Introduction to the 2021 IBC, IRC and IFC

Selection of Topics

- The provisions addressed are based primarily on:
  - Frequency of application
  - Special significance
  - Change in application

The discussion is based upon the code changes approved in the 2018-2020 code change cycle.

Until the publication of the 2021 I-Codes, any code change information presented is limited to information currently available at this time.
### 110.3.6 Inspection of Weather-Exposed Balconies

- Scope of the required waterproofing inspection of balconies and similar elevated walking surfaces that are exposed to water has been modified.
- Waterproofing inspection is now specifically limited to surfaces that are "weather-exposed."
- Defined term "weather-exposed surfaces":
  - Is limited to water, snow and similar elements that are weather-related (deletes irrigation water).
  - Is prescriptively established as covered areas significantly set back from the edge of the overhead projection (in general, at least twice the clear height under the projection).

### 202 Definition of Change of Occupancy

- Change of occupancy now exists where there is any change in:
  - Occupancy classification (no different), or
  - Purpose or level of activity where code requires a greater degree of safety, accessibility, structural strength, life protection, means of egress, ventilation or sanitation than exists in current building (revised).
- Previously, a change in occupancy must occur if there was a change in application of the code requirements.
- Did not limit the areas of code addressed or that it only applied where a higher risk to life safety or occupant welfare occurred.
202 Definition of Mass Timber

- Mass timber is considered as structural elements of Type IV construction primarily of solid, built-up, panelized or engineered wood products that meet minimum cross-section dimensions.
- Single term represents both:
  - Heavy timber represented by Type IV-HT which includes various types of members and fire-resistance is based on minimum dimensions.
  - Mass timber used in new Types IV-A, IV-B and IV-C that must have a fire-resistance rating.
- Noncombustible protection addresses the passive fire protection required for mass timber.
- Mass timber may have its own rating or by combination with noncombustible materials.

202 Definition of Puzzle Room

- Puzzle room is a new defined term that is mostly commonly recognized as "escape room."
- Occupants are encouraged to solve a challenge to escape from a room or, more commonly, a series of rooms.
- Of particular importance is the recognition by the definition that a puzzle room is considered as a "special amusement area."
- Special amusement areas continue to be strictly regulated under provisions of Section 411.

306.2 Group F Occupancy Classification

- Two new items added to laundry list of Group F-1 occupancies.
- Energy storage systems (ESS) dedicated use buildings (in mixed-use buildings, ESS to be classified the same as major occupancy)
- Previously would often be Group H-2, however IFC requirements reduce potential hazards
- Water/sewer treatment plants
  - Typically contain materials in use that would warrant a Group H classification should MAQs be exceeded.
307.1.1 Uses Not Classified as Group H

- Two new items have been added to the list of uses that store, use and/or handle hazardous materials but are not be classified as Group H.
  - Distilling or brewing of beverages
  - Storage of beer, distilled spirits and wines in barrels and casks
- Removal of Group H status applicable regardless of alcohol content and quantity of liquid.
- IFC has added additional requirements to address hazards, including automatic sprinkler systems in Group F-1 and S-1 fire areas where such liquids are located.

311.2, 311.3 Alcohol Beverage Storage

- Storage of alcoholic beverages with over 16% alcohol content now classified as Group S-1 occupancy.
  - Previously not specifically addressed.
- Where alcohol content does not exceed 16%, classification continues to be Group S-2.
  - Limit that containers be only metal, glass or ceramic has been deleted to allow for wooden barrels and casks.
- IFC safeguards no longer warrant restriction to only noncombustible containers.

404.5 Smoke Control in Atriums

- New allowance to permit a combination vertical opening condition consisting of both an atrium and a shaft enclosure without the requirement for a smoke control system.
- Smoke control system not required for atriums connecting more than two stories where:
  - Only the two lowest stories permitted to be open to the atrium.
  - All stories above the lowest two stories to be separated from the atrium in accordance with shaft enclosure provisions.
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406.2.4 Floor Surfaces in Parking Garages

- Floor in vehicle areas of Group S-2 parking garages now required to be sloped.
- Allowance for no slope considered helpful in design of large garages constructed of prefabricated materials.
- Applicable to both open and enclosed garages.
- Allows for means to move damaging oils and deicing salts from floor surface to approved areas.

407.6.1 Automatic-Closing Doors in Group I-2

- In Group I-2, the closing of any automatic-closing doors on hold-open devices must now occur upon activation of fire alarm system or sprinkler system.
- Activation continues to also occur upon actuation of smoke detectors or loss of power to the hold-open device or smoke detector.
- Automatic-closing required in two situations:
  - Pair of opposite-swinging doors in smoke barrier wall across a corridor, and
  - Special-purpose horizontal sliding, accordion or folding doors installed in a smoke barrier.
- Modification provides compliance with Federal standards.

411.5 Puzzle Rooms

- Puzzle rooms now regulated as special amusement areas, requiring compliance with Section 411:
  - Classified as Group A or B, based upon occupant load.
  - Fire protection systems required, including:
    - Automatic sprinkler system
    - Automatic smoke detection system
    - Emergency voice/alarm communication system
  - Class A interior finishes.
  - Special exiting, including the following new provisions:
    - Per Chapter 10, or
    - Alternate design approved by building official, or
    - Exit to be open and readily available upon activation by fire alarm system, sprinkler system, or manual control at constantly attended location.
414.2.3 Use of Fire Walls for Control Areas

- For purposes of determining the number of control areas in a building, each portion separated by one or more fire walls shall be considered a separate building.
- Previously, the “separate building” allowance has been limited to allowable area, allowable height and type of construction.
- New allowance permits additional quantities of hazardous materials without classification as a Group H occupancy by increasing the number of control areas permitted in the structure.

424 Children’s Play Structures

- No longer limited to structures used solely by children such as climbing walls.
- New requirements for structures more than 600 square feet in area or more than 10 feet in height.
- Interior finishes per Table 603.13
- Designed in accordance with Chapter 16
- Special investigation to demonstrate adequate fire safety now required where area of play structure exceeds 600 square feet.
- Previously required when greater than 300 square feet in area.

Table 604.3 Allowable Building Height in Feet

- Limits to building height (in feet) have been developed for Types IV-A, IV-B and IV-C.
- Significant decreases where building is not sprinklered.
- Consistency between I and IVB.

