

**HOUSTON CONSTRUCTION
CODE MODERNIZATION –
SIGNIFICANT CHANGES TO THE
2021 INTERNATIONAL RESIDENTIAL CODE**

**PRESENTED TO:
AMERICAN INSTITUTE OF ARCHITECTS (AIA)
FEBRUARY 7, 2024**

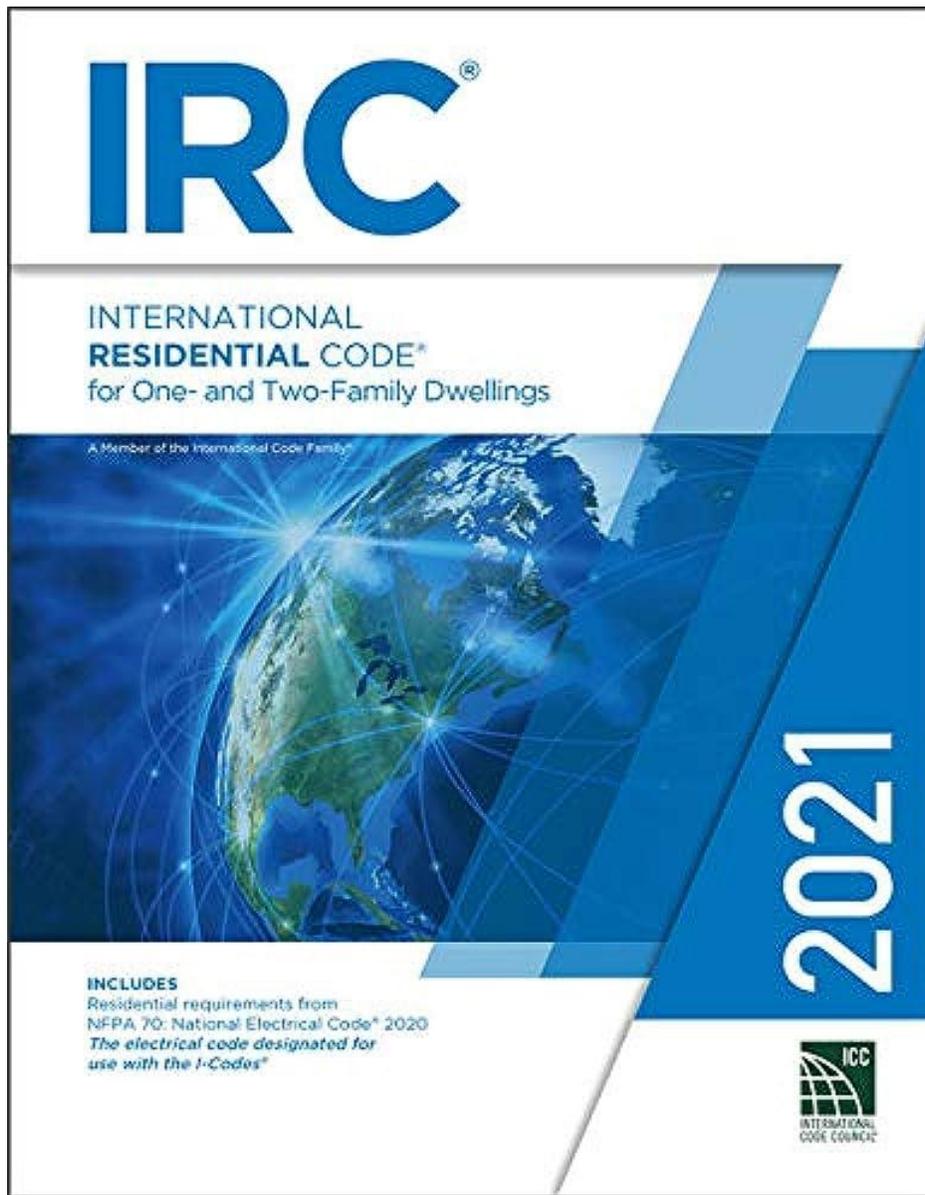


**PRESENTED BY:
CITY OF HOUSTON PERMITTING CENTER
AND
CCM CONSULTANT, JENSEN HUGHES**



2021 INTERNATIONAL EXISTING BUILDING CODE (IRC)





INTERNATIONAL RESIDENTIAL CODE (IRC)

1

Updates to Emergency Escape and Rescue Opening Req's

2

New Requirements for Exterior (Deck) Guards

3

Shipping Containers Used as Buildings or Structures

IRC CHAPTER 1 SCOPE AND ADMINISTRATION



2018 IRC – SIGNIFICANT CHANGES

Code Section

Scope

R101.2

IRC Changes:

Changes to Section 101.2

- All instances where the International Building Code (IBC) permits construction under the IRC are now listed in the exception to the scope of the IRC. Allows for the additional permits to be constructed with the IRC where a residential sprinkler system is provided in accordance with Section P2904. New facilities include:
 3. A care facility with five or fewer persons receiving custodial care within a dwelling unit.
 4. A care facility with five or fewer persons receiving medical care within a dwelling unit.
 5. A care facility for five or fewer persons receiving care that are within a single-family dwelling.



Bed and breakfast

2021 IRC – SIGNIFICANT CHANGES

Code Section

Applicability

R102

IRC Changes:

R102.5 City of Houston has adopted and made part of the code Appendices A, B, C, H, K, L, M, Q, T, U, and V.

R102.8 New section pointing to Chapter 57 of the Fire Code regarding requirements for flammable and combustible liquids.

R102.9 Part VIII-Electrical (Chapters 34-43) of the 2021 Residential Code have not been adopted by the City of Houston. All electrical work and licensing shall comply with the Electrical Code.

2021 IRC – SIGNIFICANT CHANGES

Code Section

Duties and Powers of the Building Official

R104

IRC Changes:

City of Houston added a new Section R104.12 which allows Building Officials to order work stopped in the same manner provided in Section 115 of the Building Code.

City of Houston has removed the following Flood Hazard Area Sections in their entirety.

- R104.10.1
- R105.3.1.1
- R106.1.4

2018 IRC – SIGNIFICANT CHANGES

Code Section

Alternative Materials and Methods of Construction

R104.11

IRC Changes:

The building official shall have the authority to approve alternative material upon application of the owner or owner's authorized agent.

Specifies that the materials or methods shall be not less than the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability, and safety.



Mona Makela/Shutterstock.com

A new house constructed of
alternative materials

2018 IRC – SIGNIFICANT CHANGES

Code Section

Definitions

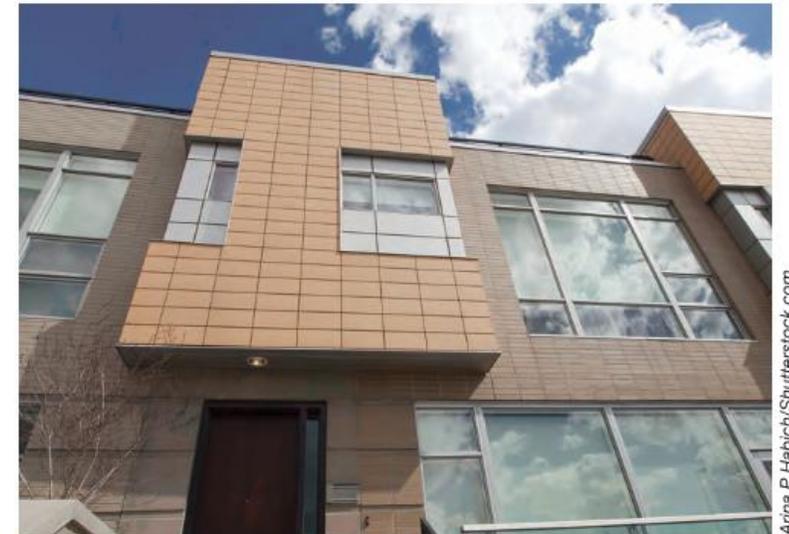
R105.1,
R110.1, and
R202

IRC Changes:

A definition for “Change of Occupancy” has been added and the requirement for a certificate of occupancy when there is a change of occupancy or use has been clarified.

