FAQ:
What are the significant changes between the 2018 and 2021 International Building Code (IBC)?

This document includes a summary of significant changes to the 2021 International Building Code (IBC) and includes the PA Uniform Construction Code Review and Advisory Council (RAC) Report Amendments. This document also provides further information for the identified code changes

Disclaimer: This document shall be utilized as guidance only. The design professional is responsible for reviewing the provisions of the International Codes, associated reference Standards, and the directives of the PA Department of Labor and Industry. The Department of Licenses and Inspections may only render a decision in response to a formal application for a construction permit or preliminary review.

Summary of changes between the 2018 and 2021 International Building Code (IBC):

(Items marked with an asterisk (*) are identified as major code changes)

Administration

Chapter 2:

- Definition- Atrium
- Definition- Change of Occupancy *
- Definition- Impact Protective System
- Definition- Mass Timber *
- Definition- Nailable Substrate
- Definition- Penthouse
- Definition- Puzzle Room *
- Definition- Structural Members

Building Planning

Chapters 3 through 6:

- Section 306.2- Group F-1 Occupancy Classification
- Section 307.1.1- Uses Not Classified as Group H

- Sections 311.2 / 311.3- Alcoholic Beverage Storage
- Section 403.3.2- Water Supply to Required Fire Pumps
- Section 404.1- Scope of Atrium Provisions
- Section 404.5- Smoke Control in Atrium Provisions
- Section 404.6 Horizontal Assemblies in Atriums
- Section 406.2.4- Floor Surfaces in Parking Garages
- Section 407.3.1.1- Group I-2 Corridor Doors
- Sections 407.4.4.1 / 407.4.4.3- Group I-2 Care Suites
- Section 407.6.1- Automatic-Closing Doors in Group I-2
- Section 411.5- Puzzle Rooms *
- Section 414.2.3- Fire Wall Use for Control Areas *
- Section 422.7- Cooking in Ambulatory Care Facilities
- Section 424- Play Structures *
- Section 426.1- Combustible Dusts, Grain Processing and Storage
- Section 503.1.4- Occupied Roof Allowances *
- Table 504.3- Allowable Height in Feet
- Table 504.4- Allowable Height in Stores
- Table 506.2- Allowable Building Area
- Section 506.3.2- Allowable Area Frontage Increase
- Section 508.4.4- Separated Occupancies
- Sections 508.4.4.1 / 509.4.1.1- Fire Separations of Mass Timber
- Section 508.5- Live/Work Units
- Table 509.1- Storage Battery Systems as Incidental Uses
- Section 510.2- Stairway Construction in Podium Buildings *
- Table 601- Type IV Fire-Resistance *
- Section 602.4- Mass Timber Type IV Buildings
- Sections 602.4.1-602.4.3- Type IV-A, IV-B, and IV-C Buildings
- Section 602.4.4- Type IV-HT Buildings
- Section 603.1- Combustible Materials in Types I and II

Fire Protection

Chapters 7 through 9:

- Sections 703.6 / 703.7- Noncombustible Protection for Mass Timber *
- Section 704.2- Column Protection
- Section 704.4.1- Light Frame Construction
- Section 704.6.1- Secondary Attachments and Fireproofing
- Table 705.5- Exterior Wall Ratings
- Sections 707.4 / 716- Separations of Energy Storage Systems
- Section 707.5- Enclosure of Exit Passageways
- Sections 708.1 / 708.4.1- Supporting Construction for Fire Partitions

- Section 709.4.1- Smoke Barrier Continuity
- Sections 710.5.2.1 / 710.5.3- Smoke Partition Opening
- Section 713.12- Top of Shaft Enclosure
- Section 715- Protection of Joints and Voids
- Section 716.2.2.1.1- Prohibited Use of Terminated Stops
- Section 716.4- Fire Protective Curtain Assemblies
- Table 716.1.[2]- Doors in Double Fire Walls
- Sections 717.2.3 / 717.6.2.1- Ceiling Radiation Dampers
- Section 717.4- Access to Dampers
- Section 717.5.2- Flex Connectors
- Section 722.7- Fire-Resistance Rating of Mass Timber
- Section 803.3- Heavy Timber Exemption
- Section 806.9- Combustible Locker as Interior Finish
- Sections 903.2.4 / 903.2.7 / 903.2.9- Upholstered Furniture and Mattresses
- Sections 903.2.4.2 / 903.2.9.2- Distilled Spirits
- Section 903.2.10- Sprinklers in Parking Garages *
- Section 903.2.10.2- Mechanical- Access Parking Garages
- Section 903.3.1.2- NFPA 13R Sprinkler Protection
- Section 903.3.1.2.2- Corridor and Balcony Sprinklers (NFPA 13R)
- Section 905.3.1- Standpipes in Parking Garages *
- Section 907.2.10- Manual Alarms in Group S Buildings
- Section 907.5.2.1.3- Fire Alarm Occupant Notification *
- Section 909.20- Smokeproof Enclosures
- Section 911- Fire Command Centers in Groups F-1 and S-1 *

Means of Egress

Chapter 10:

- Section 1006.2.1- Egress from Mechanical Rooms and Penthouses
- Section 1006.3- Egress from Occupied Roofs *
- Section 1006.3.4- Single Exit Stories *
- Section 1008.2.1- Stairway Illumination
- Section 1010.1.1- Door Widths
- Section 1010.1.1.1- Projections in Door Openings
- Section 1010.1.3- Door Opening Forces
- Section 1010.2.4- Locks and Latches
- Section 1010.2.8- Locking Arrangements in Group I-4
- Section 1011.6- Stairway Landings
- Section 1016.2- Egress through Intervening Spaces
- Section 1019.3- Exit Access Stairways
- Section 1020.5- Dead-end Corridors

- Section 1030.16- Handrails at Social Stairs *
- Section 1031- Emergency Escape and Rescue Openings *

Building Envelope, Structural Systems, and Construction Materials

Chapters 12 through 26:

- Section 1202.3- Insulations of Unvented Attics
- Section 1208.4- Efficiency Dwelling Units *
- Section 1210.3- Restroom Privacy
- Section 1404.3- Vapor Retarders
- Table 1404.3.1- Class II Vapor Retarders
- Section 1404.3.2- Class III Vapor Retarders
- Section 1406.10- Metal Composite Material Cladding
- Section 1503.3- Parapet Walls
- Section 1504.5- Ballasted Roofs
- Section 1504.9- Aggregate-Surfaced Roofs
- Section 1603.1.4- Construction Document Wind Zones
- Table 1604.5- Risk Categories of Assembly Spaces *
- Section 1605 Load Combinations
- Section 1606- Dead Loads *
- Section 1607.11.4- Rope Descent Systems
- Section 1607.17- Fixed Ladder Live Load
- Section 1608.2- Snow Maps
- Section 1610.2- Soil-Caused Uplift
- Section 1611- Rain Loads
- Section 1612.4- Flood Hazard Documents
- Section 1704.6- Structural Observations *
- Table 1705.3- Special Inspection of Precast Concrete *
- Section 1705.4.1- Empirically Designed Masonry
- Sections 1705.5.3 / 1705.20- Mass Timber Special Inspection *
- Section 1705.10- Structural Integrity of Deep Foundations
- Section 1705.18- Firestop Inspections in Group R *
- Section 1709.5- Window and Door Assemblies
- Section 1709.5.3- Impact Protection
- Section 1809.5.1- Frost Protection at Required Exits *
- Table 1810.3.2.6- Allowable Stresses in Deep Foundations
- Section 1810.3.3.1.9- Helical Piles
- Section 1810.3.6- Deep Foundation Element Splicing
- Sections 1810.3.8 / 1810.3.11 - Precast Concrete Piles & Piles Caps
- Section 1810.4.5- Vibratory Drivers
- Section 1901.2- Concrete Design and Construction

- Section 1901.7- Structural Concrete Tolerances
- Section 2109.2.4.8- Exterior Finish of Adobe Masonry
- Section 2205.2.1- AISC 358 for Prequalified Connections
- Section 2303.2- Fire-Retardant-Treated Wood
- Section 2303.4.1.2- Wood Truss Bracing
- Section 2304.10.1- Mass Timber Connection Protection *
- Table 2304.10.2- Sheathing Fasteners
- Section 2304.11 Concealed Spaces in Type IV-HT *
- Section 2305- Lateral Force-Resisting Systems
- Sections 2308.5.6 / 2308.6.6.2- Cripple Walls
- Table 2308.7.3.1- Rafter Tie Connections
- Section 2510.6- Water-Resistive Barriers for Stucco *

Building Services, Special Devices, and Special Conditions

Chapters 27 through 33:

- Chapter 30- Elevators & Conveying Systems
- Section 3001.2- Emergency Elevator Communication Systems
- Section 3103.1- Special Event Structures
- Section 3114- Public Use in Flood Hazard Areas
- Section 3115- International Shipping Containers *
- Section 3313- Fire Protection During Construction *

Summary of Changes between the 2018 and 2021 International Building Code (IBC):

Administration

Chapter 2 (Definitions)

- **Definition of "Atrium"** has been simplified by the elimination of some previous language to clearly define vertical enclosures and the number of stories connected by an atrium.

> **[BG] 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.

- **Definition of "Change of Occupancy"** narrows the scope of a change of occupancy where no classification change takes place.

> **[A] 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.

- **NEW Definition of "Impact Protective System"** has been added for assemblies that are designed to withstand windborne debris.

> **[BS] 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.

- **Definition of "Mass Timber"** has been amended to specifically define mass timber as representative of both the large wood building elements historically recognized as Heavy Timber (now Type IV-HT) constructions and the three new construction types of IV-A, IV-B and IV-C.

> **[BG] 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.

> **[BF] 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* .

- **Definition of "Nailable Substrate"** has been amended to clarify what materials should be expected to provide withdrawal resistance for roof or wall cladding assemblies.

> **[BF] NAILABLE SUBSTRATE.** A product or material such as framing, sheathing or furring, composed of wood, wood-based materials or other materials providing equivalent fastener withdrawal resistance.

- **Definition of "Penthouse"** has been slightly revised to ensure that enclosures extended to the roof in order to house stairways are considered as penthouses.

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

- **NEW Definition of "Puzzle Room"**, a relatively new type of special amusement area, is now specifically regulated by the code and a related definition provides the necessary scoping to address its unique hazards.

> **[BG] 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.

- **Definition of "Structural Members"** has been revised to better address new technologies, as well as remove archaic concepts and redundant language.

> **[BG] PRIMARY STRUCTURAL FRAME.** The primary structural frame shall include all of the following structural members:
>
> 1. The columns.
> 2. Structural members having direct connections to the columns, including girders, beams, trusses and spandrels.
> 3. Members of the floor construction and roof construction having direct connections to the columns.
> 4. Members that are essential to the vertical stability of the *primary structural frame* under gravity loading.

Building Planning

Chapter 3 (Occupancy Classification and Use)

- **Section 306.2** amended to add energy storage systems and water/sewer treatment activities to the listing of Group F-1 occupancies.

- **Section 307.1.1** now considers the distilling or brewing of alcoholic beverages, as well as the storage of beer, distilled spirits and wine, as conditions where the quantities of the beverage are not limited in a non-Group H occupancy, provided that compliance with the IFC is achieved (see Philadelphia Fire Code, Chapter 40).

- **Sections 311.2 / 311.3** clarifies the proper occupancy classification for the storage of beverages, specifically alcohol beverages, for both Group S-1 and S-2 categories.

Chapter 4 (Special Detailed Requirements Based on Occupancy and Use)

- **Section 403.3.2** amends the mandate for water supply provisions associated with required fire pumps supplied by two water mains, now extending these requirements to proposed buildings more than 120 feet in height where the building's type of construction is either IV-A or IV-B.

> **[F] 403.3.2 Water supply to required fire pumps.**
>
> In all buildings that are more than 420 feet (128 m) in *building height* and buildings of Type IVA and IVB construction that are more than 120 feet (36 576 mm) in *building height* , required fire pumps shall be supplied by connections to not fewer than two water mains located in different streets. Separate supply piping shall be provided between each connection to the water main and the pumps. Each connection and the supply piping between the connection and the pumps shall be sized to supply the flow and pressure required for the pumps to operate.
>
> **Exception:** Two connections to the same main shall be permitted provided that the main is valved such that an interruption can be isolated so that the water supply will continue without interruption through not fewer than one of the connections.

- **Section 404.1** clarifies the application of atrium provisions and prohibitions in Group H occupancies, and the relocation of several means of egress provisions for atrium designs to Chapter 10.

> **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.

- **Section 404.5** amended to recognize vertical opening protection designs in atriums consisting of a combination of both the atrium and a shaft enclosure in the evaluation of whether a smoke control system is required.

> **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.

- **Section 404.6** amended to no longer require horizontal assembly separation of the atrium from adjacent spaces at those openings created for complying escalators and/or exit access stairways.

> **404.6 Enclosure of atriums.**
>
> *Atrium* spaces shall be separated from adjacent spaces by a 1-hour *fire barrier* constructed in accordance with Section 707 or a *horizontal assembly* constructed in accordance with Section 711, or both.
>
> **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.

- **Section 406.2.4** amended to remove exceptions to sloped surfaces associated with Group S-2 parking lots, and to reinstate the mandate for a sloping floor in the vehicle areas of parking garages to address proper drainage for Group S-2 garages.

- **Section 407.3.1.1** amended to expand the smoke-resistant criteria to address the various types of doors used in corridors of Group I-2 care facilities.

> **407.3.1.1 Door construction.**
>
> Doors in *corridors* not required to have a *fire protection rating* shall comply with the following:
>
> 1. Solid doors shall have close-fitting operational tolerances, head and jamb stops.
> 2. Dutch-style doors shall have an astragal, rabbet or bevel at the meeting edges of the upper and lower door sections. Both the upper and lower door sections shall have latching hardware. Dutch-style doors shall have hardware that connects the upper and lower sections to function as a single leaf.
> 3. To provide makeup air for exhaust systems in accordance with Section 1020.7, Exception 1, doors are permitted to have louvers or to have a clearance between the bottom of the door and the floor surface that is $^{2}/_{3}$ inch (19.1 mm) maximum.

- **Sections 407.4.4.1 / 407.4.4.3** amended egress travel allowances, both within an individual care suite, as well as from a suite into a corridor, to allow for additional design flexibility and consistency with the CMS federal standard.