<table>
<thead>
<tr>
<th>Building Height</th>
<th>Type IV-A</th>
<th>Type IV-B</th>
<th>Type IV-C</th>
<th>Type I-A</th>
<th>Type I-B</th>
<th>Type IV-HT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 15</td>
<td>170</td>
<td>170</td>
<td>170</td>
<td>180</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td>15 - 30</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>170</td>
<td>170</td>
<td>170</td>
</tr>
<tr>
<td>30 - 75</td>
<td>125</td>
<td>125</td>
<td>125</td>
<td>140</td>
<td>140</td>
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<td>75 - 120</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>140</td>
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<td>140</td>
</tr>
<tr>
<td>120 - 180</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>140</td>
<td>140</td>
<td>140</td>
</tr>
<tr>
<td>180 - 240</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>140</td>
<td>140</td>
<td>140</td>
</tr>
</tbody>
</table>
### Table 504.4 Allowable Building Height in Stories

- Limits to building height (in stories) have been developed for Types IV-A, IV-B and IV-C.
- Significant reductions in height in stories where building is not sprinklered.

<table>
<thead>
<tr>
<th>Building Type</th>
<th>Height Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV-A</td>
<td>18</td>
</tr>
<tr>
<td>IV-B</td>
<td>12</td>
</tr>
<tr>
<td>IV-C</td>
<td>6</td>
</tr>
<tr>
<td>IV-HT</td>
<td>4</td>
</tr>
</tbody>
</table>

### Table 506.2 Allowable Building Area

- Limits to building floor areas have been developed for Types IV-A, IV-B and IV-C.
- No unlimited area permitted for any of Type IV classifications.

<table>
<thead>
<tr>
<th>Building Type</th>
<th>Area Limit (k sq ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV-A</td>
<td>135k</td>
</tr>
<tr>
<td>IV-B</td>
<td>90k</td>
</tr>
<tr>
<td>IV-C</td>
<td>56.25k</td>
</tr>
<tr>
<td>IV-HT</td>
<td>46.5k</td>
</tr>
<tr>
<td>IV-HM</td>
<td>324k</td>
</tr>
<tr>
<td>IV-HR</td>
<td>216k</td>
</tr>
<tr>
<td>IV-DM</td>
<td>135k</td>
</tr>
<tr>
<td>IV-DR</td>
<td>112.5k</td>
</tr>
<tr>
<td>IV-MI</td>
<td>184.5k</td>
</tr>
<tr>
<td>IV-MR</td>
<td>123k</td>
</tr>
<tr>
<td>IV-RI</td>
<td>76.87k</td>
</tr>
<tr>
<td>IV-RT</td>
<td>72k</td>
</tr>
</tbody>
</table>

### 508.4.4, 509.4.1.1 Fire Separations of Mass Timber

- Mass timber elements used as fire barriers and horizontal assemblies for separating occupancies or incidental use areas to be protected with approved thermal barrier.
- Minimum ½-inch gypsum board, or material tested to NFPA 275 (Temperature and Integrity Fire Tests of thermal barriers).
- Only needs to cover exposed wood surfaces and does not add to fire-resistance rating of mass timber.
- Only required on incidental use side of separation, on both sides for occupancy separation.
508.5 Application of Live/Work Provisions

- Live work provisions formerly in Section 419 have been moved to Section 508 dealing with mixed occupancies.
- No change in technical requirements that allow for a single Group R-2 classification (which is only reason to apply the provision).
- Live-work use continues to not create a mixed occupancy condition.
- Provision should be considered as an exception to the mixed occupancy concept.

510.2 Stairway Construction in Podium Buildings

- Stairway construction in Type IA (lower) portion of podium buildings now permitted to be of combustible materials where two conditions exist:
  - Upper building is of Type III, IV or V construction, and
  - Stairway in lower building enclosed by minimum 2-hour fire-resistance-rated construction (shaft enclosure) with protected openings.
- Addresses confusion on how to address stairway construction that connects combustible and noncombustible portions of a podium building.

Table 601 Type IV Buildings

- Table 601 identifying minimum fire-resistance rating for building elements based on type of construction has been expanded to include new Type IV-A, IV-B and IV-C buildings.
- General comparison with Type IA (IV-A), Type IB (IV-B), and Type IA (IV-C).
- IV-C has higher required ratings for structural frame members, interior bearing walls and floors.
### 602.4 Type IV Construction

- Type IV A, B and C buildings can be constructed of mass timber and noncombustible materials.
- Required fire-resistance ratings can come from timber, noncombustible protection, or both.
- Protective material to be applied directly to the timber members.
- Assigned time determined per Section 703.8 and 722.7.
- Minimum timber member dimensions per Section 602.4 and 2304.11.
- Joint publication “Mass Timber Buildings and the IBC” by ICC and AWFC addressing all provisions for Type IV construction available soon.

### 602.4.1 - 602.4.3 Type IV Mass Timber

- Type IV-A construction mandates that faces of all timber members be protected with noncombustible materials.
- Noncombustible protection to contribute a time per Table 722.7(1), but not less than 80 minutes.
- Floor assembly to be protected with noncombustible material at least 1 inch thick on top.
- Type IV-B construction mandates similar protection, but only required on an established percentage of members.
- Some degree of exposed timber permitted.
- Type IV-C construction permits all timber members to be unprotected.
- All three types permit concealed spaces with limitations.

### 602.4.4 Type IV Heavy Timber

- Traditional Type IV now identified as Type IV-HT to differentiate from other mass timber buildings.
- All fire-resistance based on dimensions of timber members, prescriptive rather than performance.
- Limited changes in application, except that concealed spaces are now permitted for limited applications and:
  - Building is sprinklered throughout, including within concealed space, or
  - Concealed space is completely filled with noncombustible insulation, or
  - Surfaces within concealed space to be fully covered with minimum 5/8” Type X gypsum board.
1207 Enhanced Classroom Acoustics

- In Group E occupancies, enhanced classroom acoustics shall be provided in all classrooms having a volume of 20,000 cubic feet or less.
- Such acoustics to be in compliance with Section 808 of ICC A117.1, including regulation of:
  - Reverberation times based on either the performance method or prescriptive method
  - Ambient sound levels from sources both inside and outside of the classroom
- Good acoustics are essential to support language acquisitions and learning for all children.