New definition for Change of Occupancy.

- A change in the use of a building or a portion of a building that involves a change in the application of the requirements of this code.



Converting a townhouse from a dwelling unit to a live/work unit is considered a change of use

2021 IRC – SIGNIFICANT CHANGES

Code Section

Work Exempt from Permit

R105.2

IRC Changes:

City of Houston has modified the list of work exempted from permit:

- **Building Item 1:** The floor area limit for one story accessory structures has been reduced from 200 SF to 120 SF.
- **Building Item 2:** Height limit of fences not requiring permit increased to 8 ft from 7 ft with an added provision that they are not constructed of masonry or concrete, and that are not electrically energized.
- **Building Item 5:** Clarification for sidewalks and driveways specifying those that are not covered under the provisions of the Infrastructure Design Manual.

2021 IRC – SIGNIFICANT CHANGES

Code Section

Fees

R108

IRC Changes:

City of Houston has modified R108 to provide the structural building permit fees for new one- and two-family residential dwellings and townhouses and their detached accessory structures. Tables R108.3.1(1) and R108.3.1(2) have been added that provide a fee schedule.

2021 IRC – SIGNIFICANT CHANGES

Code Section

Certificate of Compliance

R110

IRC Changes:

City of Houston has provided a new exception to R110.1

- A certificate of compliance is not required for a Group U occupancy accessory to a single-family dwelling or townhouse not containing hazardous materials exceeding the maximum allowable quantities identified in Section 307 of the Building Code.

R110.3 modified with new item to be included in the certificate of compliance:

- The use and occupancy of the building.
- The type of construction as defined by Chapter 6 of the Building Code.

2021 IRC – SIGNIFICANT CHANGES

Code Section

Violations

R113

IRC Changes:

City of Houston has added a new Section R113.4.1 which provides the penalty requirements for when no specific penalty is otherwise provided in this code.

2021 IRC – SIGNIFICANT CHANGES

Code Section

Private Plan Review And Inspection Services

R115

IRC Changes:

City of Houston has added a new Section R115 detailing the establishment of a private plan review and inspection program.

IRC CHAPTER 2 DEFINITIONS



2018 IRC – SIGNIFICANT CHANGES

Code Section

Definitions

R202

IRC Changes:

New definition for ‘Access’ and ‘ready access’.

- Definitions apply to equipment and devices that must be reached for replacement or service.

Modification to other definitions to include new definitions

- Cleanout
- Supply fitting

2018 IRC – SIGNIFICANT CHANGES

Code Section

Definitions

R202

IRC Changes:

New definition for ‘Crawl Space’

- Defines a crawl space as an underfloor space that is not a basement.

2018 IRC – SIGNIFICANT CHANGES

Code Section

Definitions

R202

IRC Changes:

New definitions to differentiate ‘carbon monoxide alarm’ and ‘carbon monoxide detector’

- Clarifies that the alarm will alert occupants by means of an audible signal and the detector is a device that will transmit a signal to a connected fire alarm control unit.



Carbon monoxide alarm

Danny E. Hooper/Shutterstock.com

2018 IRC – SIGNIFICANT CHANGES

Code Section

Definitions

R202

IRC Changes:

Clarification of the definition of ‘fenestration’

- General term for vertical fenestration and skylights and sloped glazing

New definition for ‘vertical fenestration’

- Certain doors and windows installed at less than 15° from vertical

Clarification of the definition of ‘skylights and sloped glazing’

- Glass or other glazing material installed at a slope of 15° (previously 30°) or more



Skylights

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Code Section

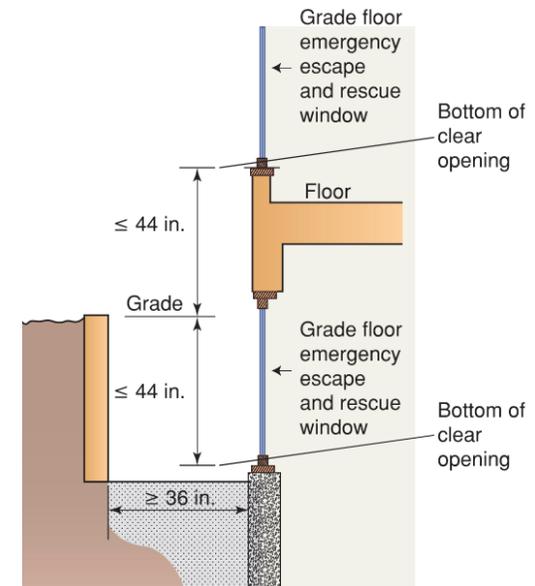
Definitions

R202

IRC Changes:

Revised definition for Grade Floor Emergency Escape And Rescue Opening.

- An emergency escape and rescue opening located such that the bottom of the clear opening is not more than 44 inches above or below the finished ground level adjacent to the opening.



2018 IRC – SIGNIFICANT CHANGES

Code Section

Definitions

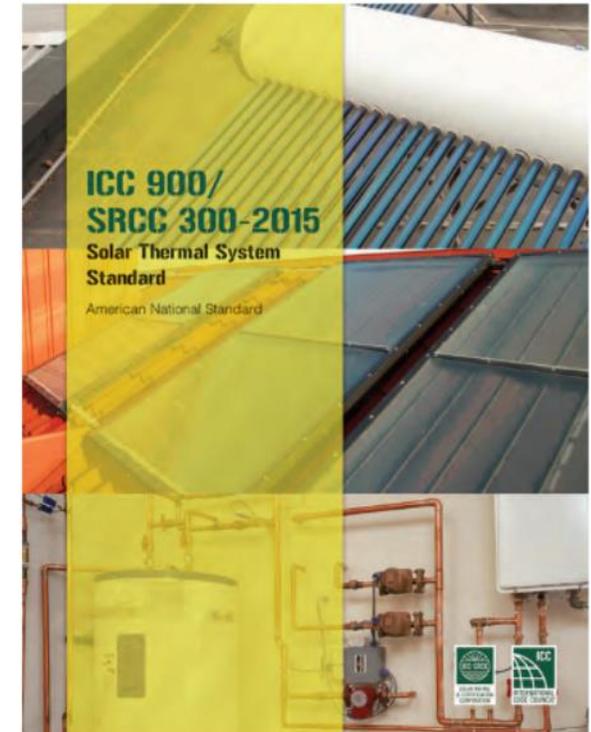
R202

IRC Changes:

New definitions related to solar energy systems for clarification in the related provisions in chapters 3 and 9.

New definitions for:

- Solar energy system
- Solar thermal collector
- Solar thermal system



New defined terms for solar thermal systems and collectors are from ICC 900/SRCC 300

2021 IRC – SIGNIFICANT CHANGES

Code Section

Definitions

R202

IRC Changes:

New definition for Storm Shelter.

- A building, structure or portion thereof, constructed in accordance with ICC 500 and designated for use during a severe windstorm event, such as a hurricane or tornado.



2021 IRC – SIGNIFICANT CHANGES

Code Section

Definitions

R202

IRC Changes:

Revised definition for Townhouse.

- A building that contains three or more attached townhouse units.

New definition for 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.



2021 IRC – SIGNIFICANT CHANGES

Code Section

Definitions

R202

IRC Changes:

New definition for Live/Work Unit.

- A dwelling unit or sleeping unit in which a significant portion of the space includes a nonresidential use that is operated by the tenant.

New definition for Sleeping Unit.

- A single unit that provides rooms or spaces for one or more persons, 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 are also part of a dwelling unit are not sleeping units.

2021 IRC – SIGNIFICANT CHANGES

Code Section

Definitions

R202

IRC Changes:

Revised definition for High-efficacy Lamps Light Sources.

- Compact fluorescent lamps, light-emitting diode (LED) lamps, T-8 or smaller diameter linear fluorescent lamps, or other lamps with an efficacy of not less than the following: 65 lumens per watt, or luminaires with an efficacy of not less than 45 lumens per watt.

