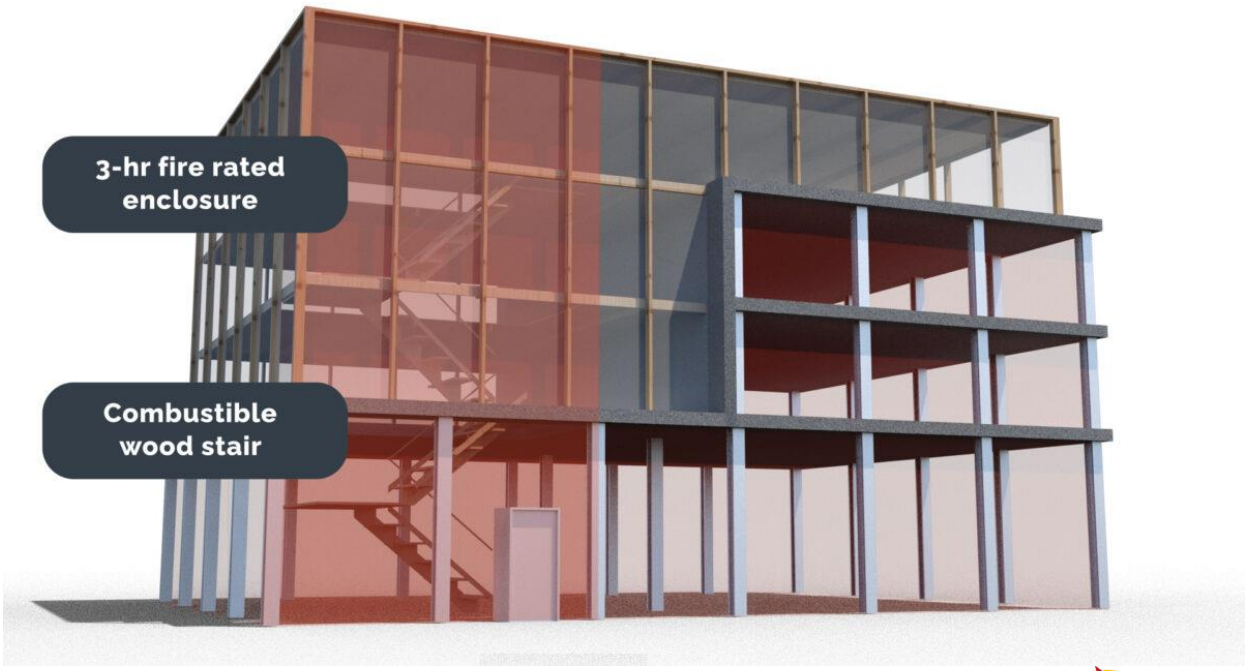
4. Interior exit stairways located within the Type IA building are permitted to be of combustible materials where the following requirements are met:

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.


# 510.2 Stairway Construction in Podium Buildings



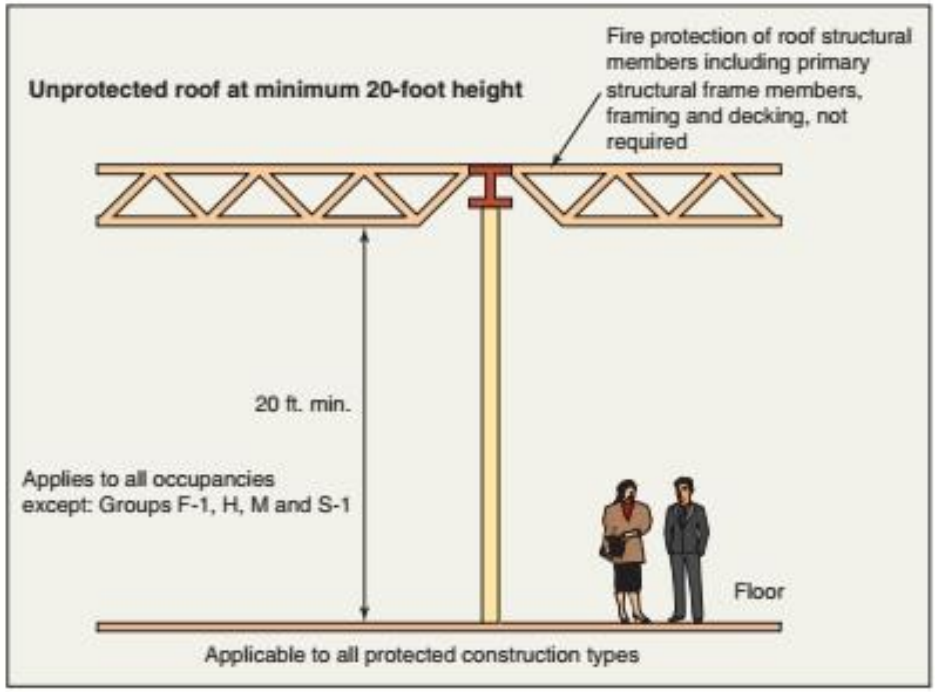
# Table 601 Fire- Resistance Rating

**TABLE 601**
**FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HOURS)**

| BUILDING ELEMENT | TYPE I | | TYPE II | | TYPE III | | TYPE IV | | | | TYPE V | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | A | B | A | B | A | B | C | HT | A[h] | B |
| Primary structural frame[f] (see Section 202) | 3[a, b] | 2[a, b, c] | 1[b, c] | 0[c] | 1[b, c] | 0 | 3[a] | 2[a] | 2[a] | HT | 1[b, c] | 0 |
| Bearing walls | | | | | | | | | | | | |
| Exterior[e, f] | 3 | 2 | 1 | 0 | 2 | 2 | 3 | 2 | 2 | 2 | 1 | 0 |
| Interior | 3[a] | 2[a] | 1 | 0 | 1 | 0 | 3 | 2 | 2 | 1/HT[g] | 1 | 0 |
| Nonbearing walls and partitions Exterior | See Table 705.5 | | | | | | | | | | | |
| Nonbearing walls and partitions Interior[d] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | See Section 2304.11.2 | 0 | 0 |
| Floor construction and associated secondary structural members (see Section 202) | 2 | 2 | 1 | 0 | 1 | 0 | 2 | 2 | 2 | HT | 1 | 0 |
| Roof construction and associated secondary structural members (see Section 202) | $1\frac{1}{2}$[b] | 1[b,c] | 1[b,c] | 0[c] | 1[b,c] | 0 | $1\frac{1}{2}$ | 1 | 1 | HT | 1[b,c] | 0 |

# Table 601, Note b Fire Protection of Structural Roof Members

b. Except in Group F-1, H, M and S-1 occupancies, fire protection of structural members in roof construction shall not be required, including protection of primary structural frame members, roof framing and decking where every part of the roof construction is 20 feet or more above any floor immediately below. Fire-retardant-treated wood members shall be allowed to be used for such unprotected members.



# 602.3, 602.4.1 FRT Wood Sheathing in Exterior Wall Assemblies

**602.3 Type III.** Type III construction is that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of any material permitted by this code. Fire-retardant-treated wood framing and sheathing complying with Section 2303.2 shall be permitted within exterior wall assemblies of a 2-hour rating or less.

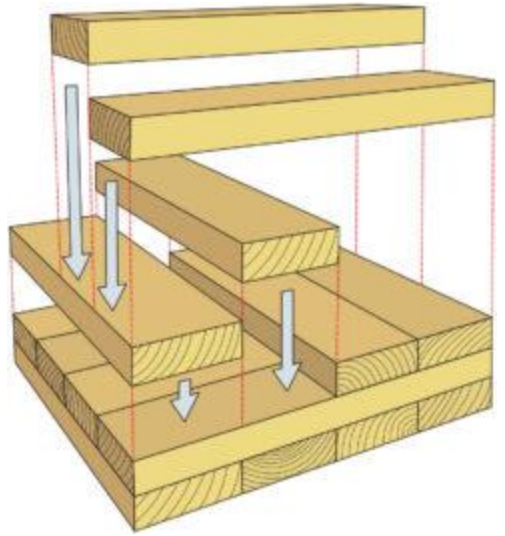
**602.4.4.1 Fire-retardant-treated wood in exterior walls.** Fire-retardant-treated wood framing and sheathing complying with Section 2303.2 shall be permitted within exterior wall assemblies with a 2-hour rating or less.

# 202 Definition of Mass Timber

**MASS TIMBER.** Structural elements of Type IV construction primarily of solid, built-up, panelized or engineered wood products that meet minimum cross-section dimensions of Type IV construction.

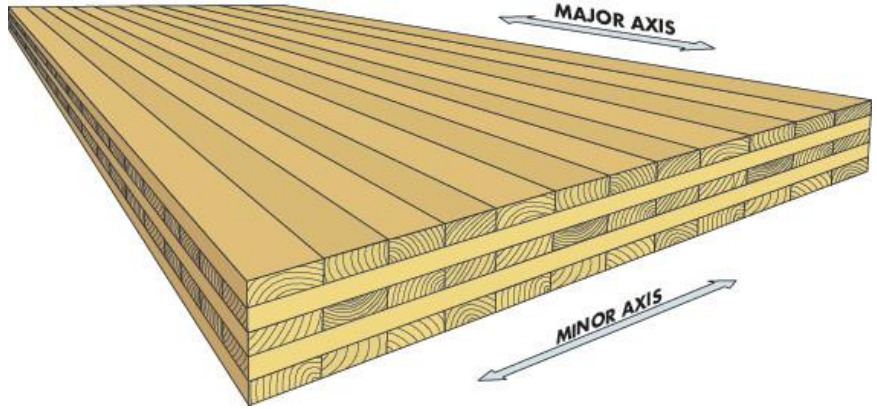
# 602.4 Mass Timber

The mass timber family of products includes cross-laminated timber (CLT), nail-laminated timber (NLT), dowel-laminated timber (DLT), glue-laminated timber (glulam or GLT), and some types of structural composite lumber (SCL).



**Cross-Laminated Timber (CLT)**

CLT consists of layers—typically three, five or seven plies—of solid sawn lumber or structural composite lumber (SCL), oriented at right angles to one another and glued to form structural panels. CLT can be used for floors, roofs, and walls.



# 602.4 Mass Timber

## Cross-Laminated Timber (CLT)

# 602.4 Mass Timber

**Glue-Laminated Timber (Glulam or GLT)**

Structural glue-laminated timber is referred to as glulam when used for framing (e.g., columns and beams), and GLT when used in plank applications (e.g., decking). It is created by combining solid sawn lumber members (typically 2x), layered parallel on their wide faces, with adhesive between layers.

# 602.4 Mass Timber

**Structural Composite Lumber (SCL)**

SCL is a family of engineered wood products created by layering dried and graded wood veneers or strands with moisture-resistant adhesive into blocks of material known as billets, which are subsequently re-sawn to specified sizes. In SCL billets, the grain of each layer of veneer or strands runs primarily in the same direction. SCL is sawn to consistent sizes and exhibits highly predictable physical and mechanical properties.


# 602.4.1– 602.4.3 Type IV-A, IV-B and IV-C Buildings

2021 International Building Code (IBC) introduced three new construction types for mass timber buildings: Types IV-A, IV-B, and IV-C. The existing heavy timber type (Type IV-HT) remains unchanged.

Mass timber building elements, used in the new types of construction, must meet the heavy timber dimensions assigned in the code.

Mass timber elements shall have a fire-resistance rating (per Table 601 and 705.5), with 80 mins of the rating coming from noncombustible protection.

In Types IV-A and IV-B, floors must have a minimum of 1 inch of noncombustible material above the mass timber.

Exterior mass timber walls must have at least one layer of 5/8 inch Type X gypsum board on the outside, and everything outboard of the mass timber is required to be non-combustible..

# 602.4.1– 602.4.3 Type IV-A, IV-B and IV-C Buildings

**Section 602.4.1, Type IV-A.**

- All mass timber elements are completely protected (encapsulated in drywall) to provide the required fire resistance rating.
- Concealed spaces, shafts, etc., required to be fully protected.
- Maximum proposed potential – 18 story Residential / 18 story Business

# 602.4.1– 602.4.3 Type IV-A, IV-B and IV-C Buildings

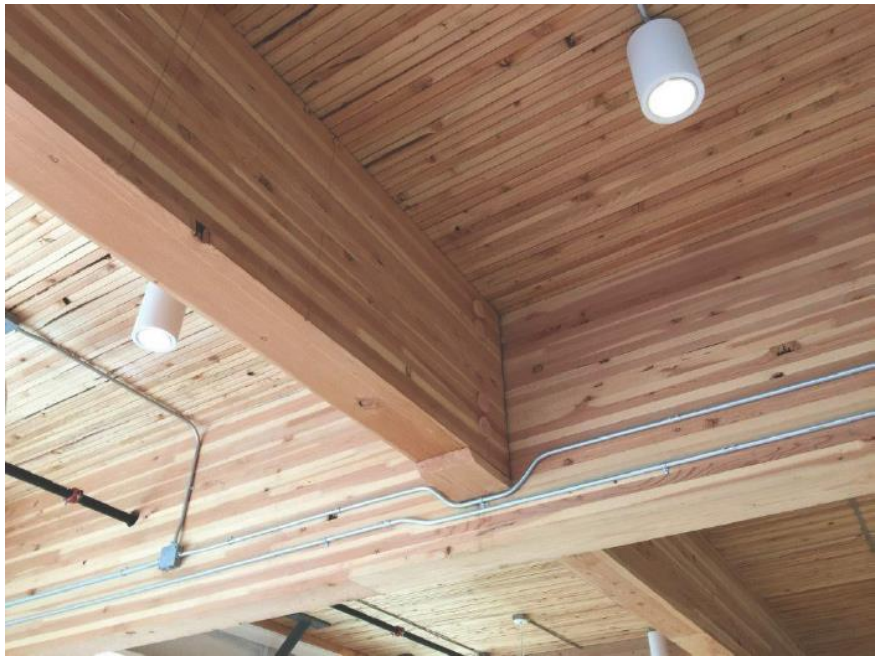
**Section 602.4.2, Type IV-B.**

- Allows exposed wood surfaces not to exceed 40% of the wall area.
- Exposed areas must be separated by a minimum of 15 feet.
- Concealed spaces, shafts and certain other spaces are still required to be fully protected by non-combustible materials.
- Maximum proposed potential – 12 story Residential / 12 story Business

# 602.4.1– 602.4.3 Type IV-A, IV-B and IV-C Buildings

**Section 602.4.3, Type IV-C.**

- Exposed wood surfaces permitted to be similar to HT construction. (No requirement for noncombustible protection except certain features)
- Concealed spaces, shafts, etc., still required to be fully protected.
- Maximum proposed potential – 8 story Residential / 9 story Business



# 602.4.4 Type IV-HT Buildings

**Section 602.4.4, Type IV-HT.** This is the same as the current Type IV construction with no fundamental changes. Maximum potential – 5 story Residential / 6 story Business. Concealed spaces shall be protected in accordance with one or more of the following:

1. The building shall be sprinklered throughout in accordance with Section 903.3.1.1 and automatic sprinklers shall also be provided in the concealed space.

2. The concealed space shall be completely filled with noncombustible insulation.

3. Surfaces within the concealed space shall be fully sheathed with not less than 5/8-inch Type X gypsum board.

If concealed spaces are within any interior walls/partitions that possess a 1-hour or greater fire-resistance rating, no additional protection is required.

# 703.6, 703.7 Noncombustible Protection for Mass Timber

**NONCOMBUSTIBLE PROTECTION** (FOR MASS TIMBER). Noncombustible material, in accordance with Section 703.6, designed to increase the fire-resistance rating and delay the combustion of mass timber.

# 703.6, 703.7 Noncombustible Protection for Mass Timber

**703.6 Determination of noncombustible protection time contribution.** The time, in minutes, contributed to the fire-resistance rating by the noncombustible protection of mass timber building elements, components, or assemblies, shall be established through a comparison of assemblies tested using procedures set forth in ASTM E119 or UL 263. The test assemblies shall be identical in construction, loading and materials, other than the noncombustible protection. The two test assemblies shall be tested to the same criteria of structural failure with the following conditions:

1. Test Assembly 1 shall be without protection.

# 703.6, 703.7 Noncombustible Protection for Mass Timber

**703.6 Determination of noncombustible protection time contribution.**

2. Test Assembly 2 shall include the representative noncombustible protection. The protection shall be fully defined in terms of configuration details, attachment details, joint sealing details, accessories and all other relevant details.

The noncombustible protection time contribution shall be determined by subtracting the fire-resistance time, in minutes, of Test Assembly 1 from the fire-resistance time, in minutes, of Test Assembly 2.

.

# 722.7 Fire-Resistance Rating of Mass Timber

**TABLE 722.7.1(1)**
**PROTECTION REQUIRED FROM NONCOMBUSTIBLE COVERING MATERIAL**

| REQUIRED FIRE-RESISTANCE RATING OF BUILDING ELEMENT PER TABLE 601 AND TABLE 705.5 (hours) | MINIMUM PROTECTION REQUIRED FROM NONCOMBUSTIBLE PROTECTION (minutes) |
|---|---|
| 1 | 40 |
| 2 | 80 |
| 3 or more | 120 |

**TABLE 722.7.1(2)**
**PROTECTION PROVIDED BY NONCOMBUSTIBLE COVERING MATERIAL**

| NONCOMBUSTIBLE PROTECTION | PROTECTION CONTRIBUTION (minutes) |
|---|---|
| $^{1}/_{2}$-inch Type X gypsum board | 25 |
| $^{5}/_{8}$-inch Type X gypsum board | 40 |

# 703.6, 703.7 Noncombustible Protection for Mass Timber

**703.7 Sealing of adjacent mass timber elements.** In buildings of Types IV-A, IV-B and IV-C construction, sealant or adhesive shall be provided to resist the passage of air in the following locations:

1. At abutting edges and intersections of mass timber building elements required to be fire-resistance rated.

2. At abutting intersections of mass timber building elements and building elements of other materials where both are required to be fire-resistance rated.

# 722.7 Fire-Resistance Rating of Mass Timber

**722.7 Fire-resistance rating for mass timber.** The required fire resistance of mass timber elements in Section 602.4 shall be determined in accordance with Section 703.2. The fire-resistance rating of building elements shall be as required in Tables 601 and 705.5 and as specified elsewhere in this code. The fire-resistance rating of the mass timber elements shall consist of the fire resistance of the unprotected element added to the protection time of the noncombustible protection.

**Unprotected Mass Timber**

+

**Noncombustible Protection**

=

**Fire-Resistance Rating of Mass Timber**

# 722.7 Fire-Resistance Rating of Mass Timber

**TABLE 722.7.1(1)**
**PROTECTION REQUIRED FROM NONCOMBUSTIBLE COVERING MATERIAL**

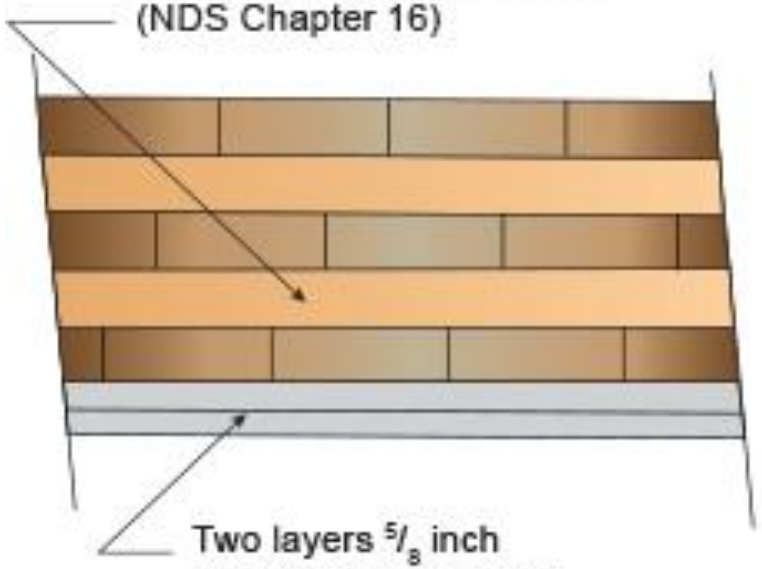
| REQUIRED FIRE-RESISTANCE RATING OF BUILDING ELEMENT PER TABLE 601 AND TABLE 705.5 (hours) | MINIMUM PROTECTION REQUIRED FROM NONCOMBUSTIBLE PROTECTION (minutes) |
|---|---|
| 1 | 40 |
| 2 | 80 |
| 3 or more | 120 |

**TABLE 722.7.1(2)**
**PROTECTION PROVIDED BY NONCOMBUSTIBLE COVERING MATERIAL**

| NONCOMBUSTIBLE PROTECTION | PROTECTION CONTRIBUTION (minutes) |
|---|---|
| $^{1}/_{2}$-inch Type X gypsum board | 25 |
| $^{5}/_{8}$-inch Type X gypsum board | 40 |

# 722.7 Fire-Resistance Rating of Mass Timber

Fire resistance of wood members and decking calculated per 722.1 Item 4 (NDS Chapter 16)



Two layers $^{5}/_{8}$ inch Type X gypsum board

- Each provides 40 min. protection contribution per Table 722.7.1(2)

Example

CLT time = 50 min.

5/8" Type X = 40 min.

5/8" Type X = 40 min.

Total = 130 min.

(Ok for 2-hour rating)

# 508.4.4.1, 509.4.1.1 Fire Separations of Mass Timber

**508.4.4.1 Construction.** Required separations shall be fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 711, or both, so as to completely separate adjacent occupancies. Mass timber elements serving as fire barriers or horizontal assemblies to separate occupancies in Type IV-B or IV-C construction shall be separated from the interior of the building with an approved thermal barrier consisting of gypsum board that is not less than 1/2 inch (12.7 mm) in thickness or a material that is tested in accordance with and meets the acceptance criteria of both the Temperature Transmission Fire Test and the Integrity Fire Test of NFPA 275.

# 508.4.4.1, 509.4.1.1 Fire Separations of Mass Timber

**509.4.1.1 Type IV-B and IV-C construction.** Where Table 509.1 specifies a fire-resistance-rated separation, mass timber elements serving as fire barriers or horizontal assemblies in Type IV-B or IV-C construction shall be separated from the interior of the incidental use with an approved thermal barrier consisting of gypsum board that is not less than 1/2 inch (12.7 mm) in thickness or a material that is tested in accordance with and meets the acceptance criteria of both the Temperature Transmission Fire Test and the Integrity Fire Test of NFPA 275.

# 602.4.1– 602.4.3 Type IV-A, IV-B and IV-C Buildings

**TABLE 2:** Required Noncombustible Protection on Mass Timber Elements by Construction Type

| | IV-A | IV-B | IV-C | IV-HT |
|---|---|---|---|---|
| Interior Surface of Building Elements | Always required. 2/3 of FRR, 80 minutes minimum | Required with exceptions. 2/3 of FRR, 80 minutes minimum | Not required* | Not required* |
| Exterior Side of Exterior Walls | 40 minutes | 40 minutes | 40 minutes | 15/32" FRT sheathing or 1/2" gypsum board or noncombustible material |
| Top of Floor (Above Mass Timber) | 1" minimum | 1" minimum | Not required* | Not required* |
| Shafts | 2/3 of FRR, 80 minutes minimum, inside and outside | 2/3 of FRR, 80 minutes minimum, inside and outside | 40 minutes minimum, inside and outside | Not required* |

# 602.4.1– 602.4.3 Type IV-A, IV-B and IV-C Buildings

The allowable heights and areas for select occupancies are shown in Table 4.