1406.10 Metal Composite Material (MCM)

- Metal composite materials (MCM) and systems installed on buildings of Type I, II, III and IV construction are now regulated based upon one of two conditions:
  - Such installations that are over 40 feet above grade plane must comply with:
    - Surface-burning characteristics
    - Thermal barrier separation
    - Acceptance criteria of NFPA 285
  - Such installations that do not exceed 40 feet above grade plane must comply with:
    - Compliance with acceptance criteria of NFPA 285
- Modification addresses any confusion in the various requirements, as well as eliminating allowances previously provided where building is sprinklered.

Table 1604.5 Public Assembly Spaces in Risk Category III

- Risk Category III has been assigned to those buildings whose primary occupancy is not public assembly, but have one or more public assembly spaces with an occupant load exceeding 300 and a cumulative occupant load of such assembly spaces that exceeds 2,500.
- Example would be a hotel with significant conference facilities and/or ballrooms which has been previously regulated as Risk Category II
- Eliminates inconsistency in risks associated with large assembly spaces.
1704.6 Structural Observations in Risk Category III

- Two new classes of structures are now required to be provided with structural observation:
  - Structures classified as Risk Category III (previously limited only to RC IV structures), and
  - Structures in SDC E that are more than two stories above grade plane (no previous requirement based upon SDC).
- Recognizes substantial hazards that may be present in facilities considered as RC III structures, as well as those structural hazards involving multi-story structures in SDC E.

1705.3 Special Inspection of Mass Timber Buildings

- Special inspection requirements for anchorage and connection of mass timber structural elements have been added.
- All inspections need only be periodic inspections, except for adhesive anchors installed in horizontal or upwardly inclined orientation to resist sustained tension loads which shall be continuous.
- Required in Type IV-A, IV-B and IV-C construction.
- Periodic special inspection also required for sealants and adhesives that are part of a fire-resistance-rated assembly.

1809.5.1 Frost Protection at Required Exits

- Frost protection to be provided at exterior landings of all required exits utilizing outward swinging doors.
- Extent of protection need only extend enough to ensure the unobstructed opening of the required exit doors.
- Protection helps prevent concrete landings from heaving and interfering with swing of exit door.
1901.7 Tolerances in Concrete Construction

- Two new standards have been added by reference to address allowable tolerances for concrete construction:
  - ACI 117-10 Specification for Tolerances for Concrete Construction and Materials
  - ACI ITG-7-09 Specification for Tolerances for Precast Concrete
- Tolerances to be limited by applicable standard only where not indicated in the construction documents.

2304.10.1 Connection Fire-Resistance in Mass Timber Buildings

- Fire-resistance ratings for connections in Type IV-A, IV-B and IV-C construction shall be determined by one of the following methods:
  - Testing per Section 703.2 where the connection is a part of the test
  - Engineering analysis addressing temperature rise at any port of the connection
    - Limit of 250 degrees average
    - Limit of 325 degrees maximum

Chapter 29

- Provisions have been clarified for minimum toilet facilities, including:
  - Single-user, family and assisted-use facilities shall be identified as available for use by all persons regardless of their sex
  - Separate facilities not required where rooms having both water closets and lavatory fixtures are designed for use by both sexes
  - Water closet privacy provided per IPC, and
  - Urinals, where provided, to be in an area visually separated or each urinal located in a stall.
3114 Intermodal Shipping Containers

- Use of shipping containers as buildings and structures now addressed in code.
- Previously, approval based on Section 104.11 addressing alternate methods and materials.
- ICC GS-2019 Guideline for the Safe Use of ISO Intermodal Shipping Containers Repurposed as Buildings and Building Components
- Evaluation Reports
- Provisions intended to supplement existing applicable IBC requirements, including:
  - Inspection by approved agency
  - Verification of data plate
  - Method of structural design (detailed design procedure or simplified method for single units)

Appendix B Board of Appeals

- New and expanded criteria for board of appeals as established in Section 113, including detailed provisions dealing with:
  - Application process
  - Board membership
  - Board meetings
- As with all appendix chapters, only applicable where specifically adopted by jurisdiction.

Appendix O Application of ICC Performance Code

- New appendix chapter containing administrative provisions excerpted from ICCPC.
- Intended to serve as starting point for formulation of an effective submittal and review process under IBC allowance for alternate methods, materials and designs.
- Also can assist in evaluating a rational analysis, such as Section 909 (smoke control systems).
- No new code requirements are involved, just an optional design, review and approval framework.
- Jurisdiction may:
  - Adopt appendix as written, or
  - Adopt with local amendments, or
  - Use as a guideline on a case-by-case basis.
320 Additive Manufacturing

- New code section to address hazards associated with “3D printing” process.
- IFC now addresses two types of printing:
  - Powder feed/dust collection from external equipment
  - Self-contained equipment (non-industrial)
- Non-industrial 3D printers:
  - To be listed and labeled per UL 60950-1 or 62368-1
  - Are permitted in all occupancy groups
- Industrial 3D printers require permits and are:
  - To be listed and labeled per UL 2011
  - Regulated for combustible dusts and metals, powder evaluation and ancillary equipment
  - Only allowed in occupancies associated with manufacturing operation w/ permitted MAQs

508.1 Fire Command Centers in Group F-1 and S-1 Occupancies

- Fire command centers complying with Section 508 now also required in all Group F-1 and S-1 occupancies with building footprint exceeding 500,000 sf.
- Minimum room size to be 96 sf with minimum dimension of 8 feet.
- Room to be identified with permanent signage indicating “Fire Command Center”.
603.3 Fuel Oil Storage for Building Heating Systems
• Clarifies that provisions are only applicable to fuel oil storage for building heating systems, not for generators or fire pumps.
• Provisions address both installation and maintenance.
• Identifies appropriate standards to be applied.
• Adds additional alternative standards for tank compliance.
• Correlates with definitions of containers (60 gallons or less) and tanks (more than 60 gallons).
• Previous threshold was 55 gallons.

703.2, 704.2 Repair of Fire-Resistant-Rated Construction
• When fire-resistance-rated protection has been damaged it needs to be repaired, not simply maintained.
• Materials used to replace or restore penetrations, joints and voids shall meet or exceed the code requirements applicable when the assembly was constructed, remodeled or altered.