IRC CHAPTER 3 BUILDING PLANNING



2021 IRC – SIGNIFICANT CHANGES

Code Section

Intermodal Shipping Containers

R301.1.4

IRC Changes:

Intermodal shipping containers that are repurposed for use as buildings or structures shall be designed in accordance with the structural provisions in Section 3115 of the International Building Code.



2018 IRC – SIGNIFICANT CHANGES

Code Section

Climatic and Geographic Design Criteria

Table
R301.2(1)

IRC Changes:

Variables for Manual J – Residential Load Calculation assessments with other climatic and geographic design criteria are now included in the design criteria

<u>Manual J Design Criteriaⁿ</u>							
<u>Elevation</u>	<u>Latitude</u>	<u>Winter Heating</u>	<u>Summer Cooling</u>	<u>Altitude Correction Factor</u>	<u>Indoor Design Temperature</u>	<u>Design Temperature Cooling</u>	

<u>Heating Temperature Difference</u>	<u>Cooling Temperature Difference</u>	<u>Wind Velocity Heating</u>	<u>Wind Velocity Cooling</u>	<u>Coincident Wet Bulb</u>	<u>Daily Range</u>	<u>Winter Humidity</u>	<u>Summer Humidity</u>

For SI: 1 pound per square foot = 0.0479 kPa, 1 mile per hour = 0.447 m/s.

(no changes to footnotes a through m)

n. The jurisdiction shall fill in these sections of the table to establish the design criteria using Table 1a or 1b from ACCA Manual J or established criteria determined by the jurisdiction.

o. The jurisdiction shall fill in this section of the table using the Ground Snow Loads in Figure R301.2(6).

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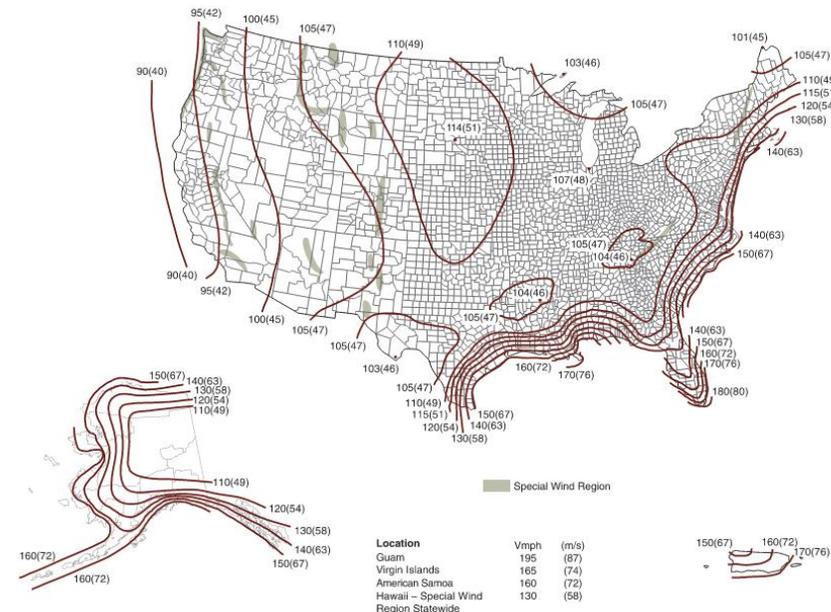
Code Section

Wind Speeds

R301.2

IRC Changes:

- Figure R301.2(2) has been updated, the map is now identical to the 2021 IBC and ASCE 7-16 wind speed maps for Risk Category II buildings.
- Table R301.2.1(1) has been updated for new design wind speeds and hip or gable roof profiles



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Code Section

Wind Speeds

R301.2.1.1

IRC Changes:

- The provisions of this code shall not apply to the design of buildings where wind design is required based on Figure R301.2.1.1.
- In regions where wind design is required in accordance with Figure R301.2.1.1 or where the ultimate design wind speed, V , in Figure R301.2(2) equals or exceeds 140 miles per hour (225 kph) in a special wind region, the design of buildings for wind loads shall be in accordance with one or more of the following methods:

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Code Section

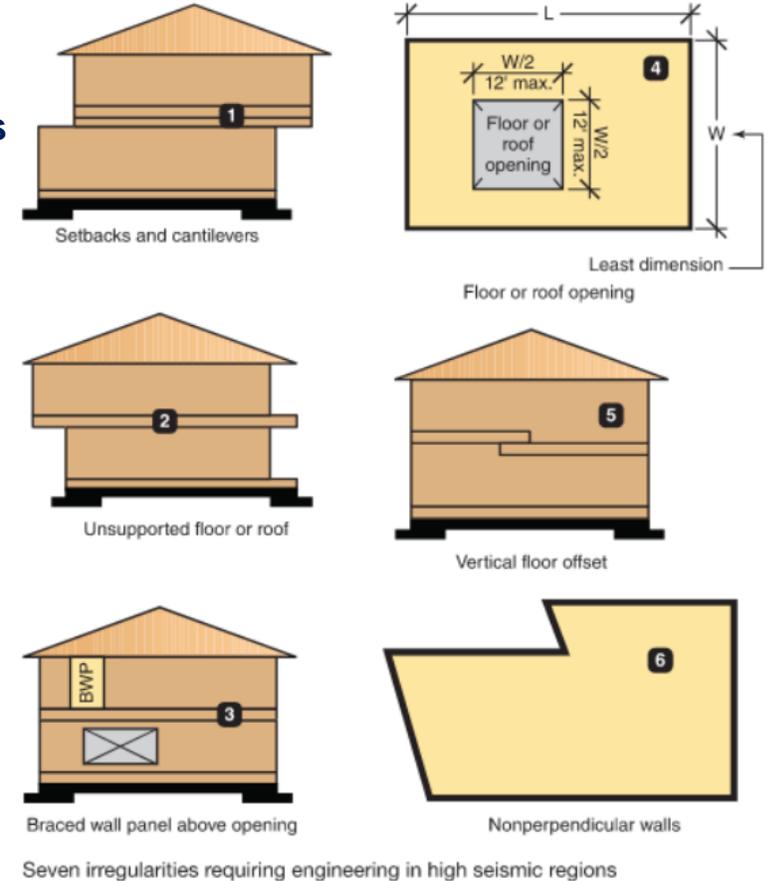
Irregular Buildings

R301.2.2.6

IRC Changes:

Modification. The section now clarifies that the seismic provisions are to be used for both irregular structures or portions thereof.

Clarifies that if one or more conditions are present in certain design categories the building is to be deemed irregular.



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Code Section

**Irregular Buildings
in Seismic Areas**

R301.2.2.6

IRC Changes:

R301.2.2.6 modified to now include Hillside Light-Frame Construction as one of the conditions that define an irregular building.

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Code Section

Story Height

R301.3

IRC Changes:

New exception for story height reads:

- Exception: A story height not exceeding 13 feet 7 inches (4140 mm) is permitted provided that the maximum wall stud clear height does not exceed 12 feet (3658 mm), the wall studs are in accordance with Exception 2 or 3 of Section R602.3.1 or an engineered design is provided for the wall framing members, and wall bracing for the building is in accordance with Section R602.10. Studs shall be laterally supported at the top and bottom plate in accordance with Section R602.3.