> **407.4.4.3 Access to corridor.**
>
> Every *care suite* shall have a door leading directly to an *exit access corridor* or *horizontal exit*. Movement from habitable rooms within a *care suite* shall not require more than 100 feet (30 480 mm) of travel within the *care suite* to a door leading to the *exit access corridor* or *horizontal exit*. Where a *care suite* is required to have more than one *exit access* door by Section 407.4.4.5.2 or 407.4.4.6.2, the additional door shall lead directly to an *exit access corridor*, *exit* or an adjacent suite.

- **Section 407.6.1** amended to require that the closing of automatic closing door on hold-open devices must also occur upon the activation of the fire alarm system or automatic sprinkler system in Group I-2 occupancies.

> **407.6.1 Activation of automatic-closing doors.**
>
> Automatic-closing doors on hold-open devices in accordance with Section 716.2.6.6 shall also close upon activation of a *fire alarm* system, an *automatic sprinkler system*, or both. The *automatic* release of the hold-open device on one door shall release all such doors within the same *smoke compartment* .

- **Section 411.5** added to regulate puzzle rooms, a new type of building use, in a manner consistent with traditional special amusement areas. Special means of egress requirements have also been established that are specific only to such 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.

- **Section 414.2.3** added to expand the scoping limitations of hazardous materials handling with use of fire walls to create separate buildings through a new allowance for the number of control areas permitted.

> **[F] 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.

- **Section 422.7** amended to establish conditions for ambulatory care facilities addressing the installation of the cooking appliances and address any fire concerns where domestic cooking facilities are provided.

> **422.7 Domestic cooking.**
>
> Installation of cooking appliances used in domestic cooking facilities shall comply with all of the following:
>
> 1. The types of cooking appliances permitted are limited to ovens, cooktops, ranges, warmers and microwaves.
> 2. Domestic cooking hoods installed and constructed in accordance with Section 505 of the International Mechanical Code shall be provided over cooktops or ranges.
> 3. A shutoff for the fuel and electrical supply to the cooking equipment shall be provided in a location to which only staff has access.
> 4. A timer shall be provided that automatically deactivates the cooking appliances within a period of not more than 120 minutes.
> 5. A portable fire extinguisher shall be provided. Installation shall be in accordance with Section 906 and the extinguisher shall be located within a 30-foot (9144 mm) distance of travel from each domestic cooking appliance.

- **Section 424** amended to regulate the interior finish materials of play structures for flame spread purposes. Additionally, the scoping provisions have been modified to include larger structures, and the requirements are no longer limited to play structures for children's use.

> **424.2 Materials.**
>
> Play structures shall be constructed of noncombustible materials or of combustible materials that comply with the following:
>
> 10. Interior finishes for structures exceeding 600 square feet (56 m^2) in area or 10 feet (3048 mm) in height shall have a flame spread index not greater than that specified in Table 803.13 for the occupancy group and location designated. Interior wall and ceiling finish materials tested in accordance with NFPA 286 and meeting the acceptance criteria of Section 803.1.1.1, shall be permitted to be used where a Class A classification in accordance with ASTM E84 or UL 723 is required.

> **424.5 Area limits.**
>
> Play structures shall be not greater than 600 square feet (56 m^2) 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 m^2) in area or 10 feet (3048 mm) in height shall be designed in accordance with Chapter 16.

- **Section [F] 426.1** Provision, with regard to storage & handling of materials that produce combustible dust, was not modified for the Pennsylvania 2021 IBC adoption, and will remain as published in the 2018 IBC as follows:

> ***[F] 426.1 General.*** *The provisions of Sections 426.1.1 through 426.1.7 shall apply to buildings in which materials that produce combustible dusts are stored or handled. Buildings that store or handle combustible dusts shall comply with NFPA 652 and the applicable provisions of NFPA 61, NFPA 85, NFPA 120, NFPA 484, NFPA 654, NFPA 655 and NFPA 664 and the International Fire Code.*

Chapter 5 (General Building Heights and Areas)

- **Section 503.1.4** clarifies the proper approach to dealing with occupied roofs from the perspectives of building height, number of stories, and installation of occupant notification & emergency voice/alarm system features for a more consistent application of the code's intent.

> **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.

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.
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.

- **Table 504.3** established height limits in feet above grade plane for the three new construction types addressing mass timber construction: IV-A, IV-B, I-VC.

- **Table 504.4** established height limits in stories above grade plane for the three new construction types included in mass timber construction, and increases in allowable height for Group S-1 occupancies in sprinklered buildings Type IIB and IIIB construction have been made.

- **Table 506.2** added allowable building area limitations for the three new construction types included in mass timber construction, and an increase has occurred in allowable single-story floor area for Group I-3 occupancies in sprinkled buildings of Type IIA construction.

- **Section 506.3.2** amended the methodology for establishing the permissible allowable area increase for frontage, which has been simplified through the use of a tabular format to make a for a more efficient approach to allowable area determination.

506.3.2 Minimum frontage distance.

To qualify for an area factor increase based on frontage, the *public way* or open space adjacent to the building perimeter shall have a minimum distance *(W)* of 20 feet (6096 mm) measured at right angles from the building face to any of the following:

1. The closest interior lot line.
2. The entire width of a street, alley or *public way*.
3. The exterior face of an adjacent building on the same property.

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 506.3.3FRONTAGE INCREASE FACTOR[a]

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

- **Section 508.4.4** amended format for Table 508.4.4 addressing separated occupancies is intended to eliminate any confusion as to the tables' proper use with regard to any non-permitted or non-separated mixed occupancy groups.

TABLE 508.4REQUIRED 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

- **Sections 508.4.4.1 / 509.4.1.1** added criteria for the use of mass timber elements serving as fire barriers and horizontal assemblies in mass timber buildings, including the installation of a thermal barrier as part of any required incidental use and occupancy separations.

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.

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.

- **Section 508.5** relocated the criteria for live/work units from the special use provisions of Chapter 4 to the mixed occupancy provisions of Section 508, with no change to the technical requirements.

- **Section 509.1** removed the identification of stationary storage battery systems as incidental uses, and the corresponding fire separations required for such uses, have been deleted from Table 509.1 and are now more comprehensively regulated by Section 1207 of the IFC.

- **Section 510.2** amended to allow interior exit stairways located within the Type IA building for podium structures to be constructed of combustible materials where specified conditions are met.

510.2 Horizontal building separation allowance.

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

3. *Shaft, stairway, ramp* and escalator enclosures through the *horizontal assembly* shall have not less than a 2-hour *fire-resistance rating* with opening protectives in accordance with Section 716.

   Exception: Where the enclosure walls below the *horizontal assembly* have not less than a 3-hour *fire-resistance rating* with opening protectives in accordance with Section 716, the enclosure walls extending above the *horizontal assembly* shall be permitted to have a 1-hour *fire-resistance rating*, provided that the following conditions are met:

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

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.

Chapter 6 (Types of Construction)

- **Table 601** added the minimum required fire-resistance ratings for the building elements of this structures classified as one of the new construction types for mass timber (Types IV-A, IV-B and IV-C).

- **Section 602.4** added three new construction types to recognize other forms of mass timber construction.

602.4 Type IV.

Type IV construction is that type of construction in which the *building elements* are *mass timber* or noncombustible materials and have *fire-resistance ratings* in accordance with Table 601. *Mass timber* elements shall meet the *fire-resistance-rating* requirements of this section based on either the *fire-resistance rating* of the *noncombustible protection*, the *mass timber* , or a combination of both and shall be determined in accordance with Section 703.2. The minimum dimensions and permitted materials for *building elements* shall comply with the provisions of this section and Section 2304.11. *Mass timber* elements of Types IV-A, IV-B and IV-C construction shall be protected with *noncombustible protection* applied directly to the *mass timber* in accordance with Sections 602.4.1 through 602.4.3. The time assigned to the *noncombustible protection* shall be determined in accordance with Section 703.6 and comply with Section 722.7.

Cross-laminated timber shall be labeled as conforming to ANSI/APA PRG 320 as referenced in Section 2303.1.4.

Exterior *load-bearing walls* and *nonload-bearing walls* shall be *mass timber* construction, or shall be of noncombustible construction.

Exception: Exterior load-bearing walls and nonload-bearing walls of Type IV-HT Construction in accordance with Section 602.4.4.

The interior *building elements* , including *nonload-bearing walls* and partitions, shall be of *mass timber* construction or of noncombustible construction.

Exception: Interior building elements and nonload-bearing walls and partitions of Type IV-HT construction in accordance with Section 602.4.4.

Combustible concealed spaces are not permitted except as otherwise indicated in Sections 602.4.1 through 602.4.4. Combustible stud spaces within light frame walls of Type IV-HT construction shall not be considered concealed spaces, but shall comply with Section 718.

In buildings of Type IV-A, IV-B, and IV-C construction with an occupied floor located more than 75 feet (22 860 mm) above the lowest level of fire department access, up to and including 12 *stories* or 180 feet (54 864 mm) above *grade plane* , *mass timber* interior exit and elevator hoistway enclosures shall be protected in accordance with Section 602.4.1.2. In buildings greater than 12 *stories* or 180 feet (54 864 mm) above *grade plane* , interior exit and elevator hoistway enclosures shall be constructed of noncombustible materials.

- **Sections 602.4.1 - 602.4.3** added new construction types (Types IV-A, IV-B and IV-C) which are defined based upon the varying percentages of mass timber surfaces that are permitted to be unprotected, to include minimum fire separation requirements of mass timber elements.

602.4.1 Type IV-A.

Building elements in Type IV-A construction shall be protected in accordance with Sections 602.4.1.1 through 602.4.1.6. The required *fire-resistance rating* of noncombustible elements and protected *mass timber* elements shall be determined in accordance with Section 703.2.

602.4.1.1 Exterior protection.

The outside face of *exterior walls* of *mass timber* construction shall be protected with *noncombustible protection* with a minimum assigned time of 40 minutes, as specified in Table 722.7.1(1). Components of the *exterior wall covering* shall be of noncombustible material except *water-resistive barriers* having a peak heat release rate of less than 150kW/m^2, a total heat release of less than 20 MJ/m^2 and an effective heat of combustion of less than 18MJ/kg as determined in accordance with ASTM E1354 and having a*flame spread index* of 25 or less and a *smoke-developed index* of 450 or less as determined in accordance with ASTM E84 or UL 723. The ASTM E1354 test shall be conducted on specimens at the thickness intended for use, in the horizontal orientation and at an incident radiant heat flux of 50 kW/m^2.

602.4.1.2 Interior protection.

Interior faces of all *mass timber* elements, including the inside faces of exterior *mass timber* walls and *mass timber* roofs, shall be protected with materials complying with Section 703.3.

602.4.1.2.1 Protection time.

Noncombustible protection shall contribute a time equal to or greater than times assigned in Table 722.7.1(1), but not less than 80 minutes. The use of materials and their respective protection contributions specified in Table 722.7.1(2) shall be permitted to be used for compliance with Section 722.7.1.

602.4.1.3 Floors.

The floor assembly shall contain a noncombustible material not less than 1 inch (25 mm) in thickness above the *mass timber* . Floor finishes in accordance with Section 804 shall be permitted on top of the noncombustible material. The underside of floor assemblies shall be protected in accordance with Section 602.4.1.2.

602.4.1.4 Roofs.

The *interior surfaces* of *roof assemblies* shall be protected in accordance with Section 602.4.1.2. *Roof coverings* in accordance with Chapter 15 shall be permitted on the outside surface of the *roof assembly.*

602.4.1.5 Concealed spaces.

Concealed spaces shall not contain combustibles other than electrical, mechanical, fire protection, or plumbing materials and equipment permitted in plenums in accordance with Section 602 of the *International Mechanical Code*, and shall comply with all applicable provisions of Section 718. Combustible construction forming concealed spaces shall be protected in accordance with Section 602.4.1.2.

602.4.1.6 Shafts.

Shafts shall be permitted in accordance with Sections 713 and 718. Both the *shaft* side and room side of *mass timber* elements shall be protected in accordance with Section 602.4.1.2.

602.4.2 Type IV-B.

Building elements in Type IV-B construction shall be protected in accordance with Sections 602.4.2.1 through 602.4.2.6. The required *fire-resistance rating* of noncombustible elements or *mass timber* elements shall be determined in accordance with Section 703.2.

602.4.2.1 Exterior protection.

The outside face of *exterior walls* of *mass timber* construction shall be protected with *noncombustible protection* with a minimum assigned time of 40 minutes, as specified in Table 722.7.1(1). Components of the *exterior wall covering* shall be of noncombustible material except *water-resistive barriers* having a peak heat release rate of less than 150kW/m^2, a total heat release of less than 20 MJ/$m^2$and an effective heat of combustion of less than 18MJ/kg as determined in accordance with ASTM E1354, and having a *flame spread index* of 25 or less and a *smoke-developed index* of 450 or less as determined in accordance with ASTM E84 or UL 723. The ASTM E1354 test shall be conducted on specimens at the thickness intended for use, in the horizontal orientation and at an incident radiant heat flux of 50 kW/m^2.

602.4.2.2 Interior protection.

Interior faces of all *mass timber* elements, including the inside face of exterior *mass timber* walls and*mass timber* roofs, shall be protected, as required by this section, with materials complying with Section 703.3.

602.4.2.2.1 Protection time.

Noncombustible protection shall contribute a time equal to or greater than times assigned in Table 722.7.1(1), but not less than 80 minutes. The use of materials and their respective protection contributions specified in Table 722.7.1(2) shall be permitted to be used for compliance with Section 722.7.1.

602.4.2.2.2 Protected area.

Interior faces of *mass timber* elements, including the inside face of exterior *mass timber walls* and *mass timber roofs*, shall be protected in accordance with Section 602.4.2.2.1.

Exceptions: Unprotected portions of *mass timber* ceilings and walls complying with Section 602.4.2.2.4 and the following:

1. Unprotected portions of mass timber ceilings and walls complying with one of the following:
   1.1. Unprotected portions of *mass timber* ceilings, including attached beams, shall be permitted and shall be limited to an area equal to 20 percent of the floor area in any *dwelling unit* or*fire area* .
   1.2. Unprotected portions of *mass timber* walls, including attached columns, shall be permitted and shall be limited to an area equal to 40 percent of the floor area in any *dwelling unit* or *fire area*.
   1.3. Unprotected portions of both walls and ceilings of *mass timber* , including attached columns and beams, in any *dwelling unit* or *fire area* shall be permitted in accordance with Section 602.4.2.2.3.
2. *Mass timber* columns and beams that are not an integral portion of walls or ceilings, respectively, shall be permitted to be unprotected without restriction of either aggregate area or separation from one another.