708 Maintenance of Spray-Applied Fireproofing
• Now specifically requires maintenance of spray-applied fireproofing and intumescent fire-resistant coatings.
• Where such fireproofing and coatings were required when building was permitted and constructed, such materials to be visually inspected to verify that they do not exhibit exposure to the substrate.
807 Outdoor Artificial Decorative Vegetation

- Regulations addressing outdoor artificial decorative vegetation added to those for interior finishes, decorative materials and furnishings.
- Recognizes concerns with outdoor occupancies with large numbers of people, including occupied rooftops and outdoor stadiums.
- Decorative vegetation regulated for:
  - Testing (Method 1 or 2 of NFPA 701)
  - Electrical fixtures and wiring: no unlisted electrical wiring and lighting; no electrical wiring and lighting permitted on metal artificial trees.
  - Ignition sources (per IFC 808.4 and 808.5)

808.5 Play Structures

- Where play structures that exceed 10 feet in height or 150 feet in area are added inside an existing building, such structures to comply with IBC Section 424.
- Formerly limited in the IBC to children’s play structures, the provisions now apply regardless of the ages of the participants.
- Primary concern is the very large amounts of heat that are released when the structures burn.

903.2 Sprinklers and Upholstered Furniture/Mattresses

- Sprinkler requirements for Groups F-1, M and S-1 where upholstered furniture or mattresses are manufactured, sold or stored have been clarified to establish scope of provision.
- Area threshold now based on size of fire area, not that of total occupancy.
- Where threshold exceeded, sprinkler need only be provided in fire area and not throughout building.
- In addition, new exception indicates that one-story Group S-1 self-storage facilities are exempt from 2,500 sq ft threshold where all storage spaces can be accessed directly from exterior.
903.2.10 Sprinklers and Open Parking Garages

- Sprinklers now required in Group S-2 open parking garages where any fire area exceeds 48,000 sf.
- Sprinkler protection to extend to entire garage
- Concern was based on increased use of plastics and lightweight materials in vehicles, as well as types of fuels being utilized.
- Increase in fuel load plus recognition of a fire that occurred in a parking garage in Liverpool, England in late 2017 provided justification for new requirement.

903.2.4.2, 903.2.9.3 Sprinklers and Distilled Spirits Manufacture and Storage

- New requirement for sprinkler systems throughout Group F-1 and S-1 fire areas used for the manufacture or bulk storage of distilled spirits (and wine in Group S-1) is part of a series of changes in IBC and IFC addressing alcoholic beverage manufacture and storage.
- Other changes provided additional safeguards such that these types of uses are not to be classified as Group H.
- The threshold for classification is 16% alcohol content:
  - Not more than 16%: Groups F-2 and S-2
  - Over 16%: Groups F-1 and S-1

903.3.1.2 Scope of Use for NFPA 13R Sprinkler Systems

- Scoping for the permitted use of an NFPA 13R sprinkler system in Group R occupancies has been modified such that the following three conditions must be met by the Group R to allow for use of 13R system:
  - Located no more than 4 stories above grade plane, and
  - Floor level of highest story no more than 20 feet above lowest level (or lowest story below highest level) of fire department vehicle access. (previously 60 feet above grade plane)
  - In addition, the story limit of four is to be measured from grade plane in podium buildings (Sec. 510.2 and 510.4) rather than from the horizontal assembly separating the buildings.
903.3.1.2.2 13R Sprinkler Protection of Corridors and Exterior Exit Balconies

- In Group R buildings where NFPA 13R sprinkler system is provided, sprinkler protection shall extend to corridors and balconies in means of egress where any of the following conditions apply:
  - Corridors with combustible walls or floors
  - Corridors with interior change of direction exceeding 45 degrees
  - Corridors that are less than 50% open to the outside atmosphere at the ends
  - Open-ended corridors and associated exterior stairways per Section 1027.6, Exception 3
  - Egress balconies not in compliance with Sections 1021.2 (wall separation) and 1021.3 (openness)

1006.3.4 Travel Limits in Single-Exit Buildings

- In the determination of the minimum required number of exits or exit access doorways, unoccupied mechanical rooms and penthouses are no longer required to comply with the common path limitations.
- Such spaces will now typically be permitted to have a single means of egress due to the low occupant loads anticipated.
- Exit access travel distance limits set forth in Table 1017.2 will continue to apply.

1008.2.1 Stairway Illumination

- Exit stairways, exit access stairways and their associated landings must now have an illumination level under normal power of at least 10 footcandles.
- Measured at the walking surface
- Not applicable to stairs in exit discharge
- Required only when stairway is in use, allowing for occupant-sensor or daylight-responsive controls
- Exceptions for auditoriums, theaters and similar assembly occupancies still applicable
- Considered as an easily accomplished means for improving stairway safety
1009.2.1 Accessible Means of Egress from Occupied Roofs

Where an occupied roof is four or more stories above the level of exit discharge, at least one required accessible means of egress shall be a complying elevator.

Clarifies that the occupied roof is to be considered when determining if an elevator is to comply as an accessible means of egress.

1010.1.1 Maximum Door Leaf Size

The requirement limiting the maximum leaf size of a swinging egress door has been removed from the IBC. Previously, such door leaves were limited to 48 inches in width. The provision was primarily established due to the weight issues with larger doors, often resulting in the need for greater maintenance to maintain:

- Proper functioning
- Reasonable opening effort

It was determined that the maximum force provisions will continue to provide for complying swinging doors. In addition, the deletion now allows for wider doors where they may be needed, such as in hospitals.

1010.2.4 Locking Devices at Occupied Exterior Areas That Egress Through Building

New conditions have been identified where locks and latches are permitted to prevent the operation of egress doors:

- Locking devices permitted on doors to balconies, decks or other exterior spaces:
  - Serving an individual dwelling or sleeping unit
  - Serving a private office space, provided the exterior space does not exceed 250 sf

- For other than egress courts, where occupants must egress from an exterior space through the building, exit access doors are permitted to be equipped with an approved locking device where appropriately installed and operated.
1010.2.4 Locking Devices at Occupied Exterior Areas That Egress Through Building

- The following six conditions must be met in order for the locking devices to be permitted:
  - Maximum occupant load posted per Section 1004.9
  - Weatherproof telephone or two-way communication system installed
  - Locking device to be key-operated and readily distinguishable as locked
  - Minimum 5 sq ft clear window or glazed door opening provided at each exit access door
  - Signage posted on interior side at each locked door stating "THIS DOOR TO REMAIN UNLOCKED WHEN THE OUTDOOR AREA IS OCCUPIED"
  - Occupant load of exterior area limited to 300

1010.2.8 Locking Arrangements in Educational Occupancies

- The allowance for special locking arrangements in Group B educational occupancies and Group E occupancies has been extended to Group I-4.
- This new rule makes the IBC consistent with the IFC.
- In addition, it has been clarified that the remote operation of such locks (both locking and unlocking operations) is permitted in addition to the "unlocking from outside the room" option.
- Operations can be from main office, security office, or even a remote fob given to staff.
- Does not modify or override egress capabilities requiring being "openable from the inside without the use of a key, special effort or special knowledge.