2018 IRC – SIGNIFICANT CHANGES

Code Section

Exterior Walls

R302.1

IRC Changes:

Modification to requirements for fire-resistance ratings of exterior wall

- Exception modified: Walls of dwellings exempt → Walls of individual dwelling units exempt
- Fire-resistance rating of walls now references the International Building Code as an allowable testing standard
- Fire-resistance rating of projections now allows heavy timber or fire-retardant-treated wood



Gable vent below rake overhang with soffit

Germain McDaniel/Shutterstock.com

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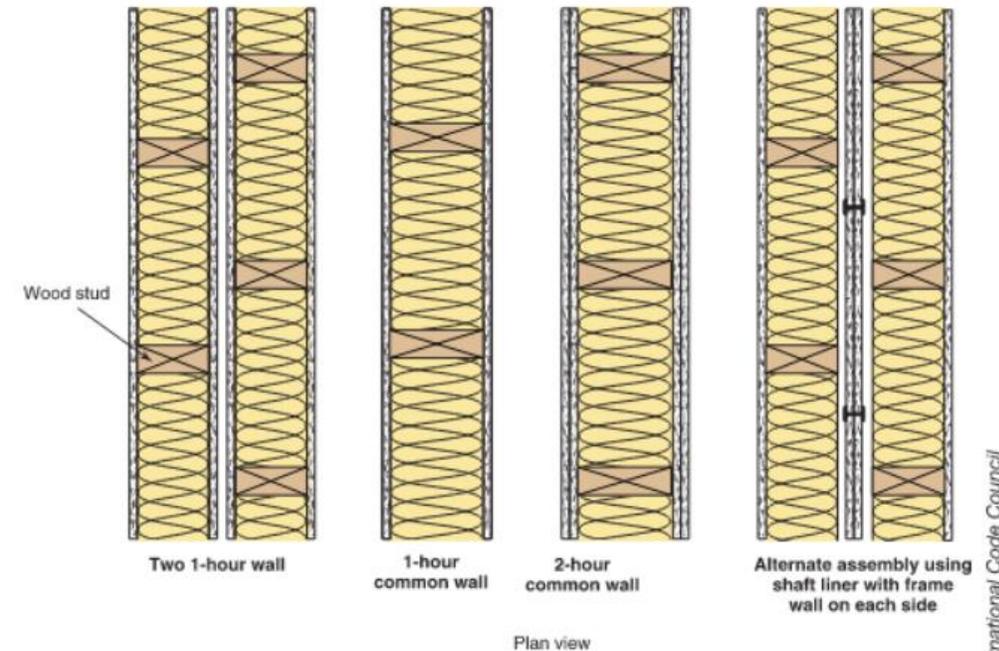
Code Section

Townhouse Separation

R302.2

IRC Changes:

- Modification to the section to include double walls fire-resistance requirements in addition to common walls, providing two paths for compliance
- Reference to the IBC Section 703.3 added throughout section R302.2



Note: Gypsum wallboard and wood stud assemblies must meet all materials, dimensions, spacing, installation and fastening requirements of the specific tested assembly

Typical fire-resistant-rated wall assemblies for separating townhouse dwelling units

2021 IRC – SIGNIFICANT CHANGES

Code Section

Townhouses

R302.2

IRC Changes:

- R302.2.1 and R302.2.2 have replaced the term Townhouse with the new more specific term Townhouse Unit.
- A new exception has been added to R302.2.2 allowing for common walls to extend to and be tight against the inside of the exterior walls
- R302.2.6 A new exception has been added to structural independence requirement of Townhouse Units based on protection by a fire sprinkler system complying with Section P2904 or NFPA 13D.

2018 IRC – SIGNIFICANT CHANGES

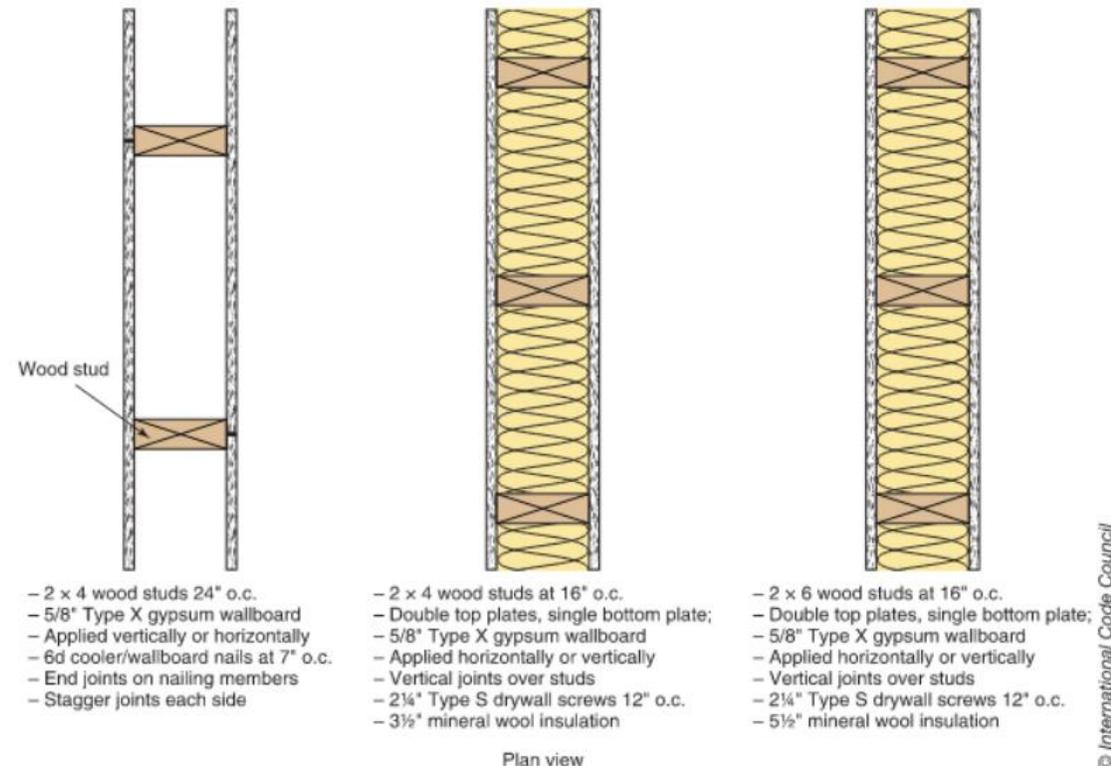
Code Section

Two-Family Dwelling Separation

R302.3

IRC Changes:

- New reference to Section 703.3 of the International Building Code provides alternatives for determining the fire-resistance rating of wall and floor/ceiling assemblies for separation of dwelling units.



Examples of prescriptive fire-resistant-rated wall assemblies from IBC Table 721.1(2)

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Code Section

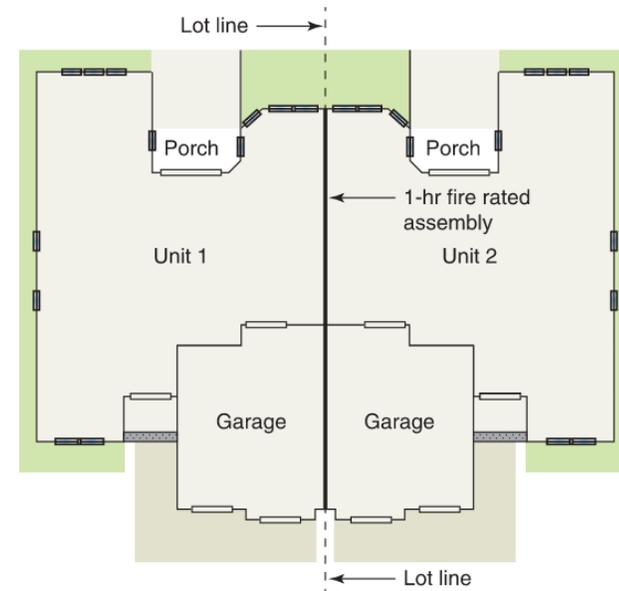
Two-Family Dwelling Separation

R302.3

IRC Changes:

Clarification of R302.3

- The two-family dwelling rated separation of 1-hour is required regardless of whether a lot line exists between the two dwelling units or not.



2018 IRC – SIGNIFICANT CHANGES

Code Section

Membrane Penetrations

R302.4.2

IRC Changes:

- New exception added for luminaires installed in fire-resistant construction:
 - Ceiling membrane penetrations by listed luminaires or by luminaires protected with listed materials that have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing



Recessed luminaire

iStock.com/Bombaert

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Code Section

Dwelling Unit Rated Penetrations

R302.4

IRC Changes:

Addition of an exception to through penetrations R302.4.1.

