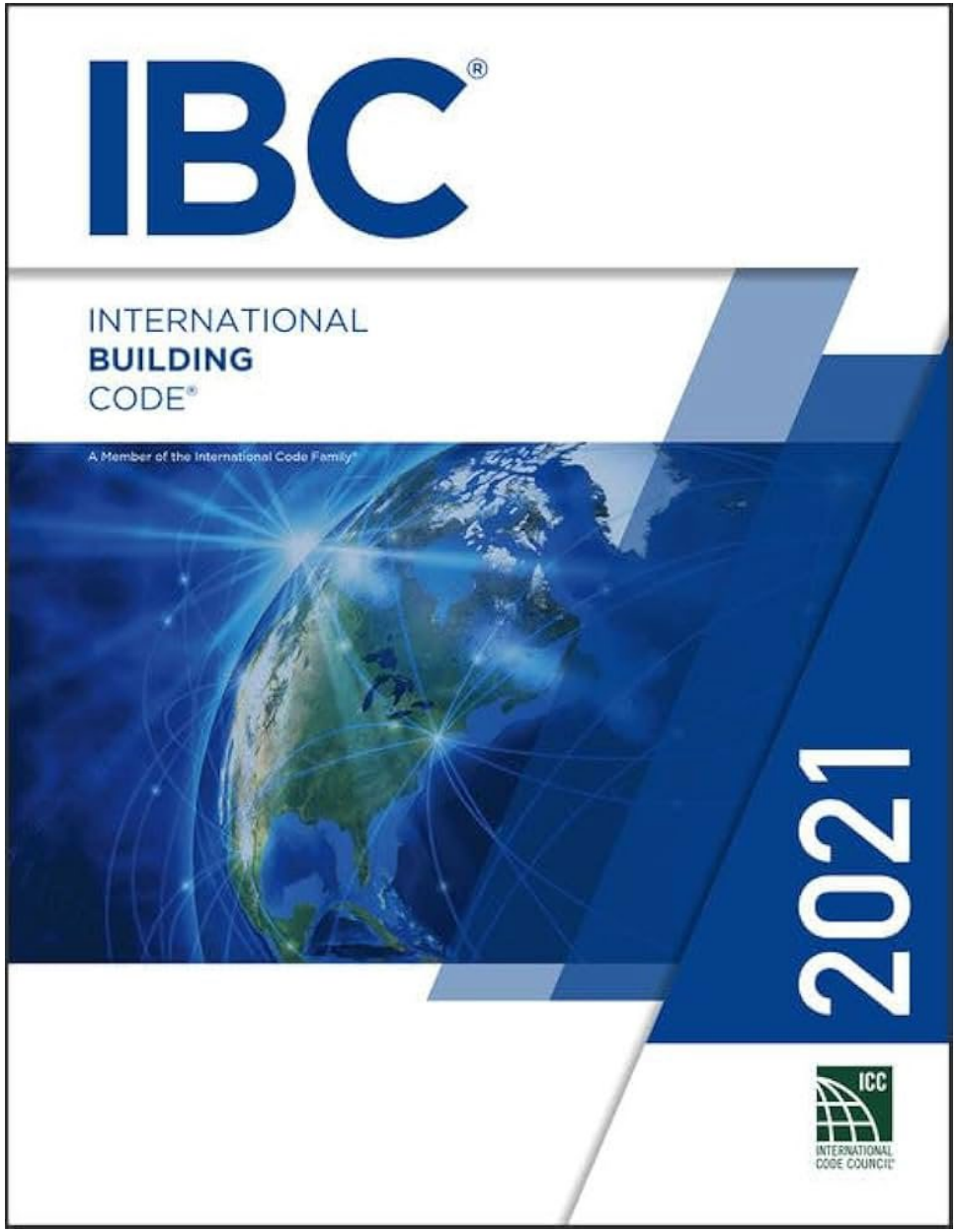
HOUSTON
PUBLIC WORKS

HOUSTON CONSTRUCTION CODE MODERNIZATION

SIGNIFICANT CODE CHANGES & HIGHLIGHTS OF THE 2015 TO 2018 AND 2018 TO 2021 INTERNATIONAL BUILDING CODE (IBC)



2021 INTERNATIONAL BUILDING CODE

Significant changes to base code requirements from 2015 to 2018 and 2018 to 2021

Changes and updates to City of Houston amendments

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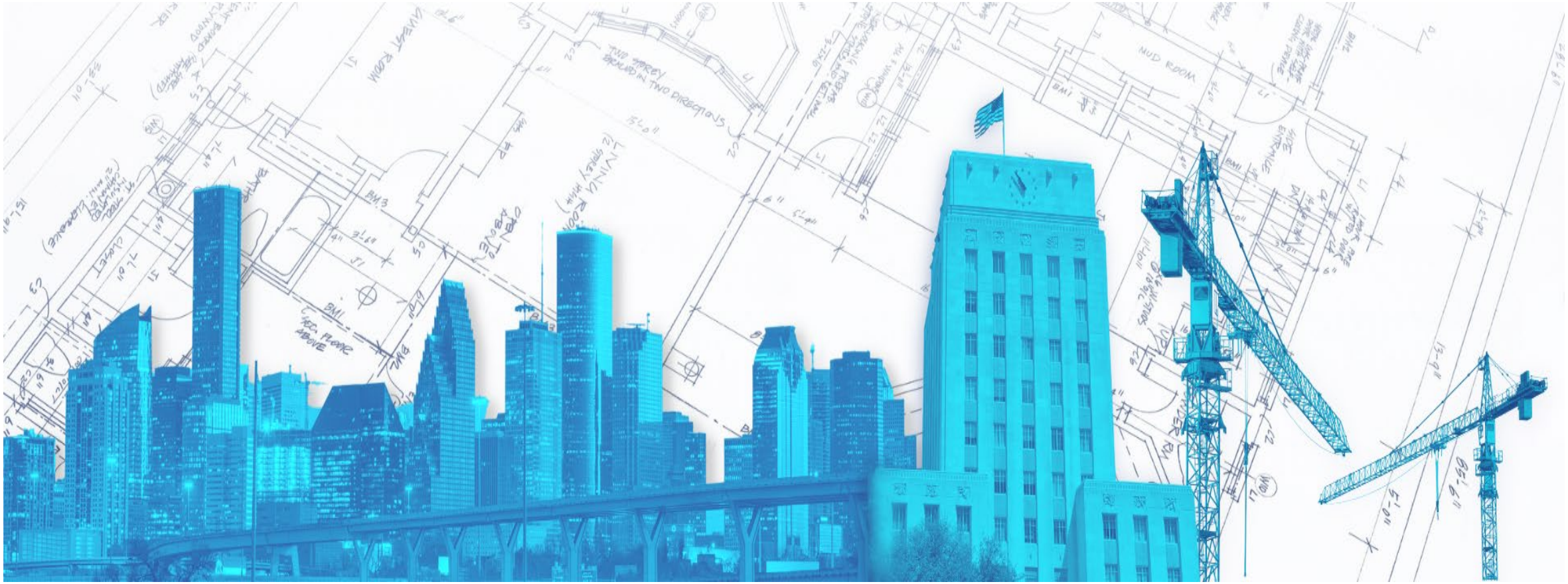
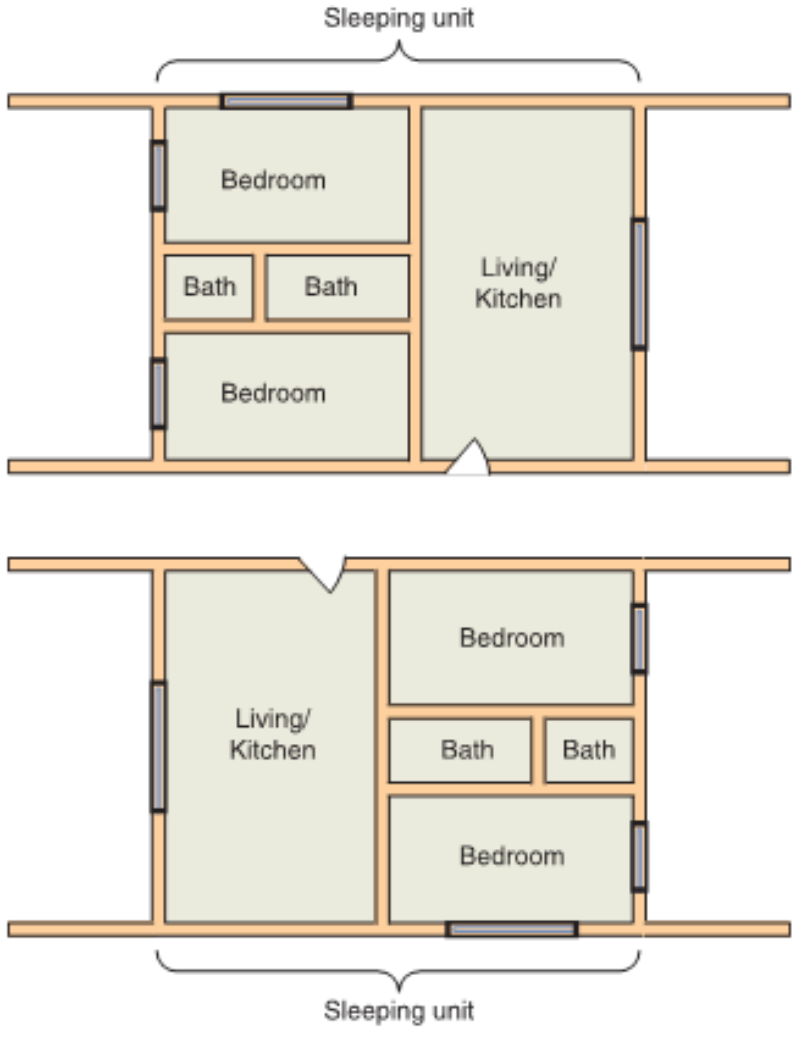
IBC CHAPTER 2 DEFINITIONS



2018 IBC CHAPTER 2 – DEFINITIONS

Sleeping Unit:

A single unit providing rooms or spaces for one or more persons that includes permanent provisions for sleeping, and can include provisions for living, eating, and either sanitation or kitchen facilities but not both. Such rooms and spaces that have both of the above are part of a dwelling unit and are not sleeping units.



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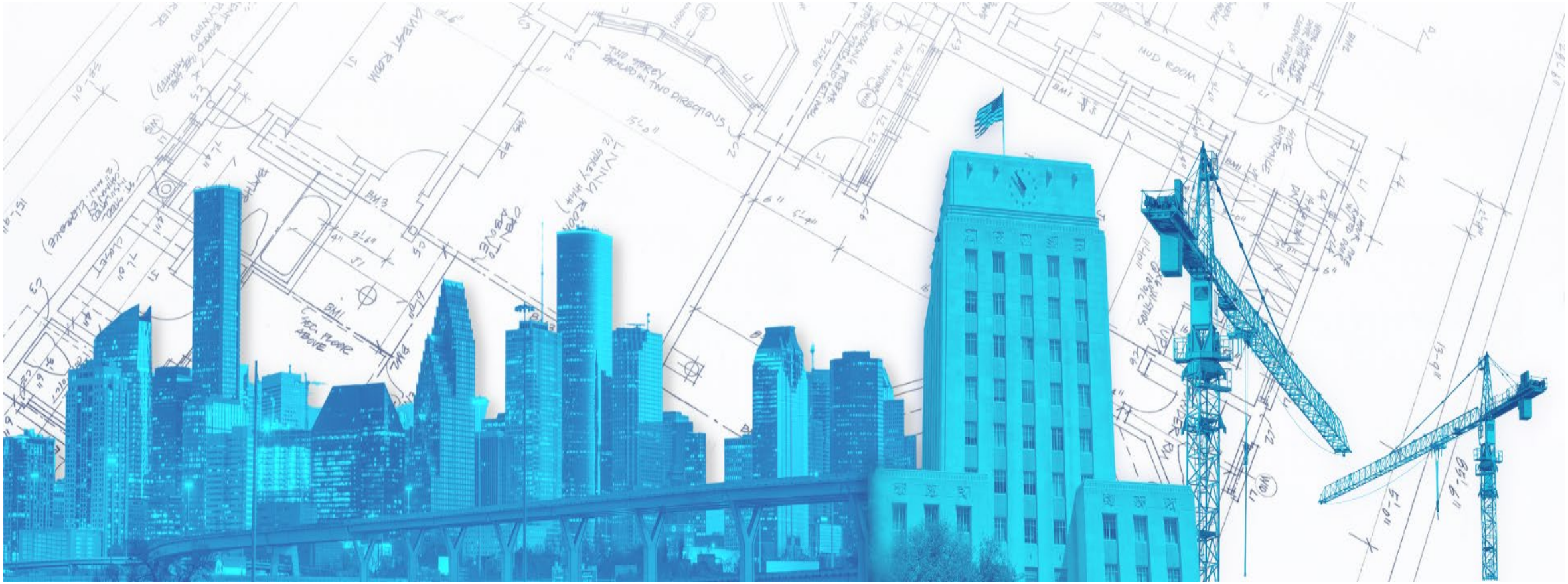
IBC CHAPTER 3 OCCUPANCY & USE



2018 OCCUPANCY CLASSIFICATION

Section 302.1- occupied roofs classified in group that the occupancy most nearly resembles

Section 303.4 Assembly Group A-3

- **Added: Greenhouses for the conservation and exhibition of plants that provide public access.**

Section 309.2 Mercantile Group M

- **Added: Greenhouses for the display and sale of plants that provide public access.**

iStock.com/bennymarty

Rooftop restaurant

iStock.com/xavierarnau

Retail sales of plants

2018 IBC CHAPTER 3 – USE AND OCCUPANCY CLASSIFICATIONS

311.1.1 Accessory Storage Spaces

- **A room or space used for storage purposes (regardless of room size) that is accessory to another occupancy shall be classified as part of that occupancy**
  - The occupant load factor of 1:300 for storage can still be applied
  - Removed: Reference to Square footage and percent area.

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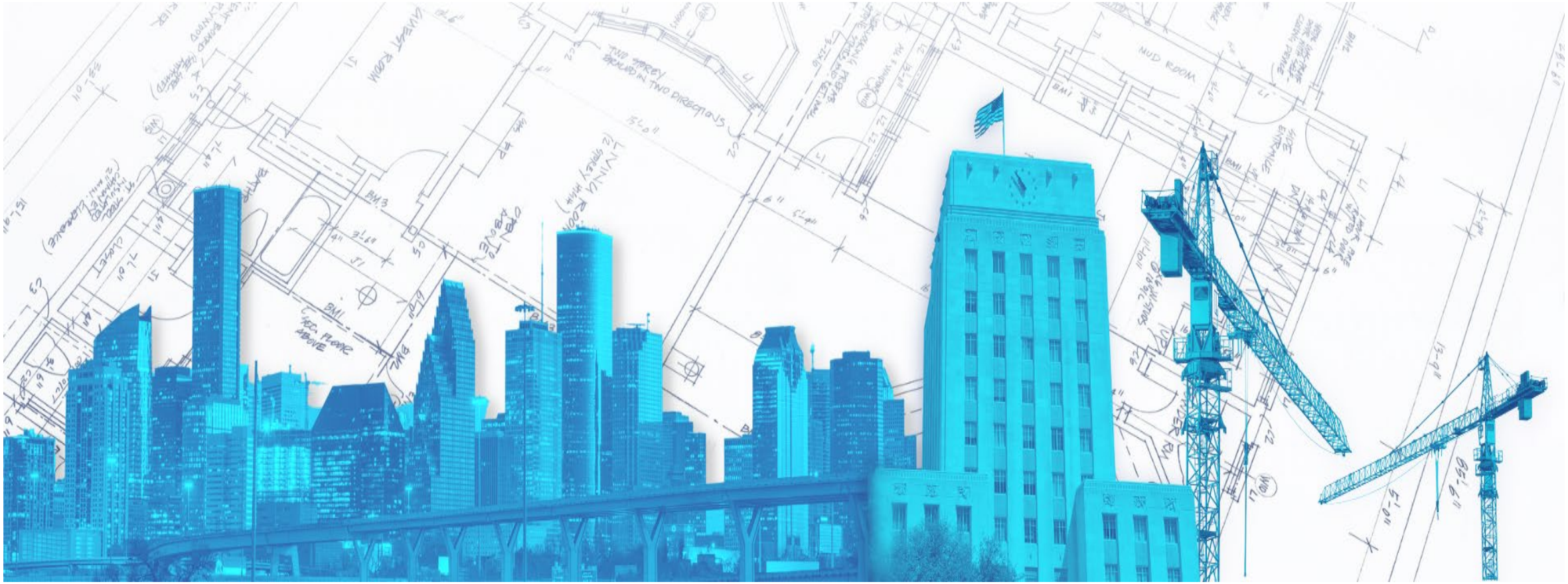
IBC CHAPTER 4 SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY CLASSIFICATIONS



WATER SUPPLY TO REQUIRED FIRE PUMPS 2021 IBC SECTION 403.3.2

- The mandate for the water supply to required fire pumps by two water mains has been extended to those buildings more than 120 in height where the building's type of construction is either IV-A or IV-B.

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 IV-A and IV-B 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.

Mass Timber Construction Taller than 120 feet.

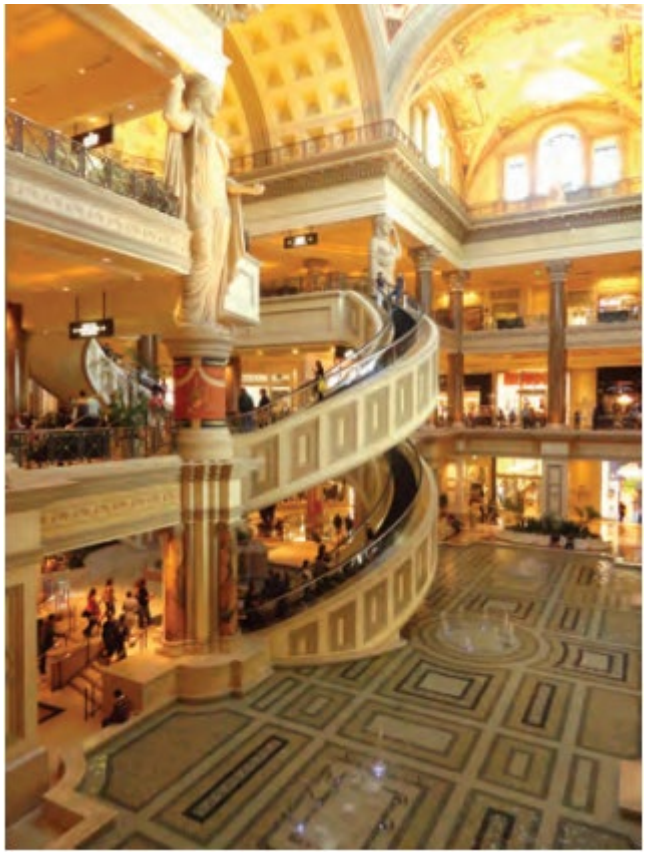
Photo Courtesy of naturallywood.com, kk Law

ATRIUMS
2018 SECTION 404

Smoke control systems are not required for 2-story atriums, in other than Group I-2 and I-1 Condition 2.

Enclosures of atriums, fire barriers

- Clarified Exception: Not required between atrium & adjoining spaces, for up to 3 floors, provided areas are accounted for in smoke control system.
- Added Exception: Not required between atrium & adjacent spaces when atrium does not require smoke control.



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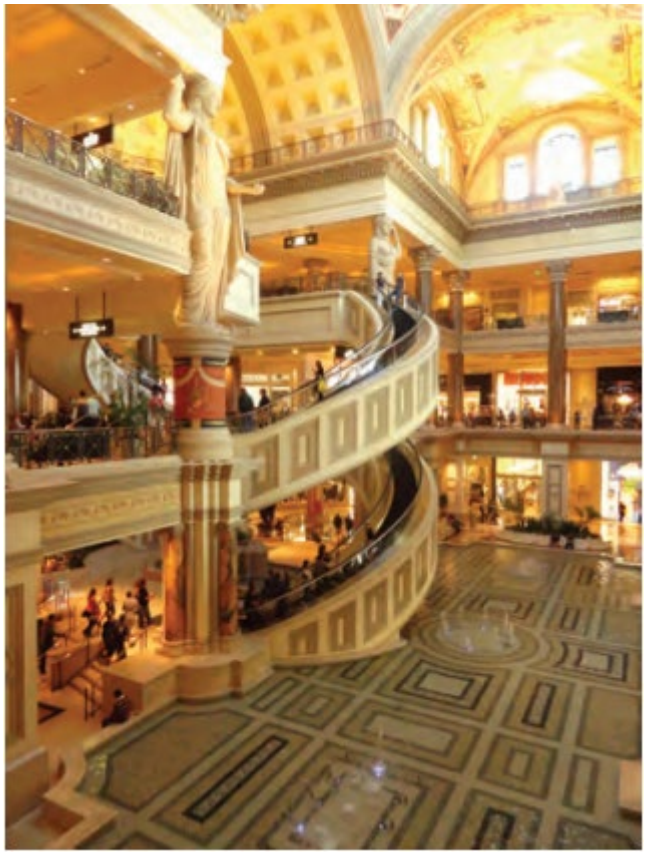


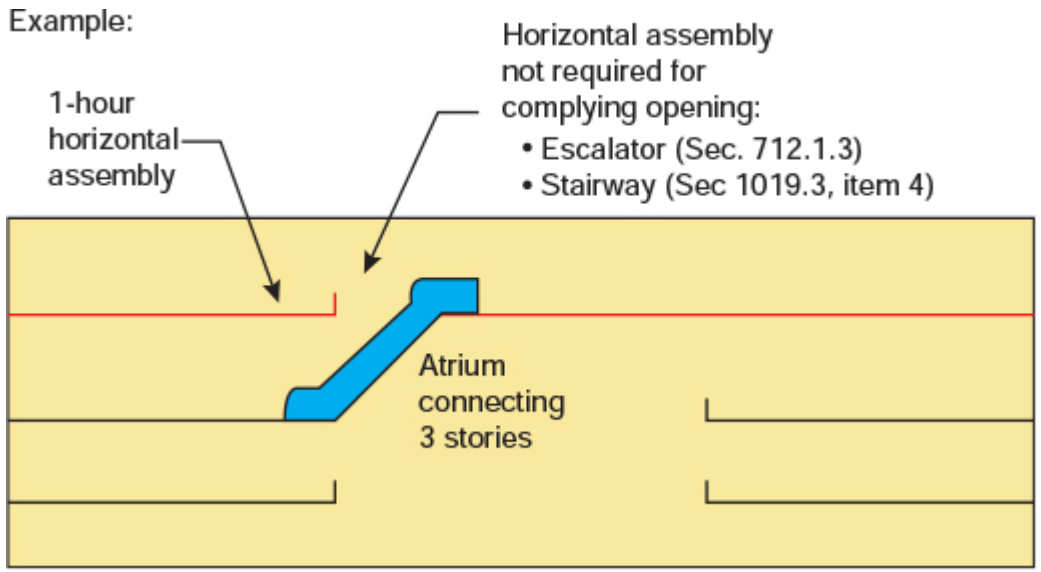
HORIZONTAL ASSEMBLIES IN ATRIUMS 2021 SECTION 404.6

- Horizontal assembly separation of the atrium from adjacent spaces is no longer required at those openings created for complying escalators and/or exit access stairways.

- No changes to **Exceptions 1-4**
- **Exceptions 5 & 6** have been added:

  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.



EGRESS TRAVEL THROUGH AN ATRIUM
2018 IBC 404.9, 404.10

Exit Access not through atrium refer to Section 1017

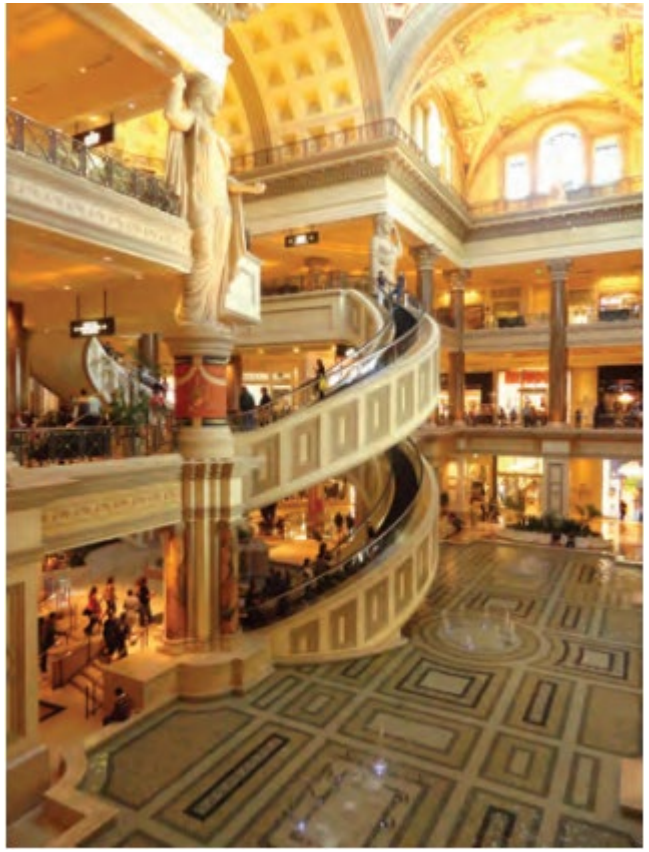
Exit Access travel distance at Level of Exit Discharge refer to Section 1017

Exit Access travel distance at other than Level of Exit Discharge:

- Travel Distance through atrium shall not exceed 200 feet.

Interior Exit Stairways :

- Up to 50% of interior exit stairways are permitted to egress through an atrium at level of exit discharge



FLOOR SURFACES IN PARKING GARAGES
2021 IBC 406.2.4

- The mandate for a sloping floor in the vehicle areas of parking garages has been reinstated in the IBC for those garages classified as Group S-2 occupancies.
- No changes to Exceptions 1 & 3.
- **Exception 2** has been removed in its entirely.