602.4.2.2.3 Mixed unprotected areas.

In each *dwelling unit* or *fire area* , where both portions of ceilings and portions of walls are unprotected, the total allowable unprotected area shall be determined in accordance with Equation 6-1.

$$(U_{tc}/U_{ac}) + (U_{tw}/U_{aw}) \leq 1$$ Equation 6-1

where:

U_{tc} = Total unprotected *mass timber* ceiling areas.
U_{ac} = Allowable unprotected *mass timber* ceiling area conforming to Exception 1.1 of Section 602.4.2.2.2.
U_{tw} = Total unprotected *mass timber* wall areas.
U_{aw} = Allowable unprotected *mass timber* wall area conforming to Exception 1.2 of Section 602.4.2.2.2.

602.4.2.2.4 Separation distance between unprotected mass timber elements.

In each *dwelling unit* or *fire area*, unprotected portions of *mass timber* walls and ceilings shall be not less than 15 feet (4572 mm) from unprotected portions of other walls and ceilings, measured horizontally along the ceiling and from other unprotected portions of walls measured horizontally along the floor.

602.4.2.3 Floors.

The floor assembly shall contain a noncombustible material not less than 1 inch (25 mm) in thickness above the *mass timber* . Floor finishes in accordance with Section 804 shall be permitted on top of the noncombustible material. The underside of floor assemblies shall be protected in accordance with Section 602.4.1.2.

- **Section 602.4.4** has been introduced to differentiate the historical Type IV “heavy timber” construction type from the three new mass timber types of construction.

602.4.4 Type IV-HT.

Type IV-HT (Heavy Timber) construction is that type of construction in which the *exterior walls* are of noncombustible materials and the interior *building elements* are of solid wood, laminated heavy timber or *structural composite lumber* (SCL), without concealed spaces or with concealed spaces complying with Section 602.4.4.3. The minimum dimensions for permitted materials including solid timber, glued-laminated timber, SCL and *cross-laminated timber* (*CLT*) and the details of Type IV construction shall comply with the provisions of this section and Section 2304.11. *Exterior walls* complying with Section 602.4.4.1 or 602.4.4.2 shall be permitted. Interior walls and partitions not less than 1-hour fire-resistance rated or heavy timber conforming with Section 2304.11.2.2 shall be permitted.

- **Section 603.1** amended the allowance for the use of fire-retardant-treated wood in shaft enclosure and roof construction for Group I-2 buildings. Additionally, the use of wood nailers for parapet flashing and roof cants is permitted in all buildings.

Fire Protection

Chapter 7 (Fire and Smoke Protection Features)

- **Sections 703.6 / 703.7** added a test method to determine the contribution time of noncombustible protection to mass timber fire-resistance. Additionally, edges and intersections between adjacent elements are to be sealed to limit smoke and air movement within a building.

> **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.
> 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.

> **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.
>
> Sealants shall meet the requirements of ASTM C920. Adhesives shall meet the requirements of ASTM D3498.
>
> **Exception:** Sealants or adhesives need not be provided where they are not a required component of a tested fire-resistance-rated assembly.

- **Section 704.2 Column protection,** was not modified in the Pennsylvania 2018 IBC adoption, maintaining the 2015 IBC language. The national language was not modified in the 2021 code, and as such, this language was maintained again in the Pennsylvania 2021 IBC adoption as follows:

> ***704.2 Column protection.*** *Where columns are required to have protection to achieve a fire-resistance rating, the entire column shall be provided individual encasement protection by protecting it on all sides for the full column height, including connections to other structural members, with materials having the required fire-resistance rating. Where the column extends through a ceiling, the encasement protection shall be continuous from the top of the foundation or floor/ceiling assembly below through the ceiling space to the top of the column.*

- **Section 704.4.1 Light-frame construction,** was not modified as a part of the Pennsylvania 2018 IBC adoption, maintain the 2015 IBC language. The national language was not modified in the 2021 code, and as such, the language was maintained in Pennsylvania 2021 IBC adoption as follows:

> ***704.4.1 Light-frame construction.*** *Studs and boundary elements that are integral elements in load-bearing walls of light-frame construction shall be permitted to have required fire-resistance ratings provided by the membrane protection provided for the load-bearing wall.*

- **Section 704.6.1** amended guidance to ensure continuity of fire-resistive protection where secondary steel attaches to either primary or secondary fire-resistance-rated structural members.

> **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 705.5** has replaced Table 602 dealing with fire-resistance ratings based on fire separation distance, and has been relocated to Table 705.5 for inclusion with the general exterior wall requirements. Table 705.5 was also revised to include the new construction types of mass timber.

- **Sections 707.4 / 716** amended to prohibit the use of glazing with only a fire-protection rating in fire-resistance-rated walls that are a portion of the enclosure of energy storage systems.

> **707.4 Exterior walls.**
>
> Where *exterior walls* serve as a part of a required fire-resistance-rated *shaft*, or separation or enclosure for a *stairway, ramp or exit passageway*, such walls shall comply with the requirements of Section 705 for *exterior walls* and the fire-resistance-rated enclosure or separation requirements shall not apply.
>
> **Exceptions:**
>
> 1. *Exterior walls* required to be *fire-resistance rated* in accordance with Section 1021 for exterior egress balconies, Section 1023.7 for *interior exit stairways and ramps*, Section 1024.8 for*exit passageways* and Section 1027.6 for *exterior exit stairways and ramps*.
> 2. *Exterior walls* required to be *fire-resistance rated* in accordance with Section 1207 of the *International Fire Code* for enclosure of energy storage systems.

> **716.2.5.4.1 Energy storage system separation.**
>
> Fire-protection-rated glazing shall not be permitted in *fire door* frames with transom lights and sidelights in *fire barriers* required by Section 1207 of the *International Fire Code* to enclose energy storage systems.

> **716.3.2.1.1.1 Energy storage system separation.**
>
> *Fire-protection-rated glazing* is not permitted for use in *fire window assemblies* in*fire barriers* required by Section 1207 of the *International Fire Code* to enclose energy storage systems.

- **Section 707.5** amended to allow fire barriers creating an exit passageway to terminate at a fire-resistance rated top (lid) instead of continuing to the underside of the roof slab above.

707.5 Continuity.

Fire barriers shall extend from the top of the foundation or floor/ceiling assembly below to the underside of the floor or roof sheathing, slab or deck above and shall be securely attached thereto. Such *fire barriers* shall be continuous through concealed space, such as the space above a suspended ceiling. *Joints* and voids at intersections shall comply with Sections 707.8 and 707.9

Exceptions:

1. *Shaft enclosures* shall be permitted to terminate at a top enclosure complying with Section 713.12.
2. *Interior exit stairway* and *ramp* enclosures required by Section 1023 and *exit access stairway* and *ramp* enclosures required by Section 1019 shall be permitted to terminate at a top enclosure complying with Section 713.12.
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* .

- **Sections 708.1 / 708.4.1** amended to include a more complete list of wall assemblies required to be constructed as fire partitions, and additional locations have been identified where fire partitions are permitted to be supported by non-rated construction.

708.1 General.

The following wall assemblies shall comply with this section:

1. Separation walls as required by Section 420.2 for Group I-1 and Group R occupancies.
2. Walls separating tenant spaces in *covered and open mall buildings* as required by Section 402.4.2.1.
3. *Corridor* walls as required by Section 1020.3.
4. Enclosed elevator lobby separation as required by Section 3006.3.
5. Egress balconies as required by Section 1021.2
6. Walls separating *ambulatory care facilities* from adjacent spaces, *corridors* or tenant as required by Section 422.2.
7. Walls separating *dwelling and sleeping units* in Groups R-1 and R-2 in accordance with Sections 907.2.8.1 and 907.2.9.1.
8. Vestibules in accordance with Section 1028.2.

708.4.1 Supporting construction.

The supporting construction for a *fire partition* shall have a *fire-resistance rating* that is equal to or greater than the required *fire-resistance rating* of the supported *fire partition*.

Exception: In buildings of Types IIB, IIIB and VB construction, the supporting construction requirement shall not apply to *fire partitions* separating tenant spaces in *covered and open mall buildings* , *fire partitions* separating *dwelling units*, *fire partitions* separating *sleeping units*, *fire partitions* serving as *corridor* walls, *fire partitions* separating *ambulatory care facilities* from adjacent spaces or *corridors*, *fire partitions* separating *dwelling and sleeping units* from Group R-1 and R-2 occupancies and *fire partitions* separating vestibules from the *level of exit discharge* .

- **Section 709.4.1** amended to clarify smoke barrier and smoke compartment continuity needed to effectively serve their intended purposes through revisions to the definition and enclosure provisions.

709.4.1 Smoke-barrier assemblies separating smoke compartments.

*Smoke-barrier*assemblies used to separate *smoke compartments* shall form an effective membrane enclosure that is continuous from an outside wall or *smoke barrier* wall to an outside wall or another *smoke barrier* wall and to the *horizontal assemblies*.

- **Sections 710.5.2.1 / 710.5.3** amended to make specific allowances for louvered doors and pass-through openings in smoke partitions that serve specified locations of a Group I-2 occupancy.

> **710.5.2.1 Louvers.**
>
> Doors in *smoke partitions* shall not include louvers.
>
> **Exception:** Where permitted in accordance with Section 407.3.1.1.

> **710.5.3 Pass-through openings in Group I-2, Condition 2.**
>
> Where pass-through openings are provided in*smoke partitions* in Group I-2, Condition 2 occupancies, such openings shall comply with the following:
>
> 1. The *smoke compartment* in which the pass-through openings occur does not contain a patient care suite or sleeping room.
> 2. Pass-through openings are installed in a wall, door or vision panel that is not required to have a*fire-resistance rating* .
> 3. The top of the pass-through opening is located a maximum of 48 inches (1219 mm) above the floor.
> 4. The aggregate area of all such pass-through openings within a single room shall not exceed 80 square inches (0.05 m^2).

- **Section 713.12** clarified the three options for termination at the top of a 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.

> **713.12.1 Penthouse mechanical rooms.**
>
> A fire/*smoke damper* shall not be required at the penetration of the *rooftop structure* where *shaft enclosures* extend up through the *roof assembly* into a *rooftop structure* conforming to Section 1511. Ductwork in the *shaft* shall be connected directly to HVAC equipment.

- **Section 715** amended to reformat and clarify the provisions for joints and voids for more consistent applications, to include exterior curtain walls and smoke barriers.

> **715.1 General.**
>
> The provisions of this section shall govern the materials and methods of construction used to protect *joints* and voids in or between horizontal and vertical assemblies.

> **715.2 Installation.**
>
> Systems or materials protecting *joints* and voids shall be securely installed in accordance with the manufacturer's installation instructions in or on the *joint* or void for its entire length so as not to dislodge, loosen or otherwise impair its ability to accommodate expected building movements and to resist the passage of fire and hot gases. *Fire-resistant joint systems* or systems used to protect voids at exterior curtain walls and fire-resistance-rated floor intersections shall also be installed in accordance with the listing criteria.

> **715.4 Exterior curtain wall/fire-resistance-rated floor intersections.**
>
> Voids created at the intersection of exterior curtain wall assemblies and fire-resistance-rated floor or floor/ceiling assemblies shall be protected with an *approved perimeter fire containment system* to prevent the interior spread of fire. Such systems shall provide an *F rating* for a time period not less than the *fire-resistance rating* of the floor or floor/ceiling assembly.

715.4.1 Fire test criteria.

Perimeter fire containment systems shall be tested in accordance with the requirements of ASTM E2307.

Exception: Voids created at the intersection of the exterior curtain wall assemblies and floor assemblies where the vision glass extends to the finished floor level shall be permitted to be protected with an *approved* material to prevent the interior spread of fire. Such material shall be securely installed and capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E119 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch (0.254 mm) of water column (2.5 Pa) for the time period not less than the *fire-resistance rating* of the floor assembly.

715.6 Exterior curtain wall/vertical fire barrier intersections.

Voids created at the intersection of nonfire-resistance-rated exterior curtain wall assemblies and vertical *fire barriers* shall be filled with an approved material or system to retard the interior spread of fire and hot gases.

715.7 Curtain wall spandrels.

Height and *fire-resistance* requirements for curtain wall spandrels shall comply with Section 705.8.5. Where Section 705.8.5 does not require fire-resistance-rated curtain wall spandrels, the requirements of Sections 715.4 and 715.5 shall still apply to the intersection between the curtain wall spandrels and the floor.

715.8 Joints and voids in smoke barriers.

Fire-resistant joint systems protecting *joints* in *smoke barriers*, and perimeter fire containment systems protecting voids at the intersection of a horizontal *smoke barrier* and an exterior curtain wall, shall be tested in accordance with the requirements of UL 2079 for air leakage. The L rating of the joint system shall not exceed 5 cubic feet per minute per linear foot (0.00775 m^3/s m) of joint at 0.30 inch (74.7 Pa) of water for both the ambient temperature and elevated temperature tests.

- **Section 716.2.2.1.1** amended to prohibit the use of "terminated stops" on door frames of doors providing smoke and draft control and protection at elevator lobbies.

716.2.2.1.1 Smoke and draft control.

The air leakage rate of the door assembly shall not exceed 3.0 cubic feet per minute per square foot (0.01524 $m^3/s \times m^2$) of door opening at 0.10 inch (24.9 Pa) of water for both the ambient temperature and elevated temperature tests. Louvers shall be prohibited. *Terminated stops* shall be prohibited on doors required by Section 405.4.3 to comply with Section 716.2.2.1 and prohibited on doors required by Item 3 of Section 3006.3, or Section 3007.6.3 or 3008.6.3 to comply with this section.

- **Section 716.4** added labeling and performance requirements for fabric fire-protective curtain assemblies have been established.

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

- **Table 716.1(2)** amended to address appropriate opening protection where two doors are used to protect a single opening, such as between adjacent hotels rooms or where a double fire wall is constructed.