1016.2 Egress Through Elevator Lobbies

- Egress through an enclosed elevator lobby now permitted for spaces having a single means of egress.
- Previous language mandated that access to not less than one of required exits to be provided without travel through an enclosed elevator lobby.
- Such requirement still applicable to spaces where two or more means of egress are required.
1019.3 Limits on Exit Access Stairways

- The allowance for exit access stairways and ramps to serve or atmospherically communicate between two stories has been clarified to limit such communication to adjacent stories.
- The change more clearly indicates the intent that such connection only address those stories that are directly adjacent to each other.

1030.16 Handrails on “Social Stairs”

- Guidance has been provided to address handrails on those stairs, primarily in assembly and educational occupancies, that are a combination of stairway travel and assembly seating.
- Based on the assembly stepped aisle provisions, the condition is viewed as an assembly seating area with the seating platforms (without seats) located to the side of the stepped aisle.
- Where the stepped aisle has seating on one side and the aisle width is at least 74 inches, two handrails are required (with at least one within 30 inches of the stepped aisle).
- Where the stepped aisle is required to have two handrails, the mid-aisle handrails shall be discontinuous.

1031 Emergency Escape and Rescue Openings

- The provisions for emergency escape and rescue openings have been reorganized and reformatted for clarity purposes.
- Two slight modifications occurred:
  - Where a door is used as an EERO, it must be a sliding door or a swinging door.
  - Where steps are used from a window well serving an EERO, they must be at least 12 inches wide, have treads more than 5 inches in depth, and have a maximum riser height of 18 inches for the full height of the area wall.
1103.4 Sprinklers in Existing High-Rise Buildings

Where Appendix M (Sprinkler Retrofit of High-Rise Buildings) has not been adopted, existing high-rise buildings w/o previously approved sprinkler system to be provided with automatic sprinkler system where the high-rise building has:

- Occupied floor located more than 120 feet above lowest level of fire department vehicle access, OR
- Occupied floor > 75 feet and < 120 feet and does not have:
  - At least two 2-hour interior exit stairways, OR
  - A fire alarm system that includes smoke detection in equipment rooms, corridors, elevator lobbies and stairway enclosure doors.

Building owners shall file a compliance schedule within one year after receipt of written notice.

Compliance schedule shall not exceed 12 years for completion of sprinkler retrofit.

1103.7.5.1 Manual Fire Alarm Systems in Existing Group R-1 Hotels and Motels

A manual fire alarm system now required in existing nonsprinklered Group R-1 hotels and motels more than one story in height.

Previously only required in nonsprinklered Group R-1 occupancies more than one story or having more than 20 occupants.

Intended to address those older multi-story hotels that were not required to have fire alarm systems.

Multiple fire fatalities and injuries have occurred recently in such structures.

New exception for sprinklered buildings not more than 3 stories and not more than 20 sleeping units.
1103.7.5.1 Manual Fire Alarm Systems in Existing Group R-1 Hotels and Motels

Fire Alarm System Required in Existing Group R-1 Hotels and Motels

Fire Alarm System Required in Existing Group R-1 Hotels and Motels

1204 Portable Generators

- Use, operation and maintenance of portable generators now regulated, including provisions dealing with:
  - When manufactured after 1/1/21, listing per UL2201
  - Operation and maintenance
  - Grounding
  - Operation only outdoors at least 5 feet from building openings or air intakes
  - Cords and wiring, including GFCI protection
  - Portable fire extinguisher with minimum 2-A:20-B:C rating within 50 feet of generator

1206 Energy Storage Systems

- Substantial rewrite, update, expansion and clarification of energy storage systems (ESS) requirements established in 2018 IFC.
- While a major step addressing modern ESS technologies, the provisions were limited in ability to address different installations, each with their own risks and exposures.
- Many basic protection concepts have been retained, while now also providing customized requirements.
### Chapter 22 Combustible Dust Explosion Prevention
- Provisions for combustible dust have been expanded to provide more information for inspectors in field to evaluate and address hazards.
- Previous standards continue to be embedded in provisions, however additional guidelines are now included to mitigate dust accumulation and sources of ignition.
- New guidelines are also provided to address housekeeping, employee training and operational procedures.

### 2308.2 Residential Vehicle Fueling Appliances
- Provisions have been expanded to deal with motor fuel-dispensing facilities for compressed natural gas (CNG) fuel.
- Two standards have been referenced to cover design, installation, labeling and other requirements for the two classes of appliances now regulated:
  - Residential fueling appliance (RFA)
  - Light-commercial vehicle fueling appliance (VFA)
- RFA coverage already addressed in IFGC, now VFA coverage is also regulated in IFGC and IFC.

### 2404.3.3.6 Maximum Spray Booth Area
- Area of individual spray booths no longer specifically limited (aggregate area continues to be limited).
- Previously could not exceed lesser of aggregate limit or 1,500 sf.
- Reasoning behind changes included:
  - Previous limit did not recognize that safety ventilation increases as amount of material being sprayed increases.
  - In addition, amount of paint stored within booth does not increase with size.
- Provides consistency with NFPA 33.
2810 Outdoor Pallet Storage

- Change addresses previous inadvertent errors that occurred in the required separation between wood pallet stacks and the exterior wall of a building.
- Several distances were reversed in 2018 IFC Table 315.7.6(1) that required a lesser distance for a greater number of pallets.
- Several edits were also made to the text for clarity and formatting.

3209.4 Shutdown of Automated Rack Storage

- Several modifications have been made to provisions regulating the emergency shutdown of automated racks used for high-piled combustible storage.
- In addition to previous requirement for a manual activated shutdown switch, an automatic shutdown process is now mandated for automated storage areas exceeding 500 sf.
- Automatic shutdown process to commence upon:
  - Water flow in sprinkler system, if present, or
  - Activation of fire detection system, if present.