Enclosed Parking Garage

Photo Courtesy of Jonas Ahrentorp/EyeEm

GROUP I-2 CARE SUITES
2021 IBC 407.4.4.1 AND 407.4.4.3

- Egress travel allowances, both within an individual care suite as well as from a suite into a corridor, have been revised to allow for additional design flexibility and consistency with the CMS federal standard.

407.4.4.1 Exit access through care suites. Exit access from all other portions of a building not classified as a care suite shall not pass through a care suite. ~~In a care suite required to have more than one exit, one exit access is permitted to pass through an adjacent care suite provided that all of the other requirements of Sections 407.4 and 1016.2 are satisfied.~~

407.4.4.3 Access to corridor. Every care suite shall have a door leading to an exit access corridor or horizontal exit. Movement from habitable rooms within a care suite shall not require ~~passage through~~ more than ~~three doors~~ and 100 feet (30 480 mm) ~~distance of travel within the~~ 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.

~~Exceptions: The distance of travel shall be permitted to be increased to 125 feet (38 100 mm) where an automatic smoke detection system is provided throughout the care suite and installed in accordance with NFPA 72~~.

Hospital Care Suite

Photo Courtesy of Johny Greig

AUTOMATIC-CLOSING DOORS IN GROUP I-2 2021 IBC 407.6.1

In Group I-2 occupancies, the closing of automatic-closing doors on hold-open devices must now also occur upon activation of the fire alarm system or automatic sprinkler system.

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 holdopen device on one door shall release all such doors within the same smoke compartment.

Cross-Corridor Doors in Hospital

Photo Courtesy of SDI Productions

PUZZLE ROOMS
2021 IBC 411.5

- A new type of building use, the puzzle room, is now regulated in a manner consistent with traditional special amusement areas. In addition, special means of egress requirements have 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.

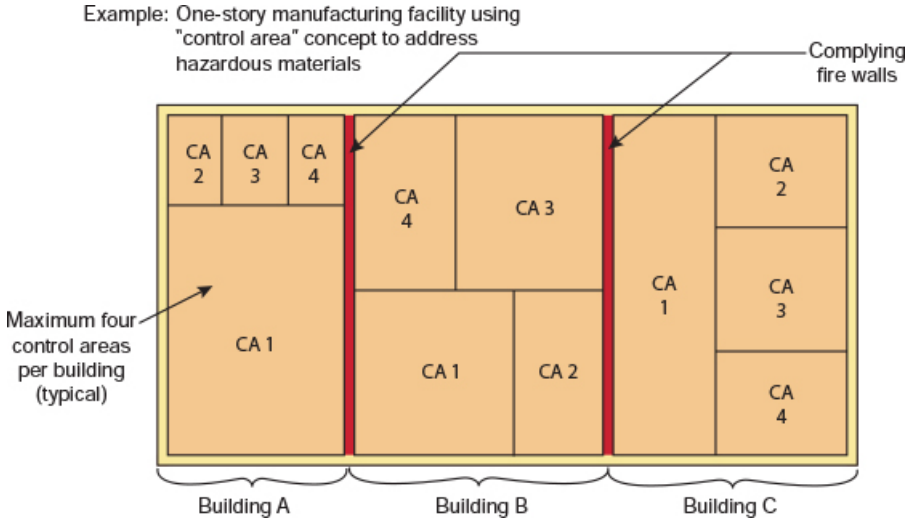
Escape Room

Photo Courtesy of Best View Stock

FIRE WALL USE FOR CONTROL AREAS 2021 IBC 414.2.3

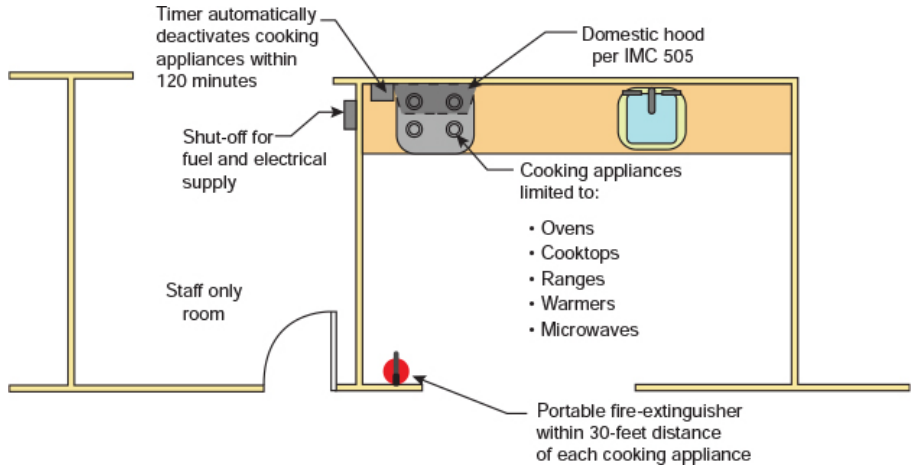
- The scoping limitations of a fire wall's use to create separate buildings have been expanded through a new allowance for the number of control areas permitted.

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.



COOKING IN AMBULATORY CARE FACILITIES
2021 IBC 422.7

- Where domestic cooking facilities are provided in ambulatory care facilities, conditions addressing the installation of the cooking appliances have now been established to address any fire concerns.



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.

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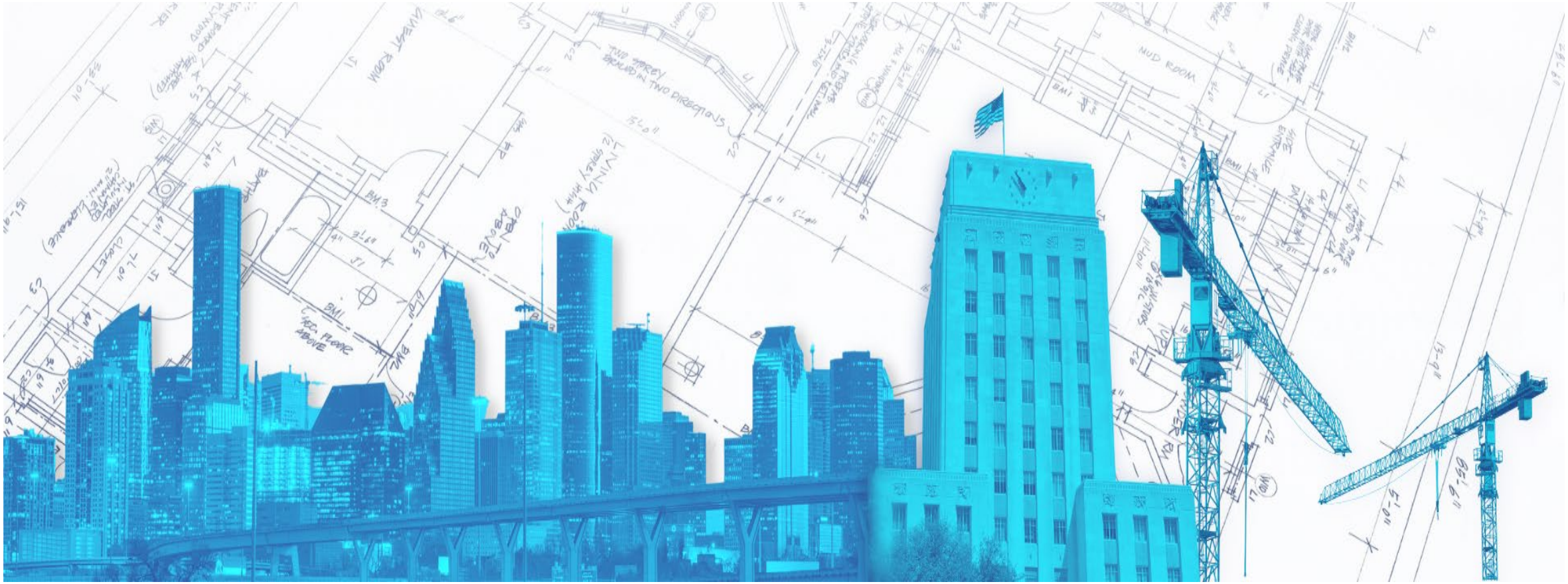
IBC CHAPTER 5 GENERAL BUILDING HEIGHTS AND AREAS



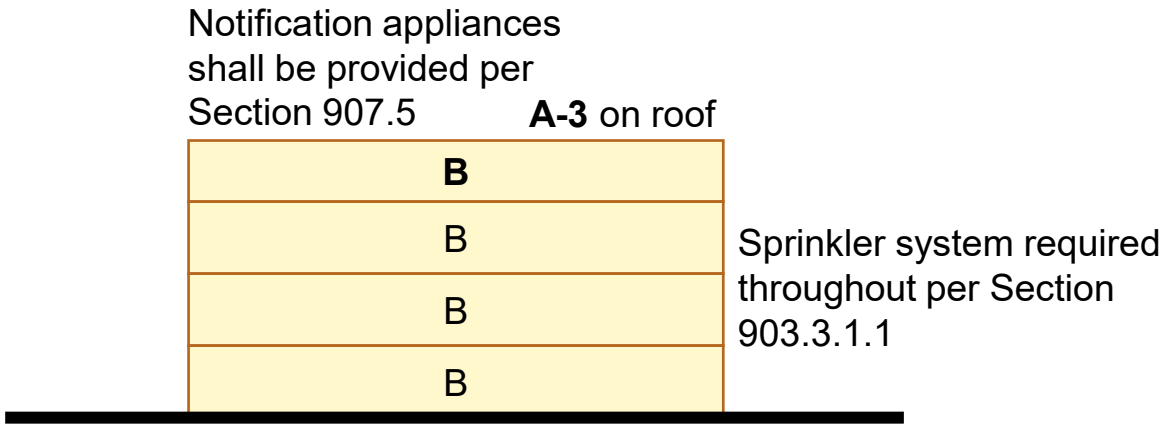
OCCUPIED ROOFS
2021 IBC 503.1.4

- **503.1.4 Occupied Roofs**
  - **A roof level or portion thereof is 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**
    - **Exception: The roof occupancy shall not be limited to the occupancies allowed on the story below where the building is equipped with sprinklers and fire alarm occupant notification is provided on the occupied roof**
      - Note: This clarifies that a roof is not a story, and the area of the occupied roof is not included in your building area calculations
      - Note: Additional restrictions on enclosures
  - **2021 – clarifies occupied roofs need not be included in the building height or number of stories provided penthouse and rooftop structures comply with 1511.**
  - **2021 - Exception 1 further clarified: Emergency voice/alarm communication (EVAC) shall also be provided for the occupied roof <u>where such system is required elsewhere in the building</u>.**

2018 IBC CHAPTER 5 – GENERAL BUILDING HEIGHT AND AREAS

- **503.1.4 Occupied Roofs – Example**

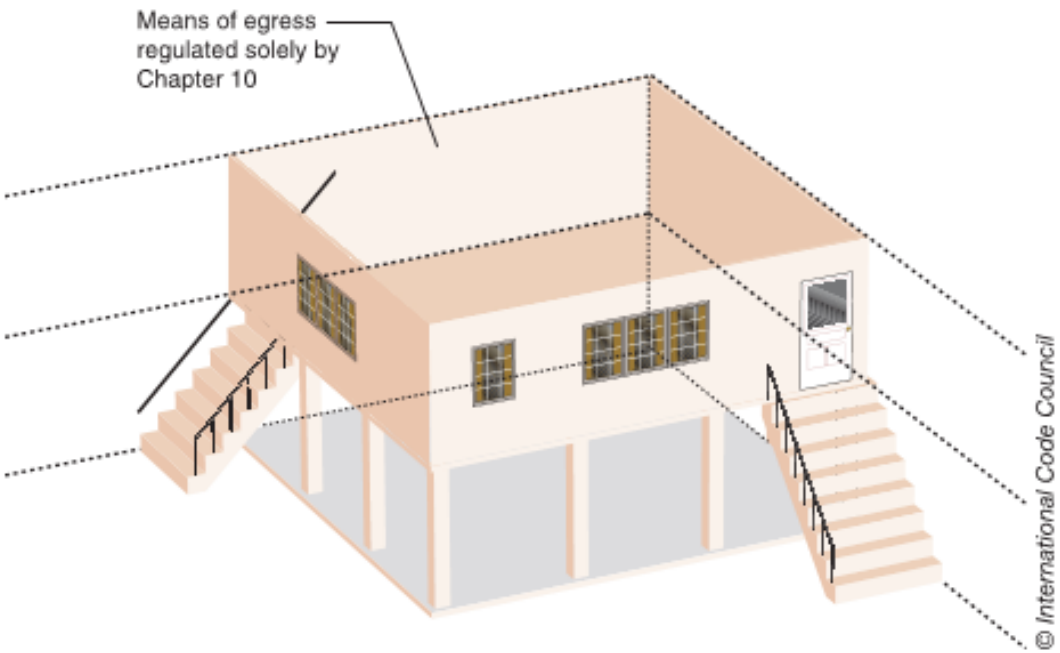
Example:
If building of Type VA construction,
Group B: 4 stories max. (S)
Group A-3: 3 stories max. (S)



Occupied roof example

MEZZANINE OPENNESS
2018 IBC 505.2.3

- Direct access to at least one exit at the mezzanine level is no longer required for enclosed mezzanines.
- The change is considered to be an acceptable reduction in the required means of egress.



Enclosed mezzanine with two means of egress

CHANGE TYPE: IBC 2021 - MODIFICATION

ALLOWABLE AREA FRONTAGE INCREASE

- **2021 IBC Tables 506.3.3 & 506.3.3.1**
  - Methodology for establishing the permissible allowable area increase for frontage has been simplified through the use of a tabular format to make a more efficient approach to allowable area determination.

TABLE 506.3.3 Frontage Increase Factor[a]

Percentage of Building Perimeter	Open Space			
	0 to less than 20 Feet	20 to less than 25 Feet	25 to less than 30 Feet	30 Feet 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

a. Interpolation is permitted.

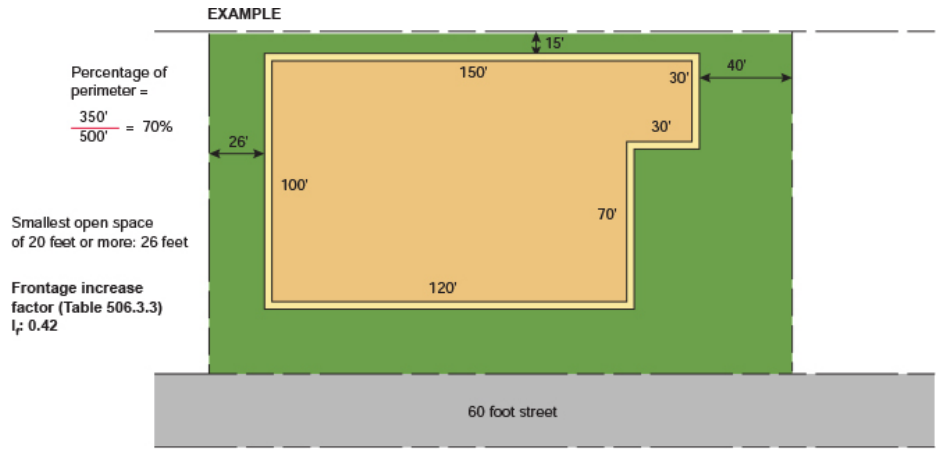
ALLOWABLE AREA FRONTAGE INCREASE 2021 IBC 506.3.2

- The methodology for establishing the permissible allowable area increase for frontage has been simplified through the use of a tabular format to make 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

Remainder of this section has been removed in its entirely.

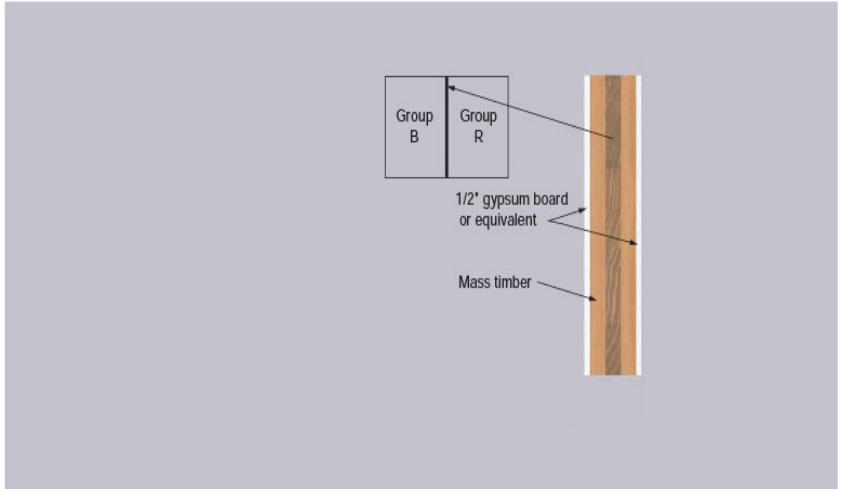


FIRE SEPARATIONS OF MASS TIMBER 2021 IBC 508.4.4.1 AND 509.4.1.1

- Additional criteria for the use of mass timber elements serving as fire barriers and horizontal assemblies in mass timber buildings include 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.

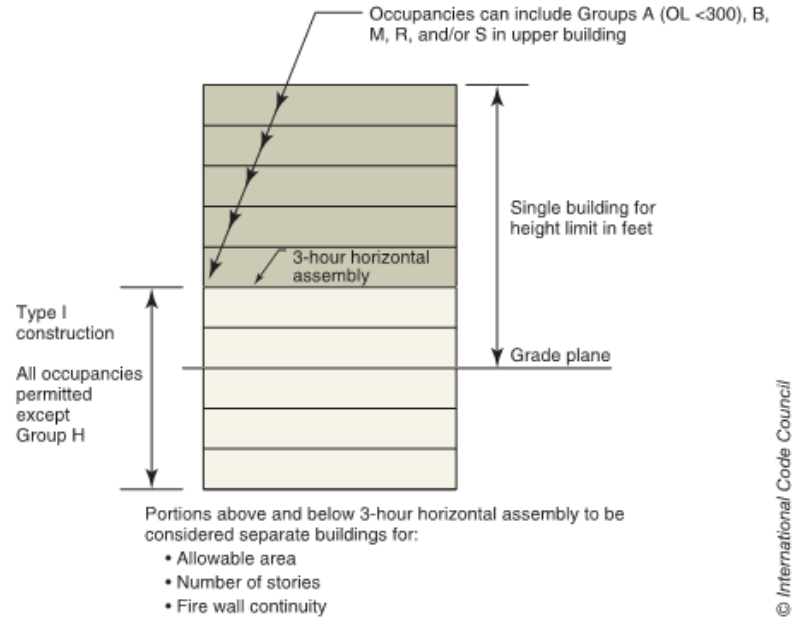


Example:

Type IV-C Construction with Mixed Occupancy Consisting of Business and Residential Uses

HORIZONTAL BUILDING SEPARATION
2018 IBC 510.2

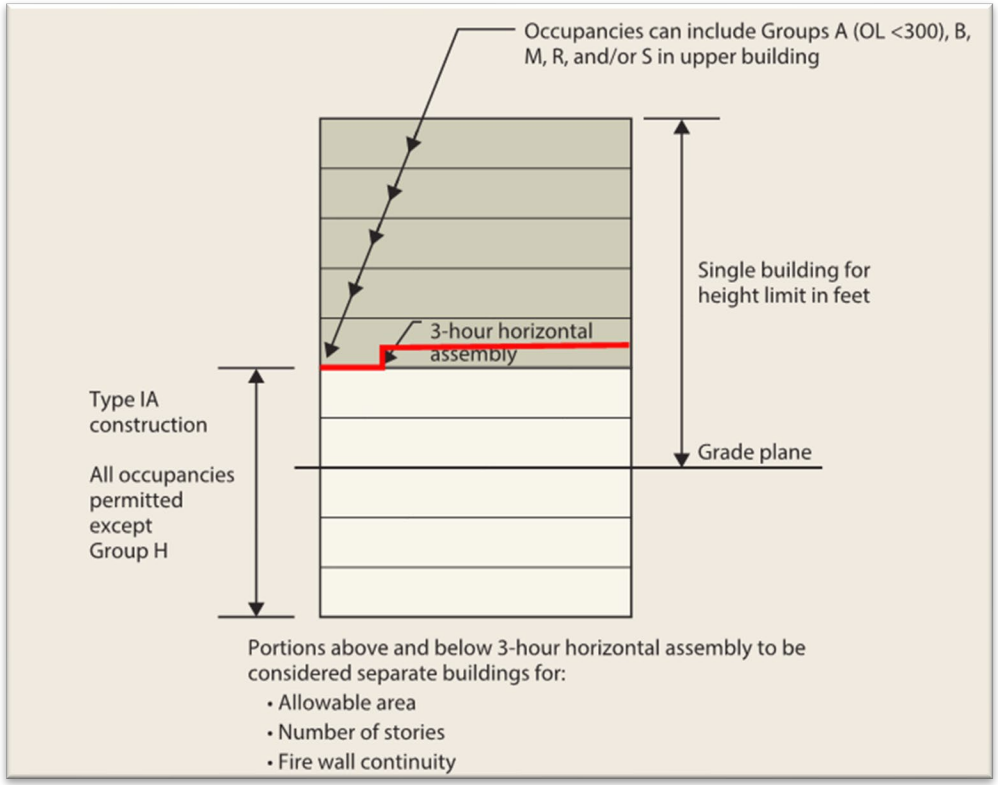
- **The portion of building below the 3-hour horizontal separation no longer limited to one story above grade**
  - All occupancy groups, except Group H, now permitted to be located below the horizontal separation



Horizontal building separation

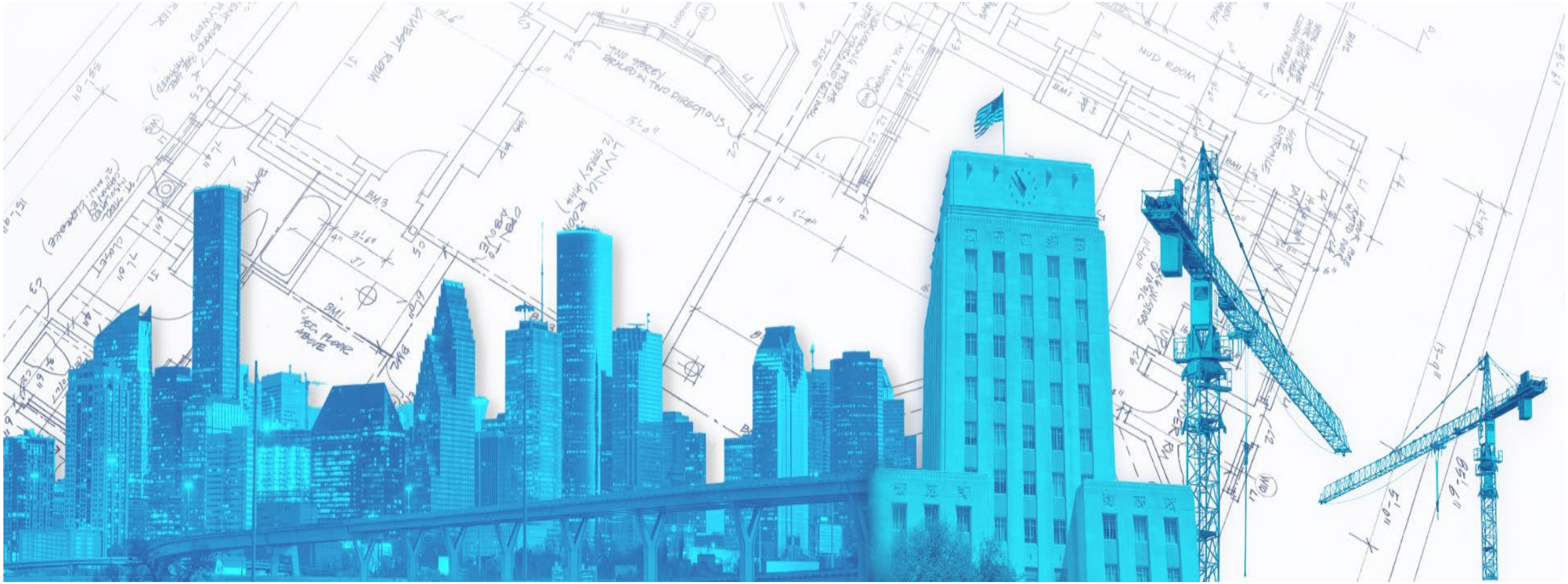
HORIZONTAL BUILDING SEPARATION

- **VERTICAL OFFSET OF PODIUM**
  - 2018 IBC Section 510.2, Item 1
    - The buildings are separated with a horizontal assembly have a fire-resistance rating of not less than 3 hours. ***Where vertical offsets are provided as part of a horizontal assembly, the vertical offset and structure shall have a 3-hour fire-resistance rating.***



HOUSTON PUBLIC WORKS

IBC CHAPTER 5 TYPES OF CONSTRUCTION



INTRODUCTION OF CONSTRUCTION TYPES IV-A, IV-B & IV-C

- **CHANGE TYPE: IBC 2021 – ADDITION**

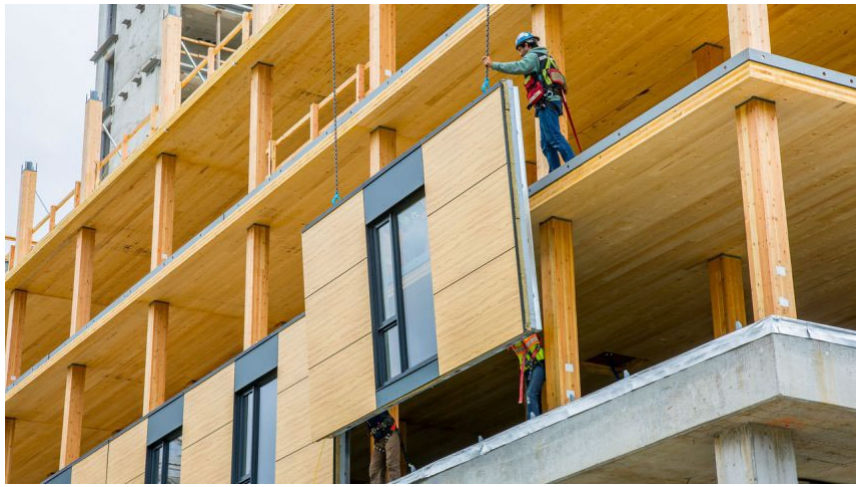
  - **2021 IBC Section 202**
    - **Mass Timber:** Structural elements of Type IV construction primarily of solid, built-up, panelized or engineering wood products that meet the minimum cross-section dimensions of Type IV construction.
  - **2021 IBC Section 602.4**
    - Type IV Construction classification further expanded to address new construction types; Types IV-A, IV-B, and IV-C added.
    - Existing Type IV-HT (i.e. Heavy-Timber) requirements further expanded upon.