TABLE 716.1(2)OPENING FIRE PROTECTION ASSEMBLIES, RATINGS AND MARKINGS

TYPE OF ASSEMBLY	REQUIRED WALL ASSEMBLY RATING (hours)		MINIMUM FIRE DOOR AND FIRE SHUTTER ASSEMBLY RATING (hours)	DOOR VISION PANEL SIZE[a]	FIRE-RATED GLAZING MARKING DOOR VISION PANEL[b,c]	MINIMUM SIDELIGHT/TRANSOM ASSEMBLY RATING (hours)		FIRE-RATED GLAZING MARKING SIDE-LIGHT/TRANSOM PANEL	
						Fire protection	Fire resistance	Fire protection	Fire resistance
Double fire walls constructed in accordance with NFPA 221	Single-wall assembly rating (hours)[e]	Each wall of the double-wall assembly (hours)[f]	—						
	4	3	3	See Note a	D-H-W-180	Not Permitted	3	Not Permitted	W-180
	3	2	$1^1/_2$	100 sq. in.	≤ 100 sq. in. = D-H-90 >100 sq. in.= D-H-W-90	Not Permitted	2	Not Permitted	W-120
	2	1	1	100 sq. in.	≤ 100 sq. in. = D-H-60 > 100 sq. in. = D-H-W-60	Not Permitted	1	Not Permitted	W-60

For SI: 1 square inch = 645.2 mm.

a. Fire-resistance-rated glazing tested to ASTM E119 in accordance with Section 716.1.2.3 shall be permitted, in the maximum size tested.

b. Under the column heading "Fire-rated glazing marking door vision panel," W refers to the fire-resistance rating of the glazing, not the frame.

c. See Section 716.1.2.2.1 and Table 716.1(1) for additional permitted markings.

➡

d. Two doors, each with a fire protection rating of $1^1/_2$ hours, installed on opposite sides of the same opening in a fire wall, shall be deemed equivalent in fire protection rating to one 3-hour fire door.

e. As required in Section 706.4.

f. As allowed in Section 4.6 of NFPA 221.

g. See Section 716.2.5.1.2.

h. Fire-protection-rated glazing is not permitted for fire barriers required by Section 1207 of the *International Fire Code* to enclose energy storage systems. Fire-resistance-rated glazing assemblies tested to ASTM E119 or UL 263, as specified in Section 716.1.2.3, shall be permitted.

i. Two doors, each with a fire rating of 20 minutes, installed on opposite sides of the same opening in a fire partition, shall be deemed equivalent in fire protection rating to one 45-minute fire door.

- **Sections 717.2.3 / 717.6.2.1** amended to allow the use of static ceiling radiation dampers where controls are used to shut down airflow.

717.2.3 Static dampers.

Fire dampers and *ceiling radiation dampers* that are *listed* for use in static systems shall only be installed in heating, *ventilation* and air-conditioning systems that are automatically shut down in the event of a fire.

717.6.2.1.1 Dynamic systems.

Only *ceiling radiation dampers labeled* for use in dynamic systems shall be installed in heating, *ventilation* and air-conditioning systems designed to operate with fans on during a fire.

717.6.2.1.2 Static systems.

Static *ceiling radiation dampers* shall be provided with systems that are not designed to operate during a fire.

Exceptions:

1. Where a static ceiling radiation damper is installed at the opening of a duct, a smoke detector shall be installed inside the duct or outside the duct with sampling tubes protruding into the duct. The detector or tubes in the duct shall be within 5 feet (1524 mm) of the damper. Air outlets and inlets shall not be located between the detector or tubes and the damper. The detector shall be listed for the air velocity, temperature and humidity anticipated at the point where it is installed. Other than in mechanical smoke control systems, dampers shall be closed upon fan shutdown where local smoke detectors require a minimum velocity to operate.
2. Where a static ceiling radiation damper is installed in a ceiling, the ceiling radiation damper shall be permitted to be controlled by a smoke detection system installed in the same room or area as the ceiling radiation damper.
3. A static ceiling radiation damper shall be permitted to be installed in a room where an occupant sensor is provided within the room that will shut down the system.

- **Section 717.4** amended to create specific damper access requirements including an allowance for remote inspections where access cannot be provided.

717.4 Access and identification.

Access and identification of fire and *smoke dampers* shall comply with Sections 717.4.1 through 717.4.2.

717.4.1 Access.

Fire and*smoke dampers* shall be provided with an approved means of access that is large enough to permit inspection and maintenance of the *damper* and its operating parts. *Dampers* equipped with fusible links, internal operators, or both shall be provided with an access door that is not less than 12 inches (305 mm) square or provided with a removable duct section.

717.4.1.1 Access openings.

The access shall not affect the integrity of *fire-resistance-rated* assemblies. The access openings shall not reduce the *fire-resistance rating* of the assembly. Access doors in ducts shall be tight fitting and suitable for the required duct construction.

717.4.1.2 Restricted access.

Where space constraints or physical barriers restrict access to a damper for periodic inspection and testing, the *damper* shall be a single- or multi-blade type *damper* and shall comply with the remote inspection requirements of NFPA 80 or NFPA 105.

717.4.2 Identification.

Access points shall be permanently identified on the exterior by a label having letters not less than $^{1}/_{2}$ inch (12.7 mm) in height reading: "FIRE/SMOKE DAMPER," "SMOKE DAMPER" or "FIRE DAMPER."

- **Section 717.5.2** introduces modified exceptions to allow the use of flexible connections in fully ducted HVAC systems without the installation of fire dampers.

717.5.2 Fire barriers.

Ducts and air transfer openings of *fire barriers* shall be protected with *listed fire dampers* installed in accordance with their listing. Ducts and air transfer openings shall not penetrate enclosures for *interior exit stairways* and *ramps* and *exit passageways*, except as permitted by Sections 1023.5 and 1024.6, respectively.

Exceptions: *Fire dampers* are not required at penetrations of *fire barriers* where any of the following apply:

1. Penetrations are tested in accordance with ASTM E119 or UL 263 as part of the fire-resistance-rated assembly.
2. Ducts are used as part of an *approved* smoke control system in accordance with Section 909 and where the use of a *fire damper* would interfere with the operation of a smoke control system.
3. Such walls are penetrated by fully ducted HVAC systems, have a required *fire-resistance rating* of 1 hour or less, are in areas of other than Group H and are in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2. For the purposes of this exception, a fully ducted HVAC system shall be a duct system for conveying supply, return or exhaust air as part of the structure's HVAC system. Such a duct system shall be constructed of sheet steel not less than No. 26 gage thickness and shall be continuous from the air-handling appliance or equipment to the air outlet and inlet terminals. Nonmetal flexible air connectors shall be permitted in the following locations:
   3.1. At the duct connection to the air handling unit or equipment located within the mechanical room in accordance with Section 603.9 of the *International Mechanical Code*.
   3.2. From an overhead metal duct to a ceiling diffuser within the same room in accordance with Section 603.6.2 of the *International Mechanical Code*.

- **Section 722.7** added a prescriptive approach to achieve the required fire-resistance ratings for new mass timber construction type members and assemblies.

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*.

722.7.1 Minimum required protection.

Where required by Sections 602.4.1 through 602.4.3, *noncombustible protection* shall be provided for *mass timber building elements* in accordance with Table 722.7.1(1). The rating, in minutes, contributed by the *noncombustible protection* of *mass timber building elements*, components or assemblies, shall be established in accordance with Section 703.6. The protection contributions indicated in Table 722.7.1(2) shall be deemed to comply with this requirement where installed and fastened in accordance with Section 722.7.2.

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

722.7.2 Installation of gypsum board *noncombustible protection*.

Gypsum board complying with Table 722.7.1(2) shall be installed in accordance with this section.

722.7.2.1 Interior surfaces.

Layers of Type X*gypsum board* serving as *noncombustible protection* for *interior surfaces* of wall and ceiling assemblies determined in accordance with Table 722.7.1(1) shall be installed in accordance with the following:

1. Each layer shall be attached with Type S drywall screws of sufficient length to penetrate the *mass timber* at least 1 inch (25 mm) when driven flush with the paper surface of the *gypsum board* .

   Exception: The third layer, where determined necessary by Section 722.7, shall be permitted to be attached with 1-inch (25 mm) No. 6 Type S drywall screws to furring channels in accordance with AISI S220.
2. Screws for attaching the base layer shall be 12 inches (305 mm) on center in both directions.
3. Screws for each layer after the base layer shall be 12 inches (305 mm) on center in both directions and offset from the screws of the previous layers by 4 inches (102 mm) in both directions.
4. All panel edges of any layer shall be offset 18 inches (457 mm) from those of the previous layer.
5. All panel edges shall be attached with screws sized and offset as in Items 1 through 4 and placed at least 1 inch (25 mm) but not more than 2 inches (51 mm) from the panel edge.
6. All panels installed at wall-to-ceiling intersections shall be installed such that ceiling panels are installed first and the wall panels are installed after the ceiling panel has been installed and is fitted tight to the ceiling panel. Where multiple layers are required, each layer shall repeat this process.
7. All panels installed at a wall-to-wall intersection shall be installed such that the panels covering an *exterior wall* or a wall with a greater fire-resistance rating shall be installed first and the panels covering the other wall shall be fitted tight to the panel covering the first wall. Where multiple layers are required, each layer shall repeat this process.
8. Panel edges of the face layer shall be taped and finished with joint compound. Fastener heads shall be covered with joint compound.
9. Panel edges protecting *mass timber* elements adjacent to unprotected *mass timber* elements in accordance with Section 602.4.2.2 shall be covered with $1^{1}/_{4}$-inch (32 mm) metal corner bead and finished with joint compound.

722.7.2.2 Exterior surfaces.

Layers of Type X *gypsum board* serving as *noncombustible protection* for the outside of the exterior *mass timber* walls determined in accordance with Table 722.7.1(1) shall be fastened 12 inches (305 mm) on center each way and 6 inches (152 mm) on center at all joints or ends. All panel edges shall be attached with fasteners located at least 1 inch (25 mm) but not more than 2 inches (51 mm) from the panel edge. Fasteners shall comply with one of the following:

1. Galvanized nails of minimum 12 gage with a $^{7}/_{16}$-inch (11 mm) head of sufficient length to penetrate the *mass timber* a minimum of 1 inch (25 mm).
2. Screws that comply with ASTM C1002 (Type S, W or G) of sufficient length to penetrate the *mass timber* a minimum of 1 inch (25 mm).

Chapter 8 (Interior Finishes)

- **Section 803.3 Heavy-timber exemption,** was modified as part of the Pennsylvania 2018 IBC adoption. The national language was not modified in 2021 code, and as such, this language was maintained as modified in the 2018 adoption and in the current Pennsylvania 2021 IBC adoption as follows:

> ***803.3 Heavy timber exemption.*** *In buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3, exposed portions of building elements complying with the requirements for buildings of heavy timber construction in Section 602.4 or Section 2304.11 shall not be subject to interior finish requirements except in interior exit stairways, interior exit ramps, and exit passageways.*

- **Section 806.9** added regulations on combustible lockers for interior finish purposes.

> **[F] 806.9 Combustible lockers.**
>
> Where lockers constructed of combustible materials are used, the lockers shall be considered to be *interior finish* and shall comply with Section 803.
>
> **Exception:** Lockers 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.

Chapter 9 (Fire Protection and Life Safety Systems)

- **Sections 903.2.4 / 903.2.7 / 903.2.9** amended and reorganized sprinkler provisions for upholstered furniture and mattresses to clearly indicate the scope of the required protection.

> **[F] 903.2.4.3 Group F-1 upholstered furniture or mattresses.**
>
> An *automatic sprinkler system* shall be provided throughout a Group F-1 *fire area* that exceeds 2,500 square feet (232 m^2) used for the manufacture of upholstered furniture or mattresses.

> **[F] 903.2.7.2 Group M upholstered furniture or mattresses.**
>
> An *automatic sprinkler system* shall be provided throughout a Group M *fire area* where the area used for the display and sale of upholstered furniture or mattresses exceeds 5,000 square feet (464 m^2).

- **Sections 903.2.4.2 / 903.2.9.3** adds a sprinkler requirement for both the manufacturing and bulk storage of distilled spirits.

> **[F] 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.

> **[F] 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.

- **Section 903.2.10** amended to require an automatic sprinkler system be installed in an open parking garage where a specific fire area or height threshold is exceeded.

- **Section 903.2.10.2** added definition for mechanical-access enclosed parking garages and requires an automatic sprinkler system.

> **[BG] MECHANICAL-ACCESS ENCLOSED PARKING GARAGE.** An enclosed parking garage that employs parking machines, lifts, elevators or other mechanical devices for vehicle moving from and to street level and in which public occupancy in the garage is prohibited in all areas except the vehicle access bay.

> **[F] 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*.

- **Section 903.3.1.2 NFPA 13R sprinkler systems,** is adopted with the following modification by the Pennsylvania 2021 UCC RAC Report to adopt 13R sprinkler provisions from the IBC 2024 language:

> ***[F] 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 meets all of the following conditions:*
>
> 1. *Four stories or fewer above grade plane.*
> 2. *For other than R-2 occupancies, the floor level of the highest story is 30 feet (9144 mm) or less above the lowest level of fire department vehicle access.*
>
>   *For R-2 occupancies, the roof assembly is less than 45 feet (13716 mm) above the lowest level of fire department vehicle access. The height of the roof assembly shall be determined by measuring the distance from the lowest required fire vehicle access road surface adjacent to the building to the eave of the highest pitched roof, the intersection of the highest roof to the exterior wall, or the top of the highest parapet, whichever yields the greatest distance.*
> 3. *The floor level of the lowest story is 30 feet (9144 mm) or less below the lowest level of fire department vehicle access*
>
> *The number of stories of Group R occupancies constructed in accordance with Sections 510.2 and 510.4 shall be measured from grade plane.*

- **Section 903.3.1.2.2** amends sprinkler protection to require extension to corridors and balconies used in the means of egress, even though the location may be exempt based upon the NFPA 13R standard.

> **[F] 903.3.1.2.2 *Corridors* and balconies in the means of egress.**
>
> Sprinkler protection shall be provided in *corridors* and for balconies in the *means of egress* where any of the following conditions apply:
>
> 1. *Corridors* with combustible floor or walls.
> 2. *Corridors* with an interior change of direction exceeding 45 degrees (0.79 rad).
> 3. *Corridors* that are less than 50 percent open to the outside atmosphere at the ends.
> 4. Open-ended corridors and associated exterior *stairways* and *ramps* as specified in Section 1027.6, Exception 3.
> 5. Egress balconies not complying with Sections 1021.2 and 1021.3.

- **Section 905.3.1** modifies the standpipe requirements for both open and enclosed parking garages, impacting the type of system, the threshold heights, and the necessary water supply.

- **Section 907.2.10** added to require a manual fire alarm system in self-storage facilities that are three stories or more in height and have interior corridors.

> **[F] 907.2.10 Group S.**
>
> A manual fire alarm system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group S public- and self-storage occupancies three stories or greater in height for interior corridors and interior common areas. Visible notification appliances are not required within storage units.
>
> **Exception:** Manual fire alarm boxes are not required where the building is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1, and the occupant notification appliances will activate throughout the notification zones upon sprinkler water flow.