**TABLE 4:** Select Height and Area Limits by Construction Type

| | | I-A | I-B | IV-A | IV-B | IV-C | IV-HT |
|---|---|---|---|---|---|---|---|
| **Occupancies** | **Value** | **Allowable Building Height above Grade Plane, Feet (IBC Table 504.3)** | | | | | |
| A, B, R | S | Unlimited | 180 | 270 | 180 | 85 | 85 |
| | | **Allowable Number of Stories above Grade Plane (IBC Table 504.4)** | | | | | |
| A-2, A-3, A-4 | S | Unlimited | 12 | 18 | 12 | 6 | 4 |
| B | S | Unlimited | 12 | 18 | 12 | 9 | 6 |
| R-2 | S | Unlimited | 12 | 18 | 12 | 8 | 5 |
| | | **Allowable Area Factor (At), Feet$^2$ (IBC Table 506.2)** | | | | | |
| A-2, A-3, A-4 | SM | Unlimited | Unlimited | 135,000 | 90,000 | 56,250 | 45,000 |
| B | SM | Unlimited | Unlimited | 324,000 | 216,000 | 135,000 | 108,000 |
| R-2 | SM | Unlimited | Unlimited | 184,500 | 123,000 | 76,875 | 61,500 |

*S is sprinklered with NFPA 13 sprinklers. SM is the multi-story allowable area factor. Underlined entries are the new additions.*

# Heavy Timber High Rise Building

**Ascent MKE – Hybrid High-Rise Apartment in** Milwaukee, Wisconsin

# Heavy Timber Building in North Carolina

**Candlewood Suites Hotels – Fort Liberty, NC**

**Type IV-C Building with 6-story, 122,212 square feet**

**MATERIAL TYPES:**

Mass Timber

Cross-Laminated Timber (CLT)

Glue-Laminated Timber (GLT or glulam)

# Table 602

TABLE 705.5

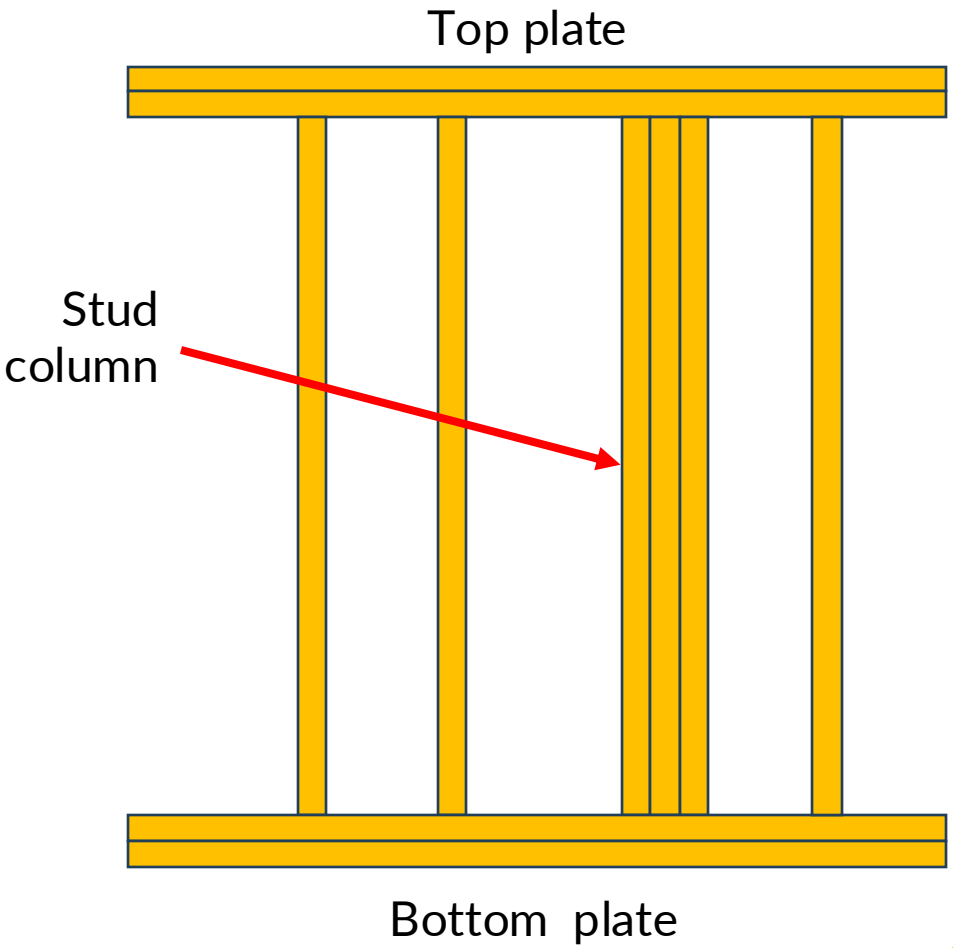
**FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE[a, d, g]**

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

**MOVED to Section 705 – TABLE 705.5**

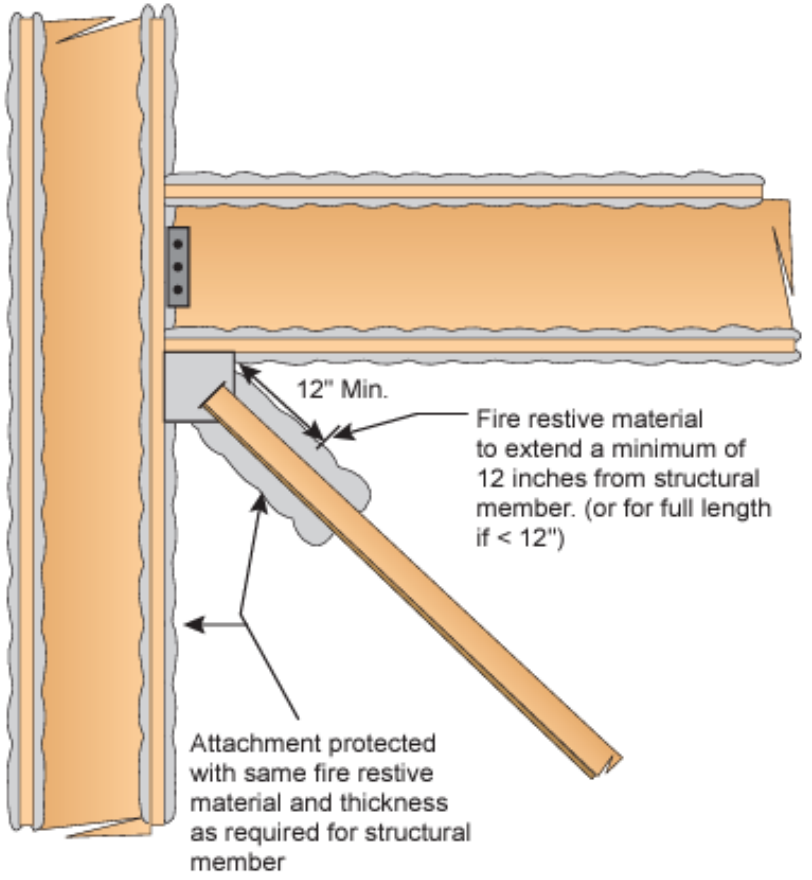
# 704.2, 704.4.1 Column Protection in Light-Frame Construction

**704.4.1 Light-frame construction.** Studs, columns and boundary elements that are integral elements in load-bearing walls of light-frame construction and are located entirely between the top and bottom plates or tracks shall be permitted to have required fire-resistance ratings provided by the membrane protection provided for the load-bearing wall.



# 704.6.1 Secondary Attachments and Fireproofing

**704.6.1 Secondary attachments to structural members.** Where primary and secondary structural steel members require fire protection, secondary steel attachments to those structural members shall be protected with the same fire-resistive material and thickness as required for the structural member. The protection shall extend away from the structural member a distance of not less than 12 inches (305 mm), or shall be applied to the entire length where the attachment is less than 12 inches (305 mm) long. Where an attachment is hollow and the ends are open, the fire-resistive material and thickness shall be applied to both exterior and interior of the hollow steel attachment.



# Table 705.2 Extent of Projections

**TABLE 705.2**
**MINIMUM DISTANCE OF PROJECTION**

| FIRE SEPARATION DISTANCE (FSD) (feet) | MINIMUM DISTANCE FROM LINE USED TO DETERMINE FSD |
|---|---|
| 0 to less than 2 | Projections not permitted |
| 2 to less than 3 | 24 inches |
| 3 to less than 5 | Two-thirds of FSD |
| 5 or greater | 40 inches |

For SI: 1 foot = 304.8 mm; 1 inch = 25.4 mm.

**2024 NCBC**

**TABLE 705.2**
**MINIMUM DISTANCE OF PROJECTION**

| FIRE SEPARATION DISTANCE (FSD) | MINIMUM DISTANCE FROM LINE USED TO DETERMINE FSD |
|---|---|
| 0 feet to 2 feet | Projections not permitted |
| Greater than 2 feet to 3 feet | 24 inches |
| Greater than 3 feet to less than 30 feet | 24 inches plus 8 inches for every foot of FSD beyond 3 feet or fraction thereof |
| 30 feet or greater | 20 feet |

For SI: 1 foot = 304.8 mm; 1 inch = 25.4 mm.

**2018 NCBC**

**TABLE 705.2**
**MINIMUM DISTANCE OF PROJECTION**

| FIRE SEPARATION DISTANCE (FSD) | MINIMUM DISTANCE FROM LINE USED TO DETERMINE FSD |
|---|---|
| 0 feet to less than 2 feet | Projections not permitted |
| 2 feet to less than 5 feet | 24 inches |
| 5 feet or greater | 40 inches |

**2012 NCBC**

# Table 705.2 Extent of Projections

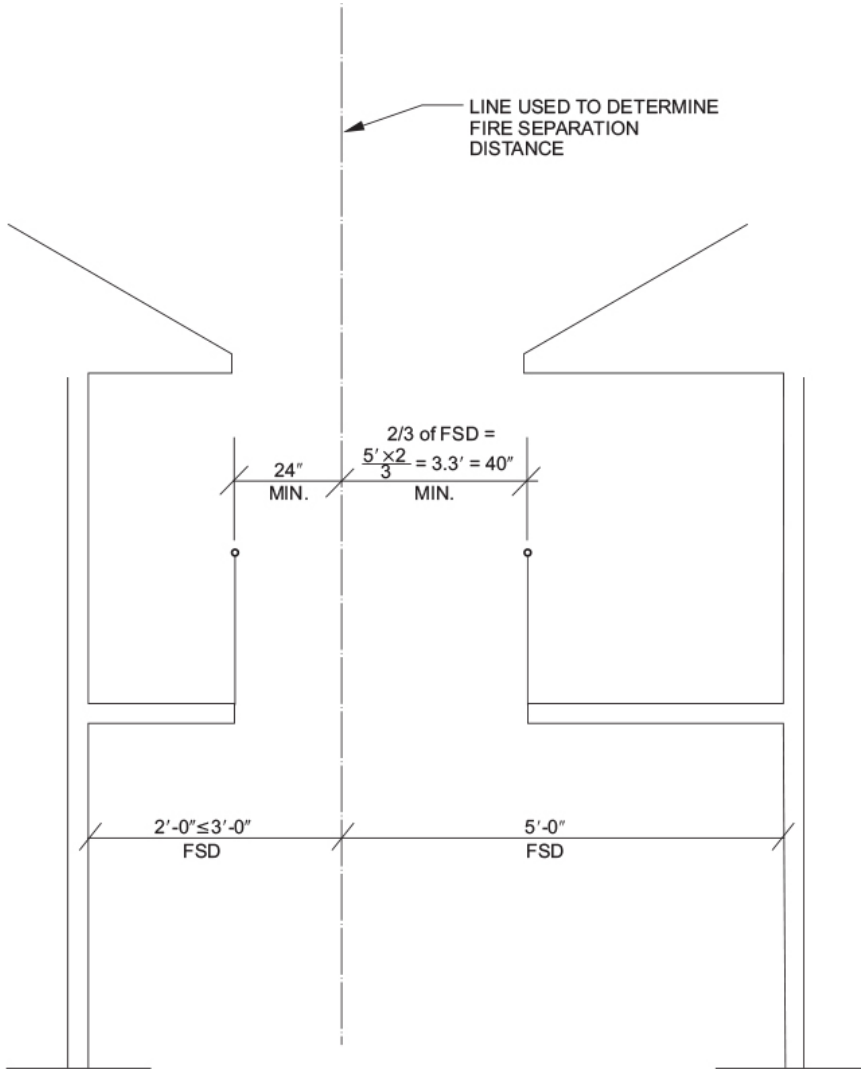



**TABLE 705.2**
**MINIMUM DISTANCE OF PROJECTION**

| FIRE SEPARATION DISTANCE (FSD) (feet) | MINIMUM DISTANCE FROM LINE USED TO DETERMINE FSD |
|---|---|
| 0 to less than 2 | Projections not permitted |
| 2 to less than 3 | 24 inches |
| 3 to less than 5 | Two-thirds of FSD |
| 5 or greater | 40 inches |

For SI: 1 foot = 304.8 mm; 1 inch = 25.4 mm.

# 705.2.3, 705.2.3.1 Combustible Balconies, Projections, and Bay Windows

**705.2.3 Projection protection.** Projections extending to within 5 feet (1524 mm) of the line used to determine the fire separation distance shall be one of the following:

1. Noncombustible materials.
2. Combustible materials of not less than 1-hour fire resistance-rated construction.
3. Heavy timber construction complying with Section 2304.11.
4. Fire-retardant-treated wood.
5. As permitted by Section 705.2.3.1.

**Exception:** Type VB construction shall be allowed for combustible projections in Group R-3 and U occupancies with a fire separation distance greater than or equal to 5 feet (1524 mm).

# 705.2.3, 705.2.3.1 Combustible Balconies, Projections, and Bay Windows

**705.2.3.1 Balconies and similar projections.**

**Exceptions:**

2. Untreated wood and plastic composites that comply with ASTM D7032 and Section 2612 are permitted for pickets, rails and similar guard components that are limited to 42 inches (1067 mm) in height.

# Table 705.5 Exterior Wall Ratings

**705.5 Fire-resistance ratings.** Exterior walls shall be fire resistance rated in accordance with Table 601, based on the type of construction, and Table 705.5, based on the fire separation distance. The required fire-resistance rating of exterior walls with a fire separation distance of greater than 10 feet (3048 mm) shall be rated for exposure to fire from the inside. The required fire-resistance rating of exterior walls with a fire separation distance of less than or equal to 10 feet (3048 mm) shall be rated for exposure to fire from both sides.

TABLE 705.5
FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE[a, d, g]

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

# 705.8.1 Measurement of Fire Separation Distance for Opening Protection

**705.8.1 Allowable area of openings.** The maximum area of unprotected and protected openings permitted in an exterior wall in any story of a building shall not exceed the percentages specified in Table 705.8 based on the fire separation distance of each individual story.

**TABLE 705.8**
**MAXIMUM AREA OF EXTERIOR WALL OPENINGS BASED ON FIRE SEPARATION DISTANCE AND DEGREE OF OPENING PROTECTION[l, m]**

| FIRE SEPARATION DISTANCE (feet) | DEGREE OF OPENING PROTECTION | ALLOWABLE AREA[a] |
|---|---|---|
| 0 to less than 3[b, c, k] | Unprotected, Nonsprinklered (UP, NS) | Not Permitted[k] |
| | Unprotected, Sprinklered (UP, S)[i] | Not Permitted[k] |
| | Protected (P) | Not Permitted[k] |
| 3 to less than 5[d, e] | Unprotected, Nonsprinklered (UP, NS) | Not Permitted |
| | Unprotected, Sprinklered (UP, S)[i] | 15% |
| | Protected (P) | 15% |
| 5 to less than 10[e, f, j] | Unprotected, Nonsprinklered (UP, NS) | 10%[h] |
| | Unprotected, Sprinklered (UP, S)[i] | 25% |
| | Protected (P) | 25% |

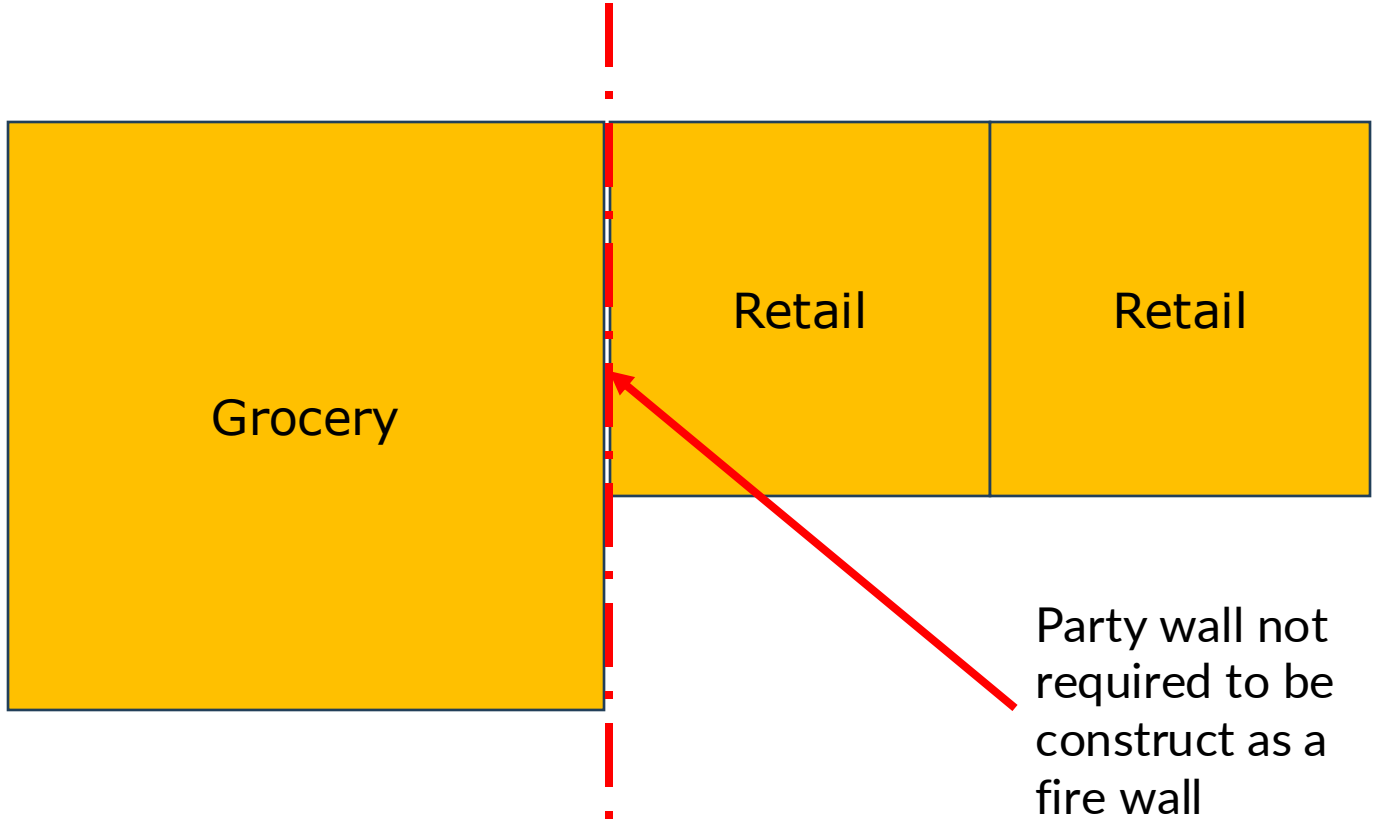
# 706.1.1 Party Walls Not Constructed as Fire Walls

**706.1.1 Party walls.**

**Exceptions:**

2. Party walls and fire walls are not required on lot lines dividing a building for ownership purposes where the aggregate height and area of the portions of the building located on both sides of the lot line do not exceed the maximum height and area requirements of this code. For the building official's review and approval, the official shall be provided with copies of dedicated access easements and contractual agreements that permit the owners of portions of the building located on either side of the lot line access to the other side for purposes of maintaining fire and life safety systems necessary for the operation of the building.

# 706.1.1 Party Walls Not Constructed as Fire Walls

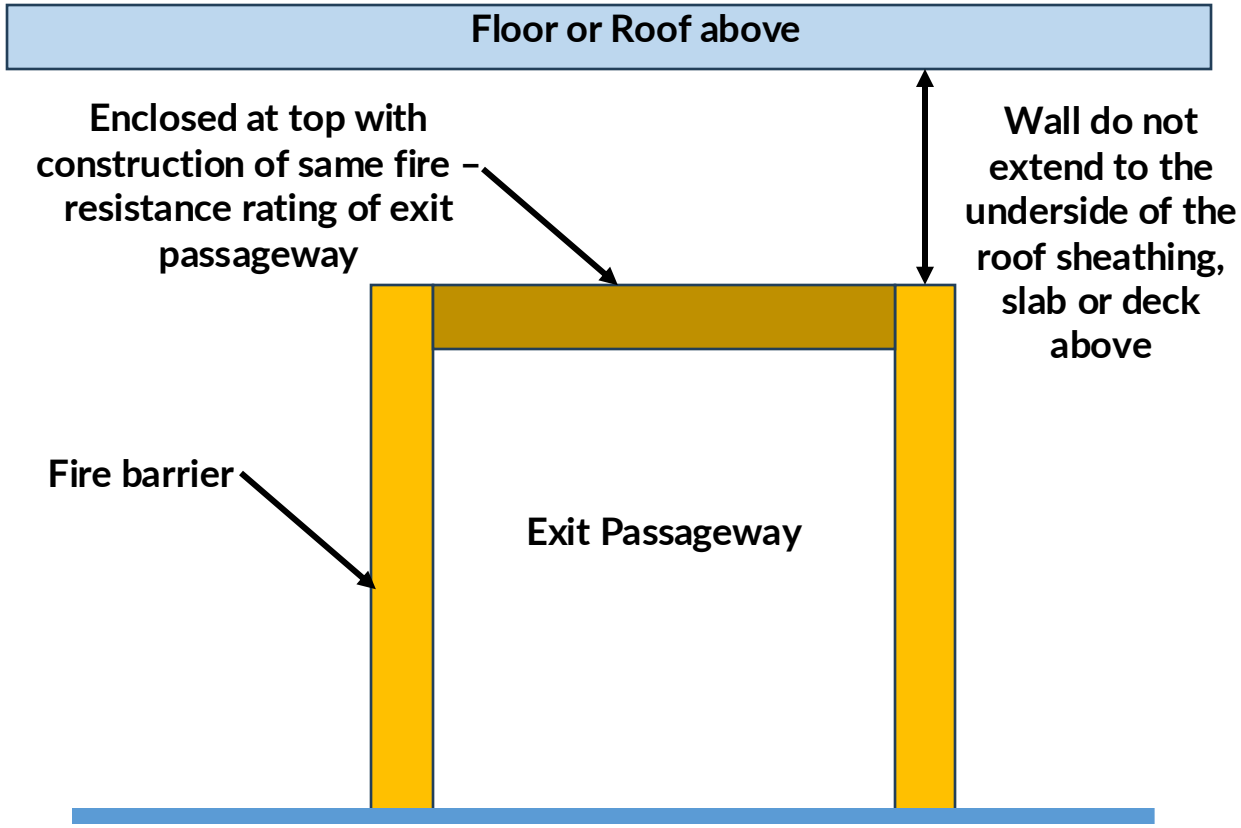


# 707.5 Enclosure of Exit Passageways

**707.5 Continuity.**

**Exceptions:**

3. An exit passageway enclosure required by Section 1024.3 that does not extend to the underside of the roof sheathing, slab or deck above shall be enclosed at the top with construction of the same fire-resistance rating as required for the exit passageway.



# 708.4, 708.4.1, 708.4.2 Fire Partitions

Section 708.4 now only addresses the continuity of fire partitions

Section 708.4.1 deals with the construction components supporting fire partitions

Section 708.4.2 now addresses the fireblocking and draftstopping of fire partitions of combustible construction.

All three of these issues were previously addressed in the single section (2018 NCBC Section 708.4)

# 713.12 Top of Shaft Enclosure

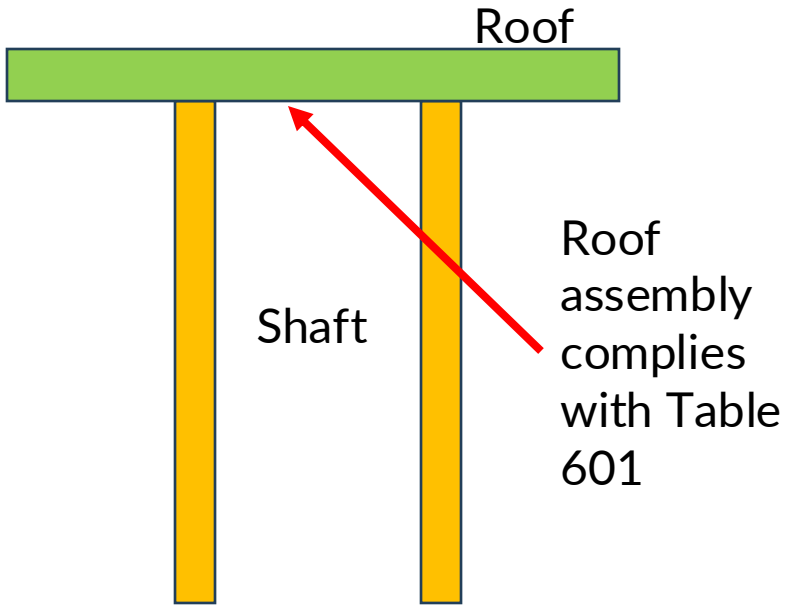
**713.12 Enclosure at top.** The top of shaft enclosures shall comply with one of the following:

1. Extend to the underside of the roof sheathing, deck or slab of the building, and the roof assembly shall comply with the requirements for the type of construction as specified in Table 601.