Photo courtesy of naturallywood.com, KK Law

Mass timber construction with glulam and CLT.

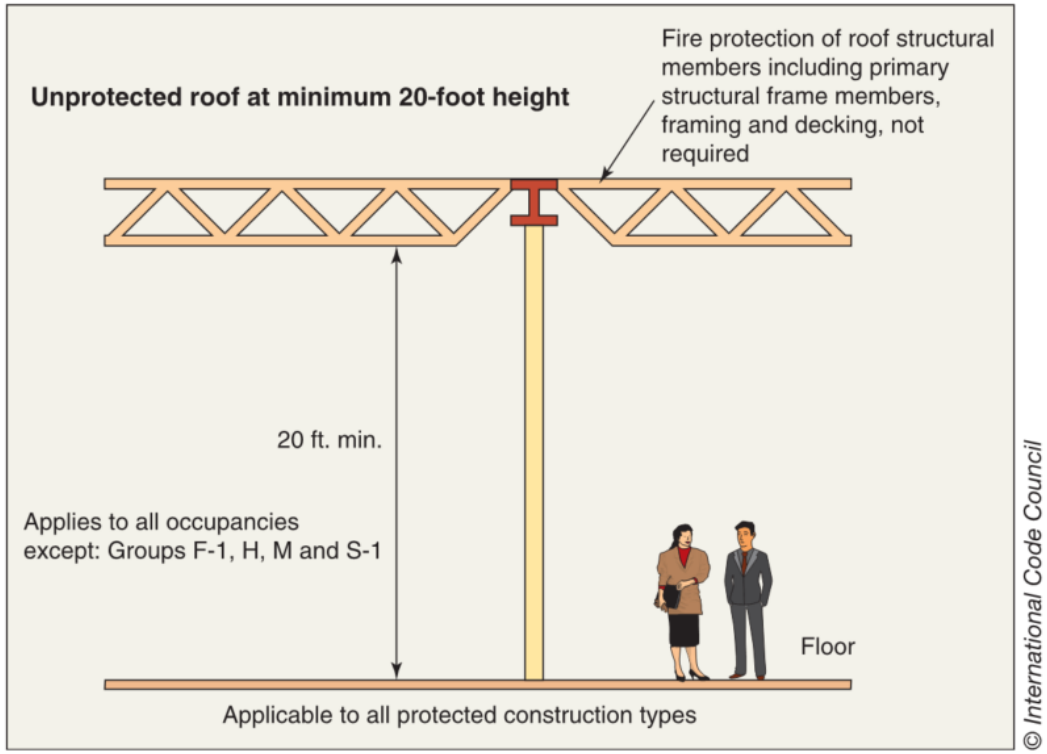
CONSTRUCTION TYPES IV-A, IV-B & IV-C (CONTINUED…)

- **CHANGE TYPE: IBC 2021 – ADDITION**
  - **2021 IBC Table 504.3**
    - Allowable Height limitations established for the three new construction types.
  - **2021 IBC Table 504.4**
    - Permissible number of stories established for the three new construction types.
  - **2021 IBC Table 506.2**
    - Allowable area factor established for the three new construction types.
  - **2021 IBC Table 601**
    - Establishment of the minimum required fire-resistance ratings for building elements of structures classified as one of the three new construction types.



FIRE PROTECTION OF STRUCTURAL ROOF MEMBERS 2021 IBC TABLE 601

- All portions of the roof construction, including primary structural frame members, are now exempted from fire-resistance requirements where every portion of the roof construction is at least 20 feet above any floor below.



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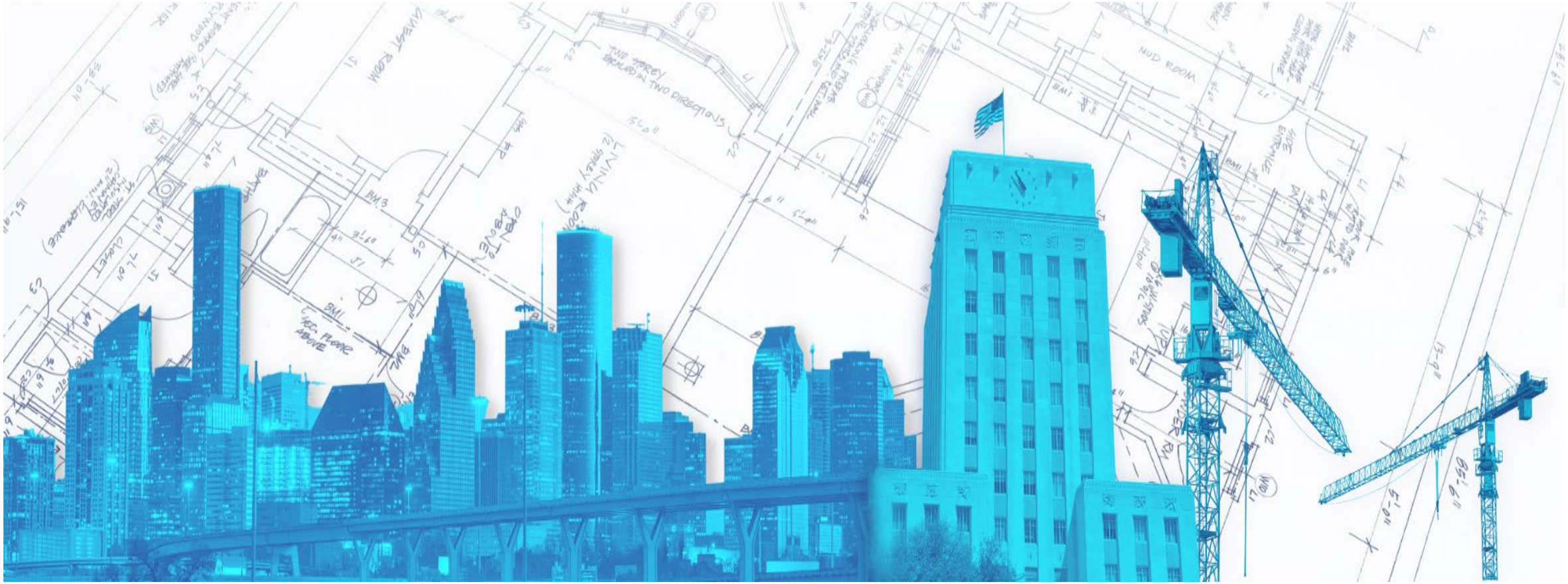
IBC CHAPTER 7 FIRE & SMOKE FEATURES



NONCOMBUSTIBLE PROTECTION FOR MASS TIMBER 2021 IBC 703.6

- A test method has been provided to determine the contribution time of noncombustible protection to mass timber fire-resistance. In addition, 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.

Sealing of Mass Timber

Photo Courtesy of ATF Fire Research Laboratory

NONCOMBUSTIBLE PROTECTION FOR MASS TIMBER 2021 IBC 703.7

- A test method has been provided to determine the contribution time of noncombustible protection to mass timber fire-resistance. In addition, edges and intersections between adjacent elements are to be sealed to limit smoke and air movement within a building.

703.7 Sealing of adjacent mass timber elements. In buildings of Type 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.

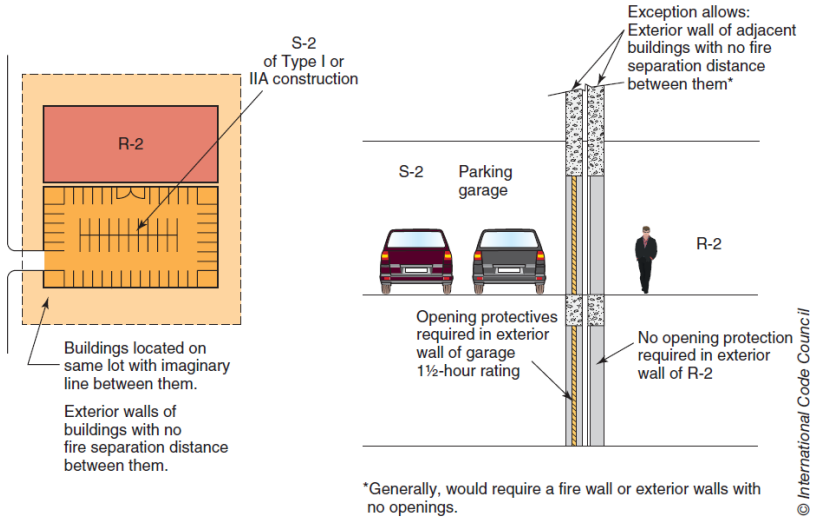
> **Exception:** Sealants or adhesives need not be provided where they are not a required component of a tested fire-resistance-rated assembly.

Mass Timber and Noncombustible Protection

Photo Courtesy of ATF Fire Research Laboratory

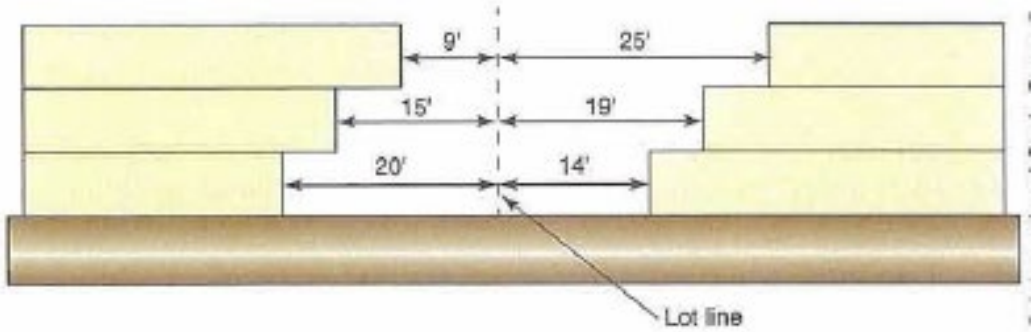
BUILDINGS ON THE SAME LOT
IBC 705.3

- 2018 Exception #2:
- When an S-2 parking garage of Construction Type I or IIA is erected on the same lot as a Group R-2 building, and there is no fire separation distance between these buildings, then the adjoining exterior walls between the buildings are permitted to have occupant use openings in accordance with Section 706.8.
- However, opening protectives in such openings shall only be required in the exterior wall openings in the S-2 parking garage and shall be not less than 1½ hour fire protection rating.



ALLOWABLE AREA OF OPENINGS IBC 705.8.1

- 2018:
- The maximum area of unprotected and protected openings permitted in an exterior wall in any story of a building shall not exceed the percentages specified in Table 705.8 based on the fire separation distance of each individual story.
- 2021:
- The maximum area of unprotected and protected openings permitted in an exterior wall in any story of a building shall not exceed the percentages specified in Table 705.8



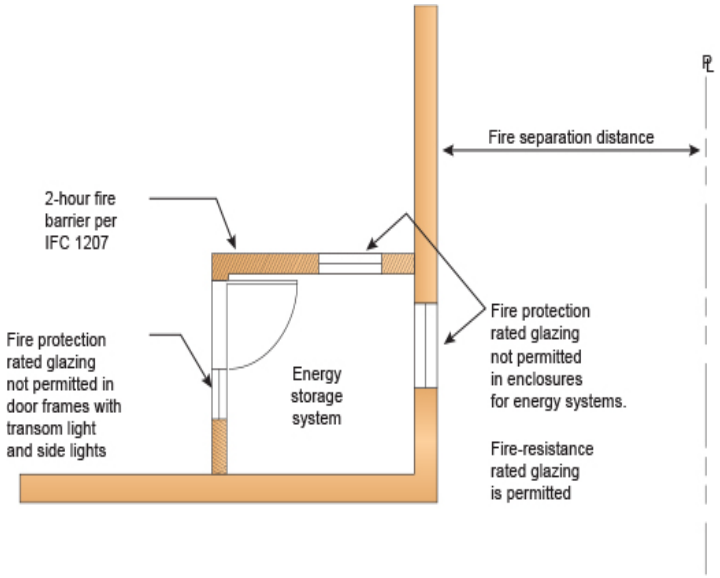
SEPARATION OF ENERGY STORAGE SYSTEMS 2021 IBC 707.4 AND 716

- To both adequately isolate and protect energy storage systems from potential thermal runaway, the use of glazing with only a fire-protection rating is prohibited 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 ~~stairway~~ separation or ~~ramp~~ enclosure for a stairway, ramp or ~~separation,~~ 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



Energy Storage System Separation

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.

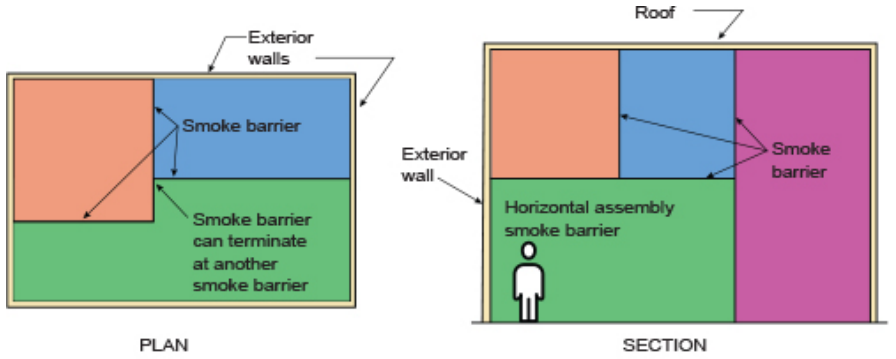
716.3.2.1.1.1 Energy storage system separation. Fire-protection rated glazing is not permitted for use in fire window assemblies in fire barriers required by Section 1207 of the International Fire Code to enclose energy storage systems.

SMOKE BARRIER CONTINUITY
2021 IBC 709.4.1

- Smoke barrier and smoke compartment continuity needed to effectively serve their intended purposes have been clarified through revisions to the definition and enclosure provisions.

709.4.1 Smoke-barrier ~~walls~~ assemblies separating smoke compartments. Smoke-barrier ~~walls~~ 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.

202 SMOKE COMPARTMENT. A space within a building ~~enclosed by smoke barriers on all sides, including the top and bottom~~ separated from other interior areas of the building by smoke barriers, including interior walls and horizontal assemblies.



Smoke compartments are created by separating interior areas using smoke barriers that are continuous to:

- Exterior wall or roof
- Another smoke barrier (wall or horizontal assembly)

Smoke Barrier Continuity

SMOKE PARTITION OPENINGS
2021 IBC 710.5.2.1 AND 710.5.3

- Specific allowances are now provided 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 all of 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 m2).

Pass-through Opening

Photo Courtesy of Getty Images/Boonyarit

PROHIBITED USE OF TERMINATED STOPS 2021 IBC 716.2.2.1.1

- The use of “terminated stops” on door frames of doors providing smoke and draft control protection at elevator lobbies is now prohibited.

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 m3/s × m2) 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.

202 TERMINATED STOPS. Factory feature of a door frame where the stops of the door frame are terminated not more than 6 inches from the bottom of the door frame. Terminated stops are also known as “hospital stops” or “sanitary stops”.

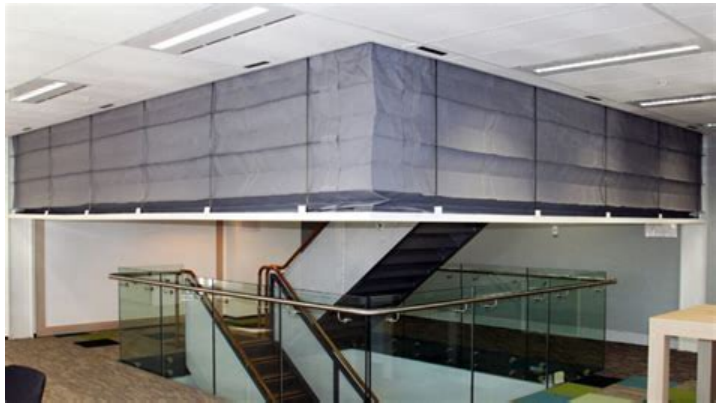
Door Frame with Terminated Stop

Photo Courtesy of

John Woestman

FIRE-PROTECTIVE CURTAIN ASSEMBLIES
2021 IBC 716.4

- **2021 IBC Section 202**
  - **Fire-Protective Curtain Assembly:** An assembly consisting of a fabric curtain, bottom bar, guides, coil, and an operating, and closing system.
- **2021 IBC Section 716.4**
  - Must be listed in accordance with UL 10D, without hose stream.
  - Must be labeled.
  - Installed in accordance with NFPA 80, *Standard for Fire Doors and Other Opening Protectives.*
- **Code doesn't specify where these can be used – still subject to AHJ approval**



PROHIBITED USE OF TERMINATED STOPS 2021 IBC 717.2.3

- The use of static ceiling radiation dampers are now permitted where controls are used to shut down the airflow.

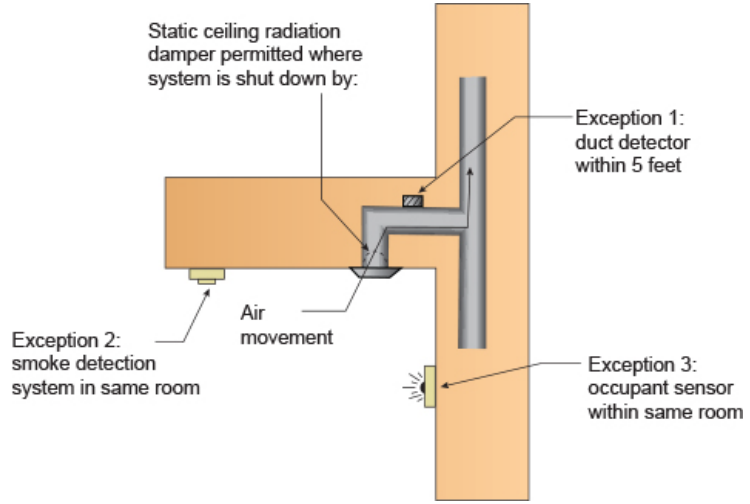
717.2 Installation. Fire dampers, smoke dampers, combination fire/smoke dampers and ceiling radiation dampers located within air distribution and smoke control systems shall be installed in accordance with the ~~requirements of this section~~, the manufacturer's instructions and, the dampers' listing and Sections 717.2.1 through 717.2.3.

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.

717.3.1 Damper testing. Dampers shall be listed and labeled in accordance with the standards in this section.

1. Fire dampers shall comply with the requirements of UL 555. ~~Only fire 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.~~

4. Ceiling radiation dampers shall comply with the requirements of UL 555C or shall be tested as part of a fire-resistance-rated floor/ceiling or roof/ceiling assembly in accordance with ASTM E119 or UL 263. ~~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~~



HOUSTON PUBLIC WORKS

PROHIBITED USE OF TERMINATED STOPS 2021 IBC 717.6.2.1

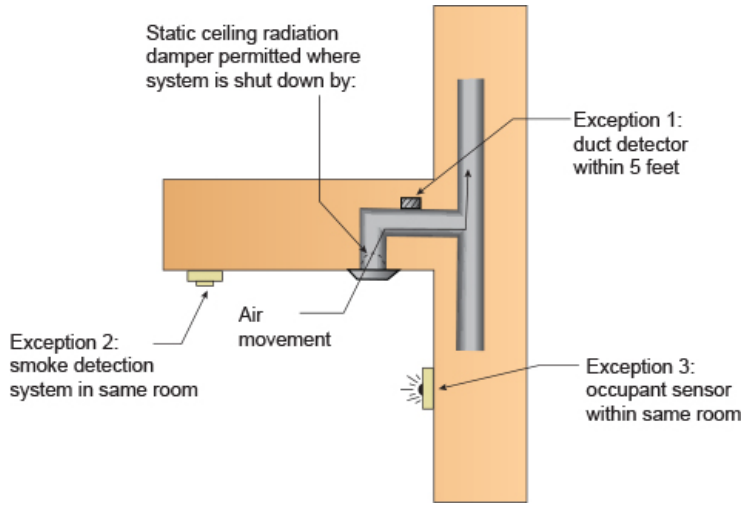
- The use of static ceiling radiation dampers are now permitted where controls are used to shut down the airflow.

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 which 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 within 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.



ACCESS TO DAMPERS
2021 IBC 717.4

- Specific damper access requirements have been established, including an allowance for remote inspection 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 and 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

717.4.1.2 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

Damper Access Opening

Photo Courtesy of

Dave Nelsen, Norton and Schmidt

Consulting Engineers

FLEXIBLE DUCTS FOR FIRE DAMPER EXCEPTION 2021 IBC 717.5.2

- Exception for HVAC ducts penetrating 1-hour fire barriers walls in fully sprinklered buildings
- Fully ducted HVAC – min. 26 gage thickness sheet steel from air-handling appliance to air outlet/inlet terminals
- Nonmetal flexible duct connectors permitted by 2021 IBC:
  - At duct connection to the AHU in the mechanical room
  - From overhead metal duct to a ceiling diffuser within same room

International Code Council

Flex connector to ceiling diffuser.

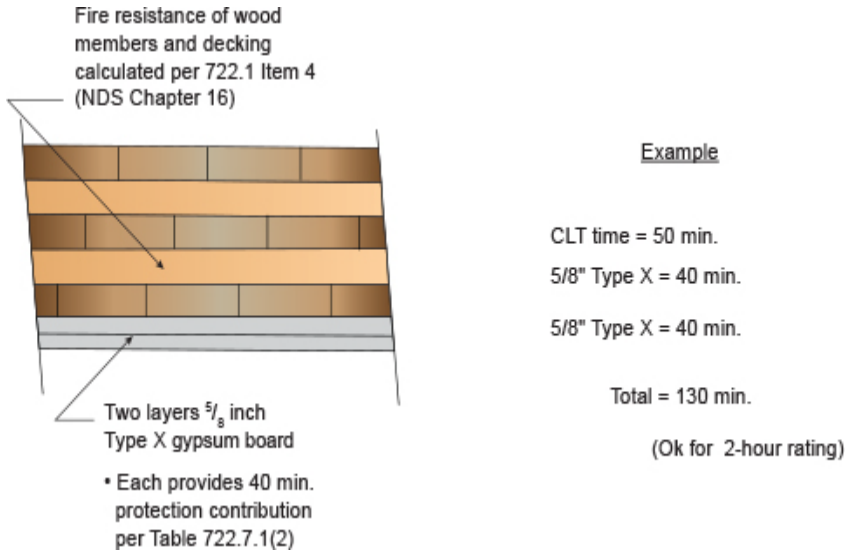
FIRE-RESISTANCE RATING OF MASS TIMBER 2021 IBC 722.7

- A prescriptive approach has been provided to achieve the required fire-resistance ratings for new mass timber construction type members and assemblies.

722.7 Fire-resistance 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.

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.



Example- Calculating Fire-Resistance

FIRE-RESISTANCE RATING OF MASS TIMBER 2021 IBC 722.7 (CONTINUED)

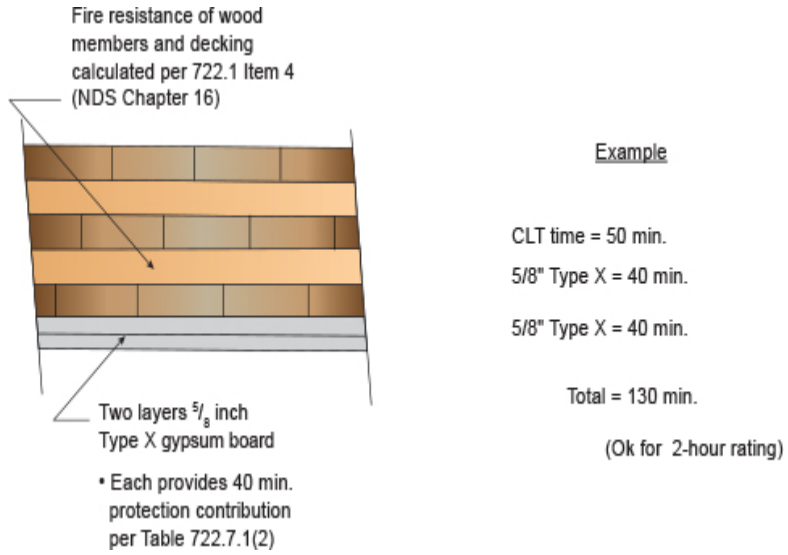
- A prescriptive approach has been provided to achieve the required fire-resistance ratings for new mass timber construction type members and assemblies.

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 above and placed at least 1 inch (25 mm) but not more than 2 inches (51 mm) from the panel edge.