3308.4 Fire Safety During Type IV-A, IV-B, and IV-C Construction

- Fire safety requirements have been established for mass timber buildings under construction.
- Where such Type IV-A, B and C buildings are more than six stories above grade plane:
  - Standpipes to be provided per Section 3313
  - Water supply to be provided per Section 3312
  - Where construction exceeds six stories above grade plane:
    - Minimum one layer of noncombustible protection per IBC to be installed on all building elements and required exterior wall coverings more than 4 floor levels below active mass timber construction before erecting additional floor levels.
3312 Fire Flow During Construction

- Fire flow now to be provided as soon as combustible building materials arrive at site, and further be provided prior to vertical construction.
- Little guidance has previously been available with respect to providing water supply during construction.
- Lack of a reliable and sufficient water supply has been cause for extensive damage in recent construction fires.
- In addition, water supply infrastructure is not always constructed prior to vertical construction.
- New provisions do not require any additional water supply than already required by Appendix B.
- Typically, minimum fire flow of 500 gpm required.

Chapter 40 Storage of Distilled Spirits and Wine

- New Chapter 40 has been created to bring together those requirements specific to the storage of distilled spirits and wines.
- Along with other modifications throughout the IFC, the emphasis was placed on regulations that would eliminate the need for a classification of Group H.
- Chapter 40 addresses:
  - Precautions against fire, such as spill control, ventilation and sources of ignition
  - Limitations on storage in basements and bulk storage
  - Fire protection, including sprinklers and portable fire extinguishers
  - Signage

5606.6 Commercial Reloading of Small Arms Ammunition

- Change not intended to limit commercial loading and reloading, but rather to provide safety measures to ensure hazards are properly mitigated.
- Due to similar hazards in classification of fireworks, similar language is utilized.
- Issues addressed include:
  - Electrical classification
  - Exhaust fans
  - Separation of work stations
  - Limits on personnel
  - Approved containers
  - Static controls
  - Waste disposal
R102.7.1 Additions, Alterations or Repairs

- 2021 Code: R102.7.1 Additions, alterations or repairs. Additions, alterations or repairs to any structure shall conform to the requirements for a new structure without requiring the existing structure to comply with the requirements of this code, unless otherwise stated. Additions, alterations, repairs and renovations shall not cause an existing structure or building element to fail to perform after the renovation is complete at least as well as it performed after the building was originally constructed or structure was put in its original condition of repair. An existing building together with its additions, alterations, repairs and renovations shall be able to withstand the forces and conditions for which it was designed. Where the alteration causes the use or occupancy to be changed to one not within the scope of this code, the provisions of the International Existing Building Code shall apply.

R202 Definitions

- Grade Floor Emergency Escape and Rescue Opening

- GRADE FLOOR EMERGENCY ESCAPE AND RESCUE OPENING: A window or other opening located such that the finished floor at the opening is less than 44 inches (1118 mm) above finished grade. The sill height shall be measured from the finished grade level to the bottom of the clear opening (see also "Emergency escape and rescue opening").
R202 Definitions

- **Townhouse**
  - **TOWNHOUSE.** A single-family dwelling unit constructed in a group of building that contains three or more attached houses or units, each of which contains at least one full story between floor and ceiling that are separated from the other elements of the group by permanently separated walls and floors that are separated from the public way by a fence or other means of separation.

- **Townhouse Unit**
  - **TOWNHOUSE UNIT.** A single-family dwelling unit in a townhouse that extends from foundation to roof and that has a yard or public way on not less than two sides.

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Figure R301.2(5)A Ultimate Design Wind Speeds

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R301.2.2.6 Irregular buildings

1. **Hillside Light-Frame Construction.** Conditions in which all of the following apply:
   - The grade slope exceeds 1 vertical in 5 horizontal where averaged across the full length of any side of the dwelling, and
   - The tallest cripple wall clear height exceeds 7’-0”, or where a post and beam system occurs at the dwelling perimeter, the post and beam system clear height exceeds 7’-0”.
   - Of the total plan area below the lowest framed floor, whether open or enclosed, less than 50% is living space having interior wall finishes conforming to Section R702.

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28
Common walls separating townhouses shall be assigned a fire resistance rating in accordance with Item 1 or 2, and installed in accordance with Sections R302.2.3 through R302.2.5. Common walls shall extend to and be tight against the exterior sheathing on the exterior walls of the building, and minus any joint, seal or cavity, and the underside of the roof sheathing. The common wall shall be constructed so that it will not permit the passage of fire, including smoke, from one townhouse to another.

The common wall shared by two townhouses shall be constructed without plumbing or mechanical equipment, ducts or vents, other than water-filled fire sprinkler piping, in the cavity of the common wall. The wall shall be rated for fire exposure from both sides and shall extend to and be tight against exterior walls and the underside of the roof sheathing. Electrical installations shall be in accordance with Chapters 34 through 43. Penetrations of the membrane of common walls for electrical outlet boxes shall be in accordance with Section R302.4.

Exception: Common walls are permitted to extend to and be tight against the interior of the exterior walls if the cavity between the end of the common wall and the exterior sheathing is filled left a minimum of two inches nominal thickness wood studs.
R302.3 Two-Family Dwellings

2021 Code: R302.3 Two-family dwellings. Dwelling units in two-family dwellings shall be separated from each other by wall and floor assemblies having a fire resistance rating of at least one hour in accordance with Section 703.3 of the International Building Code. Such separation shall be provided regardless of whether a lot line exists between the two dwelling units or not. Wall and floor assemblies shall be tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code. Wall assemblies shall extend from the foundation to the underside of the roof sheathing.

Exceptions:
1. A 1/2-hour fire resistance rating shall be permitted in buildings equipped throughout with an automatic fire sprinkler system in accordance with Section 804.2.2.10 of the International Building Code.

R302.4.1 Through Penetrations

• Exceptions:
  • 2. The annular space created by the penetration of water-filled fire sprinkler piping shall be filled with a material complying with R302.4.2 Membrane penetrations. Membrane penetrations shall comply with Section R302.4.1. Where walls are required to have a fire resistance rating, recessed fixtures shall be installed so that the required fire resistance rating will not be reduced.