Exception 2: The annular space created by the penetration of water-filled fire sprinkler piping, provided that the annular space is filled using a material complying with item 1.2 of Exception 1.

Clarification of an exception to membrane penetration R302.4.2.

- Exception 3: The annular space created by the penetration of a fire sprinkler or water-filled fire sprinkler piping, provided that the annular space is covered by a metal escutcheon plate.

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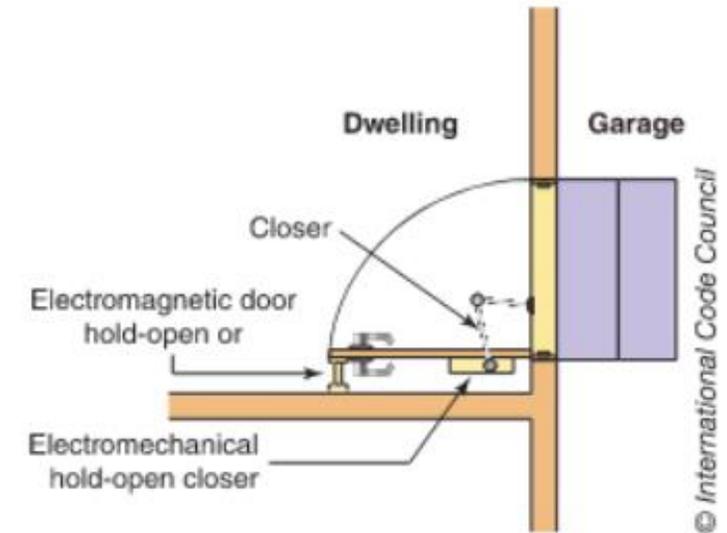
Code Section

Dwelling-Garage Opening Protection

R302.5.1

IRC Changes:

- Modification to the code permitting the use of automatic closing as an alternative to self-closing for the door between the garage and the dwelling unit.



Automatic closing door between house and garage

2021 IRC – SIGNIFICANT CHANGES

Code Section

Dwelling-Garage Opening Protection

R302.5.1

IRC Changes:

Modification of R302.5.1

- Door openings between the garage and residence to be self-latching



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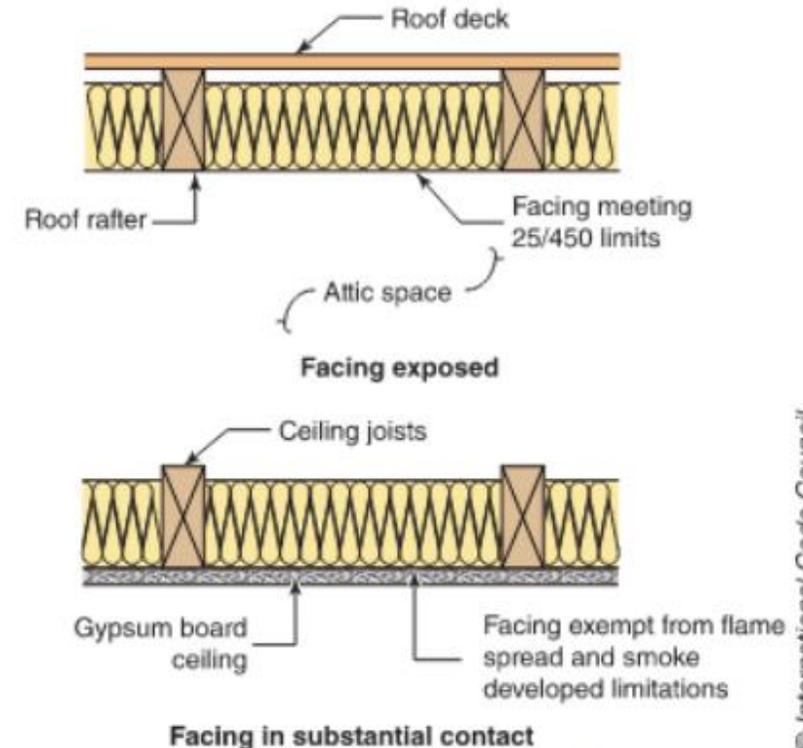
Code Section

Insulation Flame Spread

R302.10

IRC Changes:

- The testing of insulating materials for flame spread and smoke-developed ratings applies to facings including vapor retarders and other coverings.



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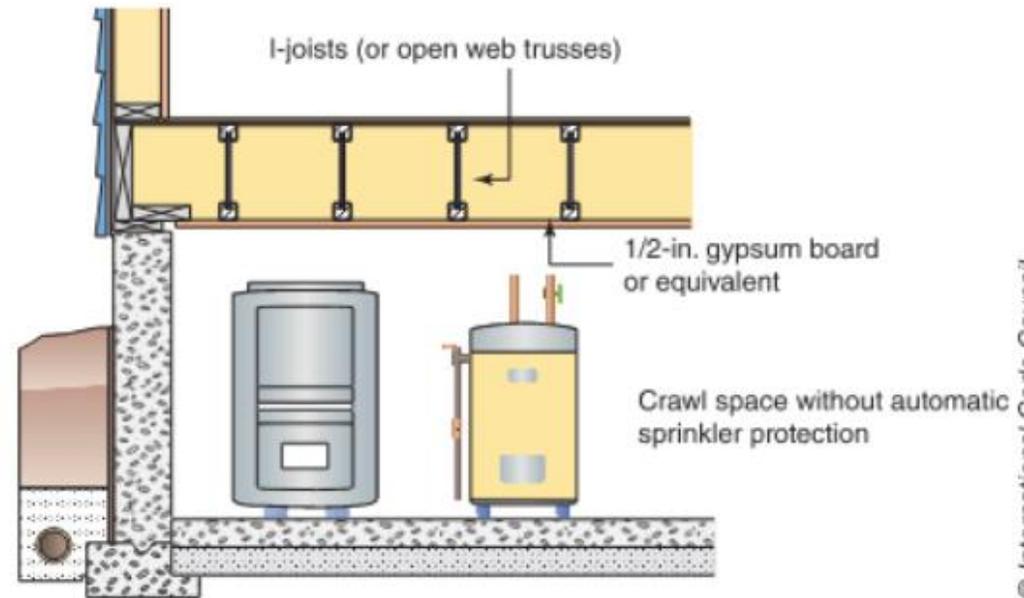
Code Section

Fire Protection of Floors above Crawl Spaces

R302.13

IRC Changes:

- Exception 2 modified: Fire-resistant membrane protection is now required for the applicable floor framing materials above crawl spaces containing fuel-fired or electric-powered heating appliances.



Protection required on underside of floor assembly over a crawl space with fuel-fired or electric-powered heating equipment

2021 IRC – SIGNIFICANT CHANGES

Code Section

Mechanical Ventilation

303.1

IRC Changes:

Modification to R303.1 allowing for local exhaust system as a substitute for natural ventilation in kitchens.