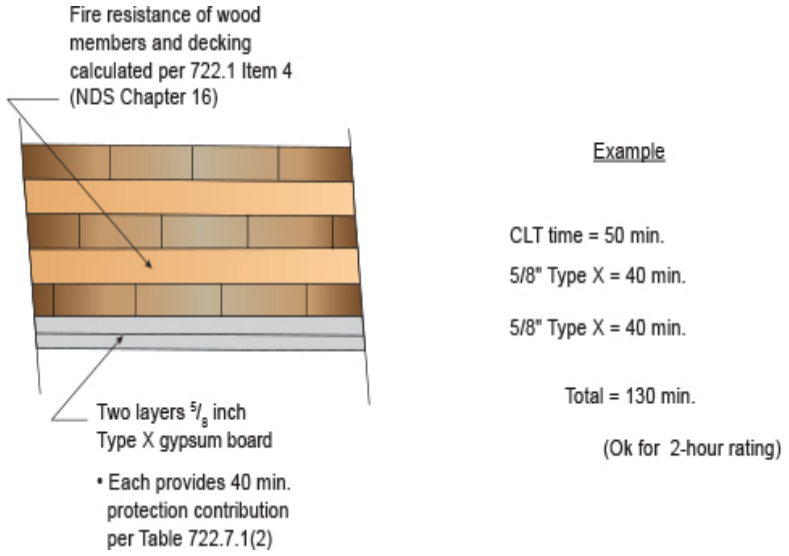


Example- Calculating Fire-Resistance

FIRE-RESISTANCE RATING OF MASS TIMBER 2021 IBC 722.7.2.1 (CONTINUED)

- A prescriptive approach has been provided to achieve the required fire-resistance ratings for new mass timber construction type members and assemblies.

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 11/4;-inch (32 mm) metal corner bead and finished with joint compound.



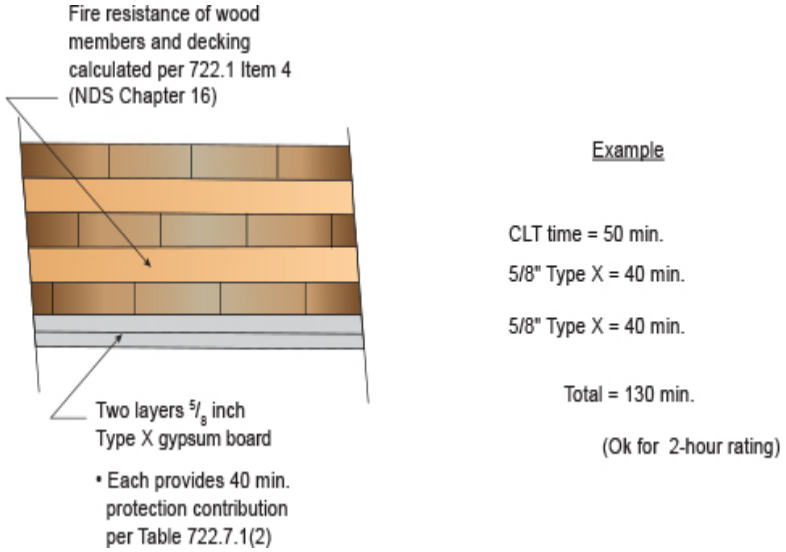
Example- Calculating Fire-Resistance

FIRE-RESISTANCE RATING OF MASS TIMBER 2021 IBC 722.7 (CONTINUED)

- A prescriptive approach has been provided to achieve the required fire-resistance ratings for new mass timber construction type members and assemblies.

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:

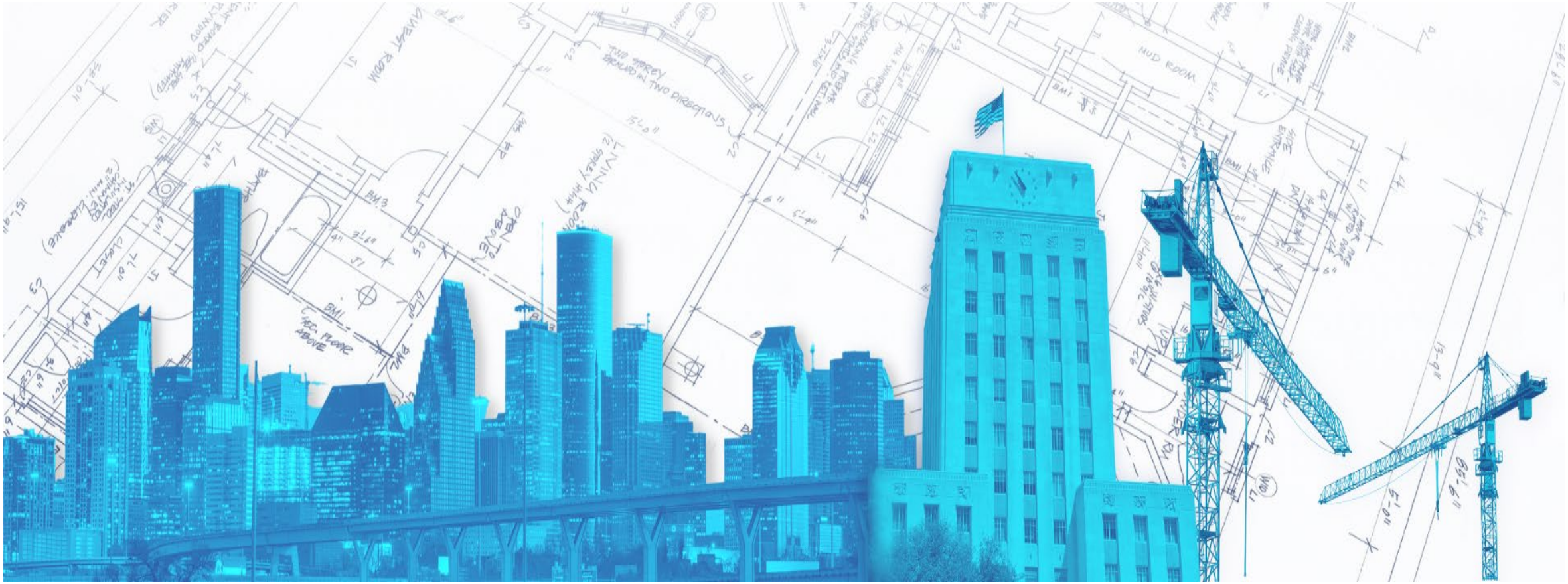
1. Galvanized nails of minimum 12 gage with a 7/16-inch (11 mm) head of sufficient length to penetrate the mass timber a minimum of 1 inch (25 mm).
2. Screws that comply with ASTM C1002 (Type S, W or G) of sufficient length to penetrate the mass timber a minimum of 1 inch (25 mm).



Example- Calculating Fire-Resistance

HOUSTON PUBLIC WORKS

IBC CHAPTER 9 FIRE PROTECTION SYSTEMS



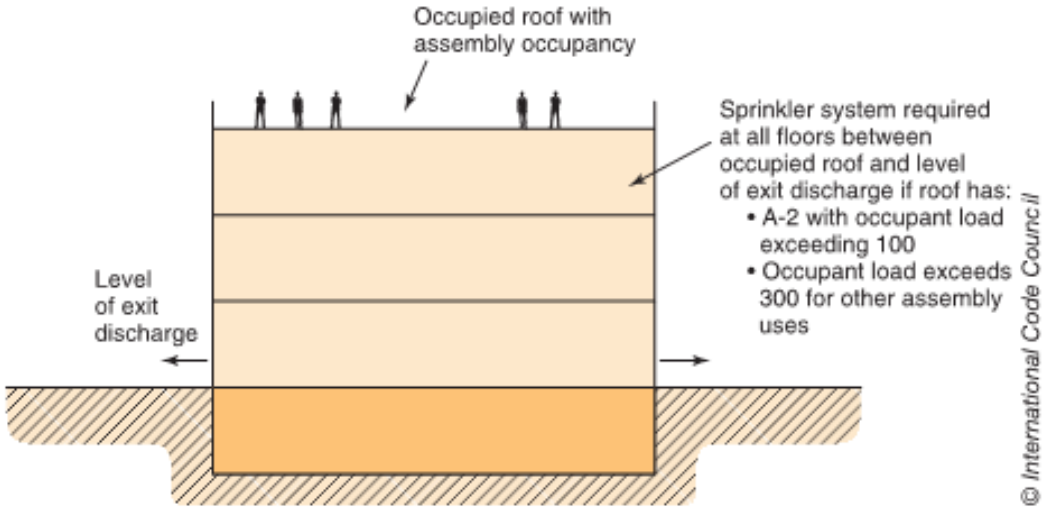
INTEGRATED TESTING IN ACCORDANCE WITH NFPA 4 2021 IBC 901.6.2

- **Required when multiple fire protection or life safety systems are interconnected**
- **Acceptance testing evaluates performance of all integrated systems as a whole**
  - High-rise buildings
  - Smoke Control Systems
- **Testing to be done at building commissioning, prior to issuance of certificate of occupancy, and every 10 years thereafter**

SPRINKLER SYSTEMS – ASSEMBLY OCCUPANCIES 2021 IBC 903.2.1.6

- **Sprinkler protection now required for buildings when the roof is:**
  - Used for a Group A-2 assembly with an occupant load exceeding 100, or
  - Used for other Group A occupancies with an occupant load exceeding 300

Provides protection for stories that occupants of the roof must egress through



Assembly occupancy on roof

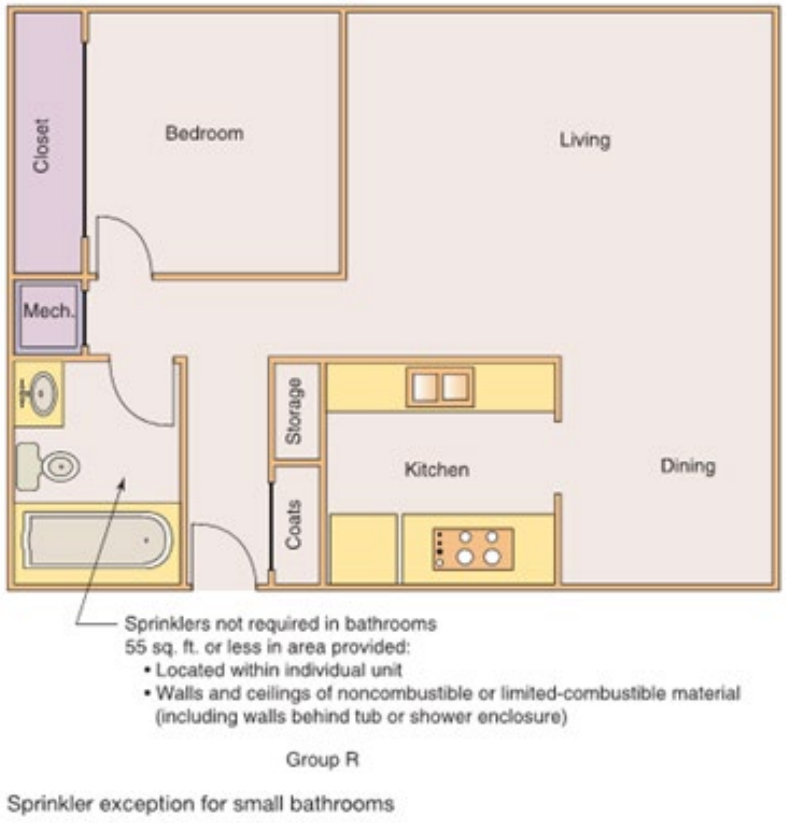
SPRINKLERS IN PARKING GARAGES

- **CHANGE TYPE: IBC 2021 - MODIFICATION**

  - **2021 IBC Section 903.2.10**
    - Where the fire area of the open parking garage exceeds 48,000 sq. ft. a sprinkler system shall be provided.
    - Enclosed garages with fire area of 12,000+ sq. ft. still require sprinkler protection.
  - **2021 IBC Section 903.2.11.3**
    - Exception removed for omitting sprinkler protection for open parking garages taller than 55 feet or with an occupant load of 30+ persons on a single floor.

EXEMPT LOCATIONS FOR NFPA 13 SPRINKLERS 2018 IBC 903.3.1.1.2

- **In Group R occupancies, sprinklers are not required in bathrooms which are less than 55 ft² in area and are located in individual dwelling/sleeping units**
  - Walls and ceilings must be of non-combustible or limited-combustible materials with a 15-minute thermal barrier rating



Sprinkler exception for small bathrooms

History of bathroom fires is statistically minimal

CORRIDOR AND BALCONY SPRINKLERS 2021 IBC 903.3.1.2.1

- Sprinkler protection must now be extended into corridors and balconies used in the means of egress, even though the location may be exempt based upon the NFPA 13R standard.

903.3.1.2.2 ~~Open-ended corridors~~ 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.

Egress Balconies

COMMERCIAL COOKING OPERATIONS
2018 IBC 904.12

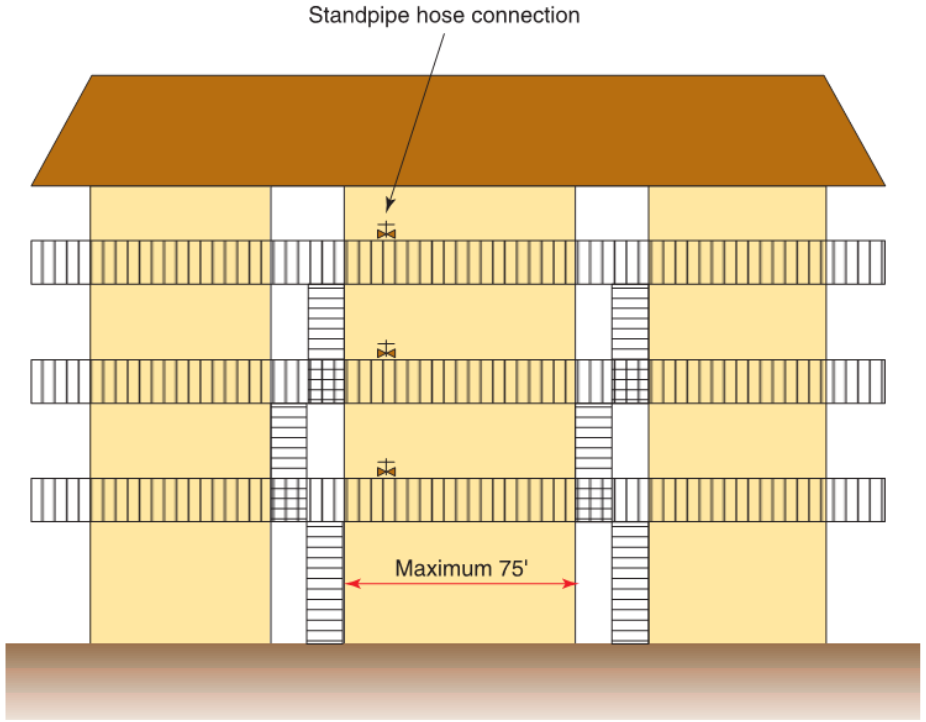
- Fire extinguishing systems protecting commercial cooking operations must also comply with NFPA 96
- NFPA 750 – automatic water mist systems also an option

Photo courtesy of CaptiveAire

Automatic water mist system protecting commercial cooking operation

CLASS I STANDPIPE CONNECTION LOCATIONS 2018 IBC 905.4

- **Specifies location of hose connections in interior exit stairway enclosures**
  - At the main floor landing for each story above and below grade plane (unless approved otherwise by fire code official)
- **Minimum number of hose connections required where open breezeways and open stairs are provided**
  - Single hose connection permitted in the open corridor or breezeway between open stairs not greater than 75 ft. apart



Standpipe connections in breezeways

MANUAL ALARMS IN GROUP S BUILDINGS
2021 IBC SECTION 907.2.10

- A manual fire alarm system is now required in self-storage facilities that are three stories or more in height and have interior corridors.

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.

Storage Building Requiring a Fire Alarm

FIRE ALARM OCCUPANT NOTIFICATION
2021 IBC SECTION 907.5.2.1.3

- Where a fire alarm system is required in Group R-1 and R-2 occupancies, a low-frequency signal shall be used in the sleeping rooms to improve the waking effectiveness of the occupant notification devices.

907.4 Initiating devices. Where ~~manual or automatic alarm initiation is required as part of a fire alarm system, the initiating~~ a fire alarm system is required by another section of this code, occupant notification in accordance with Section 907.5 shall be initiated by one or more of the following. Initiating devices shall be installed in accordance with Sections 907.4.1 through 907.4.3.1.

1. Manual fire alarm boxes.
2. Automatic fire detectors.
3. Automatic sprinkler system waterflow devices.
4. Automatic fire-extinguishing systems.

907.5 Occupant notification systems. ~~A fire alarm system shall annunciate at the fire alarm control unit and shall initiate occupant notification upon activation~~, Occupant notification by fire alarms shall be in accordance with Sections 907.5.1 through 907.5.2.3.3. ~~Where a fire alarm system is required by another section of this code, it shall be activated by:~~ Occupant notification by smoke alarms in Groups R-1 and R-2 occupancies shall comply with Section 907.5.2.1.3.2.

~~1. Automatic fire detectors.~~
~~2. Automatic sprinkler system waterflow devices.~~
~~3. Manual fire alarm boxes.~~
~~4. Automatic fire-extinguishing systems~~.

Sleeping Room in R-1 Hotel

Photo Courtesy of Getty Images/Hispanolistic

FIRE ALARM OCCUPANT NOTIFICATION 2021 IBC SECTION 907.5.2.1.3 (CONTINUED)

- Where a fire alarm system is required in Group R-1 and R-2 occupancies, a low-frequency signal shall be used in the sleeping rooms to improve the waking effectiveness of the occupant notification devices.

907.5.1 Alarm activation and annunciation. Upon activation, fire alarm systems shall initiate occupant notification and shall annunciate at the fire alarm control unit, or where allowed elsewhere by Section 907, at a constantly attended location.

~~**907.5.1**~~ **907.5.1.1 Presignal feature.** A presignal feature shall ~~not be installed unless~~ provided only where approved ~~by the fire code official. Where a~~ The presignal ~~feature is provided, a signal~~ shall be annunciated at an approved constantly attended location, ~~approved by the fire code official, so that occupant notification can be activated~~ having the capability to activate the occupant notification system in the event of a fire or other emergency.

907.5.2.1.2 Maximum sound pressure. The ~~maximum~~ total sound pressure level ~~for audible alarm~~ produced by combining the ambient sound pressure level with all audible notification appliances operating shall ~~be~~ not exceed 110 dBA at the minimum hearing distance from the audible appliance. Where the average ambient noise is greater than ~~95~~ 105 dBA, visible alarm notification appliances shall be provided in accordance with NFPA 72 and audible alarm notification appliances shall not be required.

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.

Sleeping Room in R-1 Hotel

Photo Courtesy of Getty Images/Hispanolistic

FIRE ALARM OCCUPANT NOTIFICATION
2021 IBC SECTION 907.5.2.1.3 (CONTINUED)

- Where a fire alarm system is required in Group R-1 and R-2 occupancies, a low-frequency signal shall be used in the sleeping rooms to improve the waking effectiveness of the occupant notification devices.

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.

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.

Sleeping Room in R-1 Hotel

Photo Courtesy of Getty Images/Hispanolistic

FIRE COMMAND CENTERS IN GROUPS F-1 AND S-1
2021 IBC SECTION 911

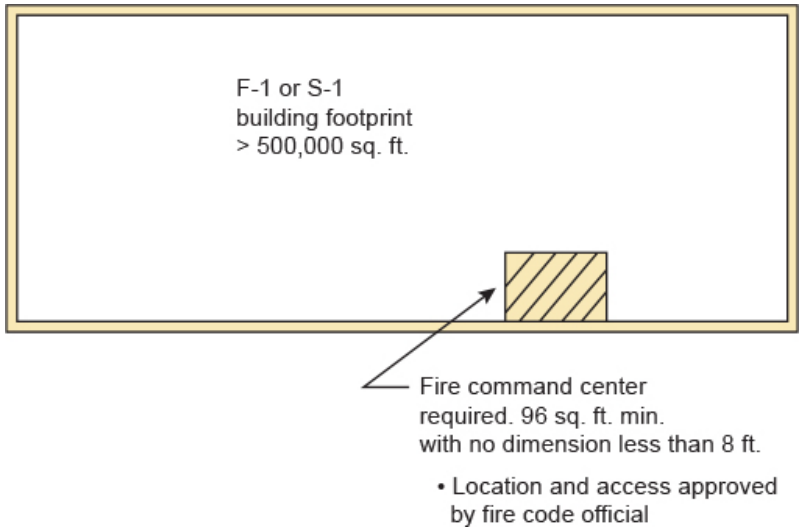
- A fire command center is now required in buildings housing Group F-1 or S-1 occupancies where the building footprint is over 500,000 square feet in size.

911.1 General. Where required by other sections of this code, and 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 m2), a fire command center for fire department operations shall be provided and shall comply with Sections 911.1.1 through ~~911.1.6~~ 911.1.7.

911.1.1 Location and access. The location and access ~~accessibility~~ of to the fire command center shall be approved by the fire code official.

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 m2) 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 m2) in area, the fire command center shall have a minimum size of 96 square feet (9 m2) with a minimum dimension of 8 feet (2348 mm) where approved by the fire code official.

911.1.7 Fire command center identification. The fire command center shall be identified by a permanent easily visible sign stating "FIRE COMMAND CENTER" located on the door to the fire command center.

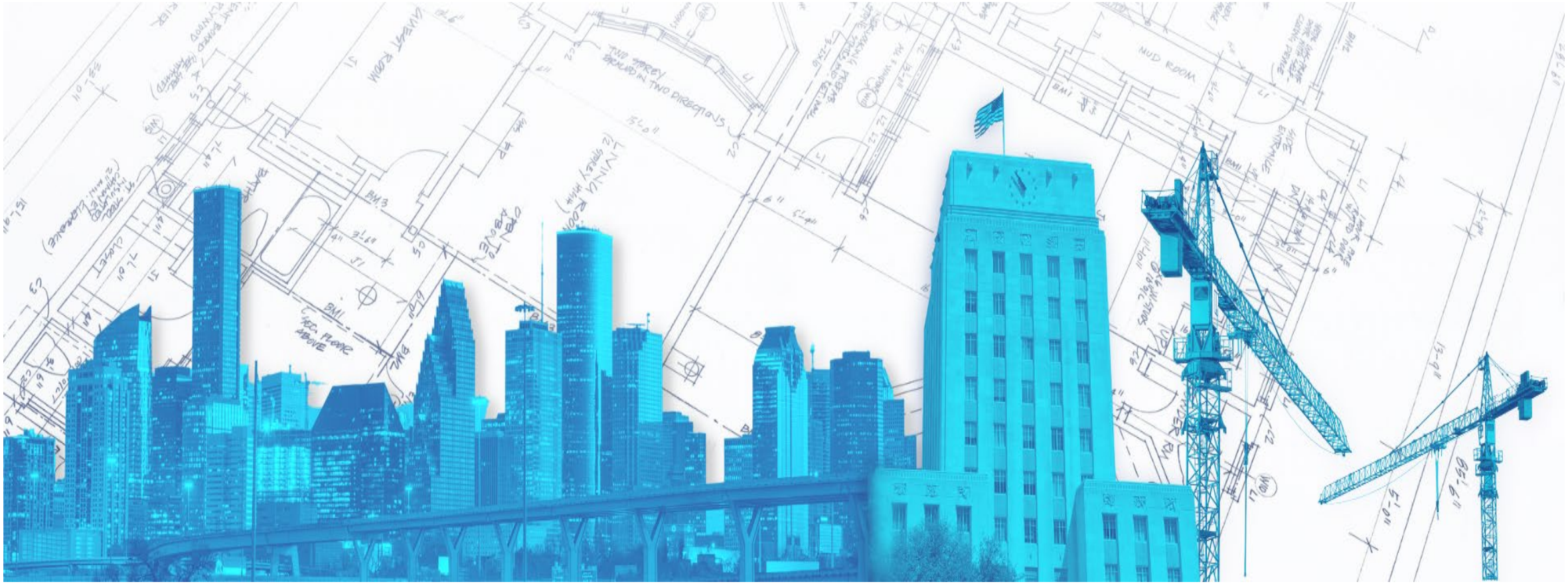


Required Fire Command Center in F-1 and S-1

HOUSTON PUBLIC WORKS

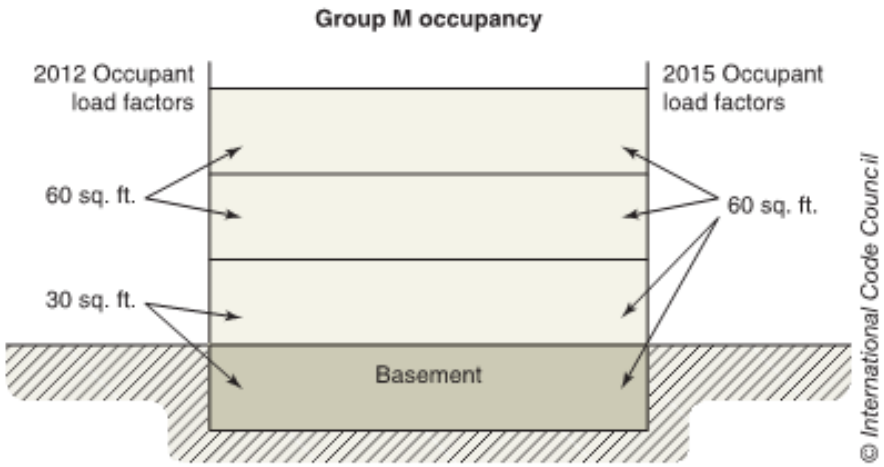
HOUSTON PUBLIC WORKS

IBC CHAPTER 10 MEANS OF EGRESS



OCCUPANT LOAD FACTORS 2018 TABLE 1004.5

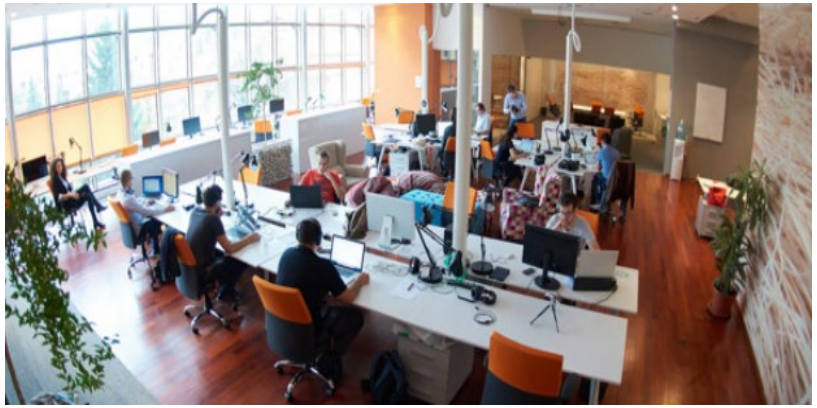
- Mercantile occupant load factor revised to one factor, regardless of the story on which the mercantile use is located (60 sq. ft. / person)
- Change in trend of retail display from multi-story single operator buildings to larger floor areas within a single story



Occupant load factor—mercantile

OCCUPANT LOAD FACTORS
2018 TABLE 1004.5

- **Business Use Occupant Load**
  - **150 square feet per person; gross area, or**
  - **Concentrated business use areas (1004.8)**
    - Call centers, trading floors, and other high-density areas
    - Where approved by building official; may be actual occupant load
    - Not less than 1 occupant per 50 square feet
  - **Application and interpretation of what constitutes "concentrated business" varies among AHJ across the country**



NUMBERS OF EXITS AND EXIT ACCESS DOORWAYS 2018 IBC 1006/1007

- **1006 Number of Exits and Exit Access Doorways**
  - Significant changes and reorganization to the whole chapter. Many egress provisions moved to this one section (e.g., number of required exits, max common path of travel, stories with one exit).
- **1006.3 Egress from stories or occupied roofs.**
  - Clarifications provided that when stairways serve more than one story or occupied roof, only the occupant load on that story or occupied roof are used to calculate required number and minimum size of those exits.