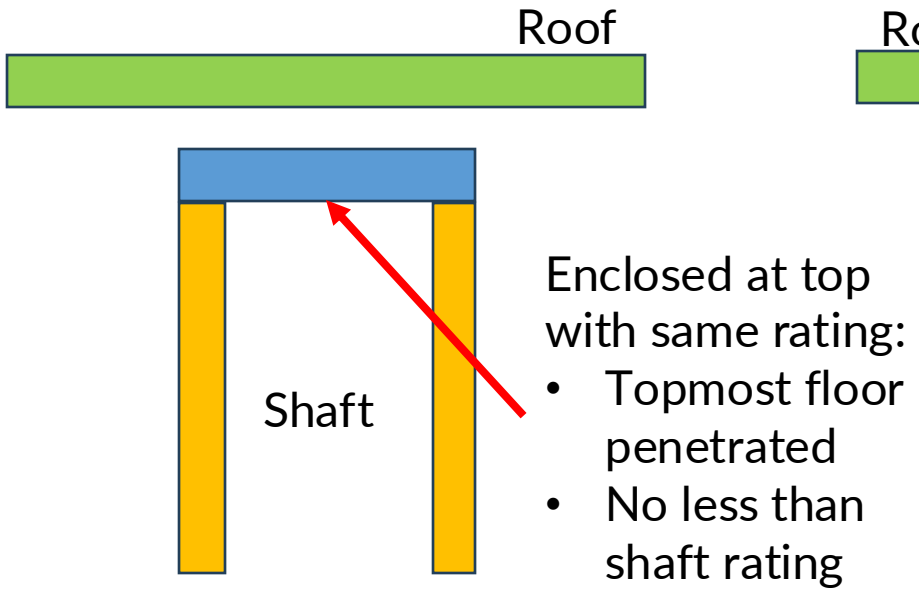
2. Terminate below the roof assembly and be enclosed at the top with construction of the same fire-resistance rating as the topmost floor penetrated by the shaft, but not less than the fire-resistance rating required for the shaft enclosure.

3. Extend past the roof assembly and comply with the requirements of Section 1511.

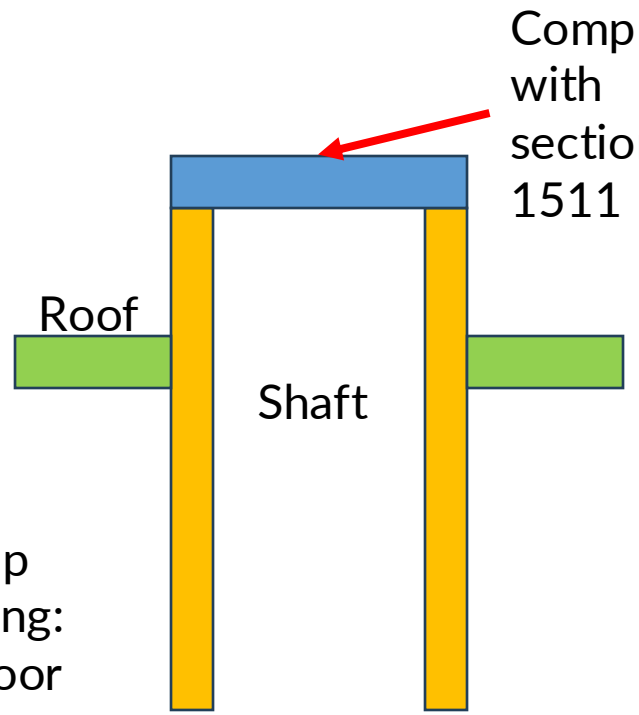
# 713.12 Top of Shaft Enclosure




Extend to the underside of the roof sheathing, deck or slab




Terminate below roof assembly




Extend past the roof assembly

# 716.4 Fire-Protective Curtain Assemblies

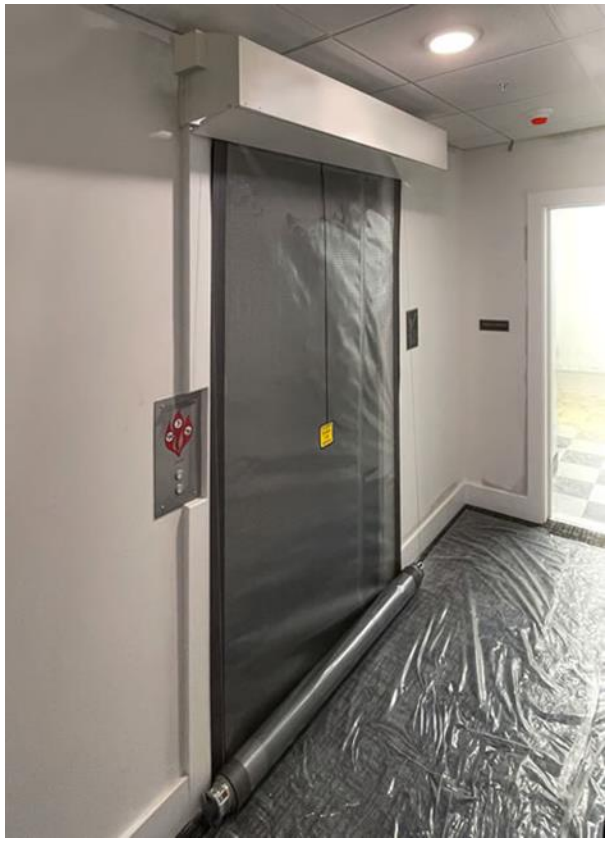
**716.4 Fire protective curtain assembly.** Approved fire protective curtain assemblies shall be constructed of any materials or assembly of component materials tested without hose stream in accordance with UL 10D, and shall comply with the Sections 716.4.1 through 716.4.3

**716.4.1 Label.** Fire protective curtain assemblies used as opening protectives in fire-rated walls and smoke partitions shall be labeled in accordance with Section 716.2.9.

**716.4.2 Smoke and draft control.** Fire protective curtain assemblies used to protect openings where smoke and draft control assemblies are required shall comply with Section 716.2.1.4.

**716.4.3 Installation.** Fire protective curtain assemblies shall be installed in accordance with NFPA 80.

# 716.4 Fire-Protective Curtain Assemblies



Hoistway Protection - Section 3006.2

Exit Access Stairs Protection – Section 1019

# 806.9 Combustible Lockers as Interior Finish

**806.9 Combustible lockers or cubbies.** Where lockers or cubbies constructed of combustible materials are used, they shall be considered to be interior finish and shall comply with Section 803.

**Exception:** Lockers or cubbies constructed entirely of wood and noncombustible materials shall be permitted to be used wherever interior finish materials are required to meet a Class C classification in accordance with Section 803.1.2.

# 903.2.4.2, 903.2.9.3 Distilled Spirits

**903.2.4.2 Group F-1 distilled spirits**. An automatic sprinkler system shall be provided throughout a Group F-1 fire area used for the manufacture of distilled spirits.

**903.2.9.3 Group S-1 Distilled spirits or wine.** An automatic sprinkler system shall be provided throughout a Group S-1 fire area used for the bulk storage of distilled spirits or wine.

2021 IFC (International Fire Code) added a whole new chapter 40 , Storage of Distilled spirits and wines. The chapter provides more specific requirements for distilled spirits in barrels and casks.

Section 4005.1 in 2021 IFC reference to Chapter 9 and Section 903.2.9.3 for Automatic Sprinkler Requirments.

# 903.2.10 Sprinklers in Parking Garages

**903.2.10 Group S-2 parking garages.**

3. Where the fire area of the open parking garage in accordance with Section 406.5 exceeds 48,000 square feet (4460 m2).

**Exception:** Open parking garages of Type I-A construction.

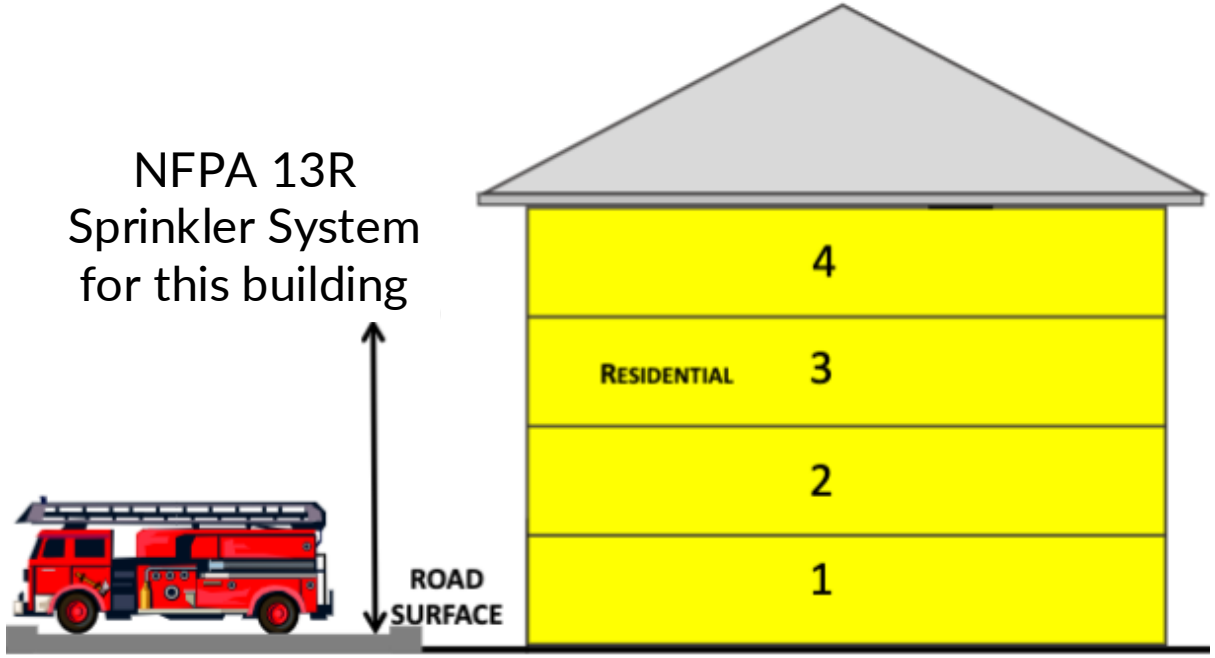
# 903.2.10.2 Mechanical-Access Parking Garages

**903.2.10.2 Mechanical-access enclosed parking garages.** An approved automatic sprinkler system shall be provided throughout buildings used for the storage of motor vehicles in a mechanical-access enclosed parking garage. The portion of the building that contains the mechanical-access enclosed parking garage shall be protected with a specially engineered automatic sprinkler system.

# 903.3.1.2 NFPA 13R Sprinkler Protection

**903.3.1.2 NFPA 13R sprinkler systems.**

Automatic sprinkler systems in Group R occupancies shall be permitted to be installed throughout in accordance with NFPA 13R where the Group R occupancy is four stories or fewer above grade plane.



# 906 Portable Fire Extinguishers

**SECTION 906**

**PORTABLE FIRE EXTINGUISHERS**

DELETED

See Section 906 of the International Fire Code.

# 907.2.3.1 Automatic Smoke Detection System

**907.2.3.1 Automatic smoke detection systems.** An automatic smoke detection system that initiates the occupant notification in accordance with Section 907.5.2.2 shall be installed throughout all stories of Group E buildings.

**Exceptions:**

1. An automatic smoke detection system shall not be required in Group E occupancies with an occupant load of 50 or less.

2. An automatic smoke detection system shall not be required in Group E occupancies that are protected with approved automatic sprinkler systems installed in accordance with Section 903.3.1.1.

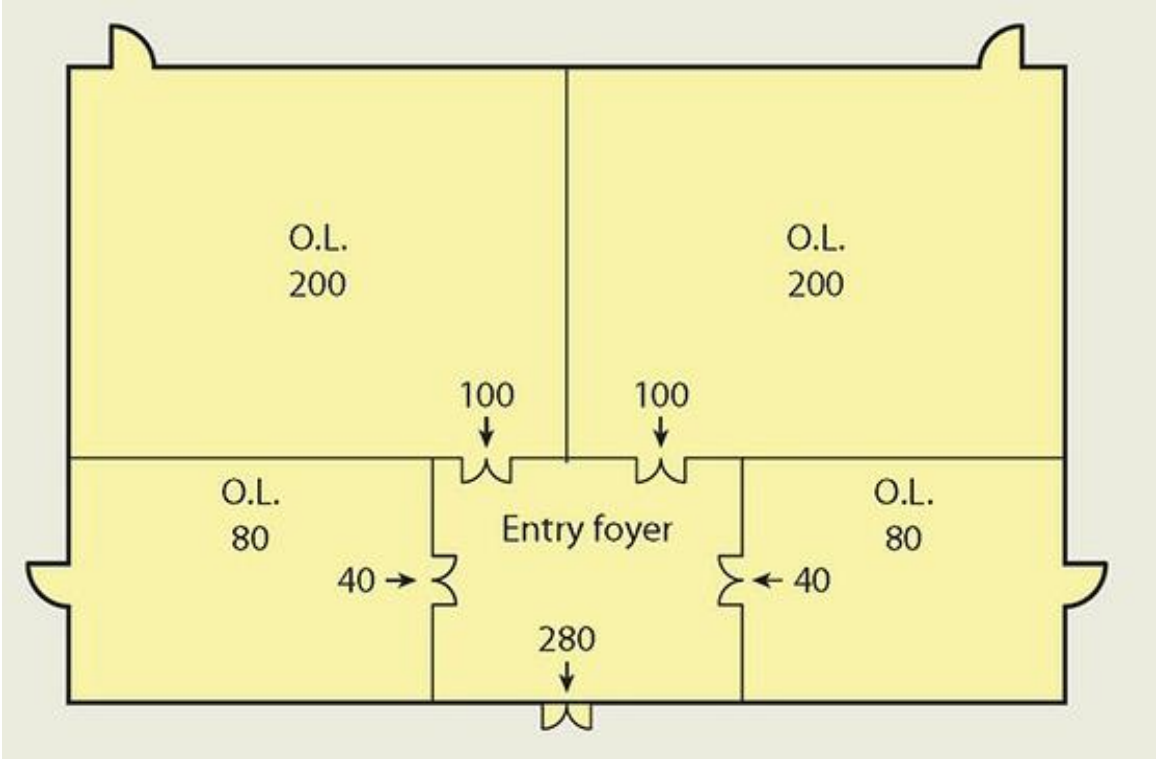
3. An automatic smoke detection system shall not be required in licensed day care facilities complying with Section 431.

# 1006.2.1 Number of Exits from Foyers, Lobbies, Vestibules

**1006.2.1 Egress based on occupant load and common path of egress travel distance.**

**Exceptions:**

1. The number of exits from foyers, lobbies, vestibules or similar spaces need not be based on cumulative occupant loads for areas discharging through such spaces, but the capacity of the exits from such spaces shall be based on applicable cumulative occupant loads.

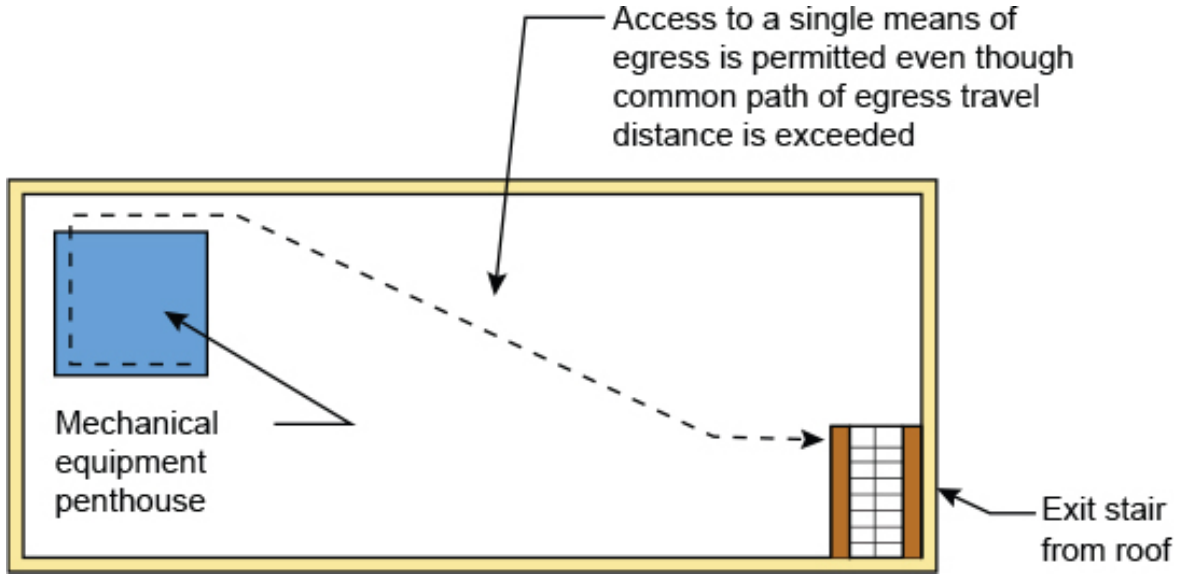


# 1006.2.1 Egress from Mechanical Rooms and Penthouses

**1006.2.1 Egress based on occupant load and common path of egress travel distance.**

**Exceptions:**

3. Unoccupied mechanical rooms and penthouses are not required to comply with the common path of egress travel distance measurement.




**These limited use spaces continue to be regulated based on:**
- **Occupant load (Table 1006.2.1)**
- **Exit access travel distance (Table 1017.2)**

# 1006.2.1, Table 1006.2.1 Group R Spaces with One Exit or Exit Access Doorway

**TABLE 1006.2.1**
**SPACES WITH ONE EXIT OR EXIT ACCESS DOORWAY[i]**

| OCCUPANCY | MAXIMUM OCCUPANT LOAD OF SPACE | MAXIMUM COMMON PATH OF EGRESS TRAVEL DISTANCE (feet) | | |
|---|---|---|---|---|
| | | Without Sprinkler System (feet) | | With Sprinkler System (feet) |
| | | Occupant Load | | |
| | | OL ≤ 30 | OL > 30 | |
| A[c], E[h], M | 49 | 75 | 75 | 75[a] |
| B | 49 | 100 | 75 | 100[a] |
| F | 49 | 75 | 75 | 100[a] |
| H-1, H-2, H-3 | 3 | NP | NP | 25[b] |
| H-4, H-5 | 10 | NP | NP | 75[b] |
| I-1, I-2[d], I-4 | 10 | NP | NP | 75[a] |
| I-3 | 10 | NP | NP | 100[a] |
| R-1 | 10 | NP | NP | 75[a] |
| R-2 | 20 | NP | NP | 125[a] |
| R-3[e] | 20 | NP | NP | 125[a, g] |
| R-4[e] | 20 | NP | NP | 125[a, g] |

# 1006.3.4 Single Exit Stories

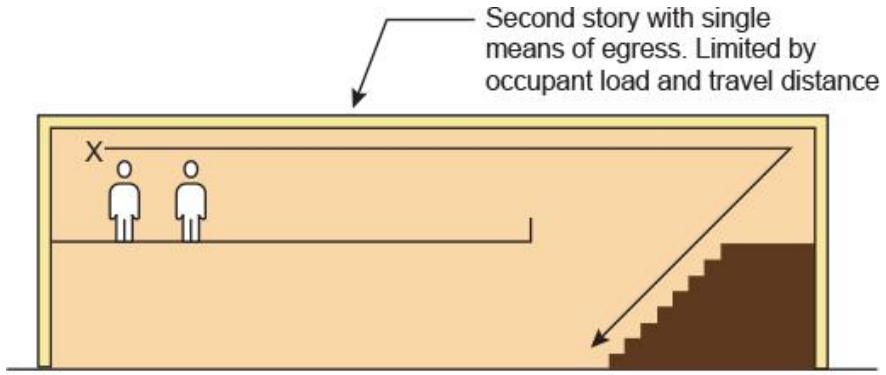
TABLE 1006.3.4(1)
STORIES WITH ONE EXIT OR ACCESS TO ONE EXIT FOR R-2 OCCUPANCIES

| STORY | OCCUPANCY | MAXIMUM NUMBER OF DWELLING UNITS | MAXIMUM EXIT ACCESS TRAVEL DISTANCE |
|---|---|---|---|
| Basement, first, second or third story above grade plane | R-2[a, b] | 4 dwelling units | 125 feet |
| Fourth story above grade plane and higher | NP | NA | NA |

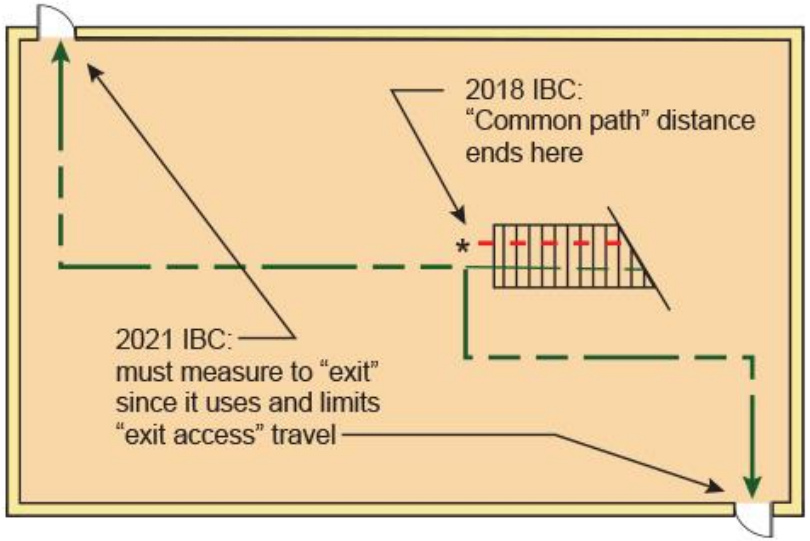
TABLE 1006.3.4(2)
STORIES WITH ONE EXIT OR ACCESS TO ONE EXIT FOR OTHER OCCUPANCIES

| STORY | OCCUPANCY | MAXIMUM OCCUPANT LOAD PER STORY | MAXIMUM EXIT ACCESS TRAVEL DISTANCE (feet) |
|---|---|---|---|
| First story above or below grade plane | A, B[b], E, F[b], M, U | 49 | 75 |
| | H-2, H-3 | 3 | 25 |
| | H-4, H-5, I, R-1, R-2[a, c] | 10 | 75 |
| | S[b, d] | 29 | 75 |
| Second story above grade plane | B, F, M, S[d] | 29 | 75 |
| Third story above grade plane and higher | NP | NA | NA |

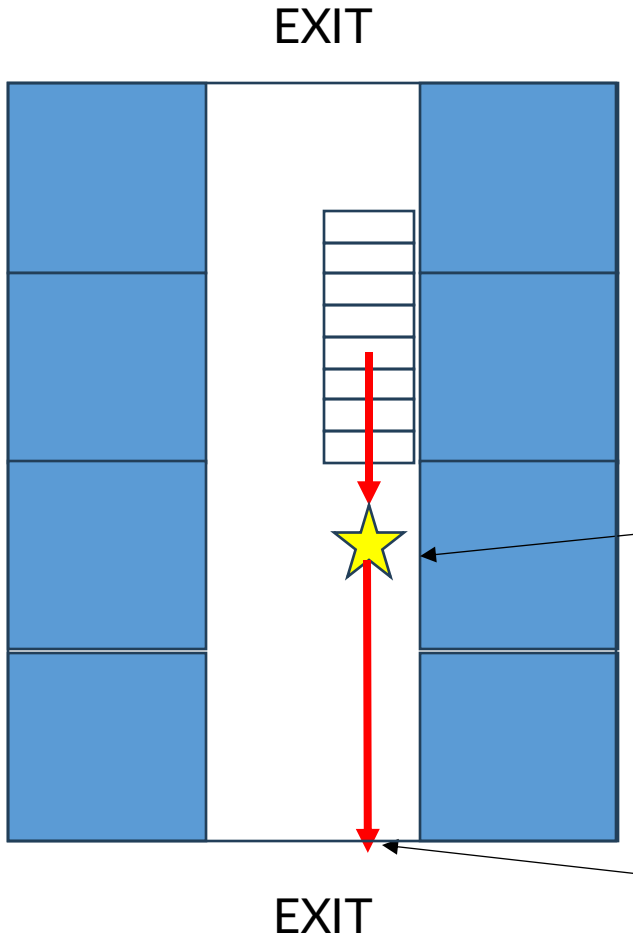
# 1006.3.4 Single Exit Stories




Section




Plan




2018 NCBC CPET terminate here

2024 NCBC required exit access to terminate here

# 1008.2.1 Stairway Illumination Level

**1008.2.1 Illumination level under normal power.** The means of egress illumination level shall be not less than 1 footcandle (11 lux) at the walking surface. Along exit access stairways, exit stairways and at their required landings, the illumination level shall not be less than 10 footcandles (108 lux) at the walking surface when the stairway is in use.

# 1010.1.1 Size of Doors

## 1010.1.1 Size of doors.

~~The maximum width of a swinging door leaf shall be 48 inches (1219 mm) nominal.~~

The elimination of the width limitation is based on several factors, including:

1. Section 1010.1.3 will continue to limit the door opening force regardless of the height, width or weight of the door; and

2. The need for wider doors in locations such as hospitals and other occupancies where the movement of patient beds, merchandise or equipment may create the need for a wider door.