R302.5.1 Opening Protection

2021 Code: R302.5.1 Opening protection. Openings from a private garage directly into a room used for sleeping purposes shall not be permitted. Other openings between the garage and residence shall be equipped with solid wood doors not less than 1 3/8 inches (35 mm) thick, solid or honeycomb-core steel doors not less than 1 3/8 inches (35 mm) thick, or 20-minute fire-rated doors. Doors shall be self-latching and equipped with a self-closing or an automatically closing device.
R303.1 Habitable Rooms

Exceptions:

1. For habitable rooms other than kitchens, the glazed areas need not be openable where the opening is not required by Section 310 and a whole-house mechanical ventilation system capable of providing 0.5 air changes per hour in the building is installed in accordance with Section M1505.

2. For kitchens, the glazed areas need not be openable where the opening is not required by Section 310 and a mechanical ventilation system capable of producing 0.35 air changes per hour in the habitable rooms is installed in accordance with Section M1505.

3. The glazed areas need not be installed in rooms where Exception 1 is satisfied and artificial light is provided that is capable of producing an average illumination of 6 footcandles (65 lux) over the area of the room at a height of 30 inches (762 mm) above the floor level.

R305.1 Minimum Height

Exceptions:

1. For rooms with sloped ceilings, the required floor area of the room shall have a ceiling height of not less than 5 feet (1524 mm) and not less than 50 percent of the required floor area shall have a ceiling height of not less than 7 feet (2134 mm).

2. The ceiling height above bathroom and toilet room fixtures shall be such that the fixture is capable of being used for its intended purpose. A shower or tub equipped with a showerhead shall have a ceiling height of not less than 6 feet 8 inches (2032 mm) above an area of not less than 20 inches (2134 mm) or the showerhead.

3. Beams, girders, ducts or other obstructions in basements containing habitable space shall be permitted to project to within 6 feet 4 inches (1931 mm) of the finished floor.

4. Beams and girders spaced apart not less than 36 inches in clear finished width shall project not more than 78 inches from the finished floor.

R308.4.5 Glazing and Wet Surfaces

2021 Code: R308.4.5 Glazing and wet surfaces. Glazing in walls, enclosures or fences containing hot tubs, spas, whirlpools, steam rooms, saunas, bathtubs, showers and indoor or outdoor swimming pools where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) measured vertically above any standing or walking surface shall be considered to be a hazardous location. This shall apply to single glazing and each pane in multiple glazing.

Exception: Glazing more than 60 inches (1524 mm) measured horizontally and in a straight line, from the water's edge of a bathtub, hot tub, spa, whirlpool or swimming pool, or from the edge of a raised, saucia or similar area.
2021 Code: R310.1 Emergency escape and rescue opening required. Basements, habitable attics and every sleeping room shall have not less than one operable emergency escape and rescue opening. Where a basement contains one or more sleeping rooms, an emergency escape and rescue opening shall be required. Emergency escape and rescue openings shall open directly into a public way, or to a yard or court having a minimum width of 36 inches that opens to a public way.

Exceptions:

1. A yard shall not be required to open directly into a public way, where the yard opens to an unobstructed path from the yard to the public way, such path shall have a width of not less than 36 in. (914 mm).

R310.2 Emergency Escape and Rescue Openings

Maximum height from floor: Where a window is provided as the emergency escape and rescue opening, it shall have a sill height of not more than 44 inches (1118 mm) above the finished floor; where the sill height is below grade, it shall be provided with a window well in accordance with Section R310.2.3.
R310.4 Area Wells

- R310.4.2.2 Steps. Steps shall have an inside width of at least 12 inches (305 mm) and a minimum tread depth of 5 inches (127 mm) and a maximum riser height of 18 inches (457 mm) for the full height of the area well.
R311.7 Stairways, R311.8 Ramps

R311.7 Stairways. Where required by the code or provided, stairways shall comply with this section.

1. Stairways not within or attached to a building, porch or deck
2. Stairways leading to non-habitable attics
3. Stairways that lead to crawl spaces.

R311.8 Ramps. Where required by the code or provided, ramps shall comply with this section.

Exception: Ramps not within or attached to a building, porch or deck.

R311.7.7 Stairway Walking Surface

2021 Code: R311.7.7 Stairway walking surface. The walking surface of treads and landings of stairways shall be sloped not steeper than one unit vertical in 48 units horizontal (2% slope).

Exception: Where the surface of a landing is required elsewhere in the code to drain surface water, the walking surface of the landing shall be sloped not steeper than 1 unit vertical in 20 units horizontal (5% slope) in the direction of travel.

R314.3 Location

• 2021 Code: R314.3 Location. Smoke alarms shall be installed in the following locations:

  5. In dwelling units where the ceiling height of a room open to a hallway serving bedrooms exceeds that of the hallway by 24 inches (610 mm) or more; smoke alarms shall be installed in the hallway and in the room open to the hallway.

  4. Smoke alarms listed and marked “helps reduce cooking nuisance alarms” shall be installed not less than 6 feet (1828 mm) horizontally or 12 feet (3658 mm) vertically from a permanently installed cooking appliance.
Introduction to the 2021 IBC, IRC and IFC

R315.2.2 Alterations, Repairs and Additions

- 2021 Code: R315.2.2 Alterations, repairs and additions.
- Exceptions:
  - 3. Installation, alteration or repairs of plumbing or heating systems.

R317.1 Location Required

- 2021 Code: R317.1 Location required. Protection of wood and wood-based products from decay shall be provided in the following locations by the use of naturally durable wood or wood that is preservative-treated in accordance with AWPA U1.
- Replaces current language in R317.1.4 Wood Columns with Section 2304.12.2.2 of the IBC.

R320 Accessibility

- R202 Definitions:
  - Live/Work Unit
  - Sleeping Unit

R320.2 Live/Work Units. A Live/Work Unit, the residential portion of which is a sleeping unit or kitchen and the nonresidential portion is a live work area, shall be served by at least one accessible route connecting the sleeping unit and the live work area. The accessible route shall consist of a horizontal path of travel in accordance with Section 419.9.3.1 of the International Building Code.

Introduction to the 2021 IBC, IRC and IFC

R324 Photovoltaic Systems
R324.5 BIPV Systems

• Standards included for equipment listings
• Clarifies the references to the NFPA 70 code
• Delineates the relationship between the electrical code sections and firefighter operations.