NUMBERS OF EXITS AND EXIT ACCESS DOORWAYS CONT. 2018 IBC 1006/1007

- Table 1006.2.1 Spaces with One Exit or Exit Access Stairway

TABLE 1006.2.1
SPACES WITH ONE EXIT OR EXIT ACCESS DOORWAY

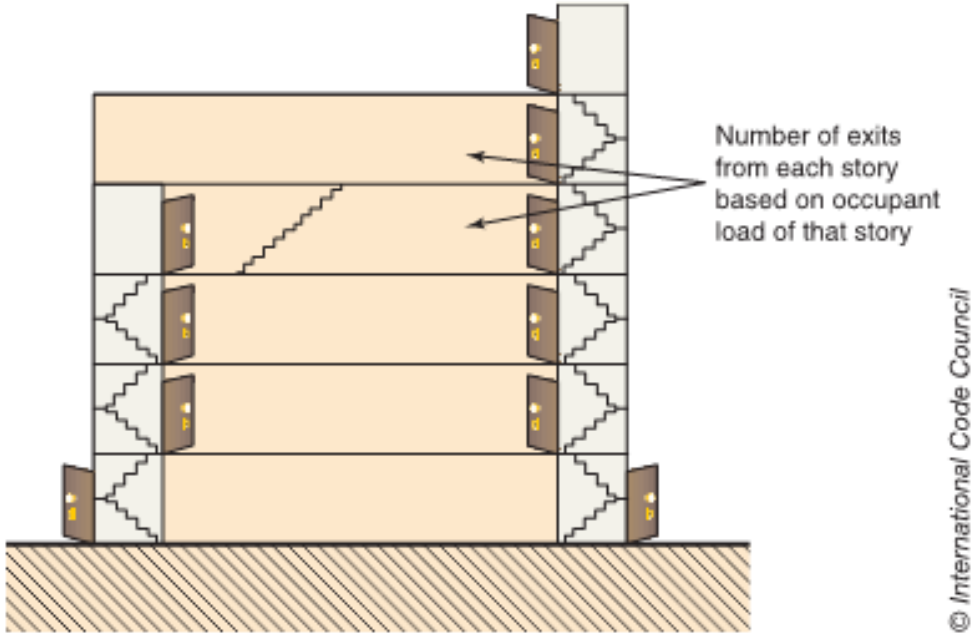
OCCUPANCY	MAXIMUM OCCUPANT LOAD OF SPACE	MAXIMUM COMMON PATH OF EGRESS TRAVEL DISTANCE (feet)		
		Without Sprinkler System (feet)		With Sprinkler System (feet)
		Occupant Load		
		OL ≤ 30	OL > 30	
A[c], E, M	49	75	75	75[a]
B	49	100	75	100[a]
F	49	75	75	100[a]
H-1, H-2, H-3	3	NP	NP	25[b]
H-4, H-5	10	NP	NP	75[b]
I-1, I-2[d], I-4	10	NP	NP	75[a]
I-3	10	NP	NP	100[a]
R-1	10	NP	NP	75[a]
R-2	20	NP	NP	125[a]
R-3[e]	20	NP	NP	125[a, g]
R-4[e]	20	NP	NP	125[a, g]
S[f]	29	100	75	100[a]
U	49	100	75	75[a]

NUMBERS OF EXITS AND EXIT ACCESS DOORWAYS CONT.
2018 IBC 1006/1007

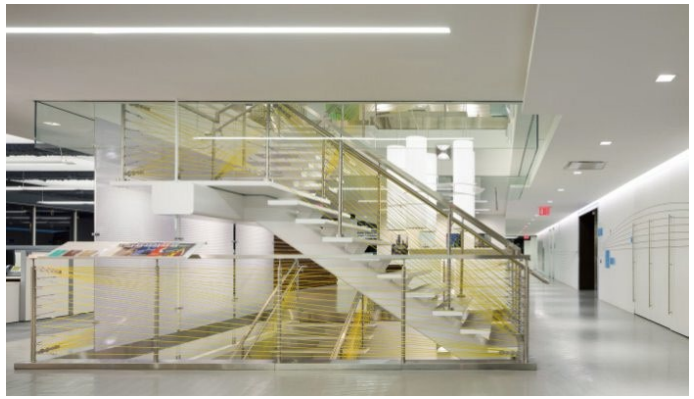
- **Limiting factor of stories with one exit or exit access doorway changed from Travel Distance to Common Path of Egress Travel**
  - i.e., Occupants of a second-story space can use unenclosed stairs as the only means of egress, provided that the common path of travel complies with IBC 1006.2.1

EGRESS THROUGH ADJACENT STORIES
2018 IBC 1006.3.1

- **1006.3.1 Adjacent Story**
  - Path of egress travel to an exit shall not pass through more than one adjacent story.
  - Exceptions provided for some residential occupancies, open parking garages, open-air assembly seating and exit access stairways serving balconies/galleries/ press boxes (theaters, auditoriums, sports facilities).

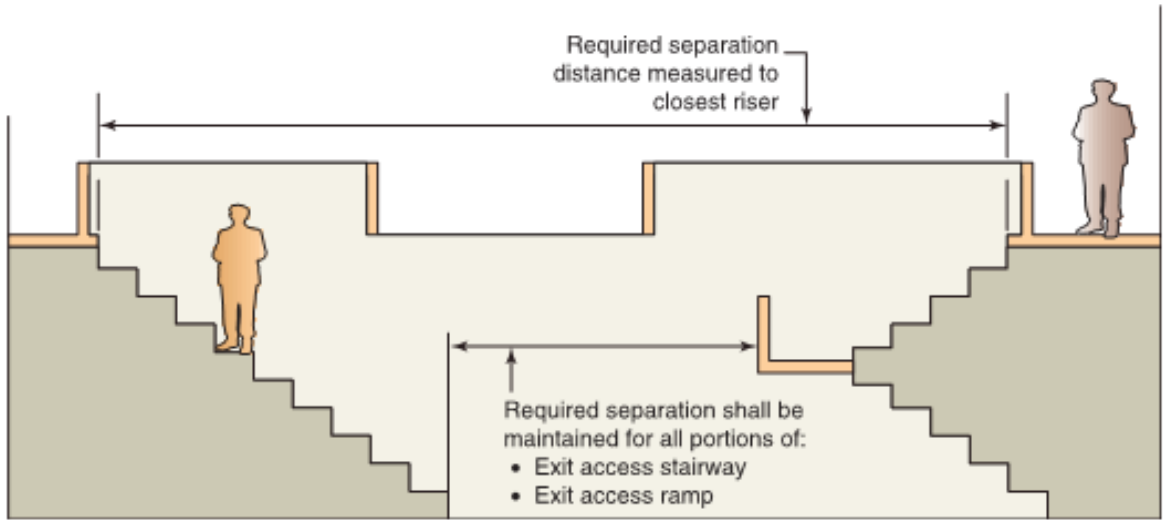


Egress travel in multi-story building



EXIT AND EXIT ACCESS DOORWAY CONFIGURATION 2018 IBC 1007.1

- **Clarifying guidance on how to measure the distance between the exit access doorways, stairs, and ramps**
  - Separation distance to be measured to any point along the width of the doorway
  - Separation distances to be maintained for entire length of travel on stair or ramp to keep them from converging towards one another



Where 3 or more exits required, additional exit shall be “placed a reasonable distance apart so that if one becomes blocked, others are available”

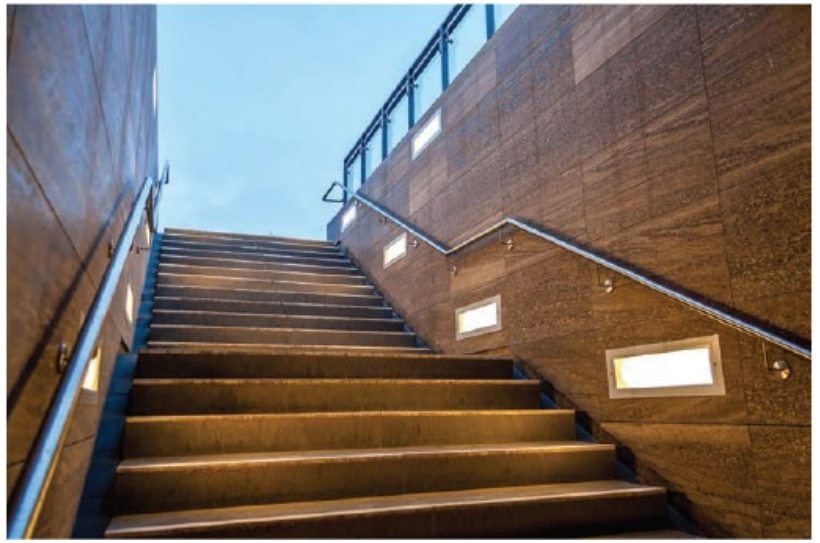
STAIRWAY ILLUMINATION
2021 IBC SECTION 1008.2.1

- The minimum illumination level for both exit and exit access stairways has been increased 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

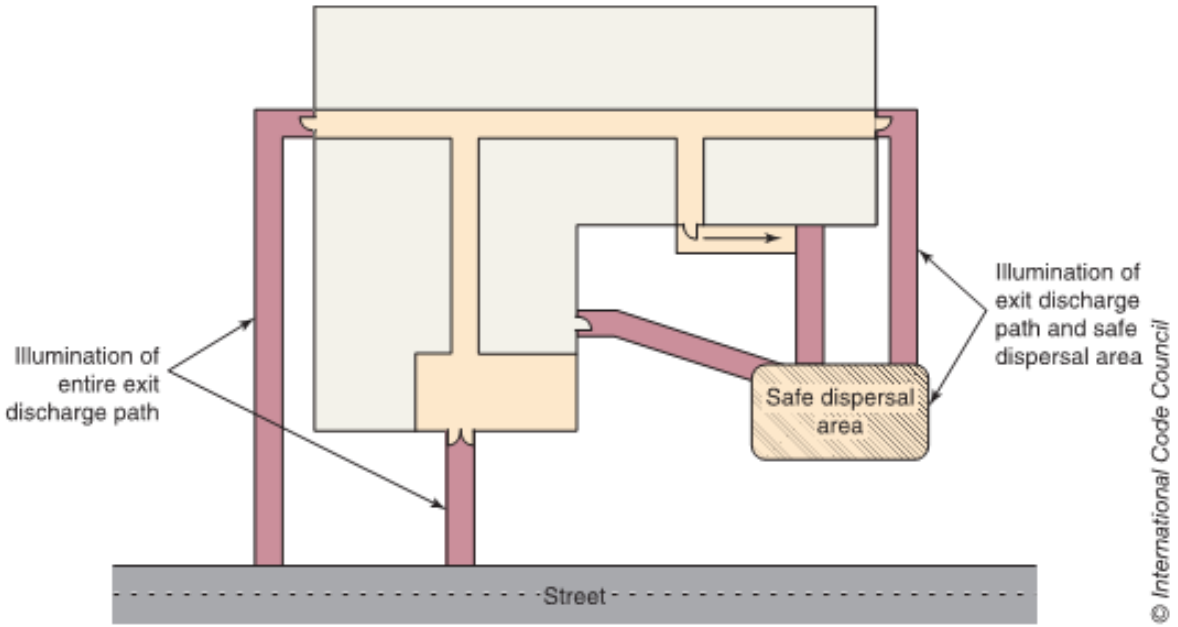


Increased Illumination Required on Stairway

Photo Courtesy of Getty Images/Patrick Palej/EyeEm

EXIT DISCHARGE ILLUMINATION
2018 IBC 1008.2.3

- **1008.2.3 Illumination of Exit Discharge**
  - Illumination required for path of travel for the exit discharge from each exit to the public way.



Exterior egress illumination

ACCESSIBLE ELEVATORS
2018 IBC 1009.2.1 (2021)

- Accessible egress elevators are required where an accessible floor including an occupied roof is four or more stories above the level of exit discharge
- Accessible egress provisions apply to occupied roofs

TWO-WAY COMMUNICATION SYSTEMS 2018 IBC 1009.8

- **Revised to clarify which landings serving elevators or a bank of elevators are required to have a two-way communication system**
- **Exceptions:**
  - Two-way communication system is provided in area of refuge
  - Floors where ramps are provided
  - Service elevators that are not designated as accessible means of egress or accessible route
  - Freight elevators
  - Private residence elevator

A two-way communication system may serve multiple elevators

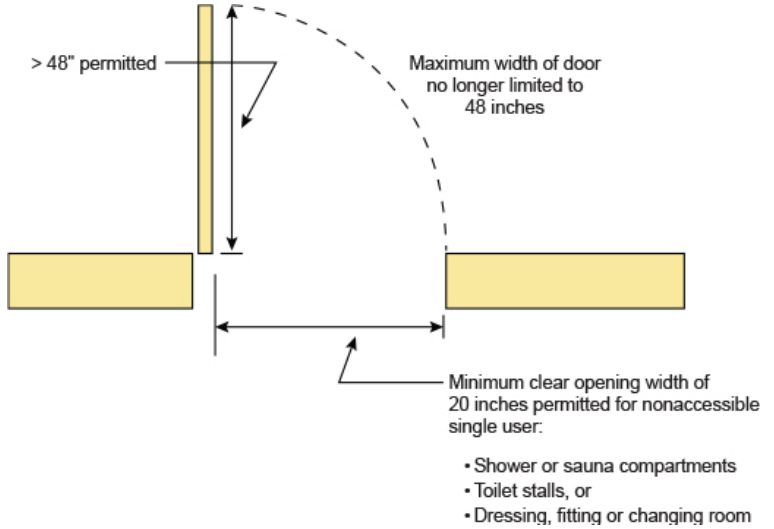
DOOR WIDTH
2021 IBC SECTION 1010.1.1

➢

1010.1.1 Size of doors. The required capacity of each door opening shall be sufficient for the occupant load thereof and shall provide a minimum clear opening width of 32 inches (813 mm). The clear opening width of doorways with swinging doors shall be measured between the face of the door and the stop, with the door open 90 degrees (1.57 rad). Where this section requires a minimum clear opening width of 32 inches (813 mm) and a door opening includes two door leaves without a mullion, one leaf shall provide a minimum clear opening width of 32 inches (813 mm). In Group I-2, doors serving as means of egress doors where used for the movement of beds shall provide a minimum clear opening width of 411/2 inches (1054 mm). ~~The maximum width of a swinging door leaf shall be 48 inches (1219 mm) nominal.~~ The minimum clear opening height of doors shall be not less than 80 inches (2032 mm).

Exceptions:

1. In Group R-2 and R-3 dwelling and sleeping units that are not required to be an Accessible unit, Type A unit or Type B unit, the minimum ~~and maximum~~ width shall not apply to door openings that are not part of the required means of egress.
4. The maximum width of door leaves in revolving doors that comply with Section ~~1010.1.4.~~ 11010.3.1 shall not be limited.
5. The maximum width of door leaves in power-operated doors that comply with Section ~~1010.1.4.2~~ 1010.3.2 shall not be limited.
11. Doors serving nonaccessible single-user shower or sauna compartments, toilet stalls or dressing, fitting or changing rooms shall have a minimum clear opening width of 20 inches (508 mm).~~The minimum clear opening width shall not apply to doors for nonaccessible shower or sauna compartments.~~
12. ~~The minimum clear opening width shall not apply to the doors for nonaccessible toilet stalls.~~



Door Width

HOUSTON PUBLIC WORKS

PROJECTIONS INTO DOOR OPENINGS
2021 IBC SECTION 1010.1.1.1

- Additional components are now specifically permitted to project into the minimum required door opening height.

1010.1.1.1 Projections into clear ~~width~~ 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 ~~stops~~ locks shall be permitted to be 78 inches (1980 mm) minimum above the floor.

Door Closer and Electromagnetic Lock Projecting into Door Height

LOCKS AND LATCHES
2021 IBC SECTION 1010.2.4

- The general locking provisions have been expanded 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:

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 sign 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.

Courtyard Egressing Through Building

Photo Courtesy of Getty Images/Nikada

LOCKS AND LATCHES
2021 IBC SECTION 1010.2.4 (CONTINUED)

- The general locking provisions have been expanded 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.

8.4. A clear window or glazed door opening, not less than 5 square feet (0.46 m2) 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 m2) or less serving a private office space

Courtyard Egressing Through Building

Photo Courtesy of Getty Images/Nikada

LOCKING ARRANGEMENTS IN GROUP I-4
2021 IBC SECTION 1010.2.8

- Group I-4 occupancies are now regulated under the special locking arrangements allowed for other “educational occupancies.”.

~~1010.1.4.4~~ 1010.2.8 **Locking arrangements in educational occupancies.** In Group E ~~and~~ occupancies, Group B educational occupancies and Group I-4 occupancies, egress doors from classrooms, offices and other occupied rooms ~~shall be permitted to be provided~~ with locking arrangements designed to keep intruders from entering the room ~~where~~ shall comply with all of the following conditions ~~are met~~:

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 ~~1010.1.9~~ 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.

~~**1010.1.4.4.1 Remote operation of locks**. Remote operation of locks complying with Section 1010.1.4.4 shall be permitted.~~

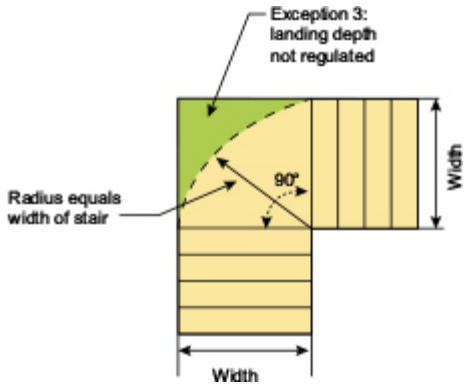
~~Remote locking or unlocking of doors from an approved location shall be permitted in addition to the unlocking operation in Item 1.~~

Door Security Hardware

Photo Courtesy of Schlage Lock Co., LLC (Part of Allegion plc)

STAIRWAY LANDINGS
2021 IBC SECTION 1011.6

- Requirements addressing the layout and configuration of landings, both curved and those that exceed the minimum size, have been revised.

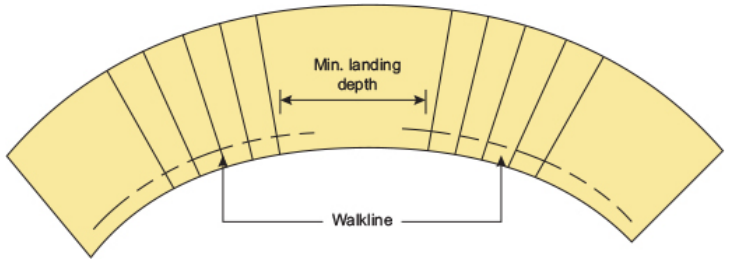


Landing at 90-degree Turn

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.

~~Exception~~ **Exceptions:**

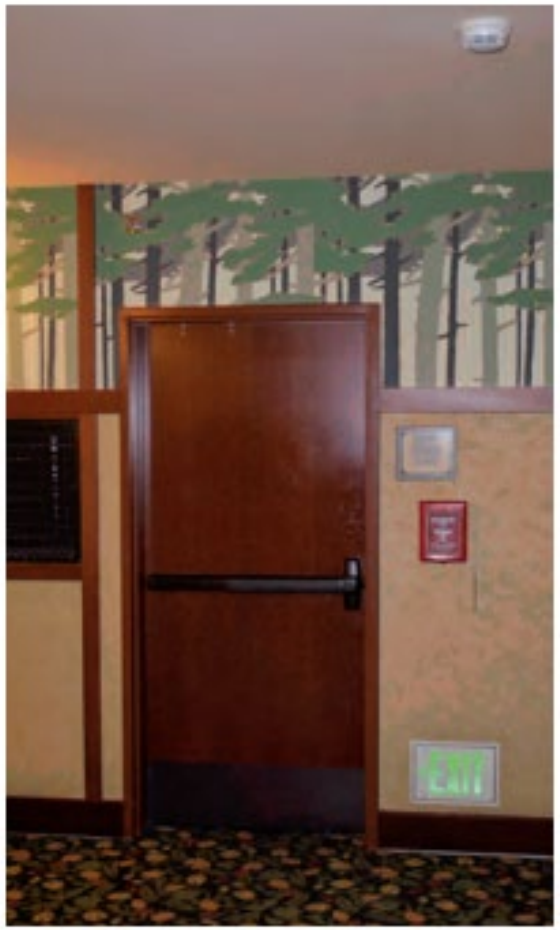
1. Where stairways connect stepped aisles to cross aisles or concourses, stairway landings are not required at the transition between stairways and stepped aisles constructed in accordance with Section 1030.
2. Where curved stairways of constant radius have intermediate landings, the landing depth shall 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.



Landing Depth at Curved Stairway

FLOOR LEVEL EXIT SIGN PLACEMENT 2018 IBC 1013.2

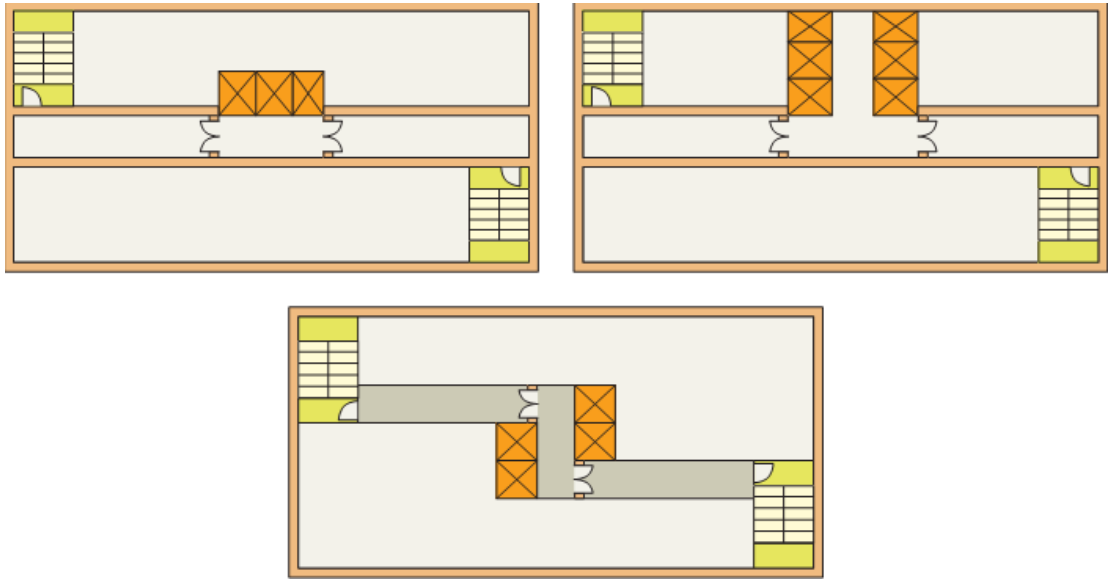
- **1013.2 Floor Level Exit Sign Placement for R-1 Occupancies**
  - The bottom of sign shall not be less than 10 in. nor more than 18 in. above the floor level.
  - Previous code version only allowed tolerance of 10 to 12 inches above the floor.