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Code Section

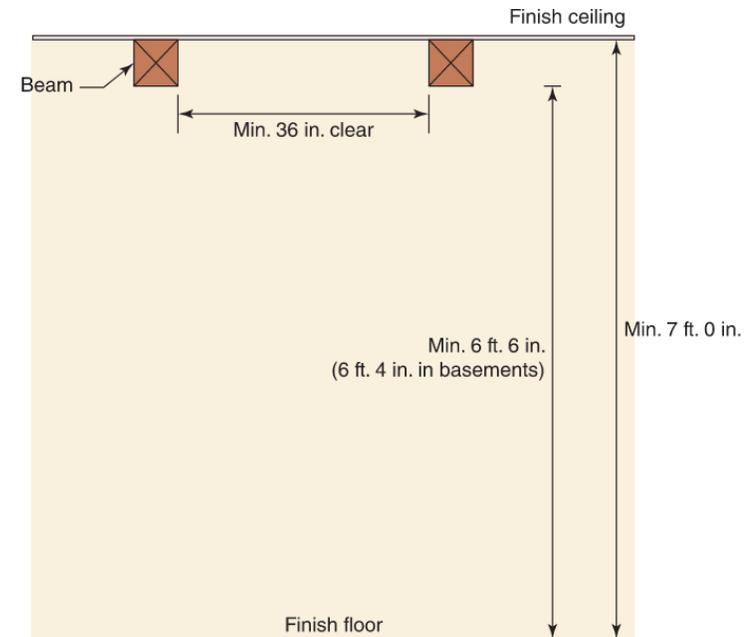
Ceiling Height

R305.1

IRC Changes:

Addition of an exception to R305.1

- **Exception 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**



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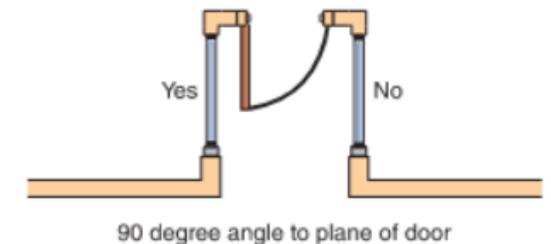
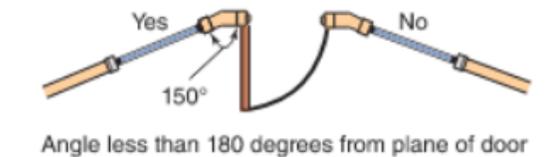
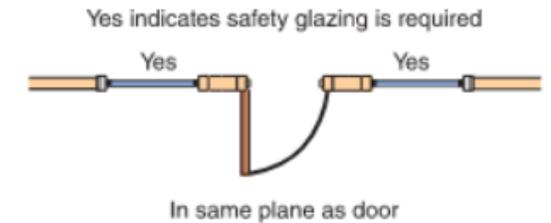
Code Section

Glazing Adjacent to Doors

R308.4.2

IRC Changes:

- Location of glazing that should be considered hazardous Condition 2 modified.
- For glazing on a wall less than 180° from plan of door in the closed position and within 24 inches (610 mm) of the hinge side of an in-swinging door.



Glazing adjacent to doors



Windows at an angle to adjacent door

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Code Section

Glazing in Guards and Railings

R308.4.4

IRC Changes:

New sub-section Structural glass baluster panels R308.4.4.1.

- Guards with structural glass baluster panels shall be installed with an attached top rail or handrail. The rail is to be supported by a minimum 3 glass baluster panels or shall be otherwise supported to remain in place should one glass baluster panel fail.
- Exception: Rail is not required where the glass baluster panels are laminated with two or more glass piles of equal thickness and of the same glass type.



Structural glass baluster panels

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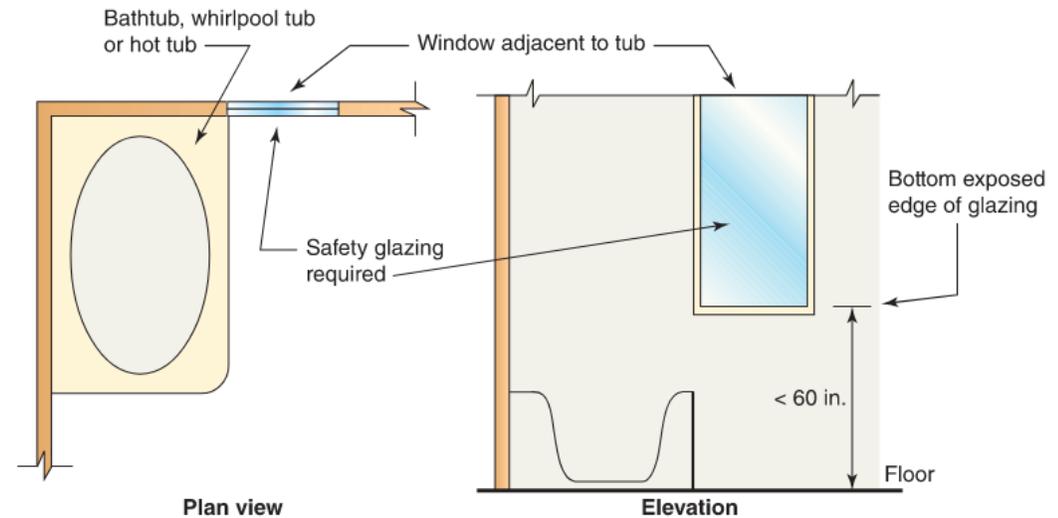
Code Section

Glazing and Wet Surfaces

R308.4.5

IRC Changes:

Clarification of the language used within R308.4.5. The word “facing” has been replaced with the words “adjacent to” for glazing provisions related to wet surface.



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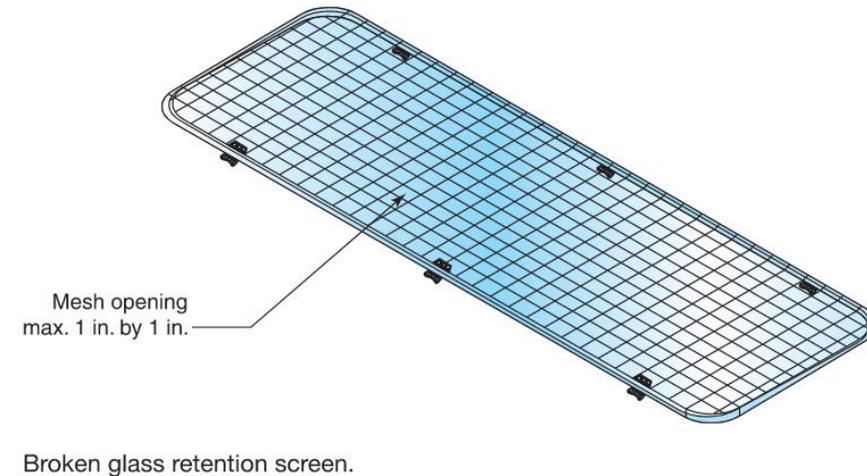
Code Section

Skylight Glass Retention Screens

R308.6

IRC Changes:

R308.6.3 Replaces the term “retaining screen” to “broken glass retention screen”



2021 IRC – SIGNIFICANT CHANGES

Code Section

Skylight Glass Retention Screens

R308.6

IRC Changes:

Modification to R308.6.5 provides additional condition where screens are not required added.

- Screens shall not be required where laminated glass complying with item 1 of Section R308.6.2 is used as single glazing or the inboard pane in multiple glazing.

Additional requirement added to R308.6.7.

- Screen are to be installed within 4 inches of the glass.

2018 IRC – SIGNIFICANT CHANGES

Code Section

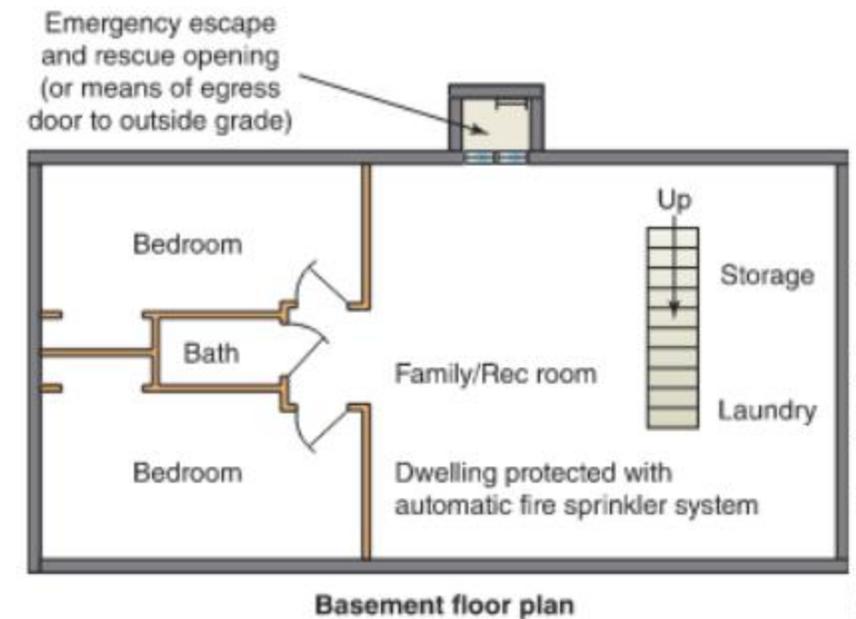
Emergency Escape and Rescue Openings

R310.1

IRC Changes:

A new exception added for emergency escape and rescue.