- **Section 907.5.2.1.3** modified to allow a low-frequency signal be used in the sleeping rooms to improve the waking effectiveness of the occupant notification devices where a fire alarm system is required in Group R-1 and R-2 occupancies.

> **[F] 907.5.2.1.3 Audible signal frequency in Group R-1 and R-2 sleeping rooms.**
>
> Audible signal frequency in Group R-1 and R-2 occupancies shall be in accordance with Sections 907.5.2.1.3.1 and 907.5.2.1.3.2.

> **[F] 907.5.2.1.3.1 Fire alarm system signal.**
>
> In sleeping rooms of Group R-1 and R-2 occupancies, the audible alarm activated by a fire alarm system shall be a 520-Hz low-frequency signal complying with NFPA 72.

> **[F] 907.5.2.1.3.2 Smoke alarm signal in sleeping rooms.**
>
> In sleeping rooms of Group R-1 and R-2 occupancies that are required by Section 907.2.8 or 907.2.9 to have a fire alarm system, the audible *alarm signal* activated by single- or multiple-station smoke alarms in the *dwelling unit* or *sleeping unit* shall be a 520-Hz signal complying with NFPA 72. Where a sleeping room smoke alarm is unable to produce a 520-Hz signal, the 520-Hz *alarm signal* shall be provided by a *listed* notification appliance or a smoke detector with an integral 520-Hz sounder.

- **Section 909.20** amended to add a new alternative method of pressurizing both the stair enclosure and the vestibule relative to the fire floor for smokeproof enclosures.

> **909.20 Smokeproof enclosures.**
>
> Where required by Section 1023.12, a *smokeproof enclosure* shall be constructed in accordance with this section. A *smokeproof enclosure* shall consist of an *interior exit stairway* or *ramp* that is enclosed in accordance with the applicable provisions of Section 1023 and an open exterior balcony, ventilated vestibule or pressurized *stair* and pressurized entrance vestibule meeting the requirements of this section. Where access to the roof is required by the *International Fire Code*, such access shall be from the *smokeproof enclosure* where a *smokeproof enclosure* is required.

- **Section 911** modified to require a fire command center in buildings housing Group F-1 or S-1 occupancies where the building footprint is over 500,000 square feet in size.

> **[F] 911.1 General.**
>
> Where required by other sections of this code, in buildings classified as high-rise buildings by this code and in all F-1 and S-1 occupancies with a building footprint of over 500,000 square feet (46 452 m^2), a fire command center for fire department operations shall be provided and shall comply with Sections 911.1.1 through 911.1.7.

> **[F] 911.1.1 Location and access.**
>
> The location and access to the fire command center shall be *approved* by the *fire code official*.

> **[F] 911.1.3 Size.**
>
> The fire command center shall be not less than 0.015 percent of the total building area of the facility served or 200 square feet (19 m^2) in area, whichever is greater, with a minimum dimension of 0.7 times the square root of the room area or 10 feet (3048 mm), whichever is greater. Where a fire command is required for Group F-1 and S-1 occupancies with a building footprint greater than 500,000 square feet (46 452 m^2) in area, the fire command center shall have a minimum size of 96 square feet (9 m^2) with a minimum dimension of 8 feet (2348 mm) where *approved* by the *fire code official*.

> **[F] 911.1.7 Fire command center identification.**
>
> The *fire command center* shall be identified by a permanent easily visible sign reading "FIRE COMMAND CENTER" located on the door to the *fire command center*.

Chapter 10 (Means of Egress)

- **Section 1006.2.1** eliminated the common path of travel distance limitations for unoccupied mechanical rooms and penthouses.

> **1006.2.1 Egress based on occupant load and common path of egress travel distance.**
>
> Two *exits* or *exit access doorways* from any space shall be provided where the design *occupant load* or the *common path of egress* travel distance exceeds the values *listed* in Table 1006.2.1. The cumulative *occupant load* from adjacent rooms, areas or spaces shall be determined in accordance with Section 1004.2.
>
> **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* .
> 2. *Care suites* in Group I-2 occupancies complying withSection 407.4.
> 3. Unoccupied mechanical rooms and *penthouses* are not required to comply with the common path of egress travel distance measurement.

- **Section 1006.3** clarified to means of egress provisions applicable to occupied roofs.

> **1006.3.1 Occupant load.**
>
> Where *stairways* serve more than one *story* , or more than one *story* and an occupied roof, only the *occupant load* of each *story* or occupied roof, considered individually, shall be used when calculating the required number of *exits* or access to *exits* serving that *story*.

> **1006.3.2 Path of egress travel.**
>
> The path of egress travel to an *exit* shall not pass through more than one adjacent *story*.
>
> **Exception:** The path of egress travel to an *exit* shall be permitted to pass through more than one adjacent *story* in any of the following:
>
> 7. Exterior *exit access stairways* and *ramps* between occupied roofs.

- **Section 1006.3.4** amended to base travel distance limits for single-exit stories on the exit access travel distance as opposed to the common path of egress travel.

> **1006.3.4 Single exits.**
>
> A single *exit* or access to a single *exit* shall be permitted from any *story* or occupied roof where one of the following conditions exists:
>
> 1. The *occupant load*, number of *dwelling units* and exit access travel distance do not exceed the values in Table 1006.3.4(1) or 1006.3.4(2).

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

For SI: 1 foot = 304.8 mm.
NP = Not Permitted.
NA = Not Applicable.

a. Buildings classified as Group R-2 equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 and provided with emergency escape and rescue openings in accordance with Section 1031.
b. This table is used for R-2 occupancies consisting of dwelling units. For R-2 occupancies consisting of sleeping units, use Table 1006.3.4(2).

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

For SI: 1 foot = 304.8 mm.
NP = Not Permitted.
NA = Not Applicable.

a. Buildings classified as Group R-2 equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 and provided with emergency escape and rescue openings in accordance with Section 1031.
b. Group B, F and S occupancies in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 shall have a maximum exit access travel distance of 100 feet.
c. This table is used for R-2 occupancies consisting of sleeping units. For R-2 occupancies consisting of dwelling units, use Table 1006.3.4(1).
d. The length of exit access travel distance in a Group S-2 open parking garage shall be not more than 100 feet.

- **Section 1008.2.1** amended to increase the minimum illumination level for both exit and exit access stairways from 1 foot-candle to 10 foot-candles.

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.

Exception: For auditoriums, theaters, concert or opera halls and similar assembly occupancies, the illumination at the walking surface is permitted to be reduced during performances by one of the following methods provided that the required illumination is automatically restored upon activation of a premises' *fire alarm system*:

1. Externally illuminated walking surfaces shall be permitted to be illuminated to not less than 0.2 footcandle (2.15 lux).
2. Steps, landings and the sides of *ramps* shall be permitted to be marked with *self-luminous* materials in accordance with Sections 1025.2.1, 1025.2.2 and 1025.2.4 by systems *listed* in accordance with UL 1994.

- **Section 1010.1.1** amended to no longer regulate the maximum width for a swinging door and consolidated exception now allows for a reduced 20-inch wide door size where serving single user showers, saunas and toilet compartments, as well as dressing, fitting and changing rooms.

- **Section 1010.1.1.1** amended to permit additional components to project into the minimum required door opening height.

1010.1.1.1 Projections into clear opening.

There shall not be projections into the required clear opening width lower than 34 inches (864 mm) above the floor or ground. Projections into the clear opening width between 34 inches (864 mm) and 80 inches (2032 mm) above the floor or ground shall not exceed 4 inches (102 mm).

Exception: Door closers, overhead door stops, power door operators, and electromagnetic door locks shall be permitted to be 78 inches (1980 mm) minimum above the floor.

- **Section 1010.1.3** amended by dividing the requirements for releasing the latching hardware and the force to open the door into separate subsections to provide coordinaton with the 2017 edition of the ICC A117.1

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).

The force to open doors shall comply with the following:

1. For interior swinging egress doors that are manually operated, other than doors required to be fire rated, the force for pushing or pulling open the door shall not exceed 5 pounds (22 N).
2. For other swinging doors, sliding doors or folding doors, and doors required to be fire rated, the door shall require not more than a 30-pound (133 N) force to be set in motion and shall move to a full-open position when subjected to not more than a 15-pound (67 N) force.

- **Section 1010.2.4** amended by expanding the general locking provisions to allow locked doors in the egress system when desired due to the clinical needs of care recipients or where exterior areas egress back through the building.

1010.2.4 Locks and latches.

Locks and latches shall be permitted to prevent operation of doors where any of the following exist:

1. Places of detention or restraint.
2. In Group I-1, Condition 2 and Group I-2 occupancies where the clinical needs of persons receiving care require containment or where persons receiving care pose a security threat, provided that all clinical staff can readily unlock doors at all times, and all such locks are keyed to keys carried by all clinical staff at all times or all clinical staff have the codes or other means necessary to operate the locks at all times.
8. Other than egress *courts*, where occupants must egress from an exterior space through the building for *means of egress*, exit access doors shall be permitted to be equipped with an approved locking device where installed and operated in accordance with all of the following:
   - 8.1. The maximum *occupant load* shall be posted where required by Section 1004.9. Such signage shall be permanently affixed inside the building and shall be posted in a conspicuous space near all the exit access doorways.
   - 8.2. A weatherproof telephone or two-way communication system installed in accordance with Sections 1009.8.1 and 1009.8.2 shall be located adjacent to not less than one required exit access door on the exterior side.
   - 8.3. The egress door locking device is readily distinguishable as locked and shall be a key-operated locking device.
   - 8.4. A clear window or glazed door opening, not less than 5 square feet (0.46 m^2) in area, shall be provided at each exit access door to determine if there are occupants using the outdoor area.
   - 8.5. A readily visible, durable sign shall be posted on the interior side on or adjacent to each locked required exit access door serving the exterior area stating, "THIS DOOR TO REMAIN UNLOCKED WHEN THE OUTDOOR AREA IS OCCUPIED." The letters on the sign shall be not less than 1 inch (25.4 mm) high on a contrasting background.
   - 8.6. The *occupant load* of the occupied exterior area shall not exceed 300 occupants in accordance with Section 1004.
9. Locking devices are permitted on doors to balconies, decks or other exterior spaces serving individual dwelling or sleeping units.
10. Locking devices are permitted on doors to balconies, decks or other exterior spaces of 250 square feet (23.23 m^2) or less serving a private office space.

- **Section 1010.2.8** amended to regulate Group I-4 occupancies with respect to special locking arrangements allowed for other "educational occupancies"

1010.2.8 Locking arrangements in educational occupancies.

In Group E occupancies, Group B educational occupancies and Group I-4 occupancies, egress doors from classrooms, offices and other occupied rooms with locking arrangements designed to keep intruders from entering the room shall comply with all of the following conditions:

1. The door shall be capable of being unlocked from outside the room with a key or other *approved* means.
2. The door shall be openable from within the room in accordance with Section 1010.2.
3. Modifications shall not be made to listed *panic hardware*, *fire door* hardware or door closers.
4. Modifications to *fire door assemblies* shall be in accordance with NFPA 80.

Remote locking or unlocking of doors from an approved location shall be permitted in addition to the unlocking operation in Item 1.

- **Section 1011.6** revised requirements addressing the layout and configuration of landings, both curved and those that exceed the minimum size.

1011.6 Stairway landings.

There shall be a floor or landing at the top and bottom of each *stairway*. The width of landings, measured perpendicularly to the direction of travel, shall be not less than the width of *stairways* served. Every landing shall have a minimum depth, measured parallel to the direction of travel, equal to the width of the *stairway* or 48 inches (1219 mm), whichever is less. Doors opening onto a landing shall not reduce the landing to less than one-half the required width. When fully open, the door shall not project more than 7 inches (178 mm) into the required width of a landing. Where wheelchair spaces are required on the *stairway* landing in accordance with Section 1009.6.3, the *wheelchair space* shall not be located in the required width of the landing and doors shall not swing over the *wheelchair spaces*.

Exceptions:

1. Where *stairways* connect stepped *aisles* to cross *aisles* or concourses, *stairway* landings are not required at the transition between *stairways* and stepped *aisles* constructed in accordance with Section 1030.
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*.
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.

- **Section 1016.2** amended to permit egress through enclosed elevator lobby areas for spaces requiring only one means of egress.

1016.2 Egress through intervening spaces.

Egress through intervening spaces shall comply with this section.

1. *Exit access* through an enclosed elevator lobby is permitted. Where access to two or more exits or exit access doorways is required in Section 1006.2.1, access to not less than one of the required *exits* shall be provided without travel through the enclosed elevator lobbies required by Section 3006. Where the path of *exit access* travel passes through an enclosed elevator lobby, the level of protection required for the enclosed elevator lobby is not required to be extended to the *exit* unless direct access to an *exit* is required by other sections of this code.

- **Section 1019.3** clarifies the allowance exempting the enclosure if exit access stairways that serve only two stories by mandating that the stories be adjacent.

1019.3 Occupancies other than Groups I-2 and I-3.

In other than Group I-2 and I-3 occupancies, floor openings containing *exit access stairways* or *ramps* shall be enclosed with a shaft enclosure constructed in accordance with Section 713.

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.

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

- **Section 1020.5** amended to allow hospital corridors that do not serve patient rooms or treatment spaces a maximum 30-foot dead end.

1020.5 Dead ends.

Where more than one *exit* or *exit access doorway* is required, the *exit access* shall be arranged such that dead-end *corridors* do not exceed 20 feet (6096 mm) in length.

Exceptions:

4. In Group I-2, Condition 2 occupancies, the length of dead-end *corridors* that do not serve patient rooms or patient treatment spaces shall not exceed 30 feet (9144 mm).

- **Section 1030.16** provides new guidance to address handrail requirements for "social stairs" which are regulated by a combination of the general stairway provisions and those for assembly seating.

1030.16 Handrails.

Ramped *aisles* having a slope exceeding one unit vertical in 15 units horizontal (6.7-percent slope) and stepped *aisles* shall be provided with *handrails* in compliance with Section 1014 located either at one or both sides of the *aisle* or within the *aisle* width. Where stepped *aisles* have seating on one side and the *aisle* width is 74 inches (1880 mm) or greater, two *handrails* are required. Where two *handrails* are required, one of the *handrails* shall be within 30 inches (762 mm) horizontally of the stepped *aisle*.

- **Section 1031** predominantly reorganizes the emergency escape and rescue opening provisions to coordinate the IBC and the International Residential Code provisions, and have also included additional language to address the size of steps from an area well and the use of a door.