Low-level exit sign

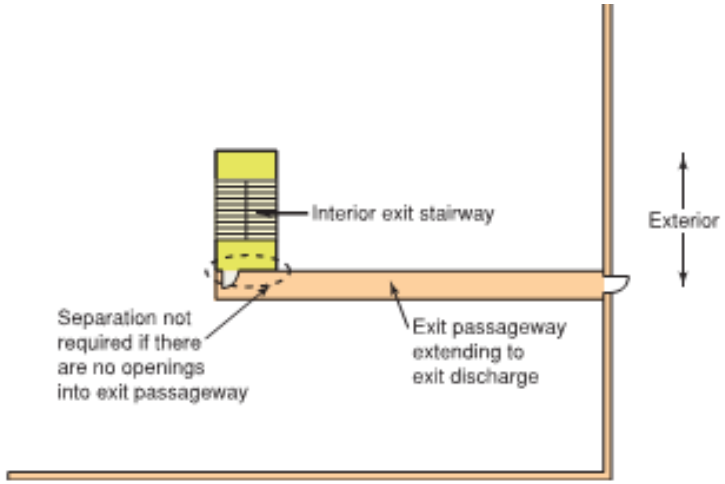
EGRESS THROUGH INTERVENING SPACES
2021 IBC 1016.2

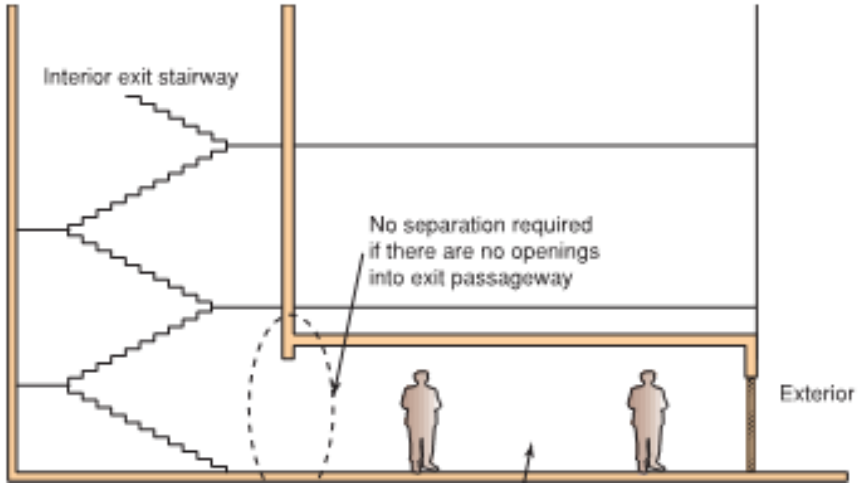
- **Exit access through an Elevator Lobby is now permitted**
  - Access to at least one exit shall be provided without travel through the lobby **where access to two or more exits or exit access doorways is required (2021)**
  - Protection required for the lobby is not required to extend to exit unless required to by other sections (e.g. Fire Service Access Elevator Lobby).
  - Similar continuity rules as foyers and lobbies



STAIRWAY EXTENSION
2018 IBC 1023.3.1

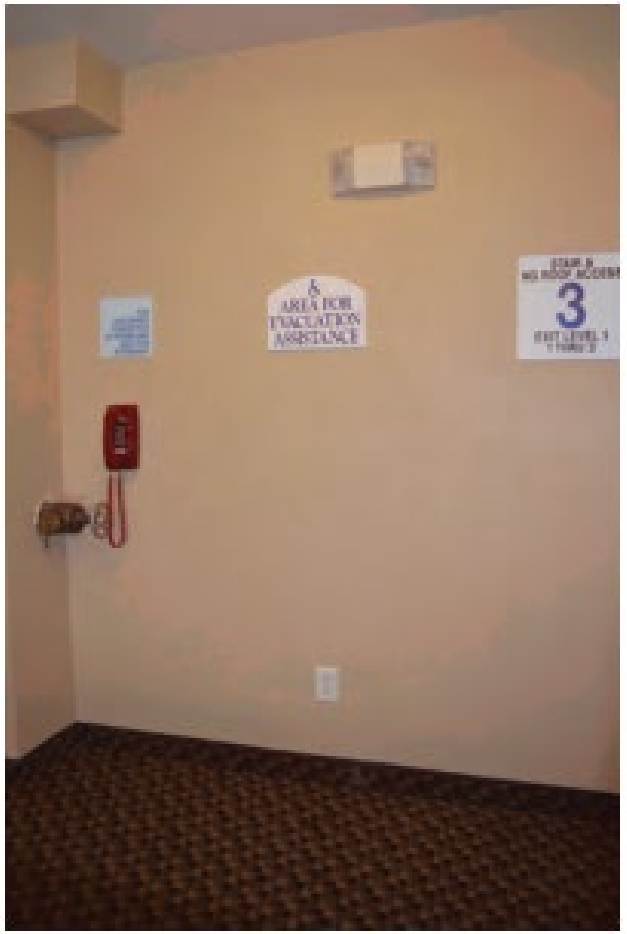
- An interior exit stairway is now permitted to continue directly into an exit passageway without a required fire-door assembly to separate the two elements provided there are no openings into the exit-passageway (2015) or the exit enclosure is pressurized (2018).





EXIT ENCLOSURE PENETRATIONS
2018 IBC 1023.5 AND 1024.6

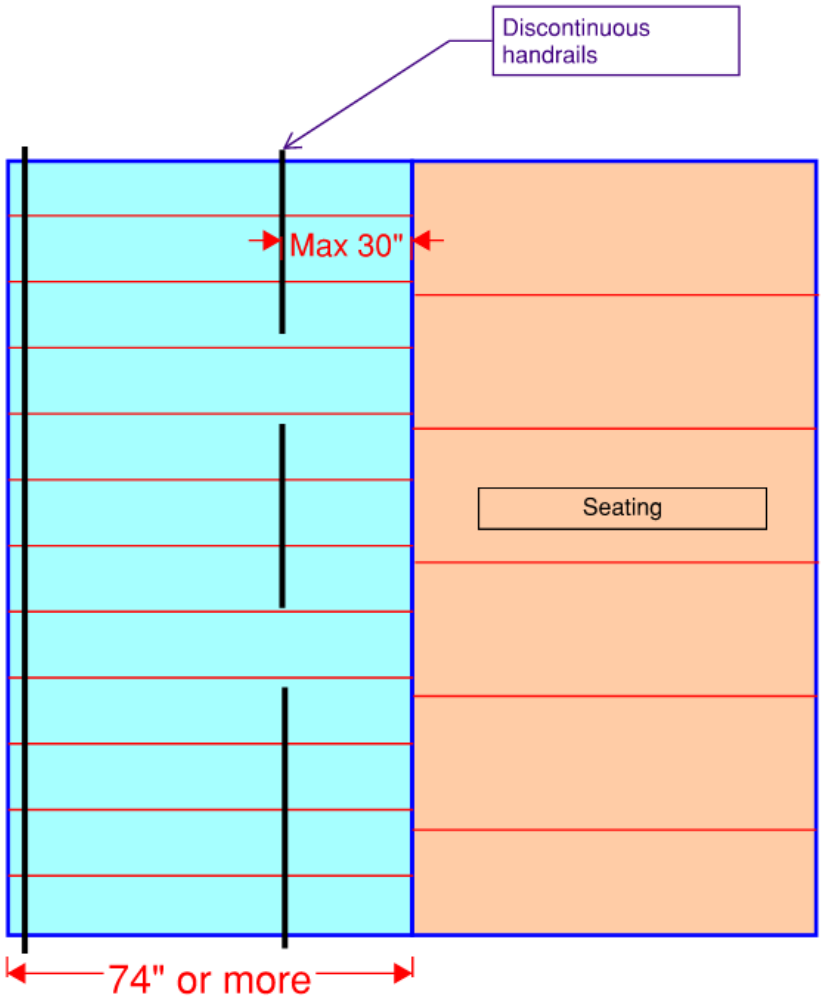
- **1023.5 & 1024.6 Interior Exit Stairway and Exit Passageway Penetrations**
  - Clarifications provided that fire protection systems, security systems and two-way communication systems are permitted to penetrate interior exit stairways and exit passageways.



Stair enclosure penetrations

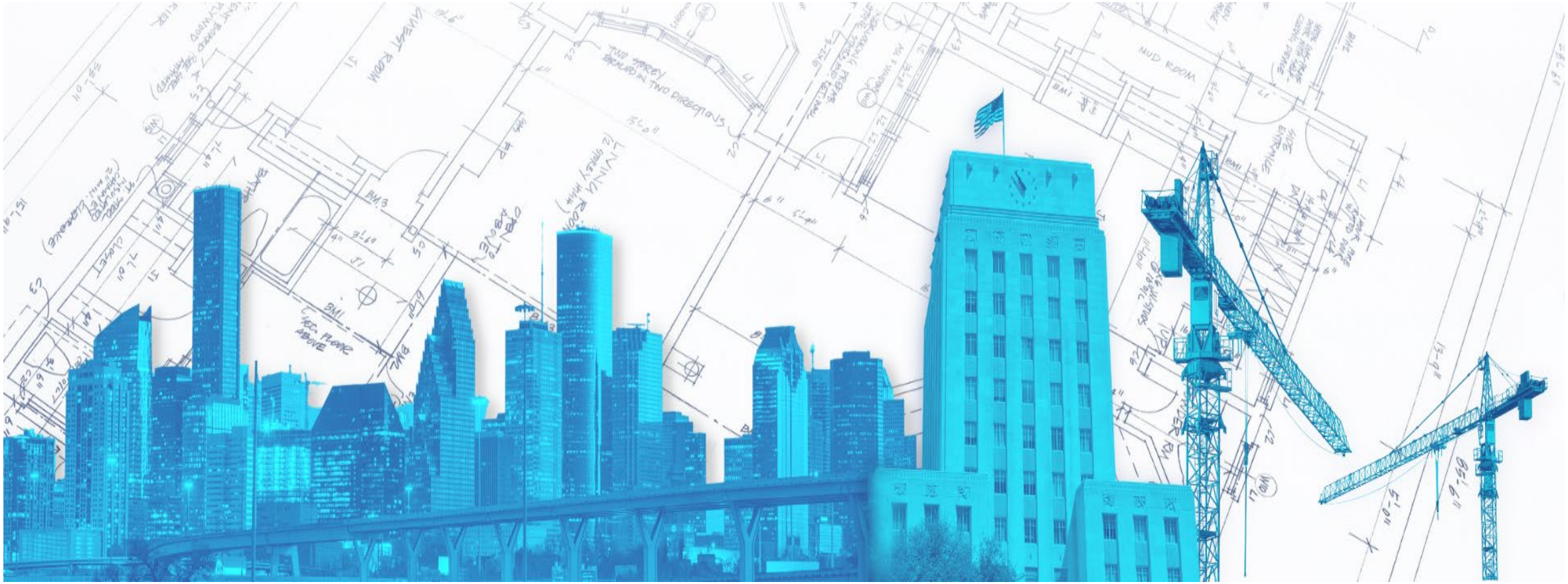
SOCIAL STAIR HANDRAILS
2021 IBC 1030.16

- **Assembly Handrails**
  - Where stepped aisles have seating on one side and the aisle width is 74 in. or more – two handrails are required
  - Where two handrails are required, one of the handrails must be within 30 in. horizontally of the stepped aisle
  - Where a stepped aisle is required to have two handrails, the mid-aisle handrails must be discontinuous with gaps/breaks at max 5-row intervals



HOUSTON PUBLIC WORKS

IBC CHAPTER 11 ACCESSIBILITY



CHAPTER 11 - ACCESSIBILITY

- Chapter 11 - Accessibility is not adopted or enforced by the City of Houston. The following information is provided for information purposes.

ACCESSIBILITY MODIFICATIONS & CLARIFICATION 2021 IBC 1003/1009/1110

- **1103.2.14 Access to Walk-In Coolers and Freezers**
  - Clarifications provided that access is not required to walk-in equipment in employee work areas. Does not apply to refrigerated buildings where persons are regularly employed.
- **1109.2.1.2 Fixtures in Family/ Assisted-Use Toilet Rooms**
  - New provision allowing a urinal, child-height water closet and child height lavatory.

1109.15 Access to Gaming Machines and Gaming Tables

- Increases scope to each type of machine and table.

1110.4.13 Access to Play Areas for Children

Adds a provision for an accessible route to play areas

ACCESSIBILITY NEW SCOPING IBC 1002/1005/1110 (2021)

1102 Accessible Design Compliance

- Adopted the 2017 version of ICC/ANSI A117.1

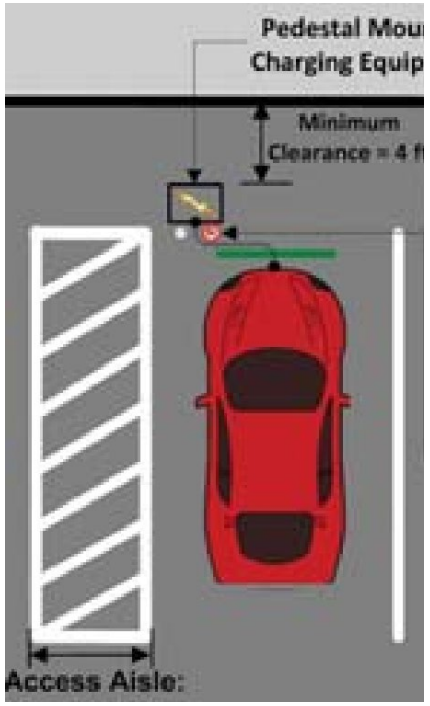
1105.1.1 Automatic Doors at Public Entrances

- New scoping provision adds automatic doors based on occupancy and building occupant loads.

TABLE 1105.1.1 Public Entrance with Power-Operated Door[a]

Occupancy	Building Occupant Load Greater Than
A-1, A-2, A-3, A-4	300
B, M, R-1	500

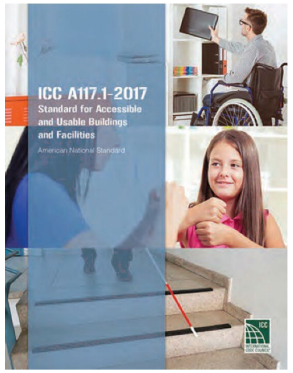
a. In mixed-use facilities where the total sum of the building occupant load is greater than those listed, the most restrictive building occupant load shall apply.



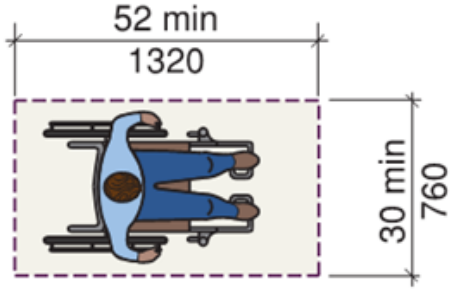
1107.2 Vehicle Charging Stations

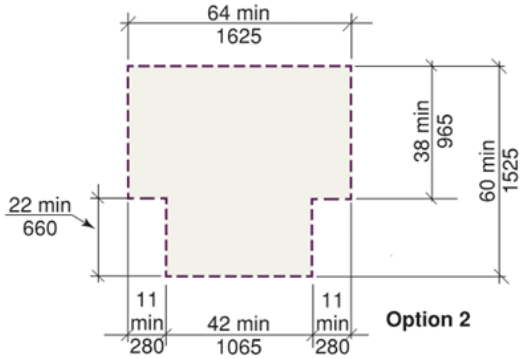
New scoping provision for a minimum of 5% EVCS required to be accessible with a van accessible parking space at 132 inches in width with an adjoining access aisle at 60 inches minimum width.

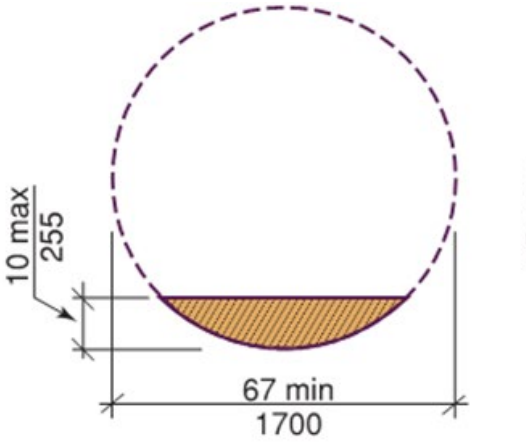
2017 ICC/ANSI A117.1 REFERENCED BY IBC 2021

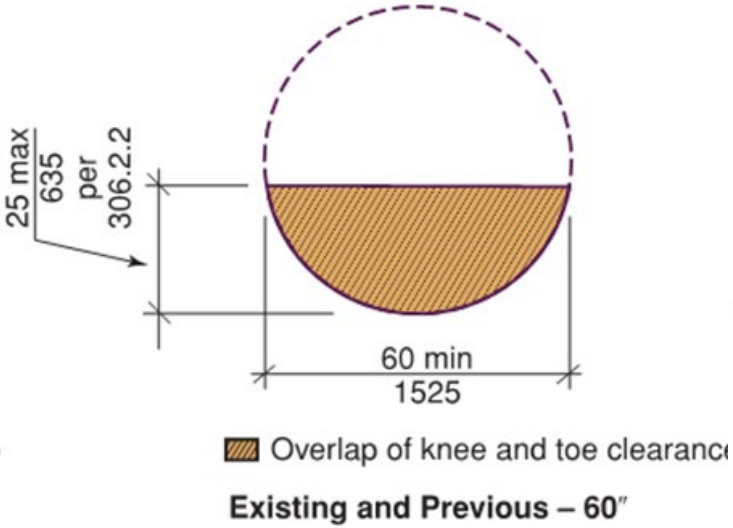


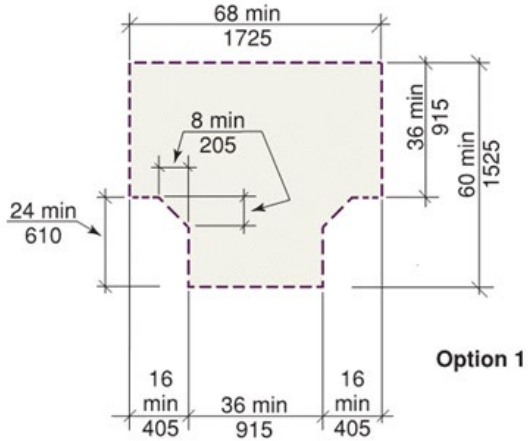
2017 A117.1 contains substantial changes including enhanced dimensions for clear floor spaces and turning spaces.

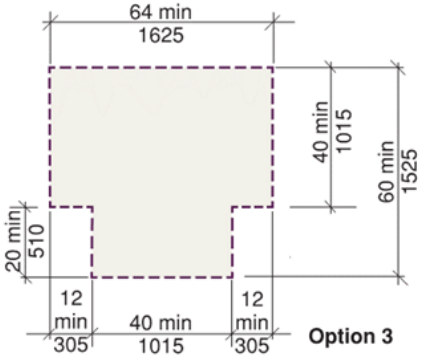












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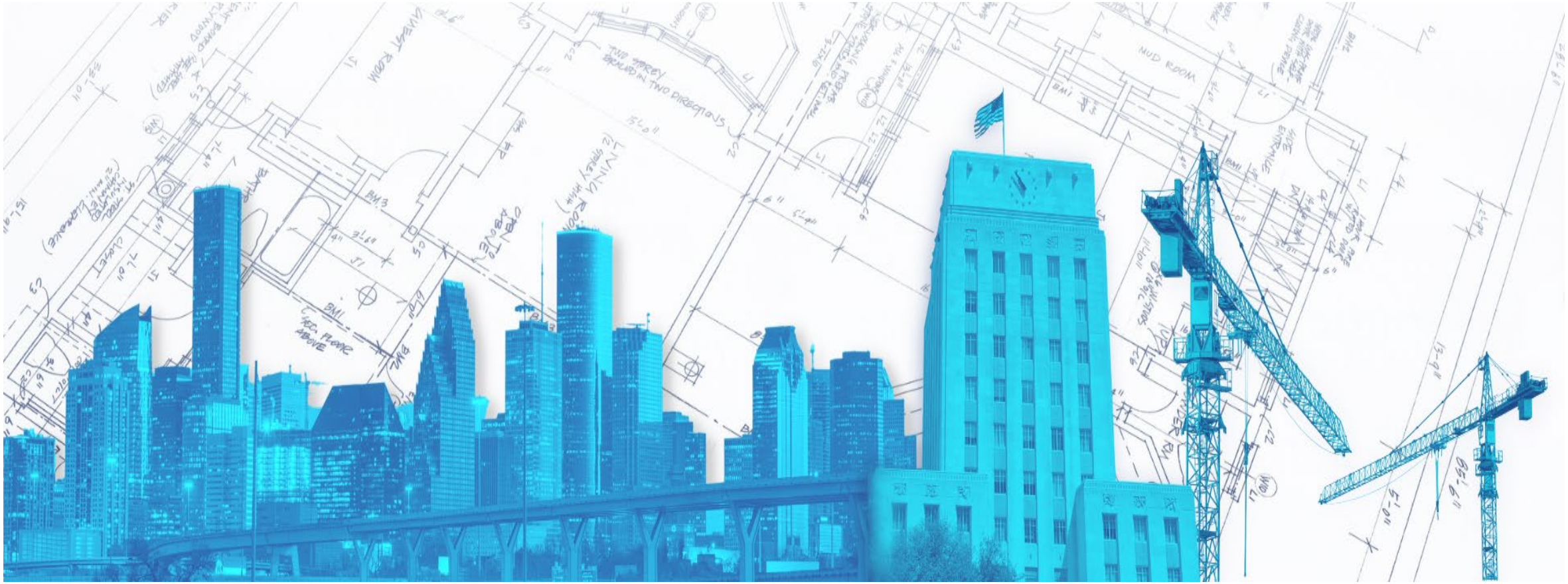
IBC CHAPTER 12 INTERIOR ENVIRONMENT



INSULATION OF UNVENTED ATTICS 2021 IBC SECTION 1202.3

- A new option is available for the regulation of unvented attics with air-permeable insulation and vapor diffusion ports in warmer climates.

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:

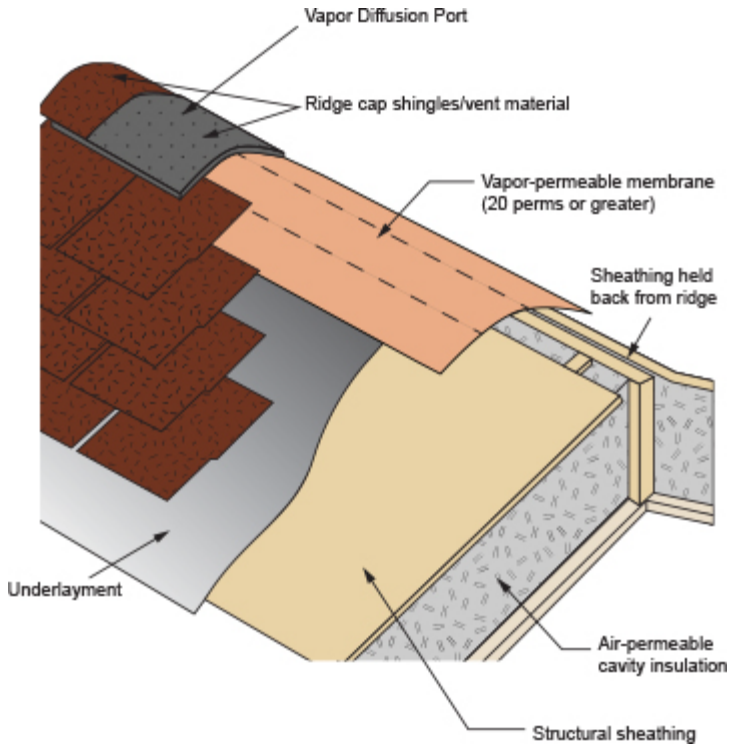
5. Insulation shall ~~be located in accordance with the following~~: comply with either Item 5.1 or 5.2, and additionally Item 5.3.

5.2. In Climate Zones 1, 2 and 3, air-permeable insulation installed in unvented attics shall meet the following requirements:

5.2.1.A vapor diffusion port shall be installed not more than 12 inches (305mm) from the highest point of the roof, measured vertically from the highest point of the roof to the lower edge of the port.

5.2.2.The port area shall be greater than or equal to 1/600 of the ceiling area. Where there are multiple ports in the attic, the sum of the port areas shall be greater than or equal to the area requirement.

5.2.3.The vapor-permeable membrane in the vapor diffusion port shall have a vapor permeance rating of greater than or equal to 20 perms when tested in accordance with Procedure A of ASTM E96.

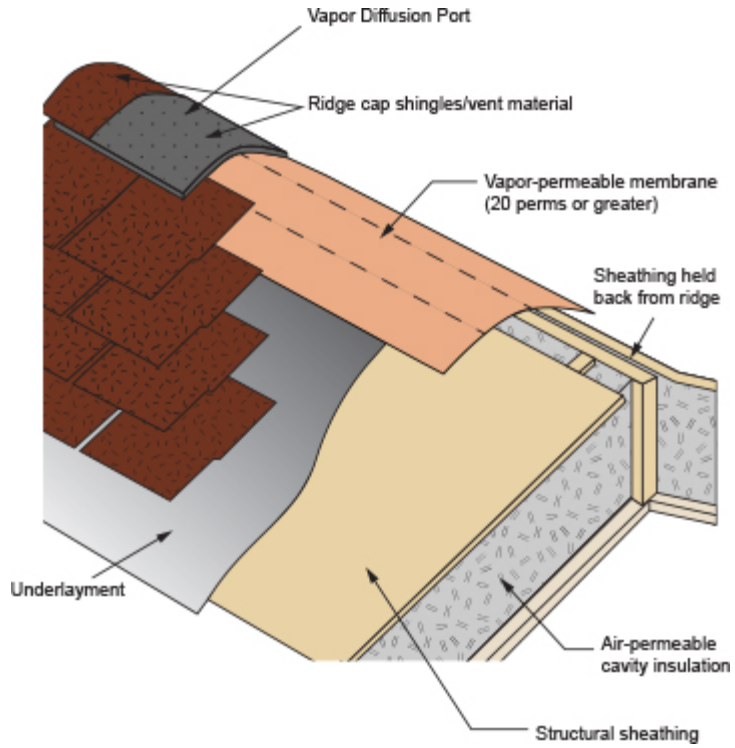


Vapor Diffusion Ports Above an Unvented Attic

INSULATION OF UNVENTED ATTICS 2021 IBC SECTION 1202.3(5) (CONTINUED)

- A new option is available for the regulation of unvented attics with air-permeable insulation and vapor diffusion ports in warmer climates.

5.2.4.The vapor diffusion port shall serve as an air barrier between the attic and the exterior of the building.
5.2.5.The vapor diffusion port shall protect the attic against the entrance of rain and snow.
5.2.6.Framing members and blocking shall not block the free flow of water vapor to the port. Not less than a 2-inch (50 mm) space shall be provided between any blocking and the roof sheathing. Air-permeable insulation shall be permitted within that space.
5.2.7.The roof slope shall be greater than or equal to 3 units vertical in 12 units horizontal (3:12).
5.2.8.Where only air-permeable insulation is used, it shall be installed directly below the structural roof sheathing, on top of the attic floor, or on top of the ceiling.
5.2.9.Where only air-permeable insulation is used and is installed directly below the structural roof sheathing, air shall be supplied at a flow rate greater than or equal to 50 cubic feet per minute (23.6 L/s) per 1000 square feet (93 m2) of ceiling.
5.25.3.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.