- Where the dwelling or townhouse is equipped with an automatic sprinkler system, sleeping rooms in basements are not required to have emergency escape and rescue provided the basement is provided with one of the following:
 - One means of egress complying with Section R311 and one emergency escape and rescue opening
 - Two means of egress complying with Section R311



2018 IRC does not require emergency escape and rescue openings in basement bedrooms when meeting conditions

2021 IRC – SIGNIFICANT CHANGES

Code Section

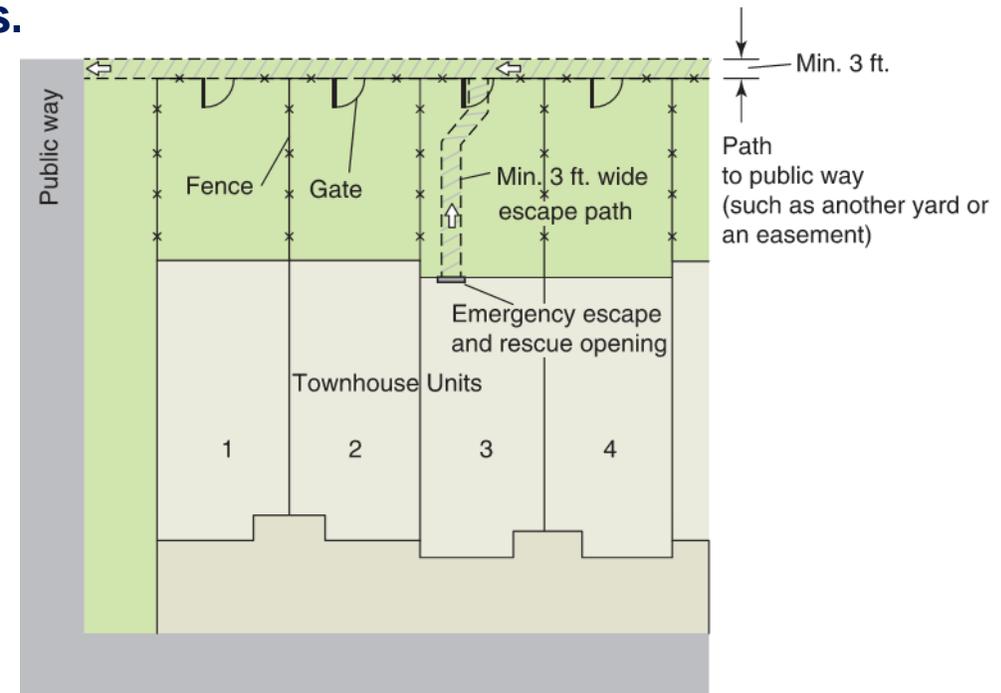
Emergency Escape and Rescue Opening Required

R310.1

IRC Changes:

Modification to R310.1

- The public way, yard, or court that the emergency escape and rescue opens to has have a minimum width of 36 inches.



2021 IRC – SIGNIFICANT CHANGES

Code Section

Emergency Escape and Rescue Opening Required

R310.1

IRC Changes:

City of Houston modifies R310.1 to include the provision that projections shall not reduce the clear width to less than 32 inches up to 80 inches above the floor or ground.

A new exception has been added to R310.1

- **Exception 3:** 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 inches.

R310.1.1 has been modified to permit fall prevention devices complying with ASTM F2090. A limitation of 70 inches above the finished floor was also added to R310.1.1.

2021 IRC – SIGNIFICANT CHANGES

Code Section

Emergency Escape and Rescue Openings

R310.2

IRC Changes:

The minimum height and width dimensions have been removed from Section R310.2.1 and added to the new Section 310.2.2.

R310.2.4 has been clarified to include cantilevers in its scope. A 36 inches in width requirement has been added to this section.

2018 IRC – SIGNIFICANT CHANGES

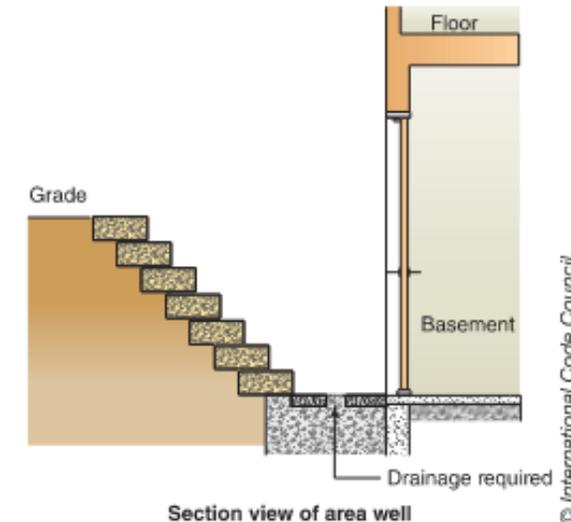
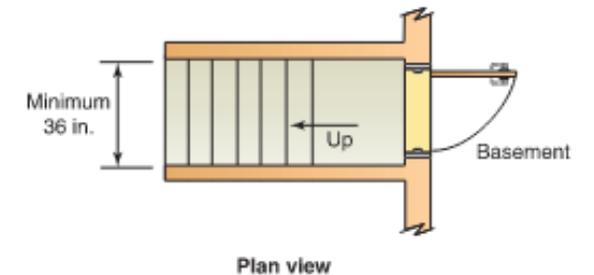
Code Section

Area Wells for Emergency Escape and Rescue Doors

R310.3

IRC Changes:

- Revised terms used “bulkhead enclosures” → “Area wells”
- Added provisions for ladders and steps
 - Area wells to be a minimum of 36”
 - Area wells with a vertical depth greater than 44” shall be equipped with a permanent ladder or steps useable with a door in a fully open position
 - These ladders or steps do not have to comply with Section R311.7
 - See Section R310.3.2.1 for ladder minimum dimensions



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Door serving as a required emergency escape and rescue opening from a basement with an area well

2021 IRC – SIGNIFICANT CHANGES

Code Section

Emergency Escape and Rescue Openings in Existing Buildings

R310.6,
R310.7

IRC Changes:

New exception added to R310.6 which allows an operable window complying with Section 310.7.1 to be acceptable as an emergency escape and rescue opening for basement dwelling additions

New Section R310.7.1 provides requirements for operable windows serving as the emergency escape and rescue opening.

2021 IRC – SIGNIFICANT CHANGES

Code Section

Stairways and Ramps

R311

IRC Changes:

Addition of 3 exceptions to R311.7 where stairways are not required to comply with R311.1

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

2021 IRC – SIGNIFICANT CHANGES

Code Section

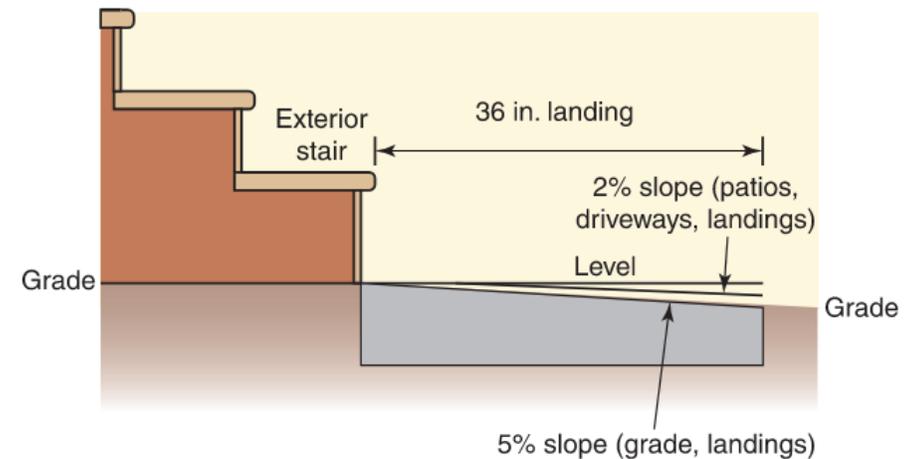
Stairways and Ramps

R311

IRC Changes:

Exception added to R311.7.7 which allows for steeper slopes.