1031.1 General.

Emergency escape and rescue openings shall comply with the requirements of this section.

1031.2 Where required.

In addition to the *means of egress* required by this chapter, *emergency escape and rescue openings* shall be provided in the following occupancies:

1. Group R-2 occupancies located in stories with only one *exit* or *access* to only one *exit* as permitted by Tables 1006.3.4(1) and 1006.3.4(2).
2. Group R-3 and R-4 occupancies.

Basements and sleeping rooms below the fourth *story above grade plane* shall have not fewer than one *emergency escape and rescue opening* in accordance with this section. Where *basements* contain one or more sleeping rooms, an *emergency escape and rescue opening* shall be required in each sleeping room, but shall not be required in adjoining areas of the *basement*. Such openings shall open directly into a *public way* or to a *yard* or *court* that opens to a *public way*.

Exceptions:

1. *Basements* with a ceiling height of less than 80 inches (2032 mm) shall not be required to have *emergency escape and rescue openings*.
2. *Emergency escape and rescue openings* are not required from *basements* or sleeping rooms that have an *exit* door or *exit access* door that opens directly into a *public way* or to a *yard*, court or exterior egress balcony that opens to a *public way*.
3. *Basements* without *habitable spaces* and having not more than 200 square feet (18.6 m^2) in floor area shall not be required to have *emergency escape and rescue openings*.
4. *Storm shelters* are not required to comply with this section where the shelter is constructed in accordance with ICC 500.

1031.5 Area wells.

An *emergency escape and rescue opening* with the bottom of the clear opening below the adjacent grade shall be provided with an area well in accordance with Sections 1031.5.1 through 1031.5.3.

1031.5.1 Minimum size.

The minimum horizontal area of the area well shall be 9 square feet (0.84 m^2), withhorizontal projection and width of not less than 36 inches (914 mm). The areawell shall allow the *emergency escape and rescue opening* to be fully opened.

Exception: The ladder or steps required by Section 1031.5.2 shall be permitted to encroach not more than 6 inches (152 mm) into the required dimensions of the area well.

1031.5.2 Ladders or steps.

Area wells with a vertical depth of more than 44 inches (1118 mm) shall be equipped with an *approved* permanently affixed ladder or steps. The ladder or steps shall not be obstructed by the *emergency escape and rescue opening* when the window or door is in the open position. Ladders or steps required by this section shall not be required to comply with Section 1011.

1031.5.2.1 Ladders.

Ladders or rungs shall have an inside width of at least 12 inches (305 mm), shall project at least 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center (o.c.) vertically for the full height of the area well.

1031.5.2.2 Steps.

Steps shall have an inside width of not less than 12 inches (305 mm), shall have treads greater than 5 inches (127 mm) in depth and a riser height not greater than 18 inches (457 mm) for the full height of the area well.

1031.5.3 Drainage.

Area wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section 1805.

Exception: A drainage system for area wells is not required where the foundation is on well-drained soil or sand-gravel mixture soils in accordance with the United Soil Classification System, Group I Soils, in accordance with Section 1803.5.1.

Chapter 12 (Interior Environment)

- **Section 1202.3** adds a new option for the regulation of unvented attics with air-permeable insulation and vapor diffusion ports in warmers climates. [*Note that Philadelphia is located in Climate Zone 4A.*]

1202.3 Unvented attic and unvented enclosed rafter assemblies.

Unvented *attics* and unvented enclosed roof framing assemblies created by ceilings applied directly to the underside of the roof framing members/rafters and the structural roof sheathing at the top of the roof framing members shall be permitted where all of the following conditions are met:

5. Insulation shall comply with either Item 5.1 or 5.2, and additionally Item 5.3.

5.3. The air shall be supplied from ductwork providing supply air to the occupiable space when the conditioning system is operating. Alternatively, the air shall be supplied by a supply fan when the conditioning system is operating. Where preformed insulation board is used as the air-impermeable insulation layer, it shall be sealed at the perimeter of each individual sheet interior surface to form a continuous layer.

→ **Section 1208.4** reduced the minimum required floor area of an efficiency dwelling unit to 190 square feet, and added a definition for efficiency dwelling unit.

[BG] 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.

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 m^2) of floor area.
2. The unit shall be provided with a separate closet.
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.

- **Section 1210.3** added a screening element requirement at the entry to the restroom due to concerns regarding privacy with public restrooms.

[P] 1210.3 Privacy.

Public restrooms shall be visually screened from outside entry or exit doorways to ensure user privacy within the restroom. This provision shall also apply 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.

Chapter 14 (Exterior Walls)

- **Section 1404.3** reorganized and clarified thresholds for when vapor retarder is required, and which retarder is required as well as locations and climate zone requirements.

1404.3 Vapor retarders.

Vapor retarder materials shall be classified in accordance with Table 1404.3(1). A vapor retarder shall be provided on the interior side of frame walls in accordance with Tables 1404.3(2) and 1404.3(3), or an approved design using accepted engineering practice for hygrothermal analysis. The appropriate climate zone shall be selected in accordance with Chapter 3 of the *International Energy Conservation Code*.

Where a Class II vapor retarder is used in combination with foam plastic insulating sheathing installed as continuous insulation on the exterior side of frame walls, the continuous insulation shall comply with Table 1404.3(4) and the Class II vapor retarder shall have a vapor permeance greater than 1 perm when measured by ASTM E96 water method (Procedure B). Use of a Class I interior vapor retarder in frame walls with a Class I vapor retarder on the exterior side shall require an approved design.

Exceptions:

1. Basement walls.
2. Below-grade portion of any wall.
3. Construction where accumulation, condensation or freezing of moisture will not damage the materials.
4. Class I and II vapor retarders with vapor permeance greater than 1 perm when measured by ASTM E96 water method (Procedure B) shall be allowed on the interior side of any frame wall in all climate zones.

- **Table 1404.3.1** assigns a minimum continuous insulation R-values where Class II vapor retarders are installed.

1404.3.1 Class I and II vapor retarders.

Where a Class II vapor retarder is used in combination with foam plastic insulating sheathing installed as continuous insulation on the exterior side of frame walls, the continuous insulation shall comply with Table 1404.3.1 and the Class II vapor retarder shall have a vapor permeance greater than 1 perm when measured by ASTM E96 water method (Procedure B). Use of a Class I interior vapor retarder in frame walls with a Class I vapor retarder on the exterior side shall require an approved design.

Exceptions:

1. Basement walls.
2. Below-grade portion of any wall.
3. Construction where accumulation, condensation or freezing of moisture will not damage the materials.
4. .Class I and II vapor retarders with vapor permeance greater than 1 perm when measured by ASTM E96 water method (Procedure B) shall be allowed on the interior side of any frame wall in all climate zones.

TABLE 1404.3(1)VAPOR RETARDER MATERIALS AND CLASSES

VAPOR RETARDER CLASS	ACCEPTABLE MATERIALS
I	Sheet polyethylene, nonperforated aluminum foil, or other approved materials with a perm rating of less than or equal to 0.1
II	Kraft-faced fiberglass batts or vapor retarder paint or other approved materials, applied in accordance with the manufacturer's instructions for a perm rating greater than 0.1 and less than or equal to 1.0
III	Latex paint, enamel paint, or other approved materials, applied in accordance with the manufacturer's instructions for a perm rating of greater than 1.0 and less than or equal to 10

TABLE 1404.3(4)CONTINUOUS INSULATION WITH CLASS II VAPOR RETARDER

CLIMATE ZONE	PERMITTED CONDITIONS[a]
4, 5, 6	Continuous insulation with *R*-value ≥ R-3 over 2 × 4 wall Continuous insulation with *R*-value ≥ R-5 over 2 × 6 wall

a. In addition to the vapor retarder, spray foam with a maximum permeance of 1.5 perms at the installed thickness, applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum is deemed to comply with the continuous insulation requirement only for the moisture control purposes of this table where the spray foam *R*-value plus any continuous insulation *R*-value provided equals or exceeds the specified continuous insulation *R*-value.

- **Section 1404.3.2** clarifies the appropriate use of Class III vapor retarders with spray from insulation.

> **1404.3.2 Hybrid insulation for moisture control with Class III vapor retarders.**
>
> For the purposes of compliance with Table 1404.3(3), the combined moisture control of spray foam plastic insulation and continuous insulation shall be permitted to be counted toward the continuous Rvalue requirement.

- **Section 1406.10** simplified limited the requirements for metal composite materials installed on exterior walls of buildings of Type I, II, III, IV construction by the deletion of the alternate conditions previously set forth in Section 1406.11.

> **1406.10 Types I, II, III and IV construction.**
>
> Where installed on buildings of Types I, II, III and IV construction, *metal composite material* (MCM) shall comply with Sections 1406.10.1 and 1406.10.2 for installations up to 40 feet (12 192 mm) above *grade plane*. Where installed on buildings of Type I, II, III and IV construction, MCMs and MCM systems shall comply with Sections 1406.10.1 through 1406.10.3, for installations greater than 40 feet (12 192 mm) above *grade plane*.

> **1406.10.2 Thermal barriers.**
>
> MCM shall be separated from the interior of a building by an approved thermal barrier consisting of $^{1}/_{2}$-inch (12.7 mm) *gypsum wallboard* or 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.
>
> **Exceptions:**
>
> 1. The MCM system is specifically approved based on tests conducted in accordance with NFPA 286 and with the acceptance criteria of Section 803.1.1.1, UL 1040 or UL 1715. Such testing shall be performed with the MCM in the maximum thickness intended for use. The MCM system shall include seams, joints and other typical details used in the installation and shall be tested in the manner intended for use.
> 2. The MCM is used as elements of balconies and similar projections, architectural trim or embellishments.

Chapter 15 (Roof Assemblies and Rooftop Structures)

- **Section 1503.3** amended to require moisture resistance for parapet walls in a similar manner to the remaining building.

> **1503.3 Parapet walls.**
>
> Parapet walls shall be coped or covered in accordance with Sections 1503.3.1 and 1503.3.2. The top surface of the parapet wall shall provide positive drainage.

> **1503.3.1 Fire-resistance-rated parapet walls.**
>
> *Parapet walls* required by Section 705.11 shall be coped or covered with weatherproof materials of a width not less than the thickness of the *parapet wall* such that the *fire-resistance* rating of the wall is not decreased.

> **1503.3.2 Other parapet walls.**
>
> *Parapet walls* meeting one of the exceptions in Section 705.11 shall be coped or covered with weatherproof materials of a width not less than the thickness of the *parapet wall*.

- **Section 1504.5** all requirements applicable to the design and construction of ballasted low-slope roofs are now contained in the ANSI/SPRI RP-4 standard.

- **Section 1504.9** now requires parapets of a minimum height for aggregate-surfaced roofs to prevent blow-off.

1504.9 Wind resistance of aggregate-surfaced roofs.

Parapets shall be provided for aggregate surfaced roofs and shall comply with Table 1504.9.

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

For SI: 1 inch = 25.4 mm; 1 foot = 304.8 mm; 1 mile per hour = 0.447 m/s.

a. Interpolation shall be permitted for mean roof height and parapet height.
b. Basic design wind speed, *V*, and wind exposure shall be determined in accordance with Section 1609.
c. Where the minimum required parapet height is indicated to be 2 inches (51 mm), a gravel stop shall be permitted and shall extend not less than 2 inches (51 mm) from the roof surface and not less than the height of the aggregate.
d. For Exposure D, add 8 inches (203 mm) to the parapet height required for Exposure C and the parapet height shall not be less than 12 inches (305 mm).

TABLE 1504.9MINIMUM 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

Chapter 16 (Structural Design)

- **Section 1603.1.4** requires component and cladding zones be identified in the construction documents.

1603.1.4 Wind design data.

The following information related to wind *loads* shall be shown, regardless of whether wind *loads* govern the design of the lateral force-resisting system of the structure:

1. Basic design *wind speed*, *V*, miles per hour and *allowable stress designwind speed*, V_{asd}, as determined in accordance with Section 1609.3.1.
2. *Risk category*.
3. Wind exposure. Applicable wind direction if more than one wind exposure is utilized.
4. Applicable internal pressure coefficient.
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/m^2).

- **Table 1604.5** designated the mixed occupancy buildings with assembly spaces as Risk Category III when the total public assembly occupant load is greater than 2,500 people.

TABLE 1604.5RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. 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. Buildings and other structures containing Group E or Group I-4 occupancies or combination therof, with an occupant load greater than 250. Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. Group I-2, Condition 1 occupancies with 50 or more care recipients. Group I-2, Condition 2 occupancies not having emergency surgery or emergency treatment facilities. Group I-3 occupancies. Any other occupancy with an occupant load greater than 5,000.[a] Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code*; and Are sufficient to pose a threat to the public if released.[b]

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.
b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

- **Section 1605** deleted the strength design and allowable stress design load combinations while direct reference to Chapter 2 of ASCE 7 has been added to Section 1605.

1605.1 General.

Buildings and *other structures* and portions thereof shall be designed to resist the strength load combinations specified in ASCE 7, Section 2.3, the *allowable stress design* load combinations specified in ASCE 7, Section 2.4, or the alternative *allowable stress design* load combinations of Section 1605.2.

Exceptions:

1. The modifications to load combinations of ASCE 7 Section 2.3, ASCE 7 Section 2.4, and Section 1605.2 specified in ASCE 7 Chapters 18 and 19 shall apply.
2. Where the allowable stress design load combinations of ASCE 7 Section 2.4 are used, flat roof snow *loads* of 30 pounds per square foot (1.44 kN/m^2) and *roof live loads* of 30 pounds per square foot (1.44 kN/m^2) or less need not be combined with seismic load. Where flat roof snow *loads* exceed 30 pounds per square foot (1.44 kN/m^2), 20 percent shall be combined with seismic loads.
3. Where the allowable stress design load combinations of ASCE 7 Section 2.4 are used, crane hook loads need not be combined with *roof live loads* or with more than three-fourths of the snow load or one-half of the wind loads.