# 1010.1.3 Door Opening Forces

**1010.1.3 Forces to unlatch and open doors.** The forces to unlatch doors shall comply with the following:

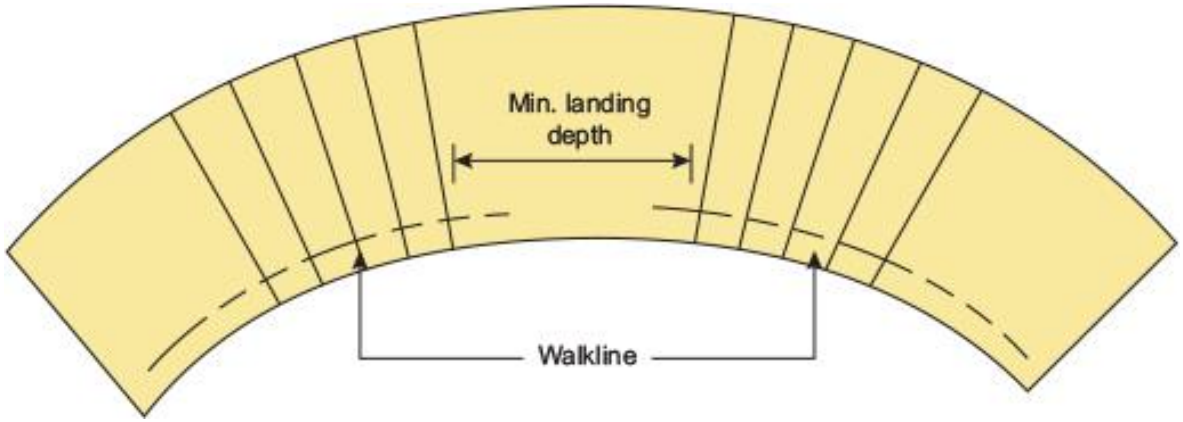
1. Where door hardware operates by push or pull, the operational force to unlatch the door shall not exceed 15 pounds (67 N).

2. Where door hardware operates by rotation, the operational force to unlatch the door shall not exceed 28 inch-pounds (315 N-cm).

# 1011.6 Stairway Landing

**1011.6 Stairway landings.**

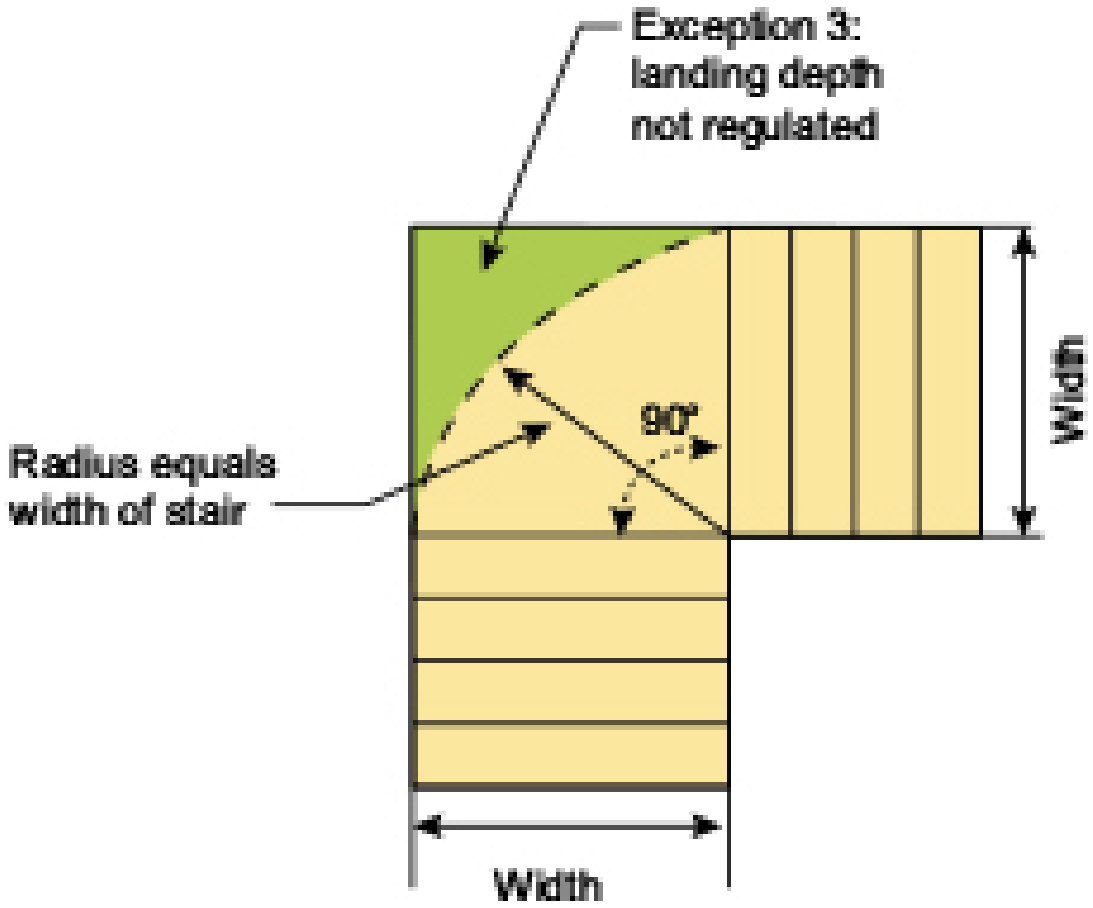
2. Where curved stairways of constant radius have intermediate landings, the landing depth shall be measured horizontally between the intersection of the walkline of the lower flight at the landing nosing and the intersection of the walkline of the upper flight at the nosing of the lowest tread of the upper flight.



# 1011.6 Stairway Landing

**1011.6 Stairway landings.**

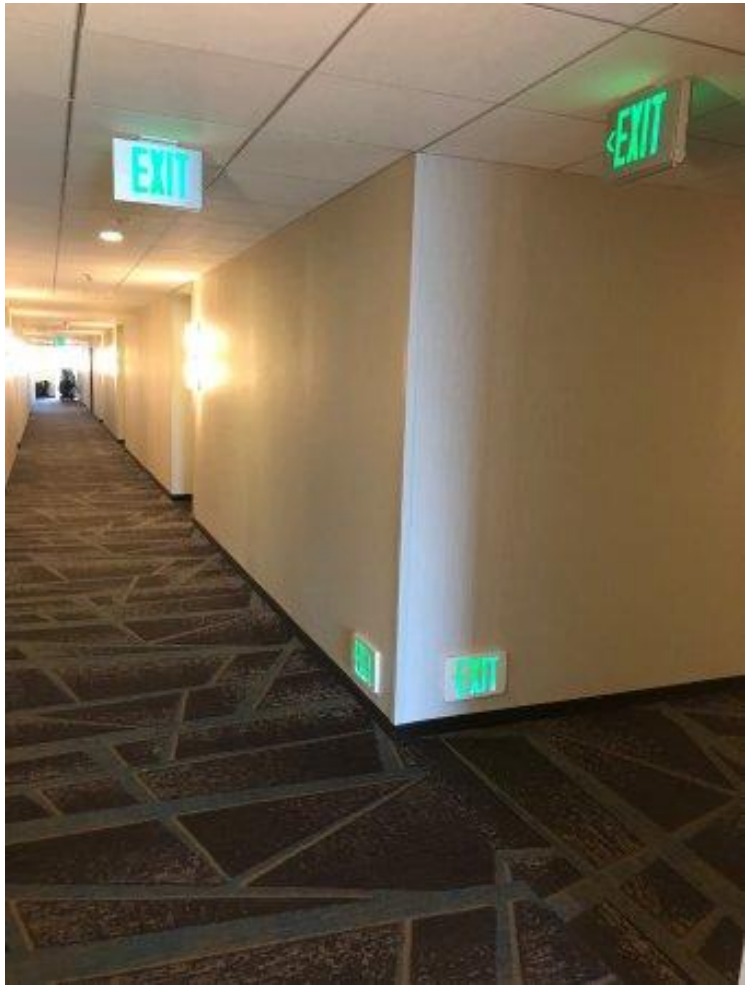
3. Where a landing turns 90 degrees (1.57 rad) or more, the minimum landing depth in accordance with this section shall not be required where the landing provided is not less than that described by an arc with a radius equal to the width of the flight served.



# 1013.2 Floor Level Exit Sign Location

**1013.2 Low-level exit signs in Group R-1.** Where exit signs are required in Group R-1 occupancies by Section 1013.1, additional low-level exit signs shall be provided in all areas serving guest rooms in Group R-1 occupancies and shall comply with Section 1013.5.

The bottom of the sign shall be not less than 10 inches (254 mm) nor more than 18 inches (455 mm) above the floor level. The sign shall be flush mounted to the door or wall. Where mounted on the wall, the edge of the sign shall be within 4 inches (102 mm) of the door frame on the latch side.



# 1017.3, 202 Measurement of Egress Travel

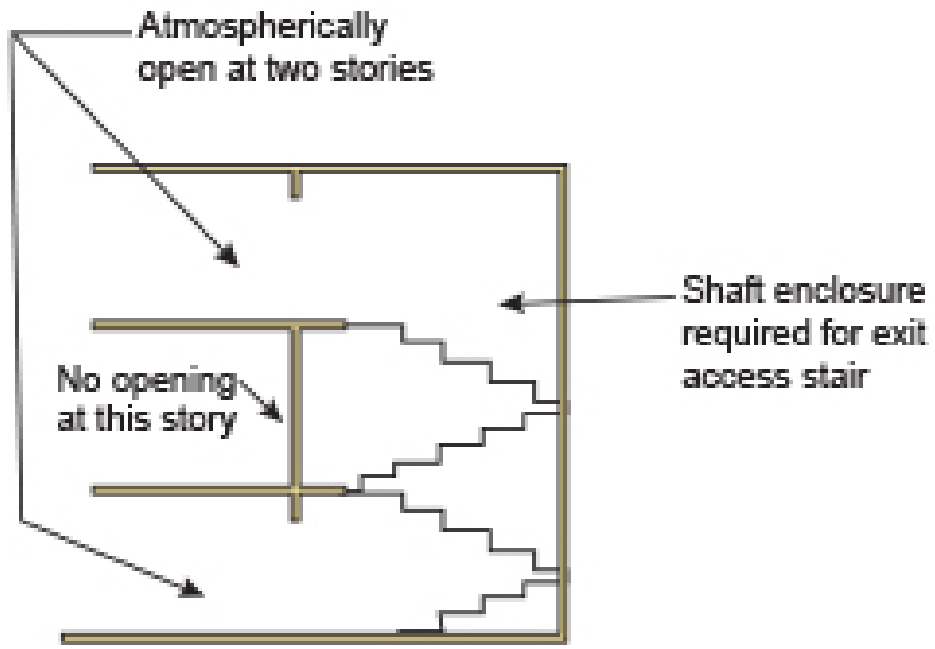
**1017.3 Measurement.** Exit access travel distance shall be measured from the most remote point of each room, area or space along the natural and unobstructed path of horizontal and vertical egress travel to the entrance to an exit. Where more than one exit is required, exit access travel distance shall be measured to the nearest exit.

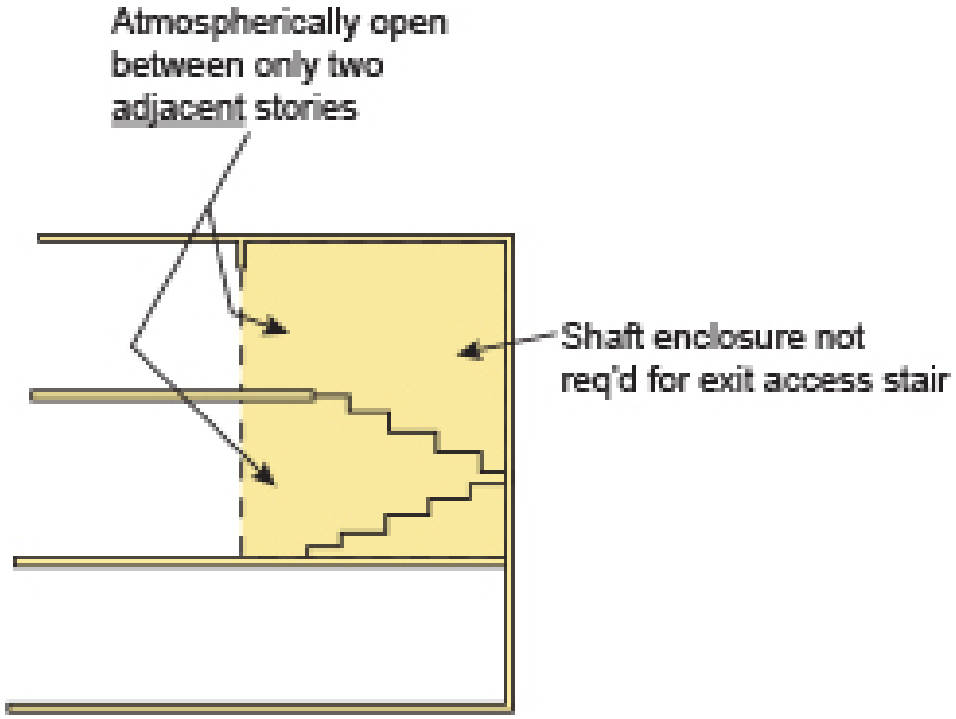
**COMMON PATH OF EGRESS TRAVEL.** That portion of ~~the~~ exit access travel distance measured from the most remote point ~~within a story~~ of each room, area or space to that point where the occupants have separate and distinct access to two exits or exit access doorways.

# 1019.3, Exit Access Stairways

**Exceptions:**

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.



# 1019.3, Exit Access Stairways

**Exceptions:**

9. Exterior exit access stairways or ramps between occupied roofs.

# 1023.5 Exit Stairway Penetrations

1023.5 Penetrations. Penetrations into or through interior exit stairways and ramps are prohibited except for the following:

2. Fire protection systems.

3. Security systems.

4. Two-way communication systems.

7. Structural elements supporting the interior exit stairway or ramp or enclosure, such as beams or joists.

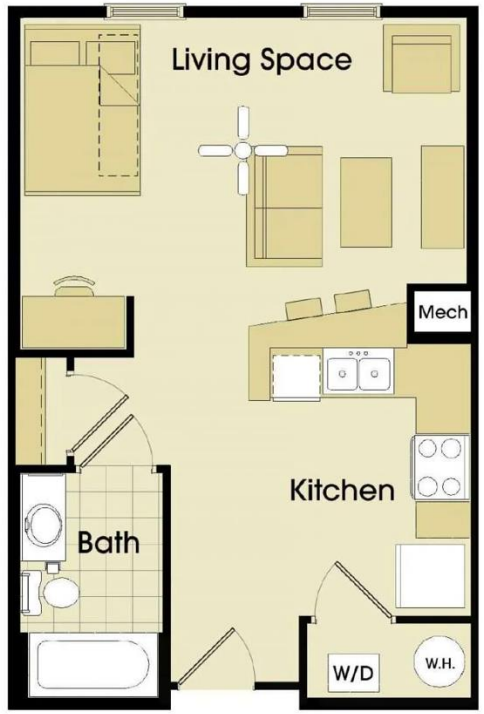
# 1208.4 Efficiency Dwelling Units

**1208.4 Efficiency dwelling units.** Efficiency dwelling units shall conform to the requirements of the code except as modified herein:

1. The unit shall have a living room of not less than 190 square feet (17.7 m2) of floor area.

2. The unit shall be provided with a separate closet.

**DWELLING UNIT, EFFICIENCY.** A dwelling unit where all permanent provisions for living, sleeping, eating and cooking are contained in a single room.



# 1208.4 Efficiency Dwelling Units

**1208.4 Efficiency dwelling units**

3. For other than Accessible, Type A and Type B dwelling units, the unit shall be provided with a kitchen sink, cooking appliance and refrigerator, each having a clear working space of not less than 30 inches (762 mm) in front. Light and ventilation conforming to this code shall be provided.

4. The unit shall be provided with a separate bathroom containing a water closet, lavatory and bathtub or shower.

| Comparison of Dwelling Units | | |
|---|---|---|
| Dwelling Unit | Standard | Efficiency |
| Primary Room - Minimum Size | 120 $ft^2$ | 190 $ft^2$ |
| Other Rooms - Minimum Size | 70 ft2 | Not Applicable |
| Cooking Facilities? | Yes | Yes |
| Sanitation Facilities? | Yes | Yes |
| Closet? | Not required in primary room | Yes |

# 1210.3 Restroom Privacy

**1210.3 Privacy.** Public restrooms shall have visual screening that prevents viewing into the restroom from outside entry or exit doorways to ensure user privacy within the restroom including where mirrors would compromise personal privacy. Privacy at water closets and urinals shall be provided in accordance with Sections 1210.3.1 and 1210.3.2.

**Exception:** Visual screening shall not be required for single-occupant toilet rooms with a lockable door.

# 1504.9 Aggregate-Surfaced Roofs

**1504.9 Wind resistance of aggregate-surfaced roofs.** Parapets shall be provided for aggregate surfaced roofs and shall comply with Table 1504.9.

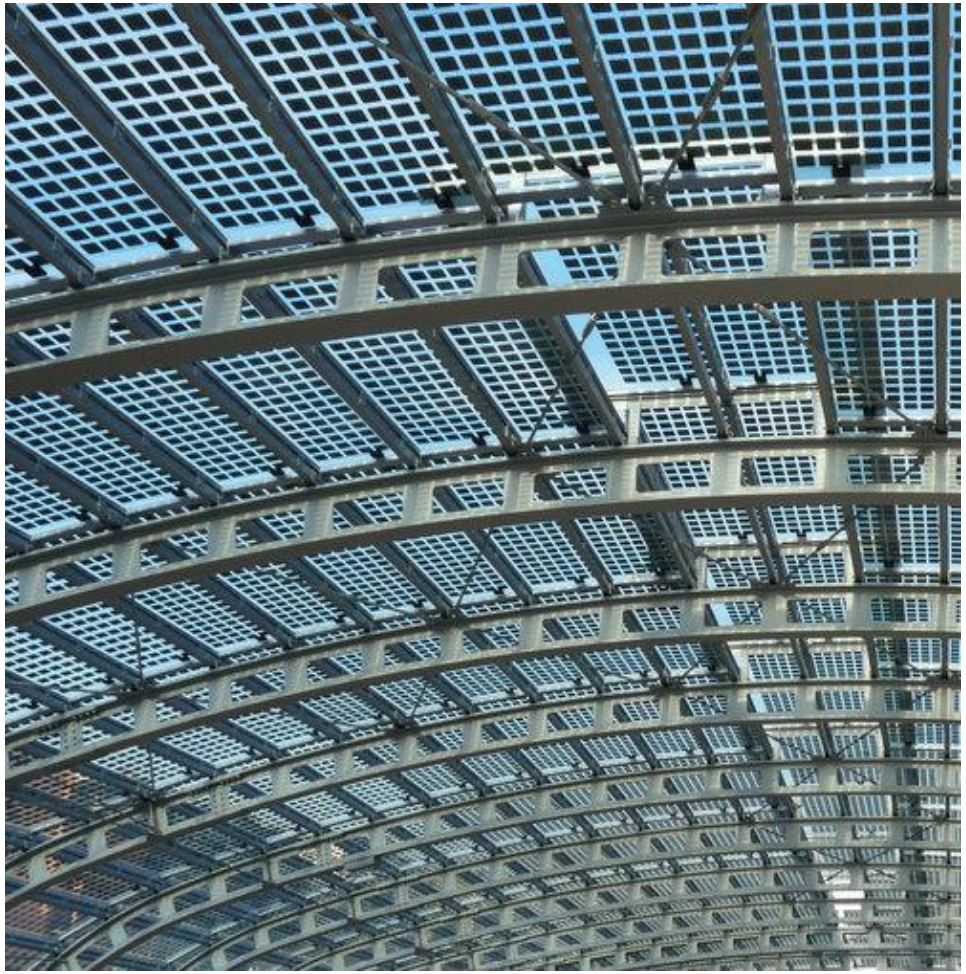
# 1504.9 Aggregate-Surfaced Roofs

**TABLE 1504.9**
**MINIMUM REQUIRED PARAPET HEIGHT (INCHES) FOR AGGREGATE SURFACED ROOFS[a, b, c]**

| AGGREGATE SIZE | MEAN ROOF HEIGHT (ft) | WIND EXPOSURE AND BASIC DESIGN WIND SPEED (MPH) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Exposure B | | | | | | | | | Exposure C[d] | | | | | | | | |
| | | ≤ 95 | 100 | 105 | 110 | 115 | 120 | 130 | 140 | 150 | ≤ 95 | 100 | 105 | 110 | 115 | 120 | 130 | 140 | 150 |
| ASTM D1863 (No. 7 or No. 67) | 15 | 2 | 2 | 2 | 2 | 12 | 12 | 16 | 20 | 24 | 2 | 13 | 15 | 18 | 20 | 23 | 27 | 32 | 37 |
| | 20 | 2 | 2 | 2 | 2 | 12 | 14 | 18 | 22 | 26 | 12 | 15 | 17 | 19 | 22 | 24 | 29 | 34 | 39 |
| | 30 | 2 | 2 | 2 | 13 | 15 | 17 | 21 | 25 | 30 | 14 | 17 | 19 | 22 | 24 | 27 | 32 | 37 | 42 |
| | 50 | 12 | 12 | 14 | 16 | 18 | 21 | 25 | 30 | 35 | 17 | 19 | 22 | 25 | 28 | 30 | 36 | 41 | 47 |
| | 100 | 14 | 16 | 19 | 21 | 24 | 27 | 32 | 37 | 42 | 21 | 24 | 26 | 29 | 32 | 35 | 41 | 47 | 53 |
| | 150 | 17 | 19 | 22 | 25 | 27 | 30 | 36 | 41 | 46 | 23 | 26 | 29 | 32 | 35 | 38 | 44 | 50 | 56 |
| ASTM D1863 (No. 6) | 15 | 2 | 2 | 2 | 2 | 12 | 12 | 12 | 15 | 18 | 2 | 2 | 2 | 13 | 15 | 17 | 22 | 26 | 30 |
| | 20 | 2 | 2 | 2 | 2 | 12 | 12 | 13 | 17 | 21 | 2 | 2 | 12 | 15 | 17 | 19 | 23 | 28 | 32 |
| | 30 | 2 | 2 | 2 | 2 | 12 | 12 | 16 | 20 | 24 | 2 | 12 | 14 | 17 | 19 | 21 | 26 | 31 | 35 |
| | 50 | 12 | 12 | 12 | 12 | 14 | 16 | 20 | 24 | 28 | 12 | 15 | 17 | 19 | 22 | 24 | 29 | 34 | 39 |
| | 100 | 12 | 12 | 14 | 16 | 19 | 21 | 26 | 30 | 35 | 16 | 18 | 21 | 24 | 26 | 29 | 34 | 39 | 45 |
| | 150 | 12 | 14 | 17 | 19 | 22 | 24 | 29 | 34 | 39 | 18 | 21 | 23 | 26 | 29 | 32 | 37 | 43 | 48 |

# 1507.17 Building-Integrated Photovoltaic Panels

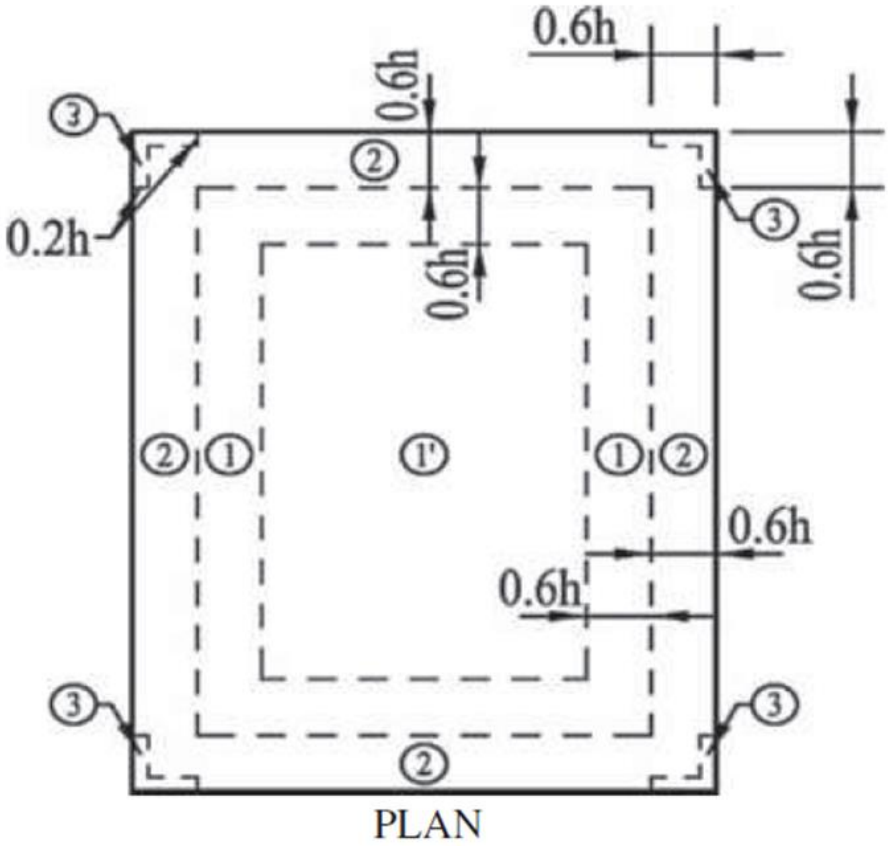
**BUILDING-INTEGRATED PHOTOVOLTAIC ROOF PANEL (BIPV ROOF PANEL).** A photovoltaic panel that functions as a component of the building envelope.