Vapor Diffusion Ports Above an Unvented Attic

202 VAPOR DIFFUSION PORT. An assembly constructed or installed within a roof assembly at an opening in the roof deck to convey water vapor from an unvented attic to the outside atmosphere.

ENHANCED CLASSROOM ACOUSTICS
2021 IBC SECTION 1207

- Educational occupancies are now required to meet the enhanced classroom acoustic requirements of Section 808 of ICC A117.1.

SECTION 1207 ENHANCED CLASSROOM ACOUSTICS

1207.1 General. Enhanced classroom acoustics, where required in this section, shall comply with Section 808 of ICC A117.1.

1207.2 Where required. In Group E occupancies, enhanced classroom acoustics shall be provided in all classrooms with a volume of 20,000 cubic feet (566 m3) or less.

Classroom Acoustics are Based on

Ceiling, Wall and Floor Finishes

Photo Courtesy of Skynesher

EFFICIENCY DWELLING UNITS
2021 IBC SECTION 1208.4

- The minimum required floor area of an efficiency dwelling unit has been reduced to 190 square feet, and a definition of an efficiency dwelling unit has been added.

~~1207.4~~ 1208.4 **Efficiency dwelling units**. ~~An efficiency living unit~~ 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 220 190 square feet (20.4 m217.7m2) of floor area. An additional 100 square feet (9.3 m2) ~~of floor area shall be provided for each occupant of such unit in excess of two.~~
2. The unit shall be provided with a separate closet.
3. ~~The~~ For other than Accessible, Type A and Type B dwelling units, the unit shall be provided with a kitchen sink, cooking appliance and ~~refrigeration facilities~~ 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.

Dwelling unit, efficiency. A dwelling unit where all permanent provisions for living, sleeping, eating and cooking are contained in a single room.

Studio Apartment With a Single Primary Living Space

Photo Courtesy of Paul Vinten

RESTROOM PRIVACY
2021 IBC SECTION 1210.3

- Concerns regarding privacy within public rest-rooms have been addressed by requiring a screening element at the entry to the restroom.

~~**1209.3**~~ **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

Screen at Restroom Entry

Photo Courtesy of baona

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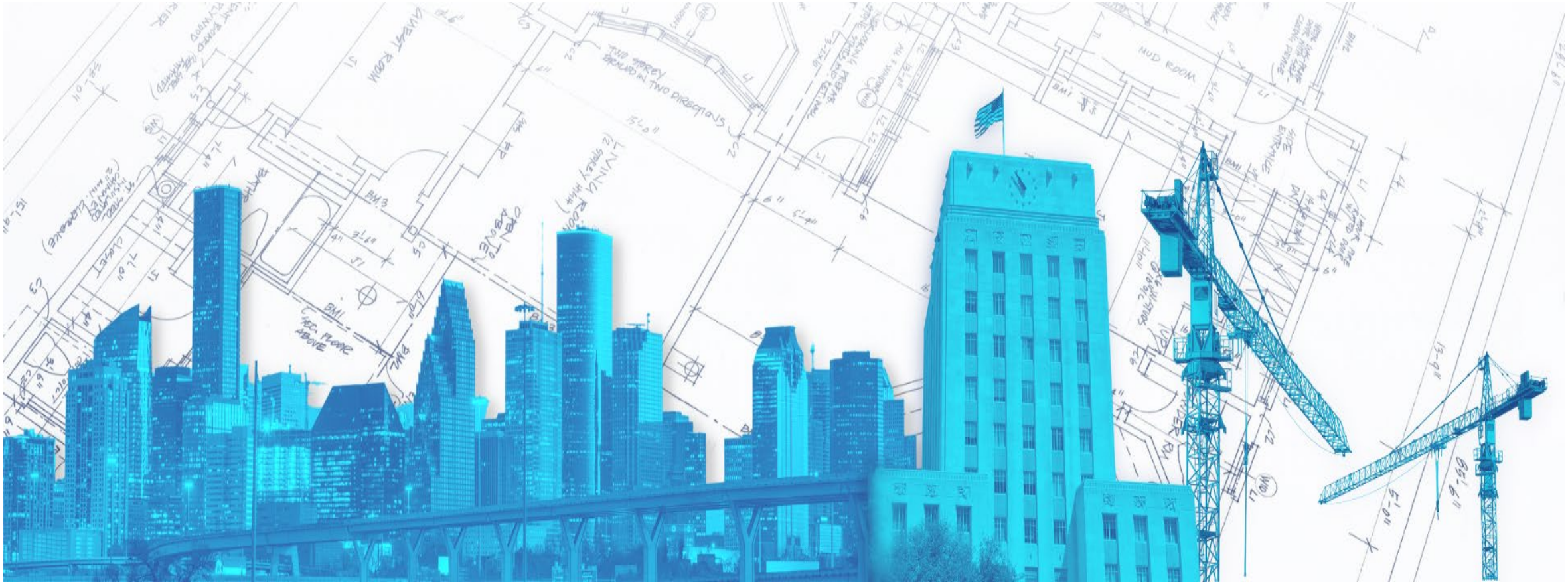
IBC CHAPTER 14 EXTERIOR WALLS



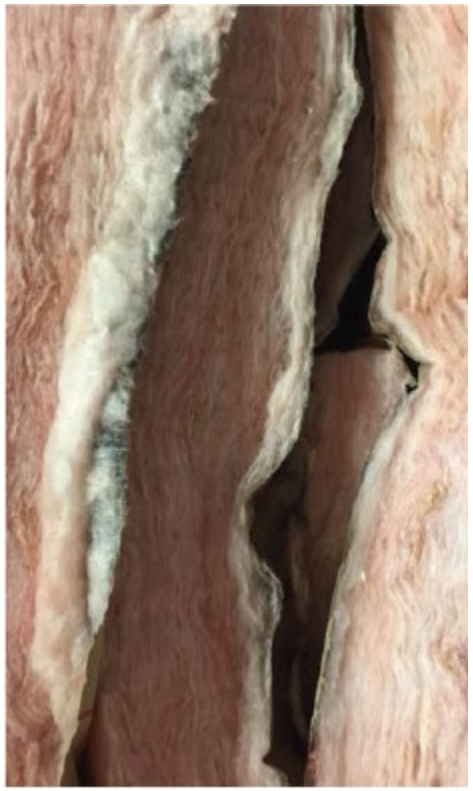
CLASS II VAPOR RETARDERS
2021 IBC TABLE 1404.3.1

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

1404.3.1 Class I and II vapor retarders. ~~Class I and II vapor retarders shall not be provided on the interior side of frame walls in Zones 1 and 2. Class I vapor retarders shall not be provided on the interior side of frame walls in Zones 3 and 4 other than Marine 4. Class I or II vapor retarders shall be provided on the interior side of frame walls in Zones 5, 6, 7, 8 and Marine 4. The appropriate zone shall be selected in accordance with Chapter 3 [CE] of the International Energy Conservation Code Commercial Provisions.~~ 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. ~~Conditions where Class III vapor retarders are required in Section 1404.3.2.~~
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.



Kraft-paper-backed Fiberglass.

Insulation is a Class II Vapor Retarder

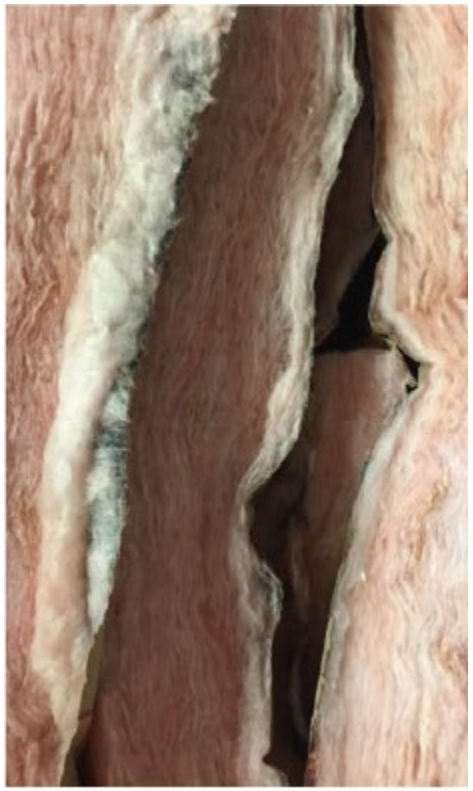
CLASS II VAPOR RETARDERS
2021 IBC TABLE 1404.3.1 (CONTINUED)

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

TABLE 1404.3.1 **Continuous Insulation with Class II Vapor Retarder**

Climate Zone	Permitted Conditions[a]
3	Continuous insulation with R-value ≥ R-2
4, 5, and 6	Continuous insulation with R-value ≥ *R-3* over 2 × 4 wall Continuous insulation with R-value ≥ *R-5* over 2 × 6 wall
7	Continuous insulation with R-value ≥ *R-5* over 2 × 4 wall Continuous insulation with R-value ≥ R-7.5 over 2 × 6 wall
8	Continuous insulation with R-value ≥ R-7.5 over 2 × 4 wall Continuous insulation with R-value ≥ R-10 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.



Kraft-paper-backed Fiberglass.

Insulation is a Class II Vapor Retarder

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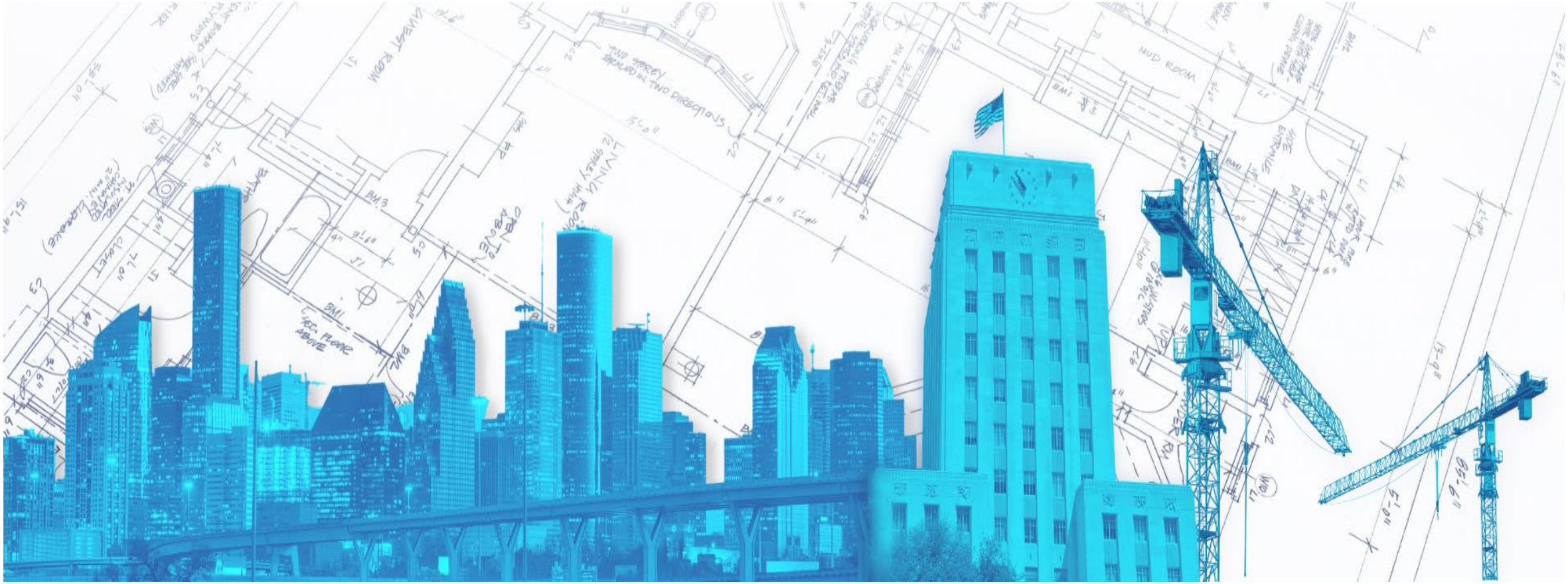
IBC CHAPTER 15 ROOF ASSEMBLIES AND ROOFTOP STRUCTURES



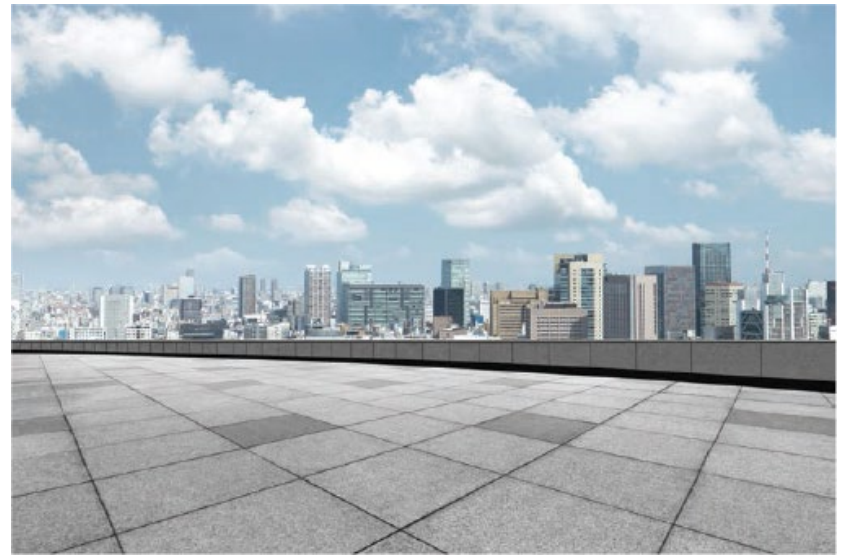
PARAPET WALLS
2021 IBC SECTION 1503.3

- Parapet walls now require moisture resistance in a manner similar to the remainder of the building.

1503.3 ~~**Coping.**~~ **Parapet walls**. Parapet walls shall be ~~properly coped with noncombustible, weatherproof materials of a width not less than the thickness of the parapet wall.~~ 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.



Short Parapet Wall on Roof

Photo Courtesy of Patrick Wong

AGGREGATE-SURFACED ROOFS
2021 IBC SECTION 1504.9

- Parapets of a minimum height are now required 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.

~~**1504.8 Surfacing and ballast materials in hurricane-prone regions.** For a building located in a hurricane-prone region as defined in Section 202, or on any other building with a mean roof height exceeding that permitted by Table 1504.8 based on the exposure category and basic wind speed at the site, the following materials shall not be used on the roof:~~

~~1. Aggregate used as surfacing for roof coverings.~~
~~2. Aggregate, gravel or stone used as ballast~~

Aggregate-Surfaced Roof With Parapet

Photo Courtesy of Baloncici

AGGREGATE-SURFACED ROOFS
2021 IBC SECTION 1504.9 (CONTINUED)

- Parapets of a minimum height are now required for aggregate-surfaced roofs to prevent blow-off

~~**TABLE 1504.8Maximum Allowable Mean Roof Height Permitted for Buildings with Aggregate on the Roof in Areas Outside A Hurricane-Prone Region**~~

TABLE 1504.9 Minimum Required Parapet Height (inches) for Aggregate Surfaced Roofs a,b,c

Aggregat Size	Mean Roof Height (ft)	Wind Exposure and Basic Design Wind Speed (mph)																	
		Exposure B									Exposure C[d]								
		≤95	100	105	110	115	120	130	140	150	≤95	100	105	110	115	120	130	140	150
ASTM D1863 (No.7 or No.67)	15	2	2	2	2	12	12	16	20	24	2	13	15	18	20	23	27	32	37
	20	2	2	2	2	12	14	18	22	26	12	15	17	19	22	24	29	34	39
	30	2	2	2	13	15	17	21	25	30	14	17	19	22	24	27	32	37	42
	50	12	12	14	16	18	21	25	30	35	17	19	22	25	28	30	36	41	47
	100	14	16	19	21	24	27	32	37	42	21	24	26	29	32	35	41	47	53
	150	17	19	22	25	27	30	36	41	46	23	26	29	32	35	38	44	50	56
ASTM D1863 (No.6)	15	2	2	2	2	12	12	12	15	18	2	2	2	13	15	17	22	26	30
	20	2	2	2	2	12	12	13	17	21	2	2	12	15	17	19	23	28	32
	30	2	2	2	2	12	12	16	20	24	2	12	14	17	19	21	26	31	35
	50	12	12	12	12	14	16	20	24	28	12	15	17	19	22	24	29	34	39
	100	12	12	14	16	19	21	26	30	35	16	18	21	24	26	29	34	39	45
	150	12	14	17	19	22	24	29	34	39	18	21	23	26	29	32	37	43	48

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).

Aggregate-Surfaced Roof With Parapet

Photo Courtesy of Baloncici

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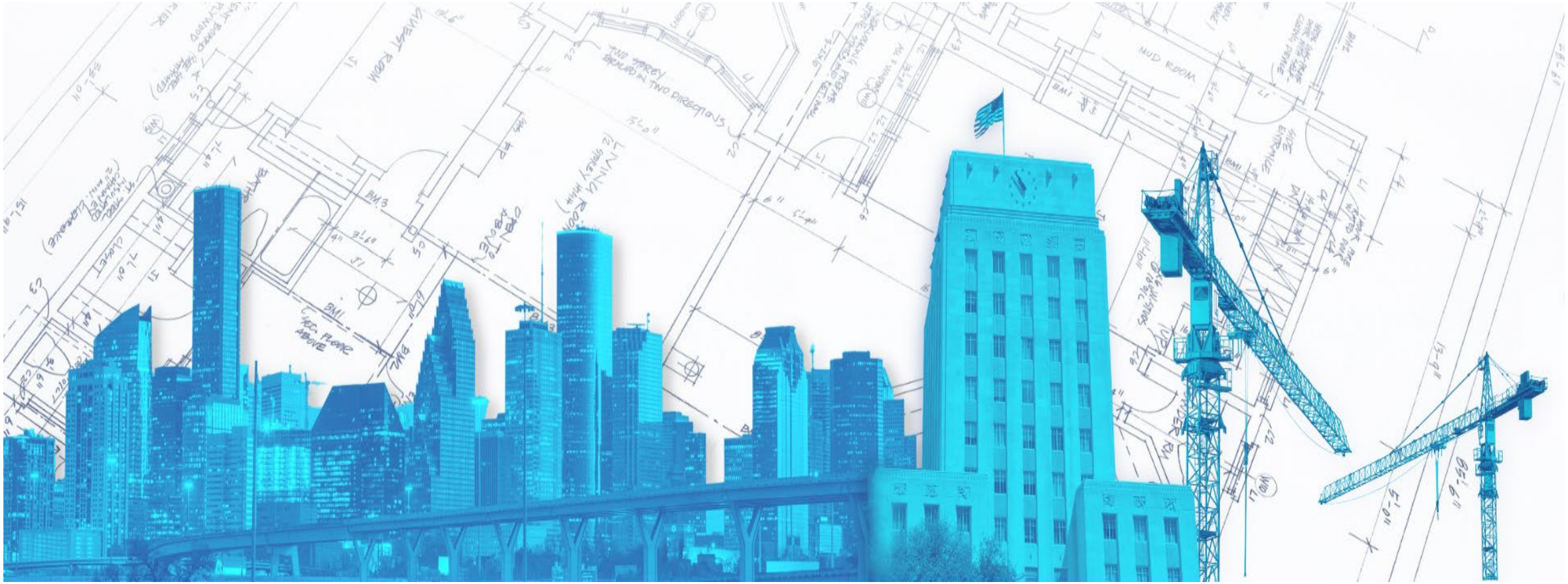
IBC CHAPTER 17 SPECIAL INSPECTIONS AND TESTS



MASS TIMBER SPECIAL INSPECTION 2021 IBC SECTION 1705.5.3 AND 1705.20

- Special inspection requirements have been added to address the anchorage and connection of mass timber structural elements

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 the 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

Connections Between Mass Timber Products that Utilize Threated, Bolted or Concealed Connections Require Special Inspection

Photo Courtesy of ATF Fire Research Laboratory

Sealant and Adhesive Specified to Resist the Passage of Air Require Special Inspection

Photo Courtesy of ATF Fire Research Laboratory

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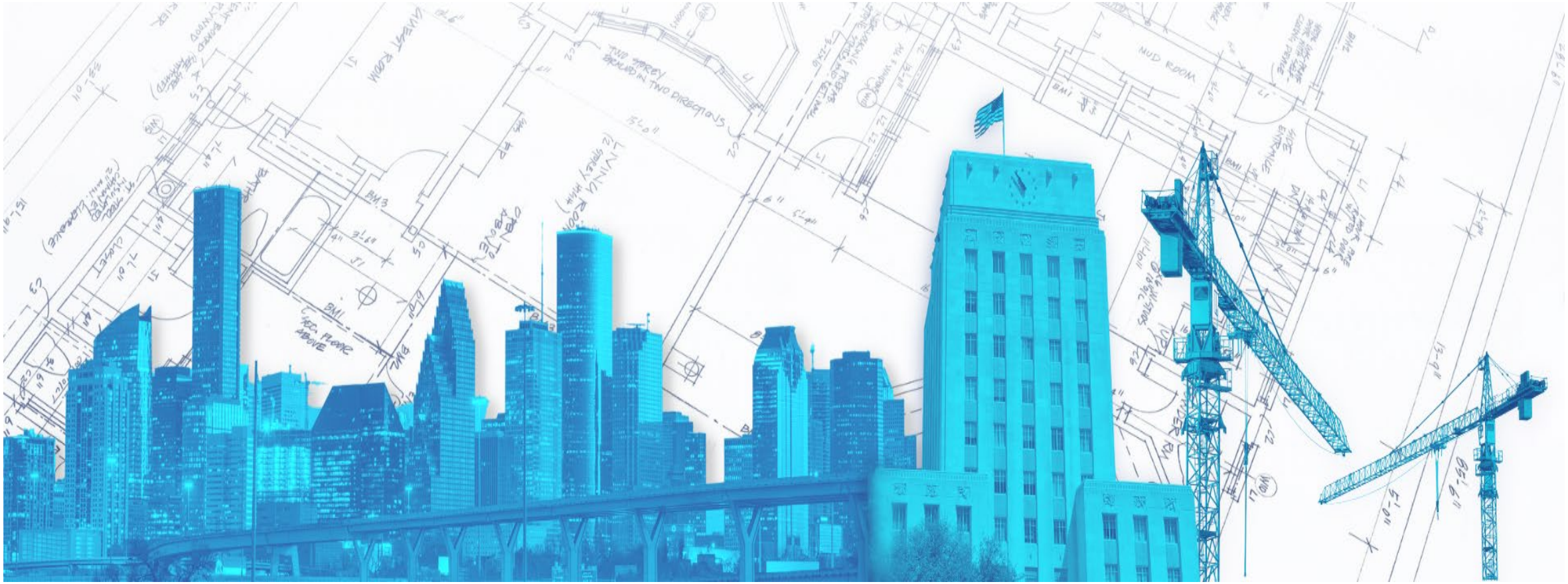
IBC CHAPTER 18 SOILS AND FOUNDATIONS



FROST PROTECTION AT REQUIRED EXITS
2021 IBC SECTION 1809.5.1

- Frost protection for egress doors has been added 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.

Frost Protection is Required in Front of a Swinging Door Only

Photo Courtesy of Bim

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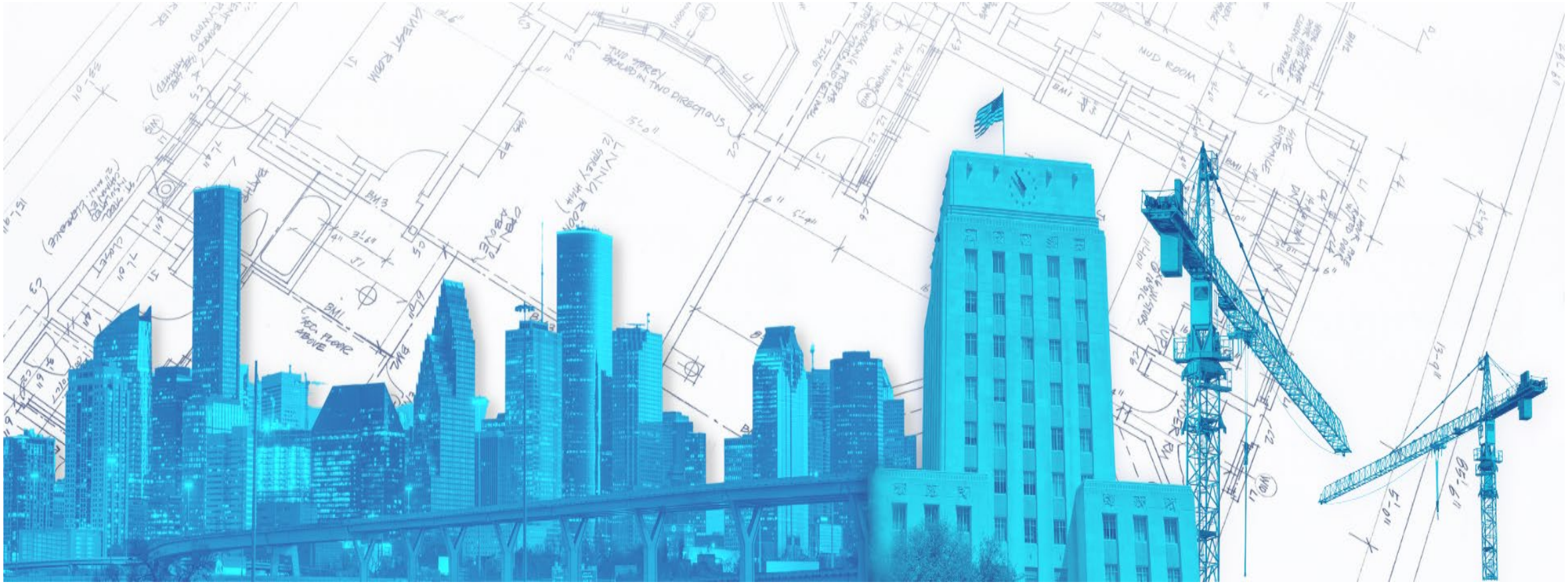
IBC CHAPTER 19 CONCRETE

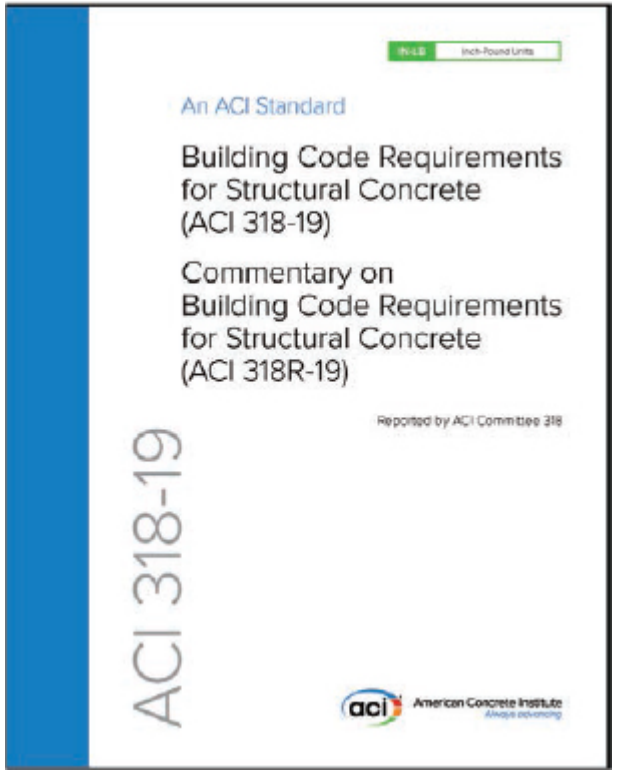


CONCRETE DESIGN AND CONSTRUCTION
2021 IBC SECTION 1901.2

- ACI 318 has been updated to the 2019 edition and includes changes addressing deep foundations, materials and seismic design.