1605.2 Alternative allowable stress design load combinations.

In lieu of the load combinations in ASCE 7, Section 2.4, structures and portions thereof shall be permitted to be designed for the most critical effects resulting from the following combinations. Where using these alternative allowable stress load combinations that include wind or seismic *loads*, allowable stresses are permitted to be increased or load combinations reduced where permitted by the material chapter of this code or the referenced standards. For load combinations that include the counteracting effects of dead and wind *loads*, only two-thirds of the minimum *dead load* likely to be in place during a design wind event shall be used. Where using these alternative load combinations to evaluate sliding, overturning and soil bearing at the soil-structure interface, the reduction of foundation overturning from Section 12.13.4 in ASCE 7 shall not be used. Where using these alternative basic *load* combinations for proportioning foundations for loadings, which include seismic *loads*, the vertical seismic *load effect*, E_v, in Equation 12.4-4 of ASCE 7 is permitted to be taken equal to zero. Where required by ASCE 7, Chapters 12, 13 and 15, the load combinations including overstrength of ASCE 7, Section 2.3.6 shall be used.

- **Section 1606** clarifies dead loads at roof level and fixes service equipment concentrated loads.

1606.3 Weight of fixed service equipment.

In determining dead loads for purposes of design, the weight of fixed service equipment, including the maximum weight of the contents of fixed service equipment, shall be included. The components of fixed service equipment that are variable, such as liquid contents and movable trays, shall not be used to counteract forces causing overturning, sliding, and uplift conditions in accordance with Section 1.3.6 of ASCE 7.

Exceptions:

1. Where force effects are the result of the presence of the variable components, the components are permitted to be used to counter those load effects. In such cases, the structure shall be designed for force effects with the variable components present and with them absent.
2. For the calculation of seismic force effects, the components of fixed service equipment that are variable, such as liquid contents and movable trays, need not exceed those expected during normal operation.

1606.4 Photovoltaic panel systems.

The weight of *photovoltaic panel systems*, their support system, and ballast shall be considered as dead *load*.

1606.5 Vegetative and landscaped roofs.

The weight of all landscaping and hardscaping materials for vegetative and landscaped roofs shall be considered as *dead load*. The weight shall be computed considering both fully saturated soil and drainage layer materials and fully dry soil and drainage layer materials to determine the most severe *load* effects on the structure.

- **Section 1607.11.4** adds rope descent system anchorage to the section on fall arrest and lifeline anchorage.

1607.11.4 Fall arrest, lifeline, and rope descent system anchorages.

In addition to any other applicable *live loads*, fall arrest, lifeline, and rope descent system anchorages and structural elements that support these anchorages shall be designed for a *live load* of not less than 3,100 pounds (13.8 kN) for each attached line, in any direction that the *load* can be applied.

Anchorages of horizontal lifelines and the structural elements that support these anchorages shall be designed for the maximum tension that develops in the horizontal lifeline from these *live loads*.

- **Section 1607.17** adds live loads for fixed and ship's ladders to the IBC.

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.

- **Section 1608.2** updates the ground snow load map to provide consistency with ASCE 7-16 snow maps by adding a reference to ASCE 7 snow tables in slates with large case study areas.

- **Section 1610.2** now requires concrete slabs on the ground be designed for uplift due to soil expansion and water pressure in areas prone to soil movement or a shallow water table.

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.

- **Section 1611** updates secondary drainage system rain loads to be consistent with ASCE 7.

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(1) through 1611.1(5) shall be permitted.

1611.2 Ponding instability.

Susceptible bays of roofs shall be evaluated for ponding instability in accordance with Chapters 7 and 8 of ASCE 7.

- **Section 1612.4** requires the design of hydrostatic loads on breakaway walls when the walls do not meet the requirements of ASCE 24.

1612.4 Flood hazard documentation.

The following documentation shall be prepared and sealed by a *registered design professional* and submitted to the *building official*:

1. For construction in *flood hazard areas* other than *coastal high hazard areas* or *coastal A zones*:

1.3. For *dry floodproofed* nonresidential buildings, *construction documents* shall include a statement that the *dry floodproofing* is designed in accordance with ASCE 24 and shall include the flood emergency plan specified in Chapter 6 of ASCE 24.

2. For construction in *coastal high hazard areas* and *coastal A zones*:

2.4 For breakaway walls where provisions to allow for the automatic entry and exit of floodwaters do not meet the minimum requirements in Section 2.7.2.1 of ASCE 24, construction documents shall include a statement that the design will provide for equalization of hydrostatic flood forces in accordance with Section 2.7.2.2 of ASCE 24.

Chapter 17 (Special Inspections and Tests)

- **Section 1704.6** requires a structural observer to visually observe the construction of structural systems for general design conformance for all buildings assigned to Risk Category III or IV.

1704.6 Structural observations.

Where required by the provisions of Section 1704.6.1, the owner or the owner's authorized agent 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 Section 110 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.

1704.6.1 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** added special inspection requirements for precast concrete diaphragm to the list of general concrete special inspections and tests.

TABLE 1705.3REQUIRED SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD[a]	IBC REFERENCE
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	—		—
b. Completion of the continuity of reinforcement across joints.	X	—	ACI 550.5	
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	—

- **Section 1705.4.1** no longer allows empirically designed masonry in Category IV buildings.

- **Sections 1705.5.3 / 1705.20** adds special inspection requirements to address the anchorage and connection of mass timber structural elements, to include application of sealants & adhesives.

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.

TABLE 1705.5.3REQUIRED 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

1705.20 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.

- **Section 1705.10** requires an engineering assessment to be done when installed deep foundation elements appear to be understrength due to quality, location, or alignment.

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*.

- **Section 1705.18** amends the installation of firestops, fire-resistant joint systems and perimeter fire barrier systems in residential-use buildings to now require special inspection in those Group R fire areas having an occupant load exceeding 250.

> **[BF] 1705.18 Fire-resistant penetrations and joints.**
>
> In high-rise buildings, in buildings assigned to *Risk Category* III or IV, or in *fire areas* containing Group R occupancies with an *occupant load* greater than 250, *special inspections* for *through-penetrations*, *membrane penetration* firestops, *fire-resistant joint systems* and perimeter fire containment systems that are tested and *listed* in accordance with Sections 714.4.1.2, 714.5.1.2, 715.3.1 and 715.4 shall be in accordance with Section 1705.18.1 or 1705.18.2.

- **Section 1709.5** clarifies testing standards and analysis procedures for exterior door and window assemblies, including garage door assemblies.

> **1709.5 Exterior window and door assemblies.**
>
> The design pressure rating of exterior windows and doors in buildings shall be determined in accordance with Section 1709.5.1 or 1709.5.2. For exterior windows and doors tested in accordance with Section 1709.5.1 or 1709.5.2, required design wind pressures determined from ASCE 7 shall be permitted to be converted to allowable stress design by multiplying by 0.6.
>
> **Exception:** Structural wind load design pressures for window or door assemblies other than the size tested in accordance with Section 1709.5.1 or 1709.5.2 shall be permitted to be different than the design value of the tested assembly, provided that such pressures are determined by accepted engineering analysis or validated by an additional test of the window or door assembly to the alternative allowable design pressure in accordance with Section 1709.5.2. Components of the alternate size assembly shall be the same as the tested or labeled assembly. Where engineering analysis is used, it shall be performed in accordance with the analysis procedures of AAMA 2502.

> **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.

- **Section 1709.5.3** clarifies required windborne debris protection for glazing by adding a design standard and definition of impact protective systems.

> **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.

Chapter 18 (Soils and Foundations)

- **Section 1809.5.1** adds frost protection for egress doors to the foundation requirements.

> **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.

- **Section 1810.3.2.6** updated the maximum allowable stress for materials in deep foundation elements to be consistent with the capacity of materials used today.

TABLE 1810.3.2.6

ALLOWABLE STRESSES FOR MATERIALS USED IN DEEP FOUNDATION ELEMENTS

MATERIAL TYPE AND CONDITION	MAXIMUM ALLOWABLE STRESS[a]
1. Concrete or grout in compression[b]	$0.4 f'_c$
Cast-in-place with a permanent casing in accordance with Section 1810.3.2.7 or Section 1810.3.5.3.4	$0.33 f'_c$
Cast-in-place in other permanent casing or rock	$0.3 f'_c$
Cast-in-place without a permanent casing	$0.33 f'_c$
Precast nonprestressed	$0.33 f'_c - 0.27 f_{pc}$
Precast prestressed	
2. Nonprestressed reinforcement in compression	$0.4 f_y \le 30{,}000$ psi
3. Steel in compression	$0.5 F_y \le 32{,}000$ psi
Cores within concrete-filled pipes or tubes	$0.5 F_y \le 32{,}000$ psi
Pipes, tubes or H-piles, where justified in accordance with Section 1810.3.2.8	$0.4 F_y \le 32{,}000$ psi
Pipes or tubes for micropiles	$0.35 F_y \le 24{,}000$ psi
Other pipes, tubes or H-piles	$0.6 F_y \le 0.5 F_u$
Helical piles	
4. Nonprestressed reinforcement in tension	$0.6 f_y$
Within micropiles	
Other conditions	
For load combinations that do not include wind or seismic loads	$0.5 f_y \le 30{,}000$ psi
For load combinations that include wind or seismic loads	$0.5 f_y \le 40{,}000$ psi
5. Steel in tension	$0.5 F_y \le 32{,}000$ psi
Pipes, tubes or H-piles, where justified in accordance with Section 1810.3.2.8	$0.35 F_y \le 24{,}000$ psi
Other pipes, tubes or H-piles	$0.6 F_y \le 0.5 F_u$
Helical piles	
6. Timber	In accordance with the ANSI/AWC NDS

a. f'_c is the specified compressive strength of the concrete or grout; f_{pc} is the compressive stress on the gross concrete section due to effective prestress forces only; f_y is the specified yield strength of reinforcement; F_y is the specified minimum yield stress of steel; F_u is the specified minimum tensile stress of structural steel.

b. The stresses specified apply to the gross cross-sectional area of the concrete for precast prestressed piles and to the net cross-sectional area for all other piles. Where a temporary or permanent casing is used, the inside face of the casing shall be considered the outer edge of the concrete cross-section.

- **Section 1810.3.3.1.9** clarifies the calculation of the available axial design load, P_a.

1810.3.3.1.9 Helical piles.

The allowable axial design *load*, P_a, of *helical piles* shall be determined as follows:

$$P_a = 0.5\,P_u \qquad \text{(Equation 18-4)}$$

where P_U is the least value of:

1. Base capacity plus shaft resistance of the *helical pile*. The base capacity is equal to the sum of the areas of the helical bearing plates times the ultimate bearing capacity of the soil or rock comprising the bearing stratum. The shaft resistance is equal to the area of the shaft above the uppermost helical bearing plate times the ultimate skin resistance.
2. Ultimate capacity determined from well-documented correlations with installation torque.
3. Ultimate capacity determined from load tests where required by Section 1810.3.3.1.2.
4. Ultimate axial capacity of pile shaft.
5. Ultimate axial capacity of pile shaft couplings.
6. Sum of the ultimate axial capacity of helical bearing plates affixed to pile.

- **Section 1810.3.6** no longer requires deep foundation element splices for buildings in Seismic Design Category A and B regions designed by general engineering practices to meet the 50 percent tension and bending capacity based on available soil resistance and expected magnitude of tension and bending demands.

1810.3.6 Splices.

Splices shall be constructed so as to provide and maintain true alignment and position of the component parts of the *deep foundation* element during installation and subsequent thereto and shall be designed to resist the axial and shear forces and moments occurring at the location of the splice during driving and for design load combinations. Where *deep foundation* elements of the same type are being spliced, splices shall develop not less than 50 percent of the bending strength of the weaker section. Where *deep foundation* elements of different materials or different types are being spliced, splices shall develop the full compressive strength and not less than 50 percent of the tension and bending strength of the weaker section. Where structural steel cores are to be spliced, the ends shall be milled or ground to provide full contact and shall be full-depth welded.

Exception: For buildings assigned to *Seismic Design Category* A or B, splices need not comply with the 50-percent tension and bending strength requirements where justified by supporting data.

- **Sections 1810.3.8 / 1810.3.11** now requires precast concrete piles and pile caps be designed in accordance with 2019 ACI 318.

- **Section 1810.4.5** no longer requires load tests when pile installation is completed with an impact hammer, or when a pile is only used for lateral resistance when vibratory drivers are utilized to install piles.

1810.4.5 Vibratory driving.

Vibratory drivers shall only be used to install *deep foundation* elements where the element load capacity is verified by load tests in accordance with Section 1810.3.3.1.2. The installation of production elements shall be controlled according to power consumption, rate of penetration or other *approved* means that ensure element capacities equal or exceed those of the test elements.

Exceptions:

1. The pile installation is completed by driving with an impact hammer in accordance with Section 1810.3.3.1.1.
2. The pile is to be used only for lateral resistance.

Chapter 19 (Concrete)

- **Section 1901.2** updates the ACI 318 to the 2019 edition and includes changes addressing deep foundations, materials and seismic design.

- **Section 1901.7** adds American Concrete institute standards ACI 117 and ITG-7 to the IBC by reference to provide acceptable tolerances for concrete construction.

> **1901.7 Tolerances for structural concrete.**
>
> Where not indicated in *construction documents*, structural tolerances for concrete structural elements shall be in accordance with this section.

> **1901.7.1 Cast-in-place concrete tolerances.**
>
> Structural tolerances for cast-in-place concrete structural elements shall be in accordance with ACI 117.
>
> **Exceptions:**
>
> 1. Group R-3 detached one- or two-family *dwellings* are not required to comply with this section.
> 2. Shotcrete is not required to comply with this section.

> **1901.7.2 Precast concrete tolerances.**
>
> Structural tolerances for precast concrete structural elements shall be in accordance with ACI ITG-7.
>
> **Exception:** Group R-3 detached one- or two-family *dwellings* are not required to comply with this section.

Chapter 21 (Masonry)

- **Section 2109.2.4.8** clarifies the use of plaster as an exterior finish for adobe construction with cement-lime, lime and clay-plaster minimum requirements now addressed.

Chapter 22 (Steel)

- **Section 2205.2.1** now require Beam-column moment connections in Seismic Design Category B and C buildings to be prequalified under the AISC 341 or AISC 358 standard where the response modification coefficient exception is not applied.

> **2205.2.1 Structural steel seismic force-resisting systems.**
>
> The design, detailing, fabrication and erection of structural steel *seismic force-resisting systems* shall be in accordance with the provisions of Section 2205.2.1.1 or 2205.2.1.2, as applicable.

2205.2.1.1 Seismic Design Category B or C.

Structures assigned to *Seismic Design Category* B or C shall be of any construction permitted in Section 2205. Where a response modification coefficient, *R*, in accordance with ASCE 7, Table 12.2-1, is used for the design of structures assigned to *Seismic Design Category* B or C, the structures shall be designed and detailed in accordance with the requirements of AISC 341. Beam-to-column moment connections in special moment frames and intermediate moment frames shall be prequalified in accordance with AISC 341, Section K1, qualified by testing in accordance with AISC 341, Section K2, or shall be prequalified in accordance with AISC 358.