# 1603.1.4 Construction Document Wind Zones

**1603.1.4 Wind design data.**

5. Design wind pressures and their applicable zones with dimensions to be used for exterior component and cladding materials not specifically designed by the registered design professional responsible for the design of the structure, pounds per square foot (kN/m2).



# 1604.3.7 Deflection of Glass Framing

**1604.3.7 Framing supporting glass**. The deflection of framing members supporting glass subjected to 0.6 times the “component and cladding” wind loads shall not exceed either of the following:

1. 1/175 of the length of span of the framing member, for framing members having a length not more than 13 feet 6 inches (4115 mm).

2. 1/240 of the length of span of the framing member + 1/4 inch (6.4 mm), for framing members having a length greater than 13 feet 6 inches (4115 mm).

# Table 1604.5 Risk Categories of Assembly Spaces

**TABLE 1604.5**
**RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES**

| RISK CATEGORY | NATURE OF OCCUPANCY |
|---|---|
| I | Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to:<br>• Agricultural facilities.<br>• Certain temporary facilities.<br>• Minor storage facilities. |
| II | Buildings and other structures except those listed in Risk Categories I, III and IV. |
| III | Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:<br>• Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300.<br>• Buildings and other structures containing one or more public assembly spaces, each having an occupant load greater than 300 and a cumulative occupant load of ~~the~~ public assembly spaces of greater than 2,500.<br>• Buildings and other structures containing Group E or Group I-4 occupancies or combination therof, with an occupant load greater than 250.<br>• Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500.<br>• Group I-2, Condition 1 occupancies with 50 or more care recipients.<br>• Group I-2, Condition 2 occupancies not having emergency surgery or emergency treatment facilities.<br>• Group I-3 occupancies. |

# Table 1604.5 Risk Categories of Assembly Spaces

**EXAMPLE:**

500 guest rooms

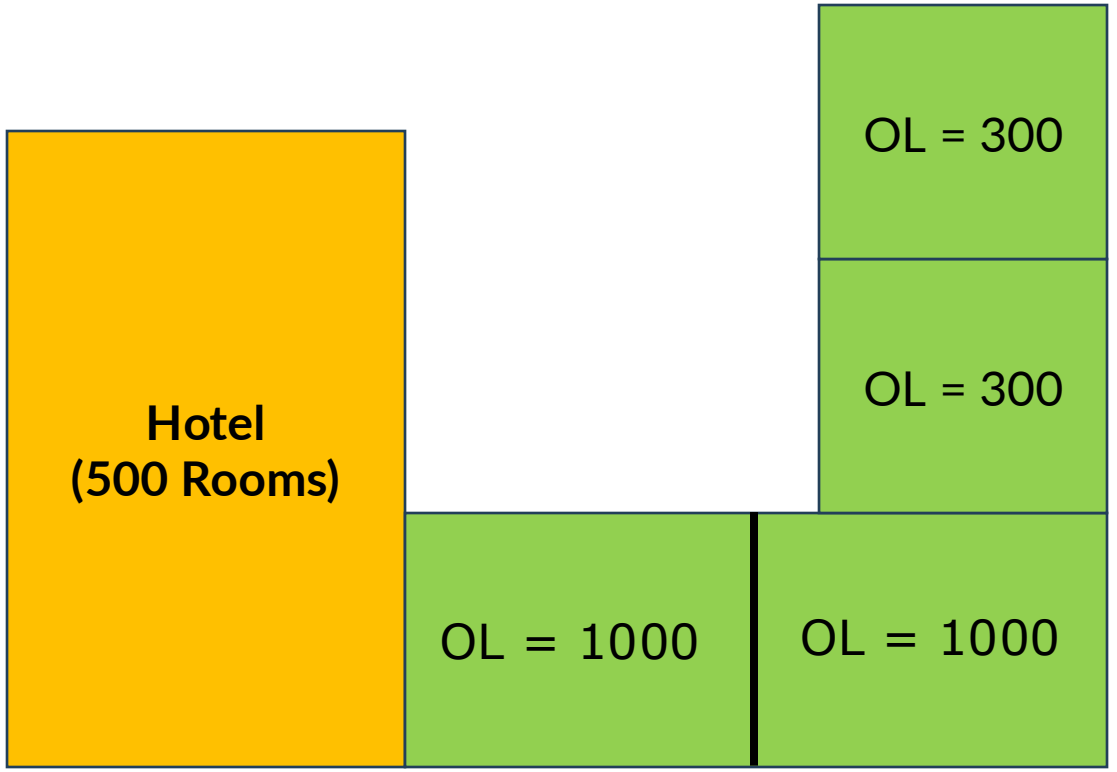
2 ballrooms with 1,000 occupants each

2 meeting rooms with 300 occupants each

Total assembly occupants: 2,600 people

Both conditions have been met, and the building is to be assigned to

**Risk Category III**




**Hotel (Primary use = Group R-1)**

# 1604.5.1 Multiple Occupancies

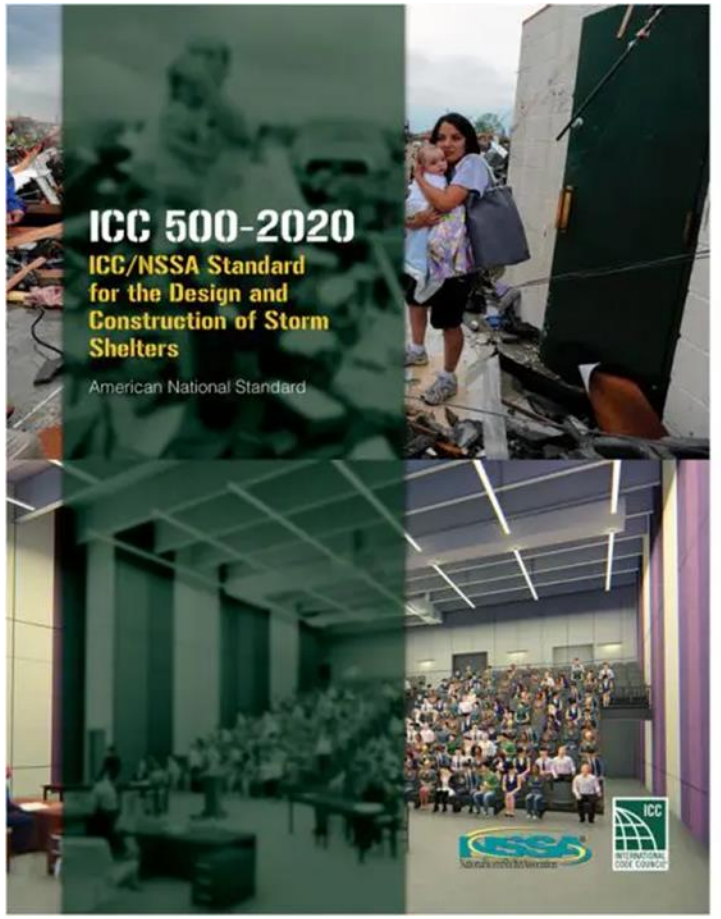
**1604.5.1 Multiple occupancies.**

**Exception:** Where a storm shelter designed and constructed in accordance with ICC 500 is provided in a building, structure or portion thereof normally occupied for other purposes, the risk category for the normal occupancy of the building shall apply unless the storm shelter is a designated emergency shelter in accordance with Table 1604.5.

# 1604.10 Storm Shelters

**1604.10 Loads on storm shelters.** Loads and load combinations on storm shelters shall be determined in accordance with ICC 500.

**ICC 500 — 2020 ICC/NSSA Standard for the Design and Construction of Storm Shelters**



# 1606 Dead Loads

**1606.3 Weight of fixed service equipment.**

**1606.4 Photovoltaic panel systems.**

**1606.5 Vegetative and landscaped roofs.**

# Table 1607.1 Deck Live Load

| | | | | |
|---|---|---|---|---|
| 5. | Balconies and decks | 1.5 times the live load for the area served, not required to exceed 100 | — | — |

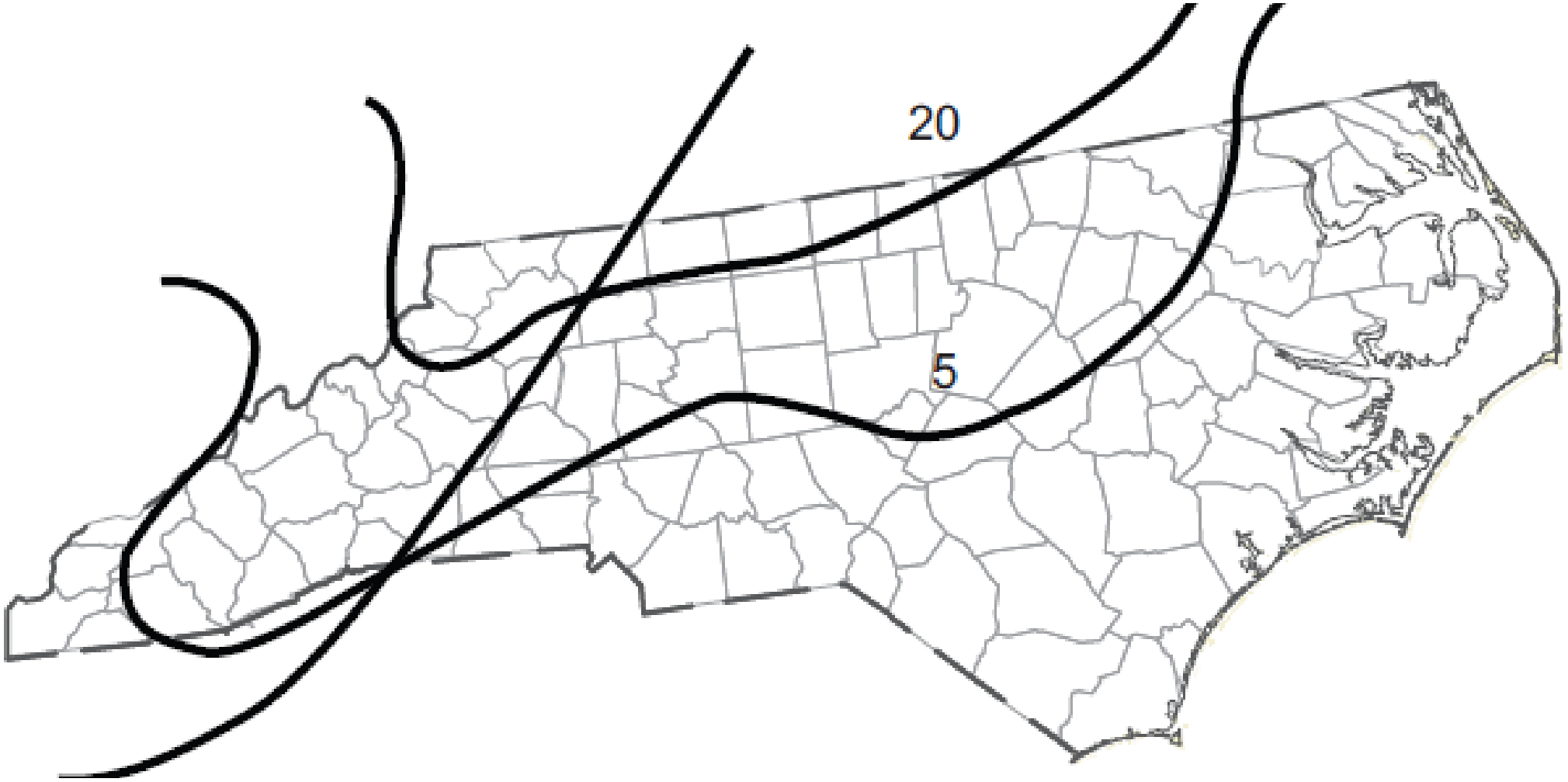
# 1607.16.2 Minimum Live Load for Fire Walls

**1607.16.2 Fire walls.** In order to meet the structural stability requirements of Section 706.2 where the structure on either side of the wall has collapsed, fire walls and their supports shall be designed to withstand a minimum horizontal allowable stress load of 5 psf (0.240 kN/m2).

# 1607.17 Fixed Ladder Live Load

**1607.17 Fixed ladders.** Fixed ladders with rungs shall be designed to resist a single concentrated load of 300 pounds (1.33 kN) in accordance with Section 4.5.4 of ASCE 7. Where rails of fixed ladders extend above a floor or platform at the top of the ladder, each side rail extension shall be designed to resist a single concentrated load of 100 pounds (0.445 kN) in accordance with Section 4.5.4 of ASCE 7. Ship's ladders shall be designed to resist the stair loads given in Table 1607.1.

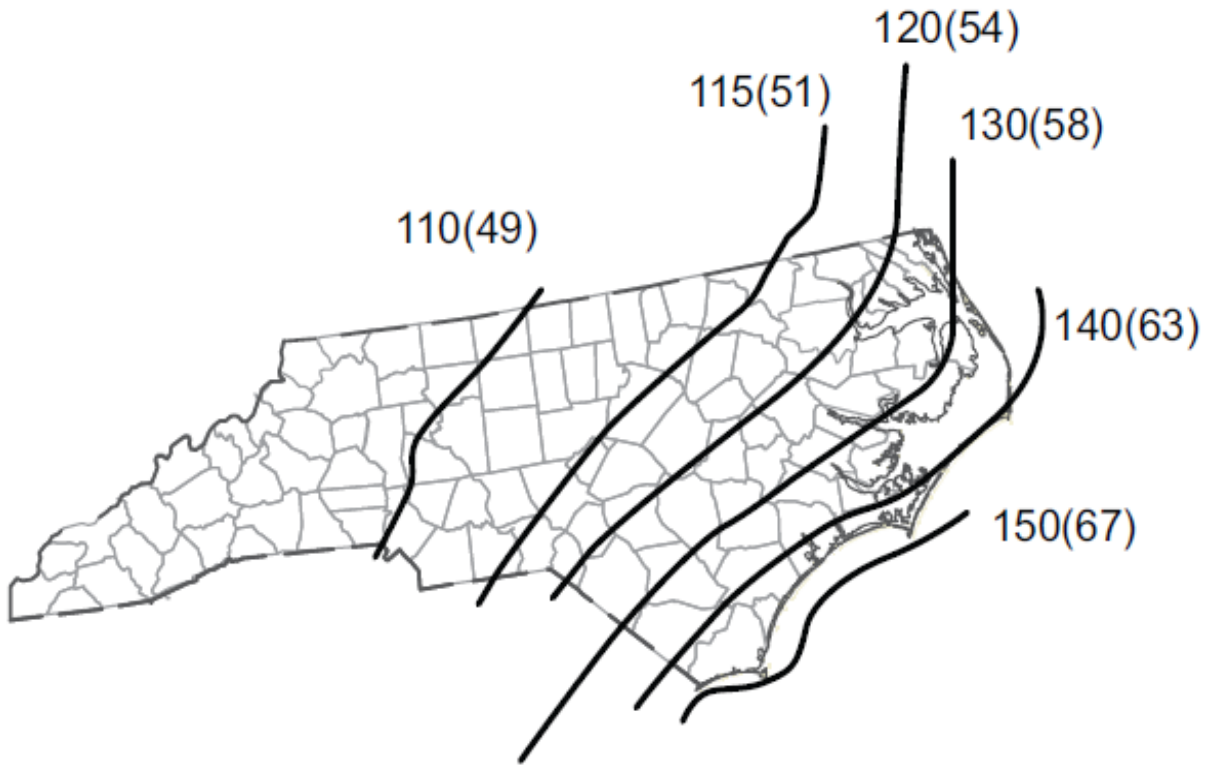
# 1608.2 Snow Maps



# 1609 Wind Loads

**FIGURE 1609.3(1)**

**BASIC DESIGN WIND SPEEDS, V, FOR RISK CATEGORY II BUILDINGS AND OTHER STRUCTURES**



# 1610.2 Soil-Caused Uplift

**1610.2 Uplift loads on floor and foundations.**

Basement floors, slabs on ground, foundations, and similar approximately horizontal elements below grade shall be designed to resist uplift loads where applicable. The upward pressure of water shall be taken as the full hydrostatic pressure applied over the entire area. The hydrostatic load shall be measured from the underside of the element being evaluated. The design for upward loads caused by expansive soils shall comply with Section 1808.6.

# 1611 Rain Loads

**1611.1 Design rain loads.** Each portion of a roof shall be designed to sustain the load of rainwater as per the requirements of Chapter 8 of ASCE 7. The design rainfall shall be based on the 100-year 15-minute duration event, or on other rainfall rates determined from approved local weather data. Alternatively, a design rainfall of twice the 100-year hourly rainfall rate indicated in Figures 1611.1 shall be permitted.

$R = 5.2(ds + dh)$ **(Equation 16-19)**

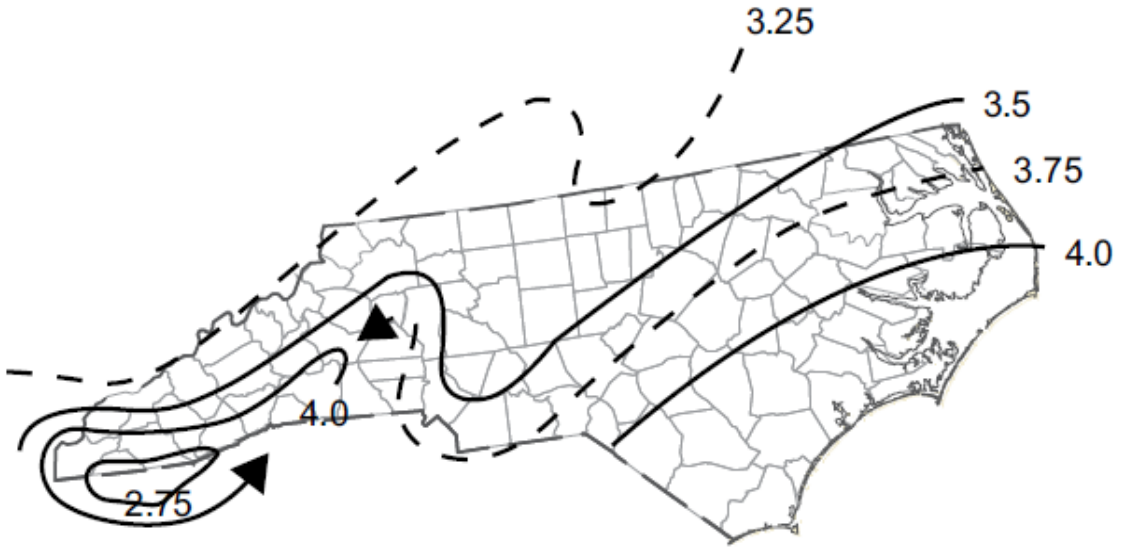
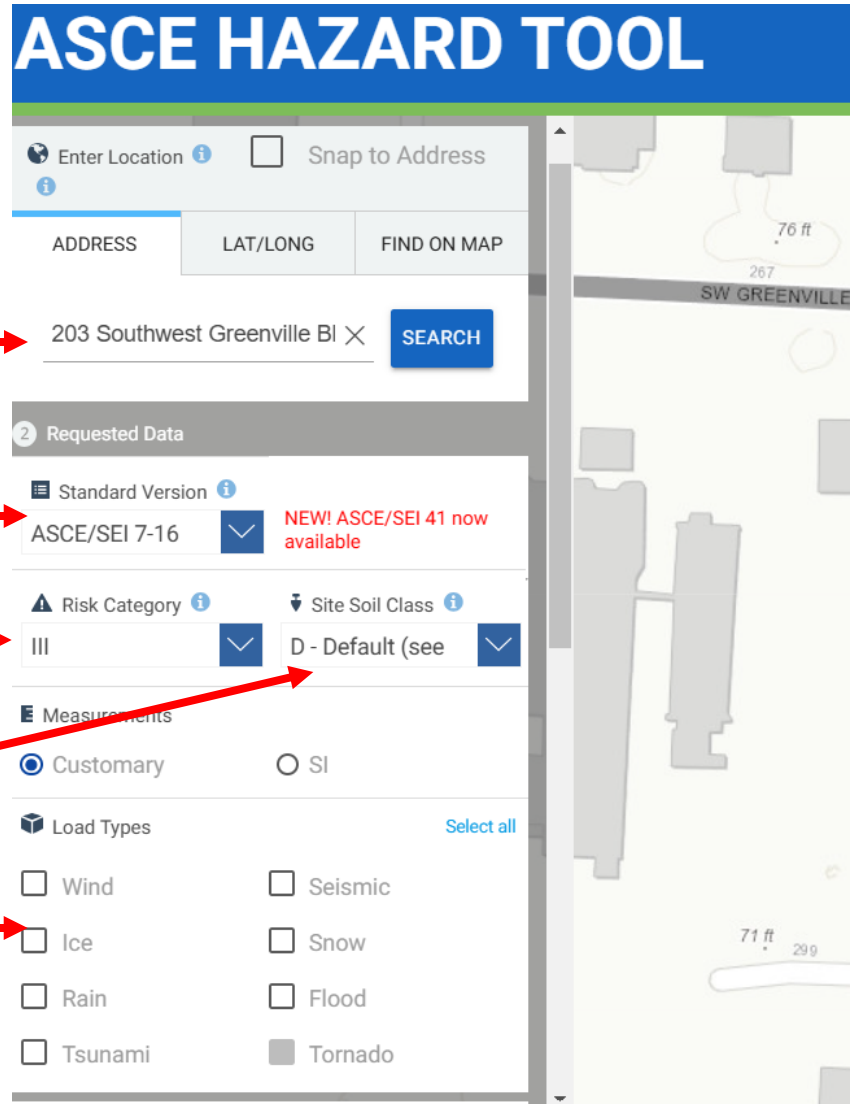



**FIGURE 1611.1**
**100-YEAR, 1-HOUR RAINFALL (INCHES)**

# 1613 Seismic Design Parameter

https://asce7hazardtool.online/




Address

ASCE 7-16

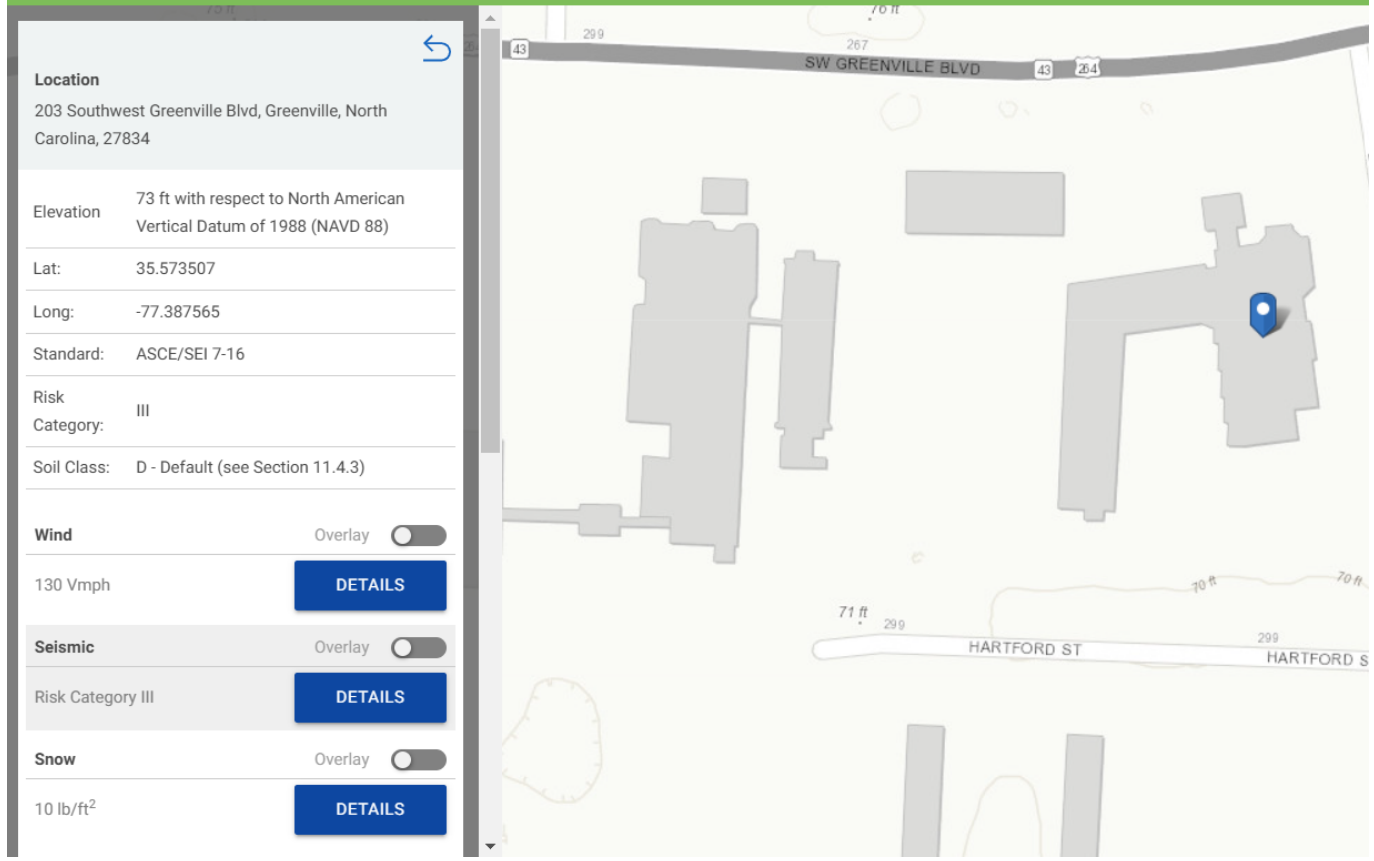
Building Risk Category

Soil Type

Load Types

# 1613 Seismic Design Parameter

## ASCE HAZARD TOOL




## REPORT SUMMARY

### Wind

| | |
|---|---|
| Wind Speed | 130 Vmph |
| 10-year MRI | 78 Vmph |
| 25-year MRI | 88 Vmph |
| 50-year MRI | 96 Vmph |
| 100-year MRI | 100 Vmph |

### Seismic

| | |
|---|---|
| $S_S$ | 0.097 |
| $S_1$ | 0.048 |
| $F_a$ | 1.6 |
| $F_v$ | 2.4 |
| $S_{MS}$ | 0.155 |
| $S_{M1}$ | 0.116 |
| $S_{DS}$ | 0.103 |
| $S_{D1}$ | 0.077 |
| $T_L$ | 8 |
| PGA | 0.046 |
| $PGA_M$ | 0.073 |
| $F_{PGA}$ | 1.6 |
| $I_e$ | 1.25 |
| $C_v$ | 0.7 |
| Seismic Design Category | B |

### Snow

| | |
|---|---|
| Ground Snow Load, $p_g$ | 10 $lb/ft^2$ |
| Mapped Elevation | 73.6 ft |

# 1615, 1604.5 Tsunami loads

**1615.1 General.**

~~The design and construction of Risk Category III and IV buildings and structures located in the Tsunami Design Zones defined in the Tsunami Design Geodatabase shall be in accordance with Chapter 6 of ASCE 7, except as modified by this code.~~

The 2024 NC Building Code (Structural) Ad-Hoc Committee does not recommend adopting this section in the 2024 NC Building Code.