R326 Habitable Attics
R326.3 Story Above Grade Plane

A habitable attic shall be considered a story above grade plane

Exception: A habitable attic shall not be considered a story above grade plane provided that the habitable attic meets all of the following:
1. The aggregate area of the habitable attic is not greater than one-third of the floor area of the dwelling unit or is not greater than one-half of the floor area of the story below where the habitable attic is located within a dwelling unit equipped with a fire sprinkler system in accordance with Section P2904.
2. The occupiable space is enclosed by the roof assembly above, knee walls, if applicable, on the sides and the floor-ceiling assembly below.
3. The floor of the habitable attic does not extend beyond the exterior walls of the story below.

R326 Habitables Attics
R326.4 Located above a Third Story

Where a habitable attic is located above a third story, the dwelling shall be equipped with a fire sprinkler system in accordance with Section P2904.
R408.8 Under-floor Vapor Retarder

R408.8 Under-floor vapor retarder. In Climate Zones 1A, 2A, and 3A below the warm-humid line, a continuous Class I or II vapor retarder shall be provided on the exposed face of air permeable insulation installed between the floor joists and exposed to the grade in the under-floor space. The vapor retarder shall have a maximum water vapor permeance of 1.5 perms when tested in accordance with Procedure B of ASTM E96.

Exception: The vapor retarder shall not be required in unvented crawl spaces constructed in accordance with Section R408.3.

R507.10 Exterior Guards

R507.10 Exterior guards. Guards shall be constructed to meet the requirements of Section R301.5, R312 and this section.

R507.10.1 Support of guards. Where guards are supported on deck framing, guard loads shall be transferred to the deck framing with a continuous load path to the deck joists.

R507.10.1.1 Guards supported by side of deck framing. Where guards are connected to the interior or exterior side of a deck joist or beam, the joist or beam shall be connected to the adjacent joists to prevent rotation of the joist or beam. Connections relying only on fasteners or end grain withdrawal are not permitted.

R507.10.2 Wood guards. 4x4 wood posts supporting guard loads applied at the top of the guard shall not be notched at the connection to the supporting structure.

R507.10.3 Plastic composite guards. Plastic composite guards shall comply with the provisions of Section R507.2.

R507.10.4 Other guards. Other guards shall be in accordance with manufacturer’s instructions or in accordance with accepted engineering principles.
R602.10.1.2 Location of Braced Wall Line

Where a wall panel along a braced wall line falls in a single line, the braced wall line shall be located at those braced wall panels. Exteriar walls parallel to a braced wall line shall be offset not more than 4 feet (1219 mm) from the designated braced wall line location as shown in Figure R602.10.1.1. Interior walls used as bracing shall be offset not more than 4 feet (1219 mm) from a braced wall line through the interior of the building as shown in Figure R602.10.1.1.

Table R602.10.3(1) Wall Bracing - Wind Speed

<table>
<thead>
<tr>
<th>Ultimate Design Wind Speed (mph)</th>
<th>Story Location</th>
<th>Brace Wall Line Method</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>GB</td>
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<tr>
<td></td>
<td></td>
<td>Methods DWB, WSP, SFB, PBS, PCP, HPS, BV</td>
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<tr>
<td></td>
<td></td>
<td>GB</td>
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<tr>
<td></td>
<td></td>
<td>Methods CS</td>
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<td></td>
<td></td>
<td>CS - WSP, CS - G, CS - PF</td>
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<tr>
<td>&lt; 95 mph</td>
<td>10</td>
<td>2.5</td>
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<tr>
<td></td>
<td>20</td>
<td>4.5</td>
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<tr>
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</table>

R609.4.1 Garage Door Labeling

- R609.4.1 Garage door labeling. Garage doors shall be labeled with a permanent label provided by the garage door manufacturer. The label shall identify the garage door manufacturer, the garage door model/series number, the positive and negative design wind pressure rating, the installation instruction drawing reference number, and the applicable test standard.
R704 Soffits

• R704.1 General wind limitations.
• R704.2 Soffit installation where the design wind pressure is 30 psf or less.
• R704.2.1 Vinyl soffit panels.
• R704.2.2 Fiber-cement soffit panels.

R703.7.3 Water-Resistive Barriers

R703.7.3.1 Dry Climates. In dry climate zones indicated in Figure N1101.7, water-resistive barriers shall comply with one of the following:

1. The water-resistive barrier shall be a single layer of a water-resistive barrier complying with ASTM E2556, Type I. The water-resistive barrier shall be installed independent of the exterior cladding systems and shall be secure to the sheathing, framing members and exterior wall assemblies. The water-resistive barrier shall be separated from the structure by a layer of foam plastic insulating sheathing or other non-water absorbing layer or a designed drainage space.

2. The water-resistive barrier shall be installed in accordance with Section R703.4 and intended to drain to the water-resistive barrier, installed independent of the exterior cladding systems. The water-resistive barrier shall be a single layer of a water-resistive barrier complying with ASTM E2556, Type I.

R703.7.3.2 Moist or marine climates. In the moist (A) or marine (C) climate zones indicated in Figure N1101.7, water-resistive barriers shall comply with one of the following:

1. In addition to complying with Section R703.7.3.1, a space or drainage material not less than 3/16 inch (5 mm) in depth shall be added to the exterior side of the water-resistive barrier.

2. In addition to complying with Section R703.7.3.1 Item 2, drainage on the exterior side of the water-resistive barrier shall have a drainage efficiency of not less than 90%, as measured in accordance with ASTM E2273 or Annex A2 of ASTM E2925.
Table R703.11.2 Required Minimum Wind Load Design Pressure Rating for Vinyl Siding Installed Over Foam Plastic Sheathing Alone.

<table>
<thead>
<tr>
<th>ULTIMATE DESIGN WIND SPEED (MPH)</th>
<th>ADJUSTED MINIMUM DESIGN WIND PRESSURE (ASD) (PSF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1: With interior gypsum wallboard</td>
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<tr>
<td>&lt;=95</td>
<td>33.2</td>
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<tr>
<td>100</td>
<td>36.8</td>
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<tr>
<td>Case 2: Without interior gypsum wallboard</td>
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<tr>
<td>115</td>
<td>52.8</td>
</tr>
<tr>
<td>&gt; 130</td>
<td>Not Allowed</td>
</tr>
</tbody>
</table>
**Final Reflection**

This slide will help the learner to reflect on the day and what they will take back to the job and apply.

- **What?** What happened and what was observed in the training?
- **So what?** What did you learn? What difference did this training make?
- **Now what?** How will you do things differently back on the job as a result of this training?
Thank you for participating!!!