Exception: The response modification coefficient, *R*, designated for "Steel systems not specifically detailed for seismic resistance, excluding cantilever column systems" in ASCE 7, Table 12.2-1, shall be permitted for systems designed and detailed in accordance with AISC 360, and need not be designed and detailed in accordance with AISC 341.

Chapter 23 (Wood)

- **Section 2303.2** updated ASTM E84 to include requirements previously only address in the IBC, accordingly, the code language has been deleted.

2303.2 Fire-retardant-treated wood.

Fire-retardant-treated wood is any wood product that, when impregnated with chemicals by a pressure process or other means during manufacture, shall have, when tested in accordance with ASTM E84 or UL 723, a *listed flame spread index* of 25 or less. Additionally, the ASTM E84 or UL 723 test shall be continued for a 20-minute period and the flame front shall not progress more than $10^1/_2$ feet (3200 mm) beyond the centerline of the burners at any time during the test.

2303.2.3 Fire testing of wood structural panels.

Wood structural panels shall be tested with a ripped or cut longitudinal gap of $^1/_8$ inch (3.2 mm).

- **Section 2303.4.1.2** added specific requirements to address use of wood truss member as permanent individual diagonal bracing and permanent individual restraint.

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

[BS] 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*.

2303.4.1.2 Permanent individual truss member restraint (PITMR) and permanent individual truss member diagonal bracing (PITMDB).

Where the truss design drawings designate the need for *permanent individual truss member restraint*, it shall be accomplished by one of the following methods:

1. *PITMR* and*PITMDB* installed using standard industry lateral restraint and diagonal bracing details in accordance with TPI 1, Section 2.3.3.1.1, accepted engineering practice, or Figures 2303.4.1.2(1), (3) and (5).
2. *Individual truss member* reinforcement in place of the specified lateral restraints (i.e., buckling reinforcement such as T-reinforcement, L-reinforcement, proprietary reinforcement, etc.) such that the buckling of any individual truss member is resisted internally by the individual truss. The buckling reinforcement of individual truss members shall be installed as shown on the truss design drawing, on supplemental truss member buckling reinforcement details provided by the truss designer or in accordance with Figures 2303.4.1.2 (2) and (4).
3. A project-specific *PITMR* and*PITMDB* design provided by any *registered design professional*.

2303.4.1.2.1 Trusses installed without a diaphragm.

Trusses installed without a *diaphragm* on the top or bottom chord shall require a project specific *PITMR* and*PITMDB* design prepared by a *registered design professional*.

Exception: Group U occupancies.

2303.4.1.3 Trusses spanning 60 feet or greater.

The owner or the owner's authorized agent shall contract with any qualified *registered design professional* for the design of the temporary installation restraint and diagonal bracing and the *PITMR* and *PITMDB* for all trusses with clear spans 60 feet (18 288 mm) or greater.

- **Section 2304.10.1** provides both a testing option for connections that are part of a fire-resistance-rated assembly and a calculation option for connections that are required to be protected for the fire-resistance rating time of the connect elements in Type IV-A, IV-B and IV-C construction.

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.

- **Table 2304.10.2** adds additional fastener options to the sheathing fastening schedule and nail patterns have been updated to current industry standards and the new ASCE 7 wind loads.

- **Section 2304.11** now permits concealed spaces in floors and roof decks for Type IV-HT.

> **2304.11.3 Floors.**
>
> Floors shall be without concealed spaces or with concealed spaces complying with Section 602.4.4.3. Wood floors shall be constructed in accordance with Section 2304.11.3.1 or 2304.11.3.2.

> **2304.11.4 Roof decks.**
>
> Roofs shall be without concealed spaces or with concealed spaces complying with Section 602.4.4.3. Roof decks shall be constructed in accordance with Section 2304.11.4.1 or 2304.11.4.2. Other types of decking shall be an alternative that provides equivalent *fire resistance* and structural properties. Where supported by a wall, *roof decks* shall be anchored to walls to resist forces determined in accordance with Chapter 16. Such anchors shall consist of steel bolts, lags, screws or *approved* hardware of sufficient strength to resist prescribed forces.

- **Section 2305** now references the 2021 edition of the AWC Special Design Provisions for Wind and Seismic (SDPWS), which includes shear wall and diaphragm design provisions for cross-laminated timber, in the IBC.

- **Section 2308.5.6** clarifies cripple wall requirements to emphasize that, if only interior wood-framed cripple walls exist in a design, no sheathing or solid blocking is required.

> **2308.5.6 Cripple walls.**
>
> Foundation *cripple walls* shall be framed of studs that are not less than the size of the studding above. Exterior *cripple wall* studs shall be not less than 14 inches (356 mm) in length, or shall be framed of solid blocking. Where exceeding 4 feet (1219 mm) in height, such walls shall be framed of studs having the size required for an additional *story*. See Section 2308.6.6 for *cripple wall* bracing.

- **Table 2308.7.3.1** updates rafter tie connection requirements to reflect current standards under the 2018 AWC National Design Standard (NDS) and Wood Frame Construction Manual (WFCM).

Chapter 25 (Gypsum Board, Gypsum Panel Products and Plasters)

- **Section 2510.6** now divides water-resistive barrier requirements for stucco into two categories based on whether the building is in a dry or moist climate. (*Note: Similar to requirements introduced in the Philadelphia Residential Code, local development is governed by moist/marine climate provisions.*)

> **2510.6 Water-resistive barriers.**
>
> *Water-resistive barriers* shall be installed as required in Section 1403.2 and, where applied over wood-based sheathing, shall comply with Section 2510.6.1 or 2510.6.2.

2510.6.2 Moist or marine climates.

In moist (A) or marine (C) climate zones, *water-resistive barrier* shall comply with one of the following:

1. In addition to complying with Item 1 or 2 of Section 2510.6.1, a space or drainage material not less than $^{3}/_{16}$ inch (4.8 mm) in depth shall be applied to the exterior side of the *water-resistive barrier*.
2. In addition to complying with Item 2 of Section 2510.6.1, drainage on the exterior side of the *water-resistive barrier* shall have a minimum drainage efficiency of 90 percent as measured in accordance with ASTM E2273 or Annex A2 of ASTM E2925.

Building Services, Special Devices, and Special Conditions

Chapter 30 (Elevators and Conveying Systems)

- **Chapter 30, only the following sections/ sub-sections were adopted by the Pennsylvania UCC RAC Report:**

  - ***3002.1 Hoistway enclosure protection.***
  - ***3002.2 Number of elevator cars in a hoistway.***
  - ***3002.4 Elevator car to accommodate ambulance stretcher.***
  - ***3002.7 Common enclosure with stairway.***
  - ***3004.2.1 Enclosure.***
  - ***3004.3.1 Enclosure.***
  - ***3005.4 Machine rooms, control rooms, machinery spaces, and control spaces.***
  - ***SECTION 3006 ELEVATOR LOBBIES AND HOISTWAY OPENING PROTECTION***
  - ***SECTION 3007 FIRE SERVICE ACCESS ELEVATOR***
  - ***SECTION 3008 OCCUPANT EVACUATION ELEVATORS***

- **Section 3001.2** provides additional direction and clarity regarding the appropriate emergency two-way communication features that are mandared for accessible elevators.

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.

Chapter 31 (Special Construction)

- **Section 3103.1** now includes special event structures, newly defined in Section 202, in the types of temporary structures that are regulated by both the *International Building* Code (IBC) and the *International Fire Code* (IFC).

> **3103.1 General.**
>
> The provisions of Sections 3103.1 through 3103.4 shall apply to structures erected for a period of less than 180 days. *Special event structures*, tents, umbrella structures and other membrane structures erected for a period of less than 180 days shall also comply with the *International Fire Code*. Those erected for a longer period of time shall comply with applicable sections of this code.

- **Section 3114** establishes special criteria to be applied where public-use restrooms are located within designated flood areas of publicly owned lands to allow such restrooms to be at-grade or above-grade but below the base flood elevation.

> **3114.1 General.**
>
> For the purpose of this section, public restroom buildings are located on publicly owned lands in *flood hazard areas* and intended for public use. Public restroom buildings and portions of other buildings that contain public restrooms are limited to toilet rooms, bathrooms, showers and changing rooms. Public restroom buildings and portions of buildings that contain public restrooms shall comply with the requirements of this section. Public-use restrooms that are not elevated or *dry floodproofed* in accordance with Section 1612 shall comply with Section 3114.2. Portions of buildings that include uses other than public-use toilet rooms, bathrooms, showers and changing rooms shall comply with Section 1612.

> **3114.2 Flood resistance.**
>
> Public-use restrooms on publicly owned lands in *flood hazard areas* shall comply with the requirements of ASCE 24, except for elevation requirements, and shall comply with all of the following criteria:
>
> 1. The building footprint is not more than 1,500 square feet (139 m^2).
> 2. Located, designed and constructed to resist the effects of *flood* hazards and *flood loads* to minimize *flood* damage from a combination of wind and water *loads* associated with the *base flood*.
> 3. Anchored to prevent flotation, collapse or lateral movement resulting from hydrodynamic and hydrostatic *loads*, including the effects of buoyancy during conditions of the *base flood*.
> 4. Constructed of *flood-damage-resistant materials*.
> 5. Where enclosed by walls, the walls have flood openings.
> 6. Mechanical and electrical systems are located above the *base flood elevation*.
> 7. Plumbing fixtures and plumbing connections are located above the *base flood elevation*.
> 8. An emergency plan, approved by the jurisdiction, is submitted to the building official and includes building design documents specifying implementation of protection measures prior to the onset of *flooding* conditions.
>
> **Exceptions:**
>
> 1. Minimum necessary electric equipment required to address health, life safety and electric code requirements is permitted below the *base flood elevation* in accordance with ASCE 24 provisions for electric elements installed below the minimum elevations.
> 2. Plumbing fixtures and connections are permitted below the *base flood elevation* provided that the fixtures and connections are designed and installed to minimize or eliminate infiltration of floodwaters into the sanitary sewage system and discharges from sanitary sewage systems into floodwaters.

- **Section 3115** now recognizes the use of intermodal shipping containers as buildings and structures in the IBC, and criteria have been established to address the minimum safety requirements without duplicating existing code provisions.

> **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.
>
> **Exceptions:**
>
> 1. *Intermodal shipping containers* previously approved as existing relocatable buildings complying with Chapter 14 of the *International Existing Building Code*.
> 2. Stationary storage battery arrays located in *intermodal shipping containers* complying with Chapter 12 of the *International Fire Code*.
> 3. *Intermodal shipping containers* that are listed as equipment complying with the standard for equipment, such as air chillers, engine generators, modular data centers, and other similar equipment.
> 4. *Intermodal shipping containers* housing or supporting experimental equipment are exempt from the requirements of Section 3115, provided that they comply with all of the following:
>
> 4.1. Such units shall be single stand-alone units supported at grade level and used only for occupancies as specified under *Risk Category* I in Table 1604.5.
>
> 4.2. Such units are located a minimum of 8 feet (2438 mm) from adjacent structures, and are not connected to a fuel gas system or fuel gas utility.
>
> 4.3. In *hurricane-prone regions* and *flood hazard areas*, such units are designed in accordance with the applicable provisions of Chapter 16.

Chapter 33 (Safeguards During Construction)

- **Section 3313** expands the scoping provisions addressing the timing and availability of the required water supply for buildings under construction and establishes specific fire flow requirements.

> **[F] 3313.1 Where required.**
>
> An *approved* water supply for fire protection, either temporary or permanent, shall be made available as soon as combustible building materials arrive on the site, on commencement of vertical combustible construction, and on installation of a standpipe system in buildings under construction, in accordance with Sections 3313.2 through 3313.5.
>
> **Exception:** The *fire code official* is authorized to reduce the fire-flow requirements for isolated buildings or a group of buildings in rural areas or small communities where the development of full fire-flow requirements is impractical.

[F] 3313.2 Combustible building materials.

When combustible building materials of the building under construction are delivered to a site, a minimum fire flow of 500 gallons per minute (1893 L/m) shall be provided. The fire hydrant used to provide this fire flow supply shall be within 500 feet (152 m) of the combustible building materials, as measured along an approved fire apparatus access lane. Where the site configuration is such that one fire hydrant cannot be located within 500 feet (152 m) of all combustible building materials, additional fire hydrants shall be required to provide coverage in accordance with this section.

[F] 3313.3 Vertical construction of Types III, IV and V construction.

Prior to commencement of vertical construction of Type III, IV or V buildings that utilize any combustible building materials, the fire flow required by Sections 3313.3.1 through 3313.3.3 shall be provided, accompanied by fire hydrants in sufficient quantity to deliver the required fire flow and proper coverage.

[F] 3313.3.1 Fire separation up to 30 feet.

Where a building of Type III, IV or V construction has a *fire separation distance* of less than 30 feet (9144 mm) from property lot lines, and an adjacent property has an *existing structure* or otherwise can be built on, the water supply shall provide either a minimum of 500 gallons per minute (1893 L/m), or the entire fire flow required for the building when constructed, whichever is greater.

[F] 3313.3.2 Fire separation of 30 feet up to 60 feet.

Where a building of Type III, IV or V construction has a *fire separation distance* of 30 feet (9144 mm) up to 60 feet (18 288 mm) from property lot lines, and an adjacent property has an *existing structure* or otherwise can be built on, the water supply shall provide a minimum of 500 gallons per minute (1893 L/m), or 50 percent of the fire flow required for the building when constructed, whichever is greater.

[F] 3313.3.3 Fire separation of 60 feet or greater.

Where a building of Type III, IV or V construction has a fire separation of 60 feet (18 288 mm) or greater from a property lot line, a water supply of 500 gallons per minute (1893 L/m) shall be provided.

[F] 3313.4 Vertical construction, Types I and II construction.

If combustible building materials are delivered to the construction site, water supply in accordance with Section 3313.2 shall be provided. Additional water supply for fire flow is not required prior to commencing vertical construction of Type I and II buildings.

[F] 3313.5 Standpipe supply.

Regardless of the presence of combustible building materials, the construction type or the *fire separation distance*, where a standpipe is required in accordance with Section 3313, a water supply providing a minimum flow of 500 gallons per minute (1893 L/m) shall be provided. The fire hydrant used for this water supply shall be located within 100 feet (30 480 mm) of the fire department connection supplying the standpipe.