# 1704.6 Structural Observations

**1704.6 Structural observations.** Where required by the provisions of Section 1704.6.1, the owner shall employ a registered design professional to perform structural observations. The structural observer shall visually observe representative locations of structural systems, details, and load paths for general conformance to the approved construction documents. Structural observation does not include or waive the responsibility for the inspections in the North Carolina Administrative Code and Policies or the special inspections in Section 1705 or other sections of this code. Prior to the commencement of observations, the structural observer shall submit to the building official a written statement identifying the frequency and extent of structural observations. At the conclusion of the work included in the permit, the structural observer shall submit to the building official a written statement that the site visits have been made and identify any reported deficiencies that, to the best of the structural observer's knowledge, have not been resolved.

# 1704.6 Structural Observations

**1704.6.1 Structural observations for structures.** Structural observations shall be provided for those structures where one or more of the following conditions exist:

1. The structure is classified as Risk Category III or IV.

2. The structure is a high-rise building.

3. The structure is assigned to Seismic Design Category E, and is greater than two stories above the grade plane.

4. Such observation is required by the registered design professional responsible for the structural design.

5. Such observation is specifically required by the building official.

# Table 1705.3 Special Inspection of Precast Concrete

| | | | | |
|---|---|---|---|---|
| 6. Prior to concrete placement, fabricate specimens for strength tests, perform slump, density and air content tests, and determine the temperature of the concrete. | X | — | ASTM C31<br>ASTM C172<br>ACI 318: 26.5, 26.12 | — |
| 6a. Verify that the concrete specimens for strength tests are maintained in the required initial curing environment, and that the maximum and minimum temperatures during the initial curing period are being reported. | — | X | ACI 318: 26.12.3.1(a)<br>ASTM C31: 10.1.2, 12.1.5 | — |
| 6b. Prior to shotcrete placement, perform slump and air content tests, and determine the temperature of the shotcrete. After the placement of the shotcrete, obtain strength test specimens. | X | — | ACI 318<br>ASTM C172<br>ASTM C143<br>ASTM C231 | — |

# Table 1705.3 Special Inspection of Precast Concrete

| | | | | |
|---|---|---|---|---|
| 11. For precast concrete diaphragm connections or reinforcement at joints classified as moderate or high deformability elements (MDE or HDE) in structures assigned to Seismic Design Category C, D, E or F, inspect such connections and reinforcement in the field for: | | | ACI 318: 26.13.1.3 | — |
| a. Installation of the embedded parts | X | — | ACI 550.5 | |
| b. Completion of the continuity of reinforcement across joints. | X | — | | |
| c. Completion of connections in the field. | X | — | | |
| 12. Inspect installation tolerances of precast concrete diaphragm connections for compliance with ACI 550.5. | — | X | ACI 318: 26.13.1.3 | — |

# 1705.4.1 Empirically Designed Masonry

**1705.4 Masonry construction.** Special inspections and tests of masonry construction shall be performed in accordance with the quality assurance program requirements of TMS 402 and TMS 602.

**Exception:** Special inspections and tests shall not be required for:

4. Non-load bearing masonry partition walls and screens as determined and designated as such by the registered design professional in or added to the construction documents.

# 1705.5.3, 1705.20 Mass Timber Special Inspection

**1705.5.3 Mass timber construction**. Special inspections of mass timber elements in Types IV-A, IV-B and IV-C construction shall be in accordance with Table 1705.5.3.

ACBH concealed beam hanger

**1705.20 Sealing of mass timber**. Periodic special inspections of sealants or adhesives shall be conducted where sealant or adhesive required by Section 703.7 is applied to mass timber building elements as designated in the approved construction documents.

The sealant or adhesive applied to mass timber

# 1705.5.3, 1705.20 Mass Timber Special Inspection

**TABLE 1705.5.3**
**REQUIRED SPECIAL INSPECTIONS OF MASS TIMBER CONSTRUCTION**

| TYPE | | | CONTINUOUS SPECIAL INSPECTION | PERIODIC SPECIAL INSPECTION |
|---|---|---|---|---|
| 1. | Inspection of anchorage and connections of mass timber construction to timber deep foundation systems. | | — | X |
| 2. | Inspect erection of mass timber construction. | | — | X |
| 3. | Inspection of connections where installation methods are required to meet design loads. | | | |
| | Threaded fasteners | Verify use of proper installation equipment. | — | X |
| | | Verify use of pre-drilled holes where required. | — | X |
| | | Inspect screws, including diameter, length, head type, spacing, installation angle and depth. | — | X |
| | Adhesive anchors installed in horizontal or upwardly inclined orientation to resist sustained tension loads. | | X | — |
| | Adhesive anchors not defined in preceding cell. | | — | X |
| | Bolted connections. | | — | X |
| | Concealed connections. | | — | X |

# 1705.10 Structural Integrity of Deep Foundations

**1705.10 Structural integrity of deep foundation elements.** Whenever there is a reasonable doubt as to the structural integrity of a deep foundation element, an engineering assessment shall be required. The engineering assessment shall include tests for defects performed in accordance with ASTM D4945, ASTM D5882, ASTM D6760 or ASTM D7949, or other approved method.

**ASTM D5882-16:** Standard Test Method for Low Strain Impact Integrity Testing of Deep Foundations

**ASTM D6760-16:** Standard Test Method for Integrity Testing of Concrete Deep Foundations by Ultrasonic Crosshole Testing

**ASTM D7949-14:** Standard Test Methods for Thermal Integrity Profiling of Concrete Deep Foundations

# 1705.13.7 Special Inspection of Storage Racks

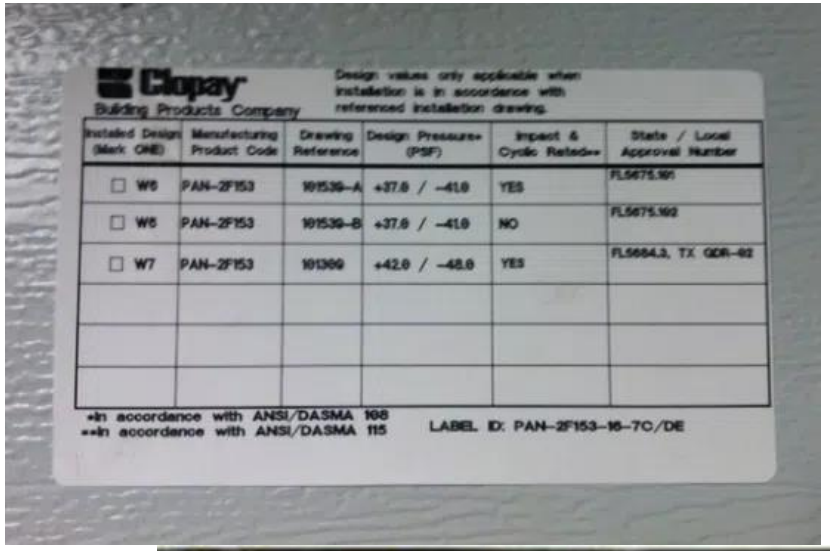
**1705.13.7 Storage racks.** Steel storage racks and steel cantilevered storage racks that are 8 feet (2438 mm) in height or greater and assigned to Seismic Design Category D, E or F shall be provided with periodic special inspection as required by Table 1705.13.7.

**TABLE 1705.13.7**
**REQUIRED INSPECTIONS OF STORAGE RACK SYSTEMS**

| TYPE | CONTINUOUS INSPECTION | PERIODIC INSPECTION | REFERENCED STANDARD | IBC REFERENCE |
|---|---|---|---|---|
| 1. Materials used, to verify compliance with one or more of the material test reports in accordance with the approved construction documents. | — | X | — | — |
| 2. Fabricated storage rack elements. | — | X | — | Section 1704.2.5 |
| 3. Storage rack anchorage installation. | — | X | ANSI/MH16.1 Section 7.3.2 | — |
| 4. Completed storage rack system, to indicate compliance with the approved construction documents. | — | X | — | — |

# 1709.5 Window and Door Assemblies

**1709.5.2.1 Garage doors and rolling doors.** Garage doors and rolling doors shall be tested in accordance with either ASTM E330 or ANSI/DASMA 108, and shall meet the pass/fail criteria of ANSI/DASMA 108. Garage doors and rolling doors shall be labeled with a permanent label identifying the door manufacturer, the door model/series number, the positive and negative design wind pressure rating, the installation instruction drawing reference number, and the applicable test standard.




# 1709.5.3 Impact Protection

**1709.5.3 Windborne debris protection.** Protection of exterior glazed openings in buildings located in windborne debris regions shall be in accordance with Section 1609.2.

**1709.5.3.1 Impact protective systems testing and labeling**. Impact protective systems shall be tested for impact resistance by an approved independent laboratory for compliance with ASTM E1886 and ASTM E1996 and for design wind pressure for compliance with ASTM E330. Required design wind pressures shall be determined in accordance with ASCE 7, and for the purposes of this section, multiplied by 0.6 to convert to allowable stress design.

Impact protective systems shall have a permanent label applied in accordance with Section 1703.5.4, identifying the manufacturer, product designation, performance characteristics, and approved inspection agency.

# 202 Definition of Impact Protect System

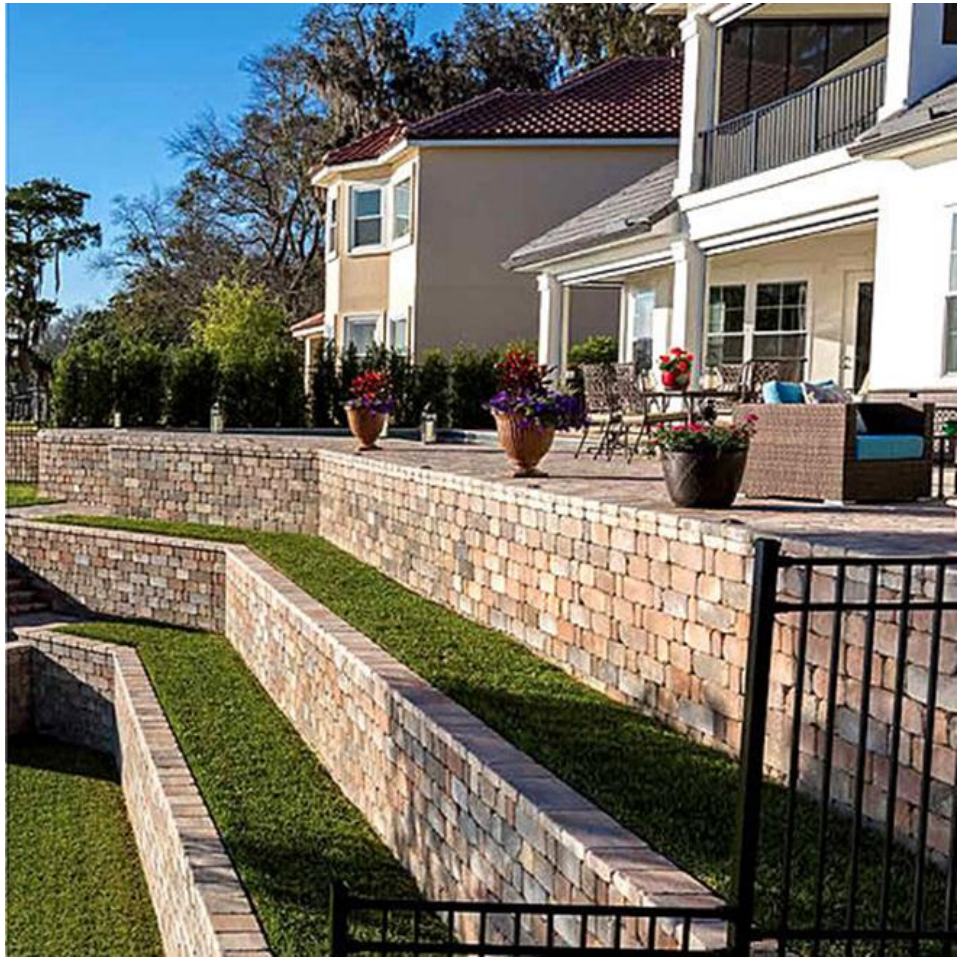
**IMPACT PROTECTIVE SYSTEM.** Construction that has been shown by testing to withstand the impact of test missiles and that is applied, attached or locked over exterior glazing.

**WINDBORNE DEBRIS REGION.** Areas within hurricane-prone regions defined as that area east of the inland water-way from the North Carolina/South Carolina state line north to Beaufort Inlet and from that point to include the barrier islands to the North Carolina/Virginia state line.

# 1807.2 Retaining Walls

**1807.2.6 Retaining systems.** Retaining systems providing a cumulative vertical relief greater than 5 feet (1524 mm) in height with a horizontal distance of 15 feet (4572 mm) or less between retaining walls or mechanically stabilized earth walls shall be designed under the responsible charge of a registered design professional. Retaining systems shall meet the requirements of Section 1610. Testing and inspection reports shall comply with Section 1704.2.4 and shall verify:

(Conditions no change)



# 1809.5.1 Frost Protection at Required Exits

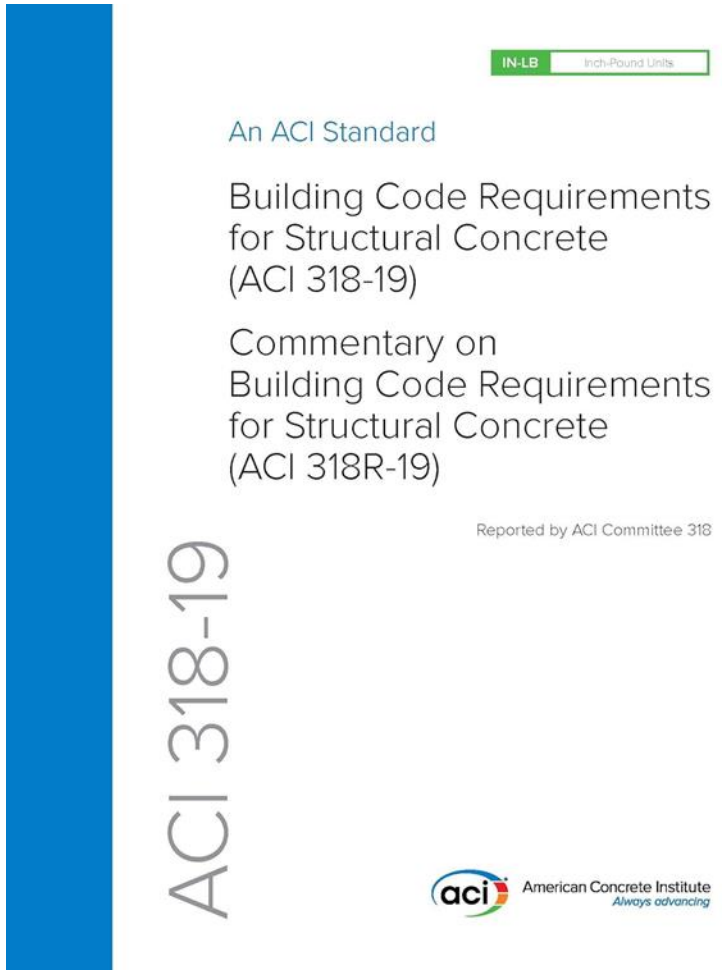
**1809.5.1 Frost protection at required exits.** Frost protection shall be provided at exterior landings for all required exits with outward-swinging doors. Frost protection shall only be required to the extent necessary to ensure the unobstructed opening of the required exit doors.

**Frost Protection:**

- **Ensure the slab is properly installed below the frost line**
- **Combined with adding insulation beneath the slab and potentially using a perimeter insulation barrier around the edges, preventing moisture from freezing and causing heaving**

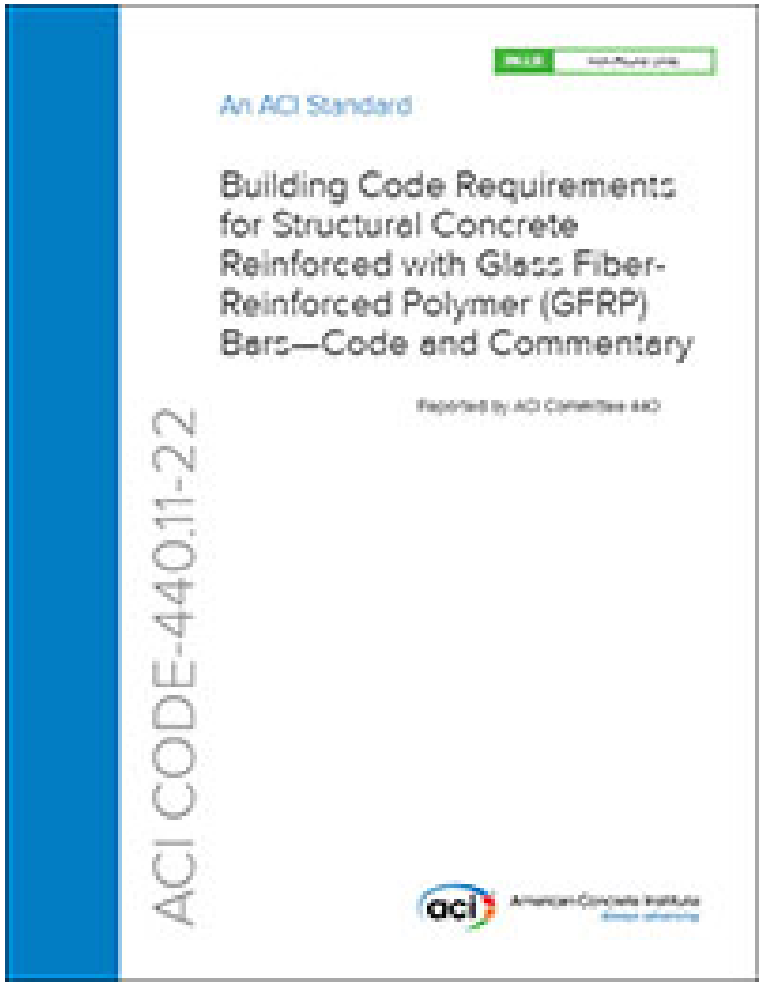
# 1901.2 Concrete Design and Construction

**1901.2 Plain and reinforced concrete.** Structural concrete shall be designed and constructed in accordance with the requirements of this chapter and ACI 318 as amended in Section 1905 of this code. Except for the provisions of Sections 1904 and 1907, the design and construction of slabs on grade shall not be governed by this chapter unless they transmit vertical loads or lateral forces from other parts of the structure to the soil.



# 1901.2.1 Glass Fiber Reinforced Polymer Reinforcement (GFRP)

**1901.2.1 Structural concrete with GFRP reinforcement.** Cast-in-place structural concrete internally reinforced with glass fiber reinforced polymer (GFRP) reinforcement conforming to ASTM D7957 and designed in accordance with ACI CODE 440.11 shall be permitted where fire resistance ratings are not required and only for structures assigned to Seismic Categories A, B or C.



# 1901.7 Structural Concrete Tolerances

**1901.7.1 Cast-in-place concrete tolerances.**

**Structural tolerances for cast-in-place concrete structural elements shall be in accordance with ACI 117.**

**1901.7.2 Precast concrete tolerances.**

**Structural tolerances for precast concrete structural elements shall be in accordance with ACI ITG-7.**

# 1908 Shotcrete

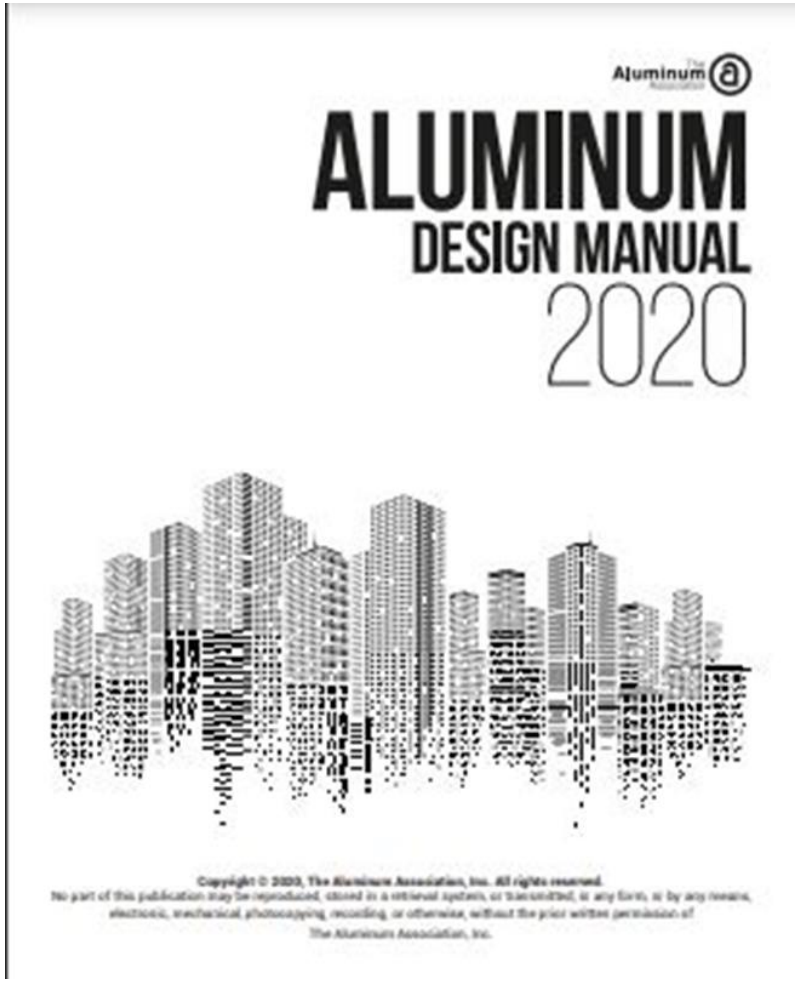
**1908.1 General.** Shotcrete shall be in accordance with the requirements of ACI 318.

# 2002 Aluminum

**2002.1 General.** Aluminum used for structural purposes in buildings and structures shall comply with AA ASM 35 and AA ADM. The nominal loads shall be the minimum design loads required by Chapter 16.