1901.2 Plain and reinforced concrete. Structural concrete shall be designed and constructed in accordance with the requirements of this chapter and ACI 318 as amended in Section 1905 of this code…

Chapter 35
318—~~14~~19: Building Code Requirements for Structural Concrete



ACI 318-19 Requirements for Structural Concrete

Photo Courtesy of American Concrete Institute

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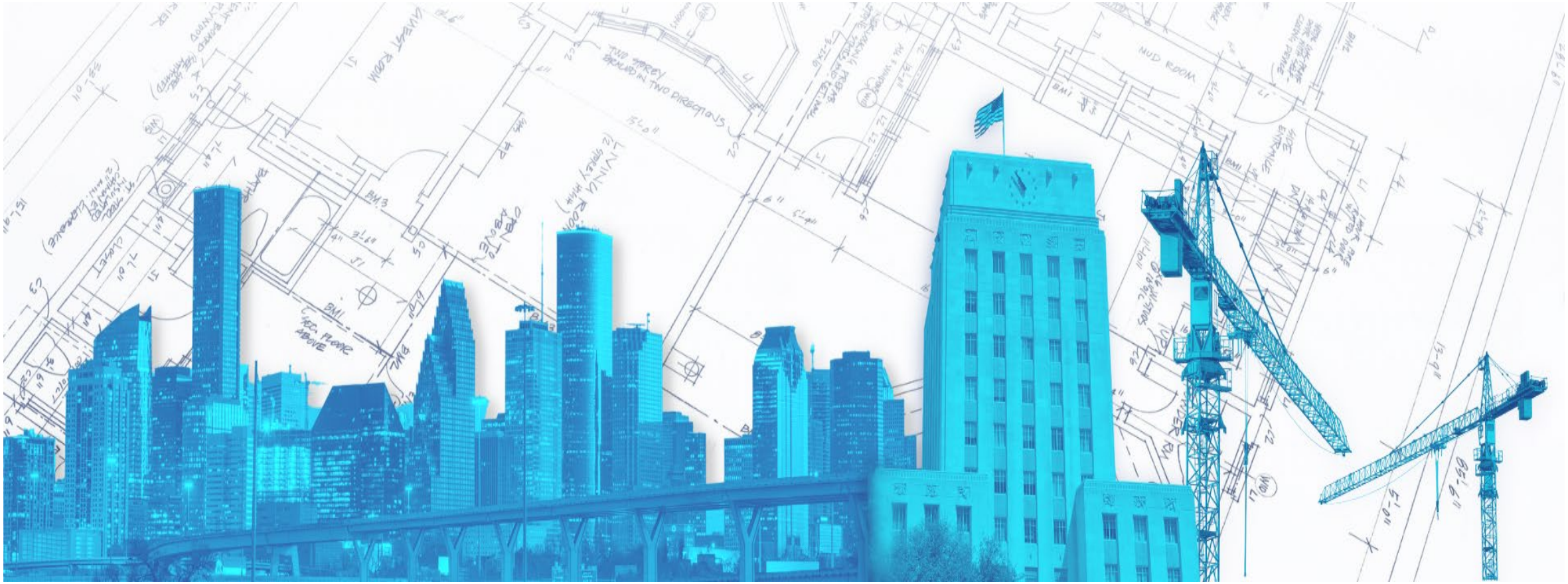
IBC CHAPTER 23 WOOD



WOOD TRUSS BRACING
2021 IBC SECTION 2303.4.1.2

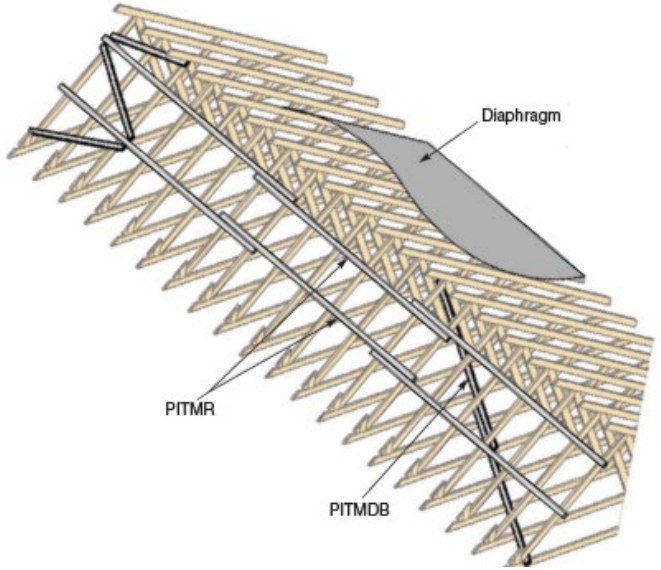
- Specific requirements have been added to address wood truss member diagonal bracing and restraint.

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.



PITMR and PITMDB for Truss Web Members Requiring Two Rows of PITMR

WOOD TRUSS BRACING
2021 IBC SECTION 2303.4.1.2 (CONTINUED)

- Specific requirements have been added to address wood truss member diagonal bracing and restraint.

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.

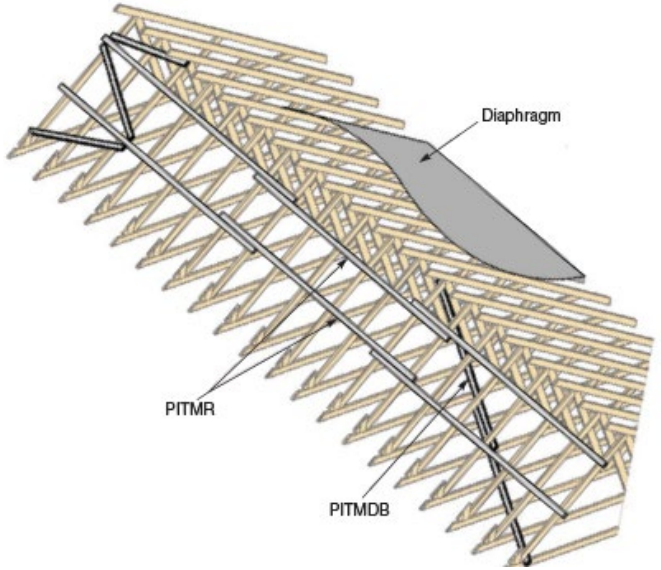
(Deleted text not shown for clarity)

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.

Permanent individual truss member diagonal bracing (PITMDB).

Structural member or assembly intended to permanently stabilize the PITMRs.

Individual truss member. A truss chord or truss web.



PITMR and PITMDB for Truss Web Members Requiring Two Rows of PITMR

MASS TIMBER CONNECTION PROTECTION
2021 IBC SECTION 2304.10.1

- In Type IV-A, IV-B and IV-C construction, 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 connected elements have been provided.

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.

Glulam Beam-to-Column Connection as Part of an Assembly Fire Test

Photo Courtesy of ATF Fire Research Laboratory

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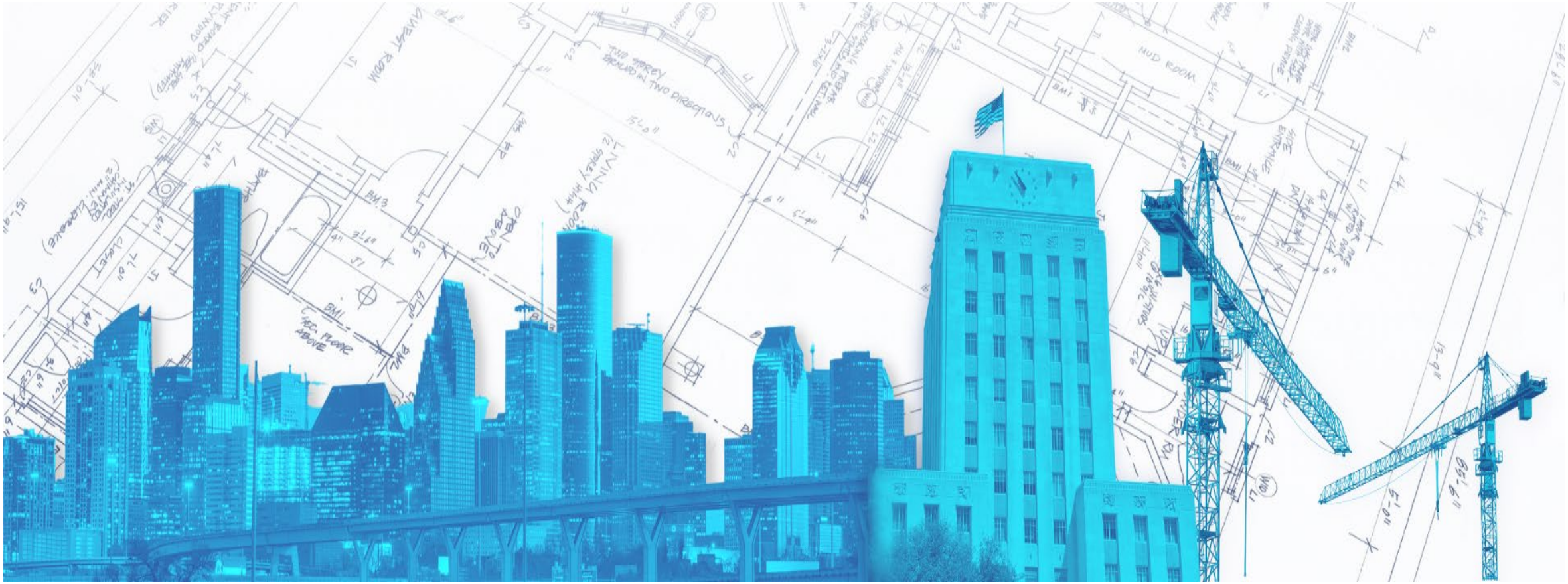
IBC CHAPTER 30 ELEVATORS AND CONVEYING SYSTEMS



EMERGENCY ELEVATOR COMMUNICATION SYSTEMS 2018 IBC 3001.2

- **New requirements for two-way communication systems for the deaf, hard of hearing and speech impaired (within elevator car).**
  - Visual and text-based and a video-based 24/7 live interactive system.
  - Fully accessible by the deaf, hard of hearing and speech impaired, and includes voice-only options for hearing individuals.
  - Has the ability to communicate with emergency personnel utilizing existing video conferencing technology, chat/text software or other approved technology.

EMERGENCY ELEVATOR COMMUNICATION SYSTEMS
2021 IBC 3001.2

Change Type: IBC 2021 – Modification

- **New requirements for two-way communication systems for the deaf, hard of hearing and speech impaired (within elevator car).**
  - Visible text and audible modes
    - Live interactive system between elevator and emergency personnel.
    - Is operational when elevator is operational.
    - Allows elevator occupants to select text-based or audible mode depending on their communication needs.

INTERMODAL SHIPPING CONTAINER

- **CHANGE TYPE: IBC 2021 - ADDITION**

  - **2021 IBC Section 202**
    - **Intermodal Shipping Containers:** A six-sided steel unit originally constructed as general cargo container used for transport of goods and materials.
  - **2021 IBC Section 3115**
    - The use of intermodal shipping containers as buildings and structures is now recognized by the IBC, and criteria has been established to address the minimum safety requirements.

Photo courtesy of RADCO, a Twining Company

Multi-level structure of intermodal shipping containers.

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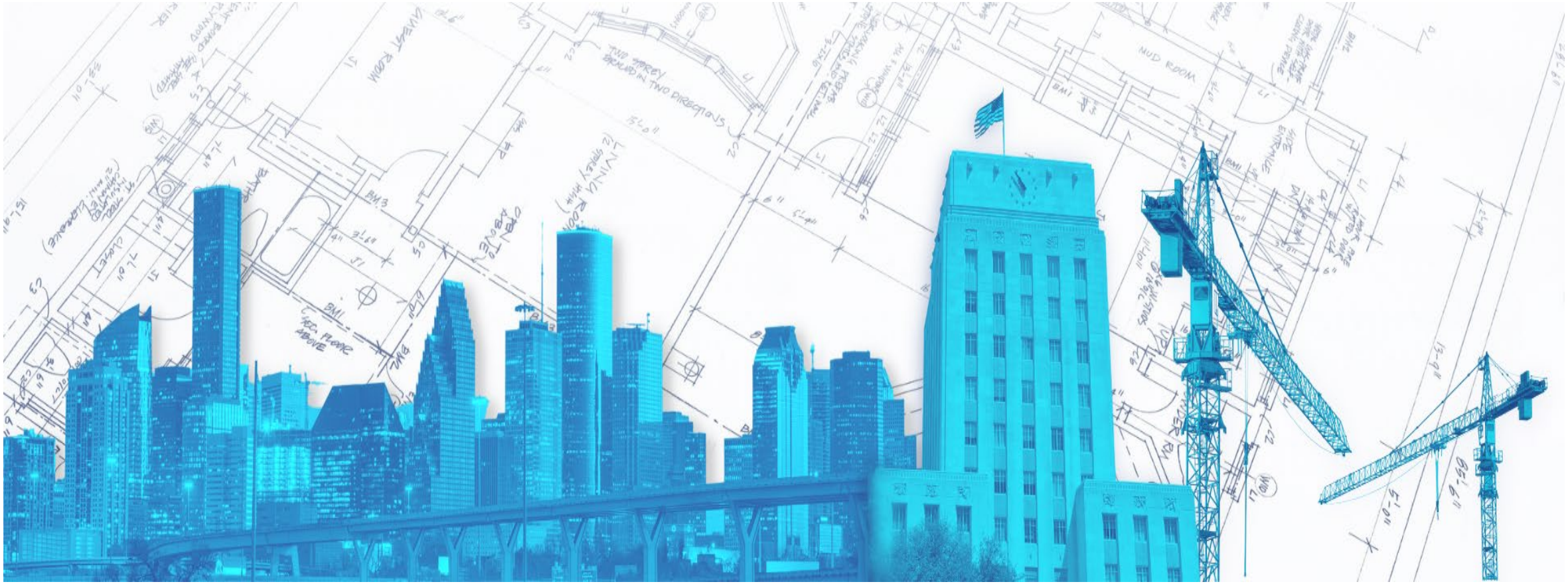
CHANGES TO 2021 CITY OF HOUSTON AMENDMENTS



2021 SIGNIFICANT AMENDMENT CHANGES – DRINKING FOUNTAINS

1. Removes outdated drinking fountain exceptions
2. Incorporates 2021 IPC language for drinking fountains
3. Allows for wider range of substitutions

DRINKING FOUNTAINS

Houston Amendment: definitions

- **DRINKING FOUNTAIN. A plumbing fixture that is connected to the potable water distribution system and the drainage system. The fixture allows the user to obtain a drink directly from a stream of flowing water without the use of any accessories.**
- **WATER COOLER. A drinking fountain that incorporates a means of reducing the temperature of the water supplied to it from the potable water distribution system.**
- **WATER DISPENSER. A plumbing fixture that is manually controlled by the user for the purpose of dispensing potable drinking water into a receptable such as a cup, glass or bottle. Such fixture is connected to the potable water distribution system of the premises.**

DRINKING FOUNTAINS

Houston Amendment: Requirements

- **BE] 2904.2.1 Minimum number. Not fewer than two drinking fountains shall be provided. One drinking fountain shall comply with the requirements for people who use a wheelchair and one drinking fountain shall comply with the requirements for standing persons.**
  - **Exceptions:**

1. **A single drinking fountain with two separate spouts that complies with the requirements for people who use a wheelchair and standing persons shall be permitted to be substituted for two separate drinking fountains.**
2. **Where drinking fountains are primarily for children's use, the drinking fountains for people using wheelchairs shall be permitted to comply with the children's provisions in ICC A117.1 and drinking fountains for standing children shall be permitted to provide the spout at 30 inches (762 mm) minimum above the floor.**

DRINKING FOUNTAINS

Houston Amendment: Requirements

- **[BE] 2904.2.2 More than the minimum number. Where more than the minimum number of drinking fountains specified in Section 2904.2.1 is provided, 50 percent of the total number of drinking fountains provided shall comply with the requirements for persons who use a wheelchair and 50 percent of the total number of drinking fountains provided shall comply with the requirements for standing persons.**
  - **Exceptions:**

1. **Where 50 percent of the drinking fountains yields a fraction, 50 percent shall be permitted to be rounded up or down, provided that the total number of drinking fountains complying with this section equals 100 percent of the drinking fountains.**
2. **Where drinking fountains are primarily for children's use, drinking fountains for people using wheelchairs shall be permitted to comply with the children's provisions in ICC A117.1 and drinking fountains for standing children shall be permitted to provide the spout at 30 inches (762 mm) minimum above the floor.**

DRINKING FOUNTAINS

Houston Amendment: Requirements

- **2904.3 Substitution. Where restaurants provide drinking water in a container free of charge, drinking fountains shall not be required in those restaurants. In other *occupancies* where three or more drinking fountains are required, *water dispensers* shall be permitted to be substituted for not more than 50 percent of the required number of drinking fountains.**
- **2904.4 Prohibited location. Drinking fountains, *water coolers* and *water dispensers* shall not be installed in *public* restrooms.**

2021 SIGNIFICANT AMENDMENT CHANGES – BREAK TANKS

1. Previous code required break tanks for any fire pump installation
2. Removes mandatory requirement for a break tank
3. Requires hydraulic calculations to determine if break tank is required

FIRE PUMPS AND BREAK TANKS

Houston Amendment: Change in use of break tanks

In summary, break tanks can still be used to separate potable water from fire pumps, but they are not required. An acceptable alternate is prescribed by NFPA 20 utilizing a backflow preventor. An amendment to provide a minimum 20 psi when using direction connection is added as well.

- **Deleted Amendment 901.9 requiring a break tank**
- **Added Amendment 913.1.1 for fire pump listing**
- **Added Amendment 913.1.2 for fire pump automatic operation**
- **Added Amendment 913.6 for minimum suction pressure**

FIRE PUMPS AND BREAK TANKS

Houston Amendment: New Language for pumps

913.1.1 Listing

- **Fire pumps shall be listed by FM Approvals, UL Solutions or other approved agency and shall not deliver less than the required flow and pressure in accordance with the listing.**

913.1.2 Automatic Operation.

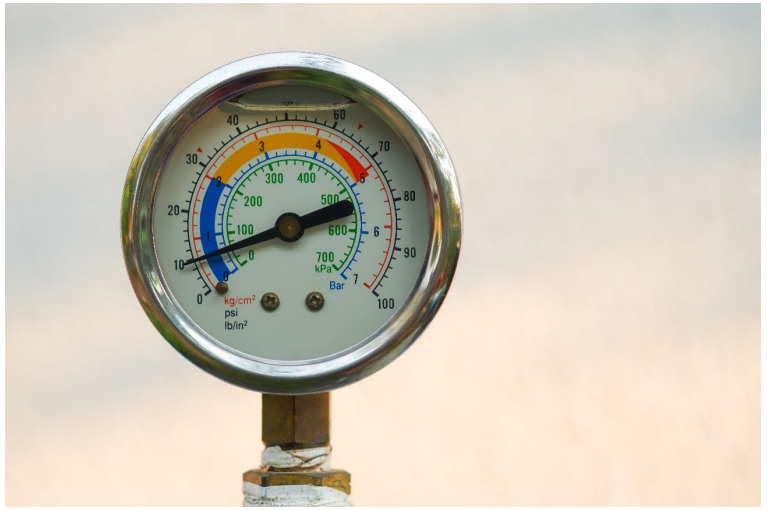
- **Fire pumps shall be automatic operation. (See the Electrical Code for additional requirements.)**

FIRE PUMPS AND BREAK TANKS

Houston Amendment: New Language for pumps

913.6 Minimum Suction Pressure

- **Fire pumps taking direct suction from the city water supply shall be designed such that the city water pressure does not drop to less than 20 psi at 150 percent of rated capacity of the selected pump. Where the public water supply is not adequate to meet the minimum suction pressure requirements, an alternative water supply shall be provided in accordance with Section 507.2. The tank size cannot be less than the full fire protection demand without the refill rate included unless it meets the requirements of a break tank per NFPA 22**

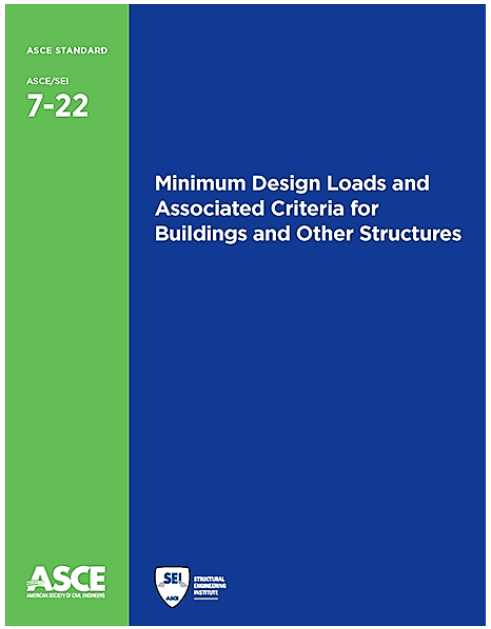


ASCE 7-22

Houston Amendment: 2022 reference for ASCE 7

Houston added an amendment to reference newer ASCE 7 requirements than what the base code referenced.

- **Supports new wind-loading requirements**
- **Supports new structural roof and framing requirements**
- **Supports flood control requirements**
- **Updated Risk Categories**



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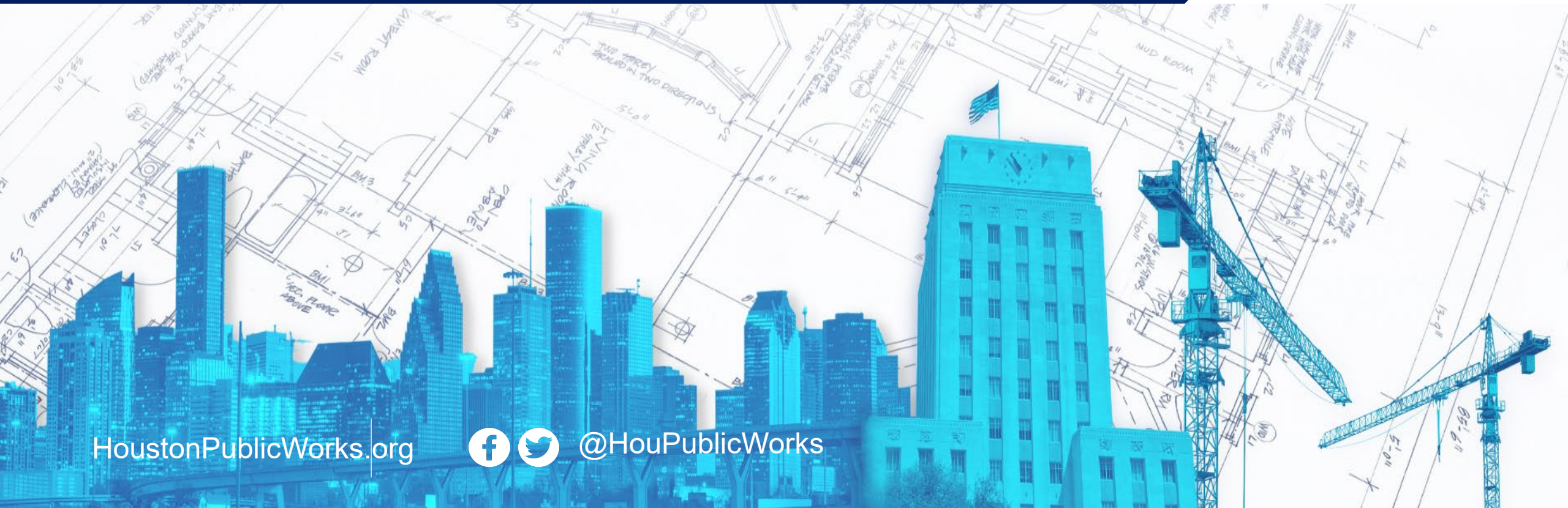
THANK YOU!



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