AA ADM — 2020 Aluminum Design Manual

AA ASM 35 — 2000 Aluminum Sheet Metal Work in Building Construction (Fourth Edition)



# 2101.2 Masonry Design

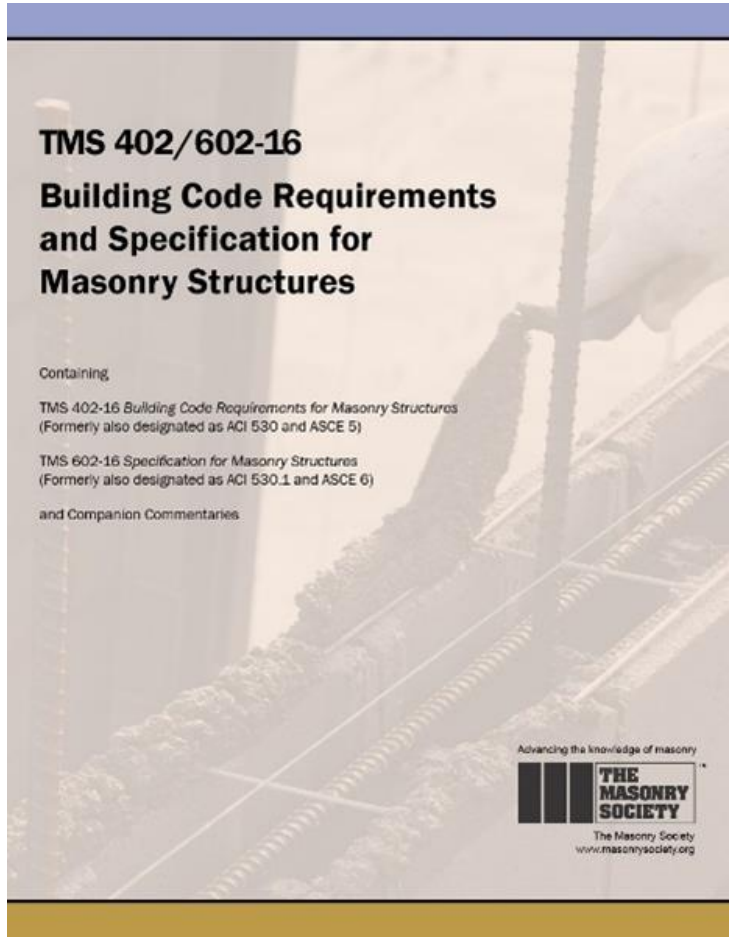
**2101.2 Design methods.** Masonry shall comply with the provisions of TMS 402, TMS 403 or TMS 404 as well as applicable requirements of this chapter.

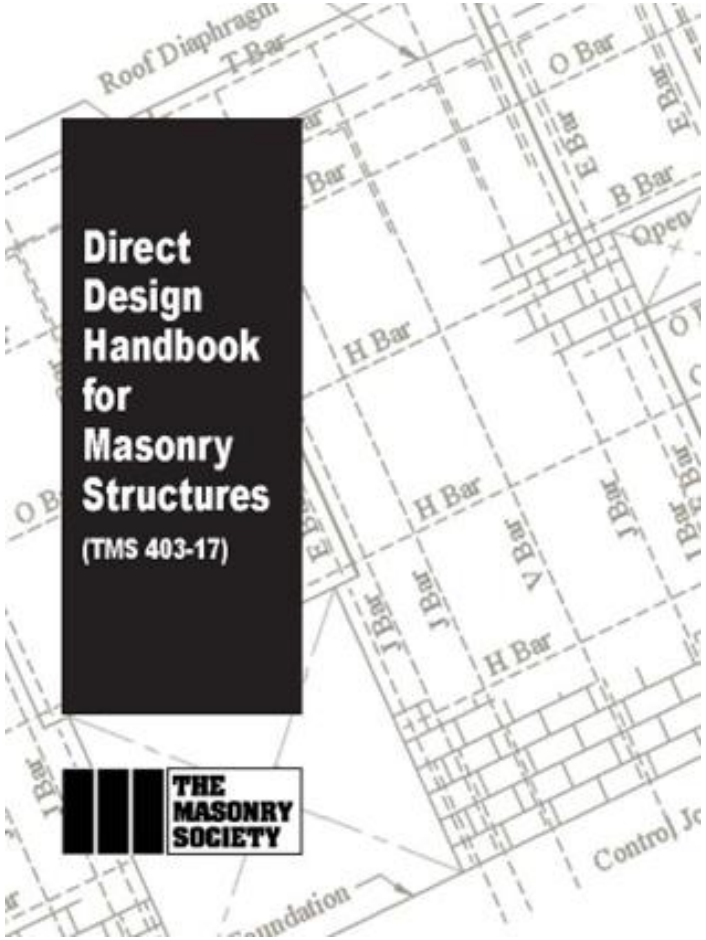
**TMS 402 — 2016 Building Code for Masonry Structures**

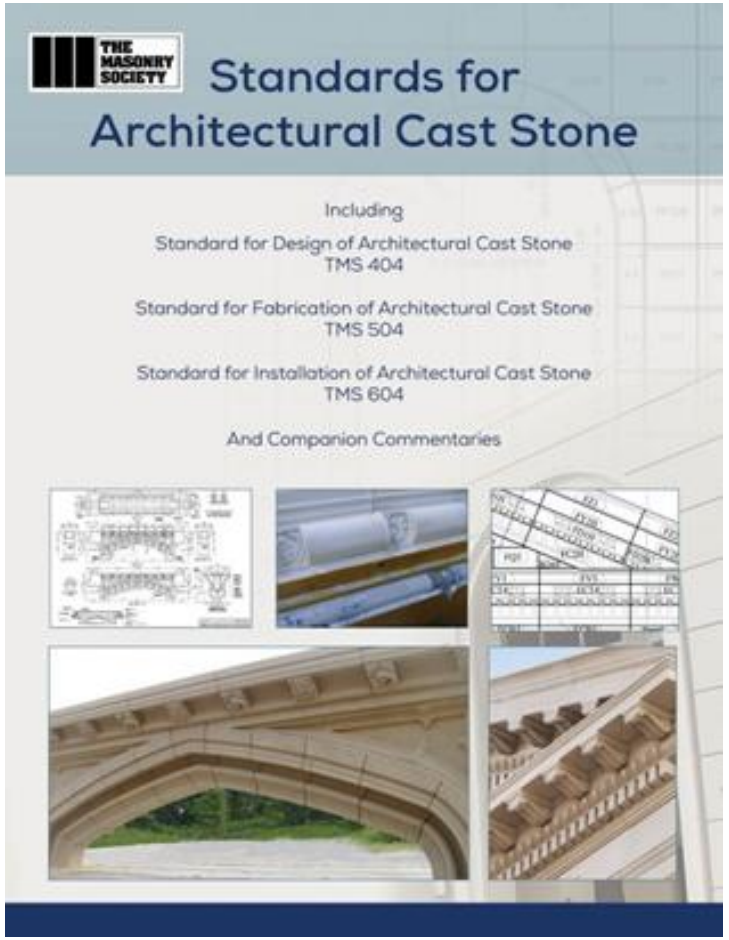
**TMS 403 — 2017 Direct Design Handbook for Masonry Structures**

**TMS 404 — 2016 Standard for the Design of Architectural Cast Stone**

# 2101.2 Masonry Design



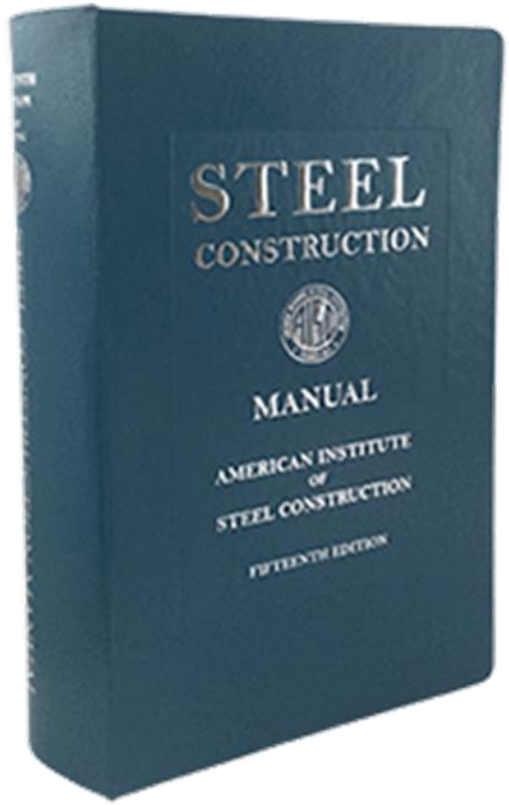
# 2202.1 Steel Design

ANSI/AISC 360 — 2016 Specification for Structural Steel Buildings

ANSI/AISC 341 — 2016 Seismic Provisions for Structural Steel Buildings

Specification for Structural Steel Buildings (ANSI/AISC 360-16) - 2016

Seismic Provisions for Structural Steel Buildings (ANSI/AISC 341-16)

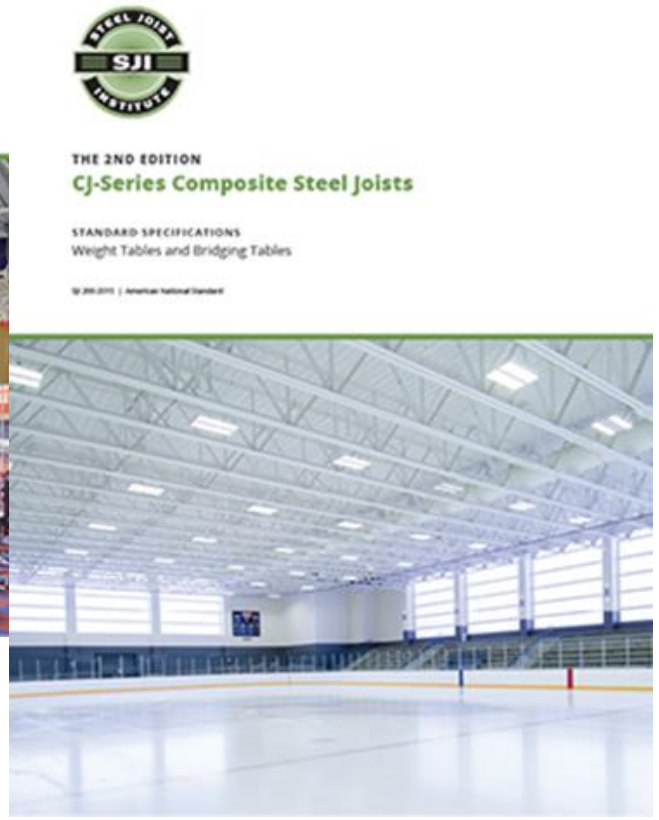


# 2207.1 SJI Standard

**2207.1 General.** The design, manufacture and use of open-web steel joists and joist girders shall be in accordance with either SJI 100 or SJI 200, as applicable.

**SJI 100 — 2020 45th Edition Standard Specifications, Load Tables and Weight Tables for K-Series, LH-Series, DLH-Series and Joist Girders**

**SJI 200 — 2015 2nd Edition Standard Specifications, Weight Tables and Bridging Tables for CJ-Series Composite Steel Joists**

# 2209.2 Cantilevered Steel Storage Racks

**STORAGE RACKS, STEEL CANTILEVERED.** A framework or assemblage composed of cold-formed or hot rolled steel structural members, primarily in the form of vertical columns, extended bases, horizontal arms projecting from the faces of the columns, and longitudinal (down-aisle) bracing between columns. There may be shelf beams between the arms, depending on the products being stored; this definition does not include other types of racks such as pallet storage racks, drive-in racks, drive-through racks, or racks made of materials other than steel.

# 2209.2, 2209.3 Steel Cantilevered Storage Racks

**2209.2 Steel cantilevered storage racks.** The design, testing and utilization of steel cantilevered storage racks made of cold-formed or hot-rolled steel structural members shall be in accordance with RMI ANSI/MH 16.3. Where required by ASCE 7, the seismic design of steel cantilevered storage racks shall be in accordance with Section 15.5.3 of ASCE 7.

**2209.3 Certification.** For rack storage structures that are 8 feet (2438 mm) in height or greater to the top load level and assigned to Seismic Design Category D, E, or F at completion of the storage rack installation, a certificate of compliance shall be submitted to the owner or the owner's authorized agent stating that the work was performed in accordance with approved construction documents.

# 2210 Cold Form Steel Design

**AISI S100 — 2016 (2020) w/S2—20:** North American Specification for the Design of Cold-Formed Steel Structural Members, 2016 Edition (Reaffirmed 2020), with Supplement 2, 2020 Edition


**AISI S220 — 2020** North American Standard for Cold-formed Steel Nonstructural Framing


**AISI S240 — 2020** North American Standard for Cold-Formed Steel Structuring Framing, 2020

# Chapter 23 Wood Design Standard

**ANSI/AWC NDS — 2018 National Design Specification (NDS) for Wood Construction— with 2018 NDS Supplement**

**ANSI/AWC WFCM — 2018 Wood Frame Construction Manual for One- and Two-Family Dwellings**

# 2303.2.2 Fire-Retardant-Treated Wood

**2303.2.2 Other means during manufacture.** For wood products impregnated with chemicals by other means during manufacture, the treatment shall be an integral part of the manufacturing process of the wood product. The treatment shall provide permanent protection to all surfaces of the wood product. The use of paints, coating, stains or other surface treatments is not an approved method of protection as required in this section.

# 2303.4.1.2 Wood Truss Bracing

**PERMANENT INDIVIDUAL TRUSS MEMBER DIAGONAL BRACING (PITMDB).** Structural member or assembly intended to permanently stabilize the PITMRs.

**PERMANENT INDIVIDUAL TRUSS MEMBER RESTRAINT (PITMR).** Restraint that is used to prevent local buckling of an individual truss chord or web member because of the axial forces in the individual truss member.

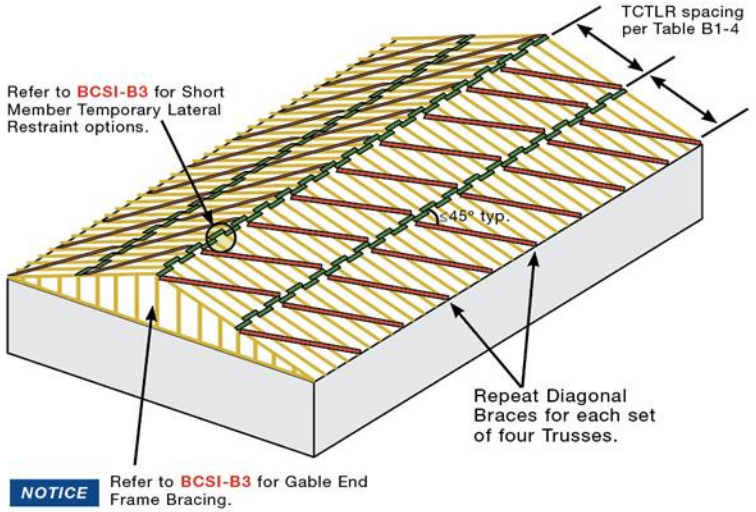
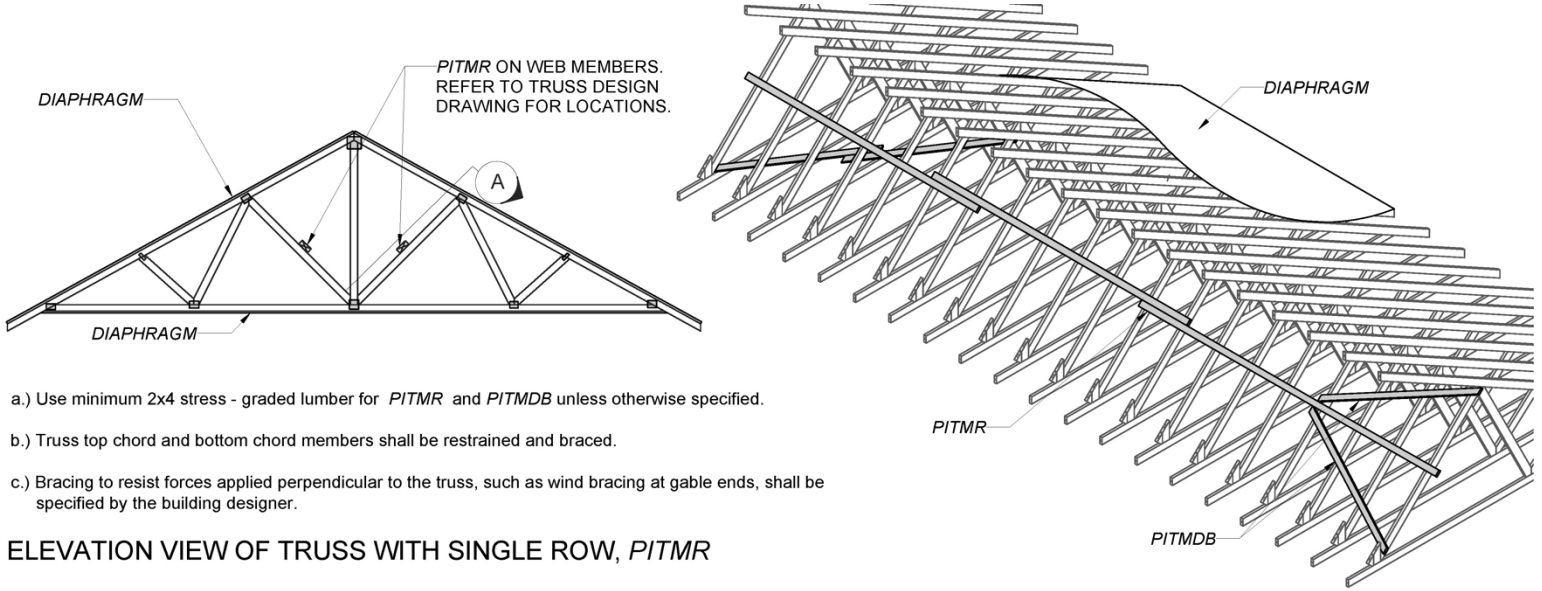


Figure B1-24B

# 2303.4.1.2 Wood Truss Bracing

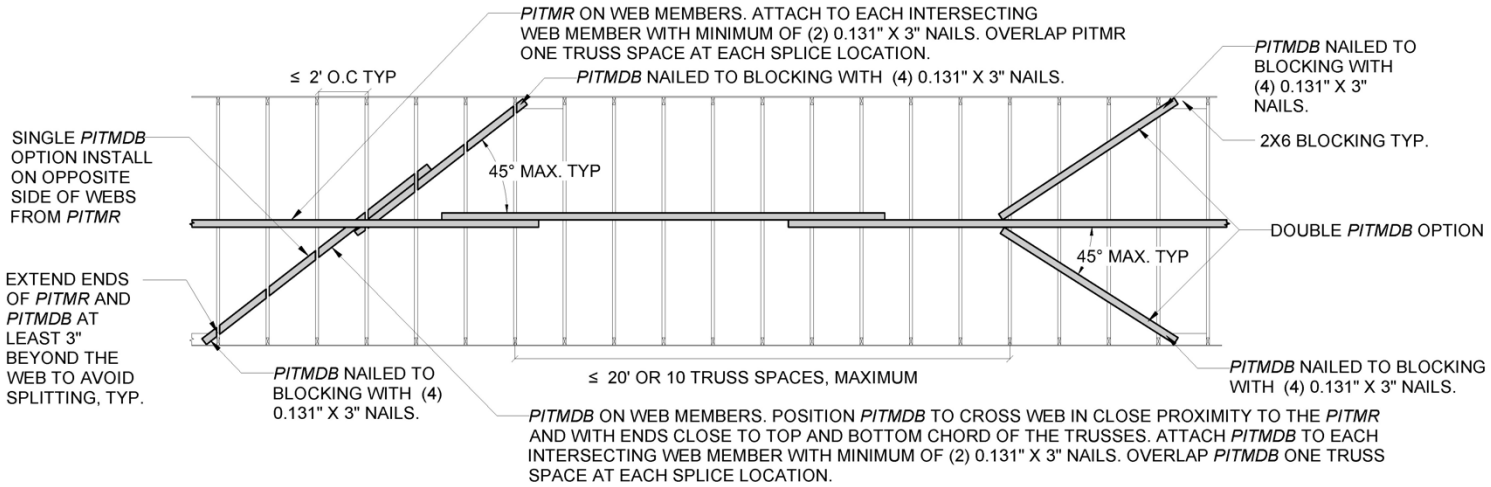



a.) Use minimum 2x4 stress - graded lumber for *PITMR* and *PITMDB* unless otherwise specified.

b.) Truss top chord and bottom chord members shall be restrained and braced.

c.) Bracing to resist forces applied perpendicular to the truss, such as wind bracing at gable ends, shall be specified by the building designer.

ELEVATION VIEW OF TRUSS WITH SINGLE ROW, *PITMR*




A SECTION (EXAMPLE OF SINGLE ROW OF *PITMR* WITH *PITMDB* ON WEB MEMBERS)

**FIGURE 2303.4.1.2 (1)**
**PITMR AND PITMDB FOR TRUSS WEB MEMBERS REQUIRING ONE ROW OF PITMR**

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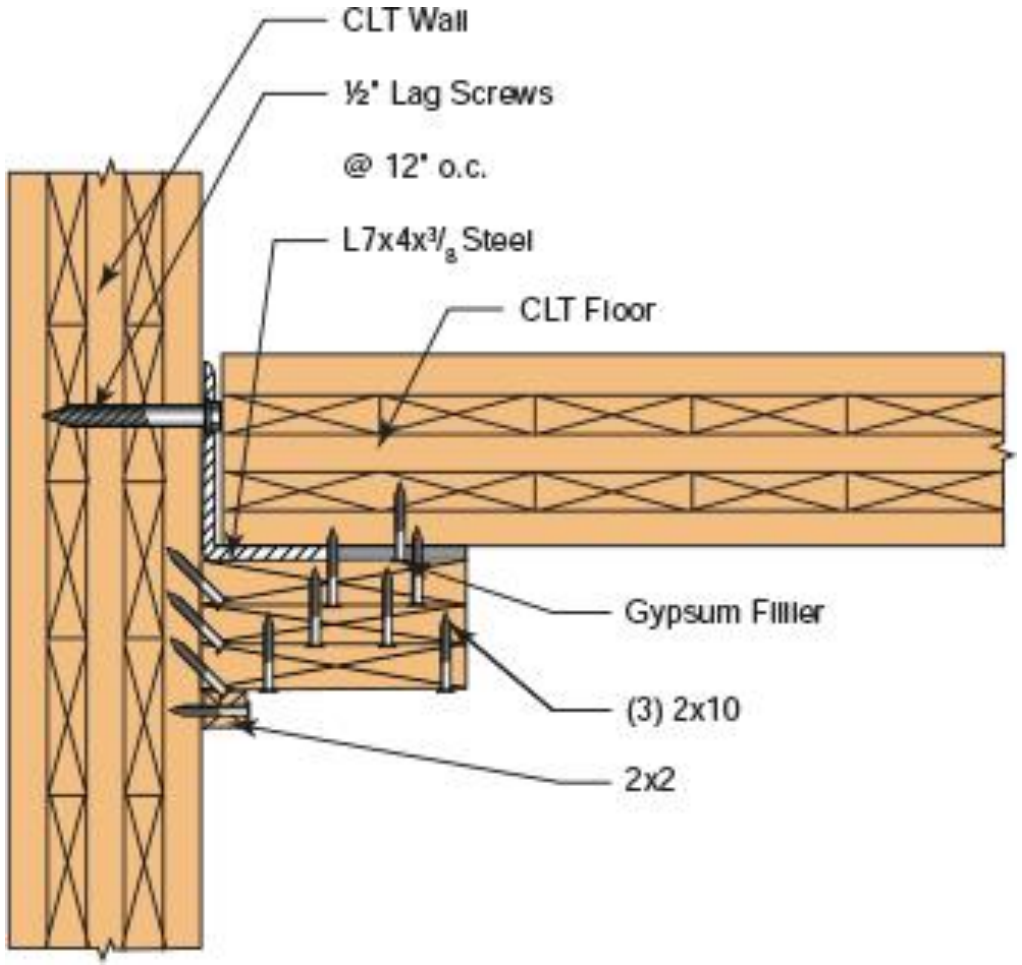
# 2304.10.1 Mass Timber Connection Protection

**2304.10.1 Connection fire-resistance rating.** Fire-resistance ratings for connections in Type IV-A, IV-B, or IV-C construction shall be determined by one of the following:

1. Testing in accordance with Section 703.2 where the connection is part of the fire resistance test.

2. Engineering analysis that demonstrates that the temperature rise at any portion of the connection is limited to an average temperature rise of 250°F (139°C), and a maximum temperature rise of 325°F (181°C), for a time corresponding to the required fire-resistance rating of the structural element being connected. For the purposes of this analysis, the connection includes connectors, fasteners, and portions of wood members included in the structural design of the connection.

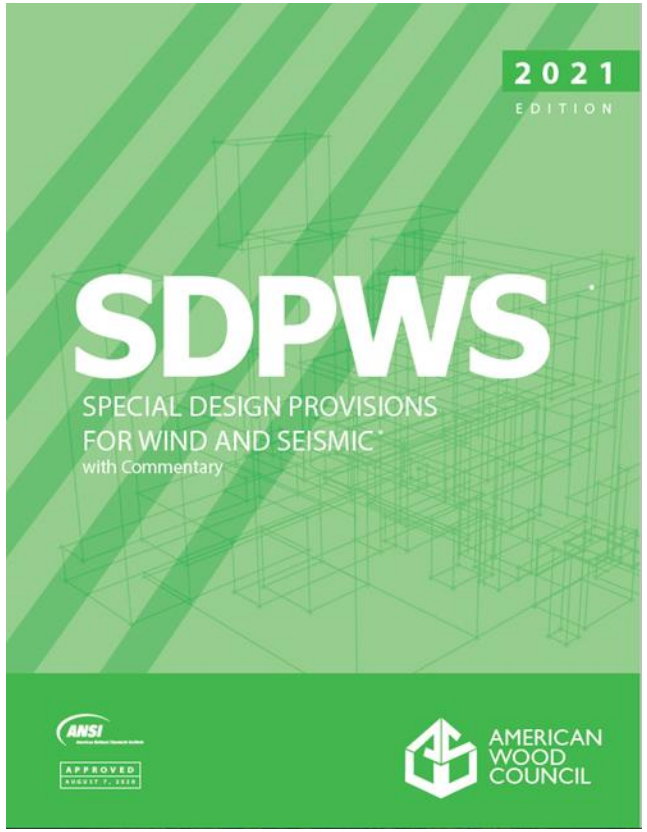
# 2304.10.1 Mass Timber Connection Protection




**CLT floor-to-wall – Engineering Analysis**

# 2305 Lateral Force-Resisting Systems

**2305.1 General.** Structures using wood-frame shear walls or wood-frame diaphragms to resist wind, seismic or other lateral loads shall be designed and constructed in accordance with AWC SDPWS and the applicable provisions of Sections 2305, 2306 and 2307.




**ANSI/AWC SDPWS — 2021 Special Design Provisions for Wind and Seismic**

# 2304.11 Heavy Timber Construction

2304.11 Heavy timber construction. Where a structure, portion thereof or individual structural elements are required by provisions of this code to be of heavy timber, the building elements therein shall comply with the applicable provisions of Sections 2304.11.1 through 2304.11.4. Minimum dimensions of heavy timber shall comply with the applicable requirements in Table 2304.11 based on roofs or floors supported and the configuration of each structural element, or in Sections 2304.11.2 through 2304.11.4. Lumber decking shall be in accordance with Section 2304.9.

# 2304.11 Heavy Timber Construction

**TABLE 2304.11**
**MINIMUM DIMENSIONS OF HEAVY TIMBER STRUCTURAL MEMBERS**

| | | MINIMUM NOMINAL SOLID SAWN SIZE | | MINIMUM GLUED-LAMINATED NET SIZE | | MINIMUM STRUCTURAL COMPOSITE LUMBER NET SIZE | |
|---|---|---|---|---|---|---|---|
| SUPPORTING | HEAVY TIMBER STRUCTURAL ELEMENTS | Width, inch | Depth, inch | Width, inch | Depth, inch | Width, inch | Depth, inch |
| Floor loads only or combined floor and roof loads | Columns; Framed sawn or glued-laminated timber arches that spring from the floor line; Framed timber trusses | 8 | 8 | $6^{3}/_{4}$ | $8^{1}/_{4}$ | 7 | $7^{1}/_{2}$ |
| | Wood beams and girders | 6 | 10 | 5 | $10^{1}/_{2}$ | $5^{1}/_{4}$ | $9^{1}/_{2}$ |
| Roof loads only | Columns (roof and ceiling loads); Lower half of: wood-frame or glued-laminated arches that spring from the floor line or from grade | 6 | 8 | 5 | $8^{1}/_{4}$ | $5^{1}/_{4}$ | $7^{1}/_{2}$ |
| | Upper half of: wood-frame or glued-laminated arches that spring from the floor line or from grade | 6 | 6 | 5 | 6 | $5^{1}/_{4}$ | $5^{1}/_{2}$ |
| | Framed timber trusses and other roof framing;[a] Framed or glued-laminated arches that spring from the top of walls or wall abutments | 4[b] | 6 | 3[b] | $6^{7}/_{8}$ | $3^{1}/_{2}$[b] | $5^{1}/_{2}$ |

# 2304.11 Heavy Timber Construction

| 2024 NCBC | 2018 NCBC | |
|---|---|---|
| Table 2304.11 | Table 602.4 | Minimum dimensions |
| 2304.11.1 | New | Details of heavy timber structural members |
| 2304.11.1.1 | 602.4.3, 2304.11.1 | Columns |
| 2304.11.1.2 | 602.4.4, 2304.11.2 | Floor framing |
| 2304.11.1.3 | 602.4.5, 2304.11.3 | Roof framing |
| 2304.11.2.1 | 602.4.8.2 | Exterior walls |
| 2304.11.2.2 | 602.4.8.1 | Partitions and interior walls |
| 2304.11.3 | 602.4.6 | Floors |
| 2304.11.3.1 | 602.4.6.2 | CLT floors |
| 2304.11.3.2 | 602.4.6.1, 2304.11.4 | Sawn or glued-laminated plank floors |
| 2304.11.4 | 2304.11.5 | Roof decks |

# Table 2308.4.1.1(1) Header and Girder Spans—Exterior Walls

**TABLE 2308.4.1.1(1)**
**HEADER AND GIRDER SPANS[a, b] FOR EXTERIOR BEARING WALLS**
**(Maximum spans for Douglas fir-larch, hem-fir, Southern pine and spruce-pine-fir and required number of jack studs)**

| GIRDERS AND HEADERS SUPPORTING | SIZE | GROUND SNOW LOAD (psf)[e] | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 30 | | | | | | 50 | | | | | | 70 | | | | | |
| | | Building width[c] (feet) | | | | | | | | | | | | | | | | | |
| | | 12 | | 24 | | 36 | | 12 | | 24 | | 36 | | 12 | | 24 | | 36 | |
| | | Span[f] | NJ[d] | Span[f] | NJ[d] | Span[f] | NJ[d] | Span[f] | NJ[d] | Span[f] | NJ[d] | Span[f] | NJ[d] | Span[f] | NJ[d] | Span[f] | NJ[d] | Span[f] | NJ[d] |
| Roof and ceiling | 1-2 × 6 | 4-0 | 1 | 3-1 | 2 | 2-7 | 2 | 3-5 | 1 | 2-8 | 2 | 2-3 | 2 | 3-0 | 2 | 2-4 | 2 | 2-0 | 2 |
| | 1-2 × 8 | 5-1 | 2 | 3-11 | 2 | 3-3 | 2 | 4-4 | 2 | 3-4 | 2 | 2-10 | 2 | 3-10 | 2 | 3-0 | 2 | 2-6 | 3 |
| | 1-2 × 10 | 6-0 | 2 | 4-8 | 2 | 3-11 | 2 | 5-2 | 2 | 4-0 | 2 | 3-4 | 3 | 4-7 | 2 | 3-6 | 3 | 3-0 | 3 |
| | 1-2 × 12 | 7-1 | 2 | 5-5 | 2 | 4-7 | 3 | 6-1 | 2 | 4-8 | 3 | 3-11 | 3 | 5-5 | 2 | 4-2 | 3 | 3-6 | 3 |
| | 2-2 × 4 | 4-0 | 1 | 3-1 | 1 | 2-7 | 1 | 3-5 | 1 | 2-7 | 1 | 2-2 | 1 | 3-0 | 1 | 2-4 | 1 | 2-0 | 1 |
| | 2-2 × 6 | 6-0 | 1 | 4-7 | 1 | 3-10 | 1 | 5-1 | 1 | 3-11 | 1 | 3-3 | 2 | 4-6 | 1 | 3-6 | 2 | 2-11 | 2 |
| | 2-2 × 8 | 7-7 | 1 | 5-9 | 1 | 4-10 | 2 | 6-5 | 1 | 5-0 | 2 | 4-2 | 2 | 5-9 | 1 | 4-5 | 2 | 3-9 | 2 |
| | 2-2 × 10 | 9-0 | 1 | 6-10 | 2 | 5-9 | 2 | 7-8 | 2 | 5-11 | 2 | 4-11 | 2 | 6-9 | 2 | 5-3 | 2 | 4-5 | 2 |
| | 2-2 × 12 | 10-7 | 2 | 8-1 | 2 | 6-10 | 2 | 9-0 | 2 | 6-11 | 2 | 5-10 | 2 | 8-0 | 2 | 6-2 | 2 | 5-2 | 3 |
| | 3-2 × 8 | 9-5 | 1 | 7-3 | 1 | 6-1 | 1 | 8-1 | 1 | 6-3 | 1 | 5-3 | 2 | 7-2 | 1 | 5-6 | 2 | 4-8 | 2 |
| | 3-2 × 10 | 11-3 | 1 | 8-7 | 1 | 7-3 | 2 | 9-7 | 1 | 7-4 | 2 | 6-2 | 2 | 8-6 | 1 | 6-7 | 2 | 5-6 | 2 |
| | 3-2 × 12 | 13-2 | 1 | 10-1 | 2 | 8-6 | 2 | 11-3 | 2 | 8-8 | 2 | 7-4 | 2 | 10-0 | 2 | 7-9 | 2 | 6-6 | 2 |
| | 4-2 × 8 | 10-11 | 1 | 8-4 | 1 | 7-0 | 1 | 9-4 | 1 | 7-2 | 1 | 6-0 | 1 | 8-3 | 1 | 6-4 | 1 | 5-4 | 2 |
| | 4-2 × 10 | 12-11 | 1 | 9-11 | 1 | 8-4 | 1 | 11-1 | 1 | 8-6 | 1 | 7-2 | 2 | 9-10 | 1 | 7-7 | 2 | 6-4 | 2 |
| | 4-2 × 12 | 15-3 | 1 | 11-8 | 1 | 9-10 | 2 | 13-0 | 1 | 10-0 | 2 | 8-5 | 2 | 11-7 | 1 | 8-11 | 2 | 7-6 | 2 |

# 2308.4.1.1(2) Header and Girder Spans—Interior Walls

**TABLE 2308.4.1.1(2)**
**HEADER AND GIRDER SPANS[a, b] FOR INTERIOR BEARING WALLS**
**(Maximum spans for Douglas fir-larch, hem-fir, Southern pine and spruce-pine-fir and required number of jack studs)**

| HEADERS AND GIRDERS SUPPORTING | SIZE | BUILDING WIDTH[c] (feet) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 12 | | 24 | | 36 | |
| | | Span[e] | NJ[d] | Span[e] | NJ[d] | Span[e] | NJ[d] |
| One floor only | 2-2 × 4 | 4-1 | 1 | 2-10 | 1 | 2-4 | 1 |
| | 2-2 × 6 | 6-1 | 1 | 4-4 | 1 | 3-6 | 1 |
| | 2-2 × 8 | 7-9 | 1 | 5-5 | 1 | 4-5 | 2 |
| | 2-2 × 10 | 9-2 | 1 | 6-6 | 2 | 5-3 | 2 |
| | 2-2 × 12 | 10-9 | 1 | 7-7 | 2 | 6-3 | 2 |
| | 3-2 × 8 | 9-8 | 1 | 6-10 | 1 | 5-7 | 1 |
| | 3-2 × 10 | 11-5 | 1 | 8-1 | 1 | 6-7 | 2 |
| | 3-2 × 12 | 13-6 | 1 | 9-6 | 2 | 7-9 | 2 |
| | 4-2 × 8 | 11-2 | 1 | 7-11 | 1 | 6-5 | 1 |
| | 4-2 × 10 | 13-3 | 1 | 9-4 | 1 | 7-8 | 1 |
| | 4-2 × 12 | 15-7 | 1 | 11-0 | 1 | 9-0 | 2 |

# 2308.5.5.1 Openings in Exterior Bearing Walls

**2308.5.5.1 Openings in exterior bearing walls.** Single-member headers of nominal 2-inch (51 mm) thickness shall be framed with a single flat 2-inch-nominal (51 mm) member or wall plate not less in width than the wall studs on the top and bottom of the header in accordance with Figures 2308.5.5.1(1) and 2308.5.5.1(2) and face nailed to the top and bottom of the header with 10d box nails [3 inches × 0.128 inches (76 mm × 3.3 mm)] spaced 12 inches (305 mm) on center.

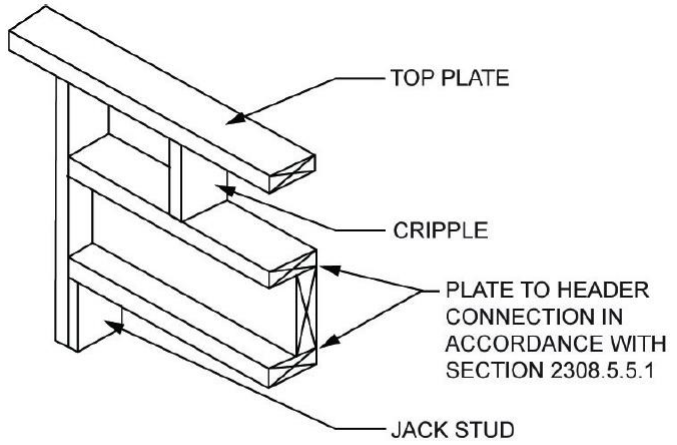



FIGURE 2308.5.5.1(1)
SINGLE-MEMBER HEADER IN EXTERIOR BEARING WALL

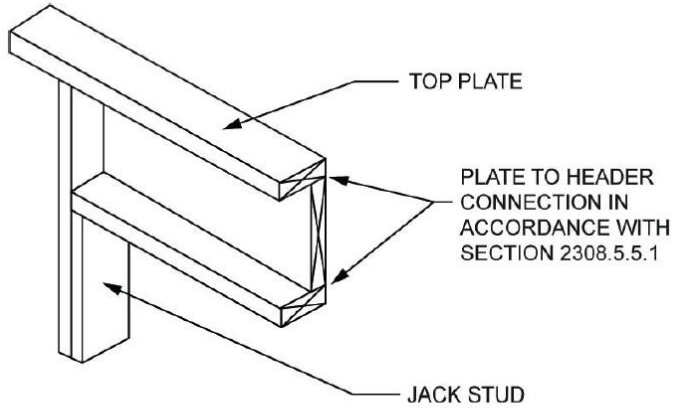



FIGURE 2308.5.5.1(2)
ALTERNATIVE SINGLE-MEMBER HEADER WITHOUT CRIPPLE

# 3001.2 Emergency Elevator Communication Systems

**3001.2 Emergency elevator communication systems for the deaf, hard of hearing and speech impaired.** An emergency two-way communication system shall be provided. The system shall provide visible text and audible modes that meet all of the following requirements:

1. When operating in each mode, include a live interactive system that allows back and forth conversation between the elevator occupants and emergency personnel.

2. Is operational when the elevator is operational.

3. Allows elevator occupants to select the text-based or audible mode depending on their communication needs to interact with emergency personnel.

# 3006.2.1 Corridors Adjacent to Elevator Hoistway Openings

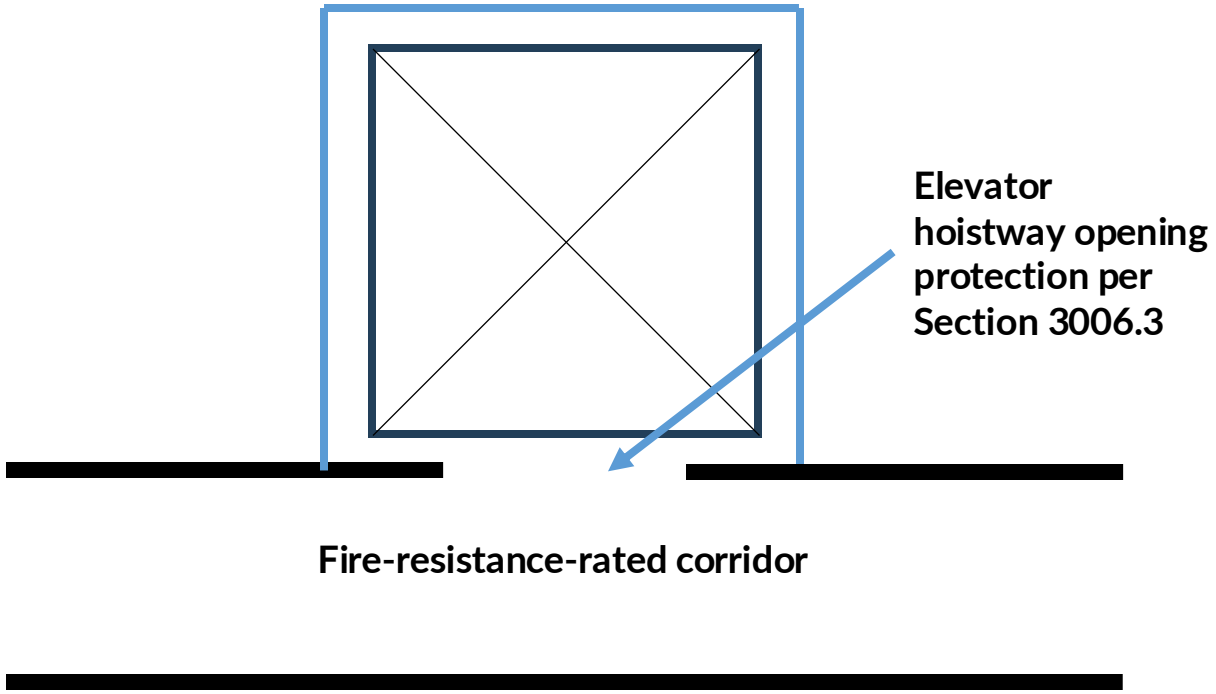
**3006.2.1 Rated corridors.** Where corridors are required to be fire-resistance rated in accordance with Section 1020.2, elevator hoistway openings shall be protected in accordance with Section 3006.3.

TABLE 1020.2
CORRIDOR FIRE-RESISTANCE RATING[l]

| OCCUPANCY | OCCUPANT LOAD SERVED BY CORRIDOR | REQUIRED FIRE-RESISTANCE RATING (hours) | |
|---|---|---|---|
| | | Without sprinkler system | With sprinkler system |
| H-1, H-2, H-3 | All | Not Permitted | 1[c] |
| H-4, H-5 | Greater than 30 | Not Permitted | 1[c] |
| A, B[g, k], E[e, h], F, M, S[i], U | Greater than 30 | 1 | 0 |
| R[f, i] | Greater than 10 | Not Permitted | 0.5[c]/1[d] |
| I-2[a] | All | Not Permitted | 0 |
| I-1[j], I-3 | All | Not Permitted | 1[b, c] |
| I-4 | All | 1 | 0 |

Elevator hoistway opening protection:

- Enclosed Elevator Lobby, or
- Additional door, or
- Pressurization of hoistway



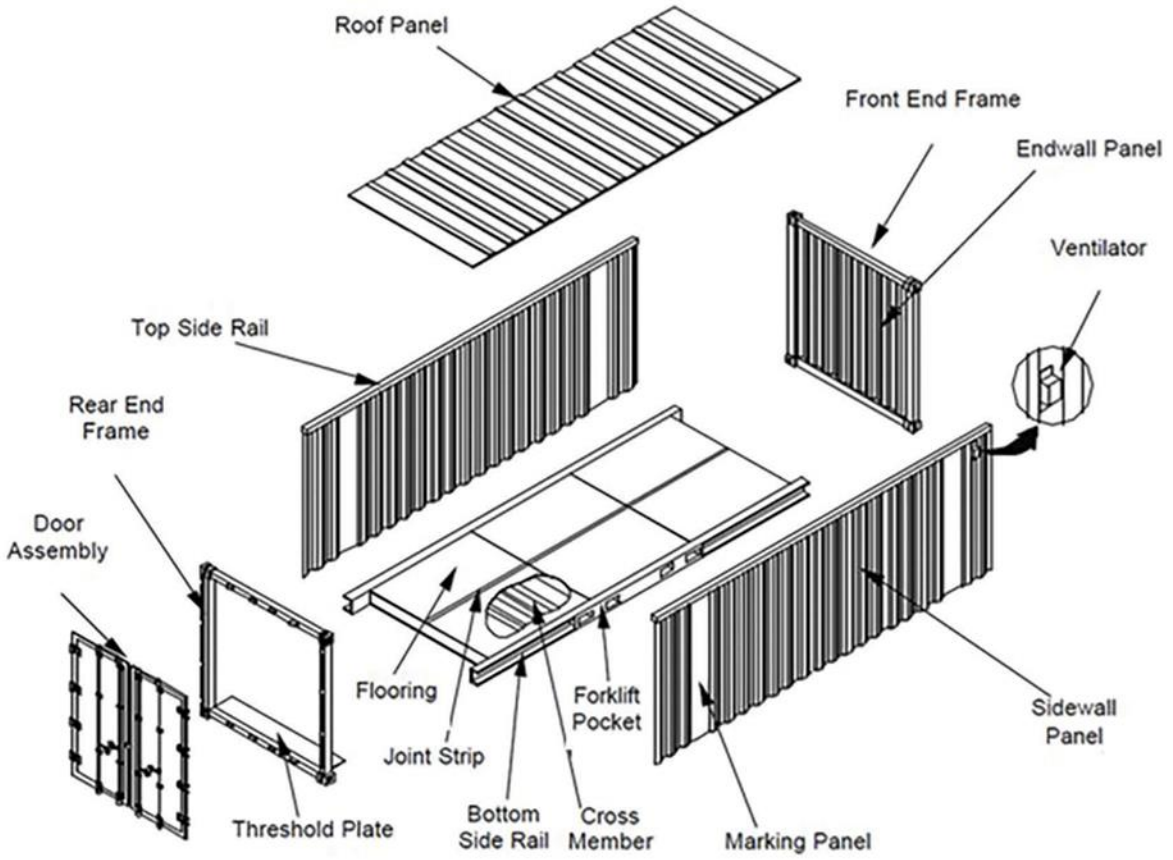
# 3103.1 Special Event Structures

**SPECIAL EVENT STRUCTURE**. Any ground-supported structure, platform, stage, stage scaffolding or rigging, canopy, tower or similar structure supporting entertainment related equipment or signage.

# 3115 Intermodal Shipping Containers

**INTERMODAL SHIPPING CONTAINER.** A six-sided steel unit originally constructed as a general cargo container used for the transport of goods and materials.

**3115.1 General.** The provisions of Section 3115 and other applicable sections of this code shall apply to intermodal shipping containers that are repurposed for use as buildings or structures, or as a part of buildings or structures.



# 3310.1 Stairways in Buildings under Construction

**3310.1 Stairways required**. Where building construction exceeds 40 feet (12 192 mm) in height above the lowest level of fire department vehicle access, a temporary or permanent stairway shall be provided. As construction progresses, such stairway shall be extended to within one floor of the highest point of construction having secured decking or flooring.

# Structural Reference Standard

| Reference Standard | | 2018 NCBC Edition | 2024 NCBC Edition |
|---|---|---|---|
| Loading/Design | Minimum Design Loads and Associated Criteria for Buildings and Other Structures | ASCE 7-10 with Supplement 1 | ASCE 7-16 with Supplement 1 |
| Aluminum | Aluminum Design Manual | ADM-2015 | ADM-2020 |
| | Aluminum Sheet Metal Work in Building Construction | ASM 35-00 | ASM 35-00 |
| Concrete | Building Code Requirements for Structural Concrete | ACI 318-14 | ACI 318-19 |
| Masonry | Building Code for Masonry Structures | TMS 402-2013 | TMS 402-2016 |
| | Specification for Masonry Structures | TMS 602-2013 | TMS 602-2016 |
| Structural Steel | Specification for Structural Steel Buildings | AISC 360-10 | AISC 360-16 |
| | Seismic Provisions for Structural Steel Buildings | AISC 341-10 | AISC 341-16 |
| Wood | National Design Specifications | NDS-2015 | NDS-2018 |
| | Special Design Provisions for Wind and Seismic | SDPWS-2015 | SDPWS-2021 |
| | Wood Frame Construction Manual | WFCM-2015 | WFCM-2018 |
| Cold-Formed Steel | North American Specification for the Design of Cold-formed Steel Structural Members | AISI S100-12 | AISI S100-16(2020) w/S2-20 |
| | North American Standard for Cold-formed Steel Framing-Nonstructural Members | AISI S220-11 | AISI S220-20 |
| | Standard for Cold-formed Steel Framing-Prescriptive Method for One- and Two-family Dwellings | AISI S230-07 with Supplement 3 | AISI S230-19 |
| | North American Standard for Cold-Formed Steel Structuring Framing | - | AISI S240-20* |
| | North American Standard for Seismic Design of Cold-formed Steel Structural Systems | - | AISI S400-20** |
| Steel Joists | 45th Edition Standard Specification, Load Tables and Weight Tables for Steel Joists and Joist Girders for K-Series, LH-Series, DHL-Series and Joist Girders | SJI - CJ, SJI JG, SJI K or SJI LH/DLH 2010 edition | SJI 100-20 |

OFFICE OF STATE FIRE MARSHAL
NC DEPARTMENT OF INSURANCE

**BRIAN TAYLOR,** State Fire Marshal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