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



2018 IRC – SIGNIFICANT CHANGES

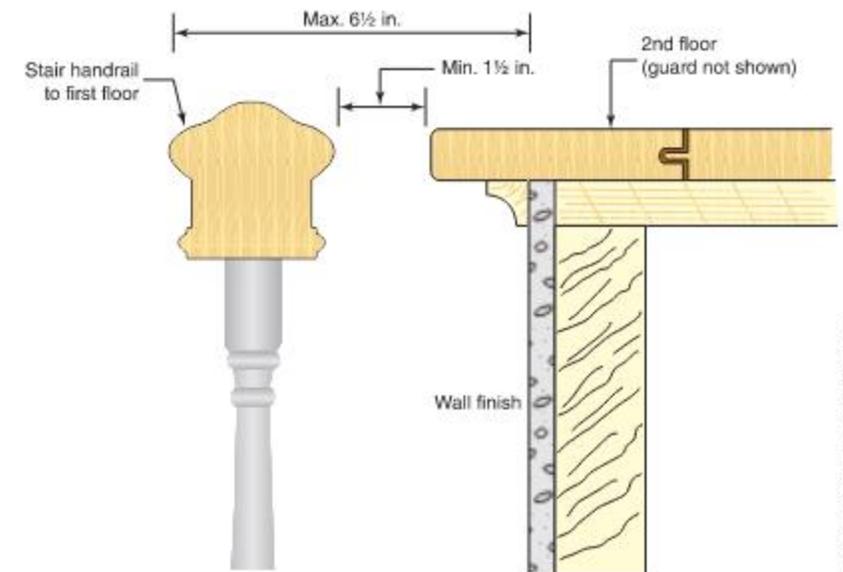
Code Section

Handrail Projection

R311.7.1,
R311.7.8

IRC Changes:

- Additional exception to section R311.7.8.2 allowing handrails to project a maximum 6.5” at nosing
- New Section R311.7.8.3 handrails adjacent to a wall shall have a space of not less than 1.5” between the wall and handrail
- Revised Section R311.7.8.4 revised for clarity and consistency



Greater projection allowed where handrail passes a floor nosing

2018 IRC – SIGNIFICANT CHANGES

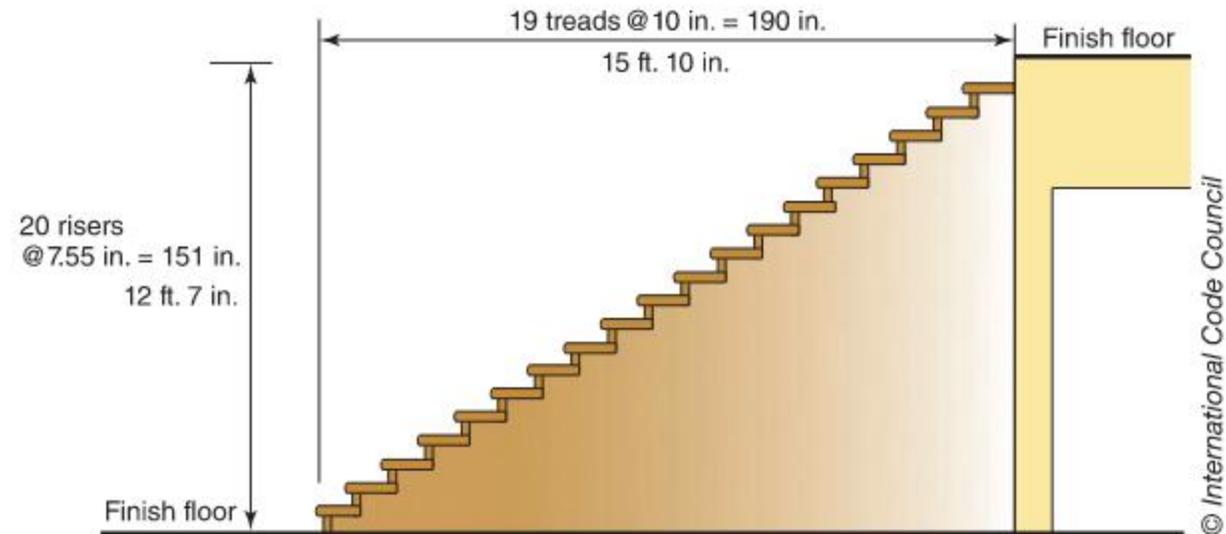
Code Section

Maximum Stair Rise between Landings

R311.7.3

IRC Changes:

- The maximum rise of a flight of stair has been increased by 4” to 151”



Maximum 151-inch total rise between floors or landings

2018 IRC – SIGNIFICANT CHANGES

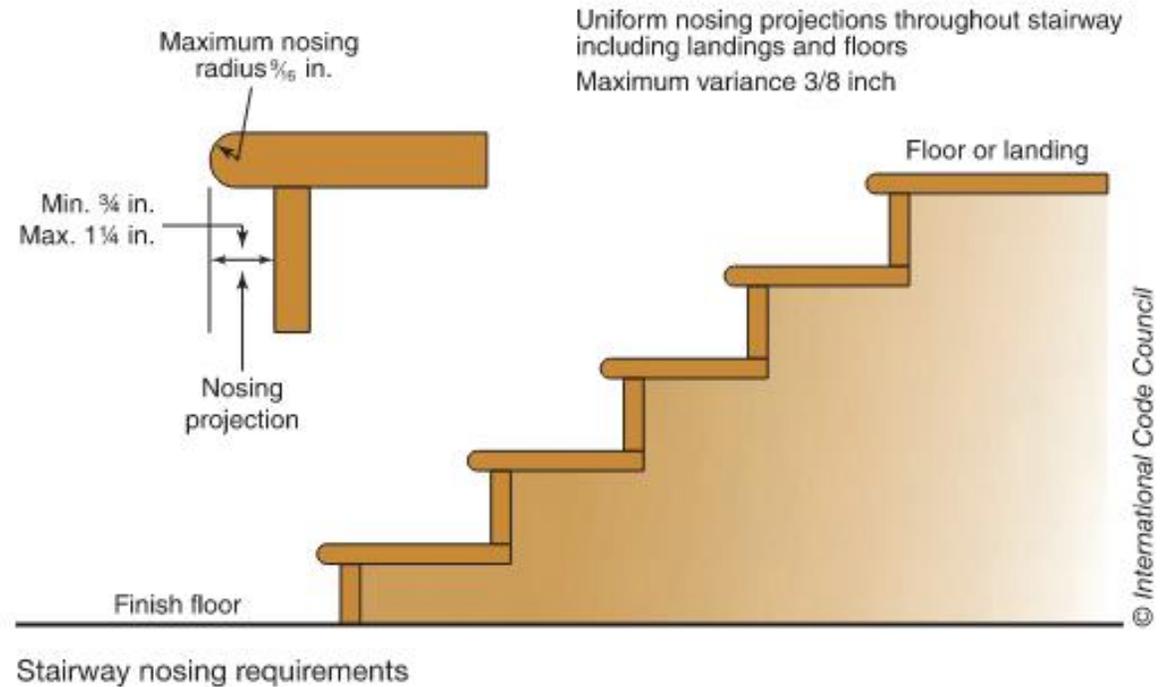
Code Section

Stair Nosing

R311.7.5.3

IRC Changes:

- Clarification to code that nosings must be consistent throughout the stairway and are not to have a bevel greater than 1/2"



2018 IRC – SIGNIFICANT CHANGES

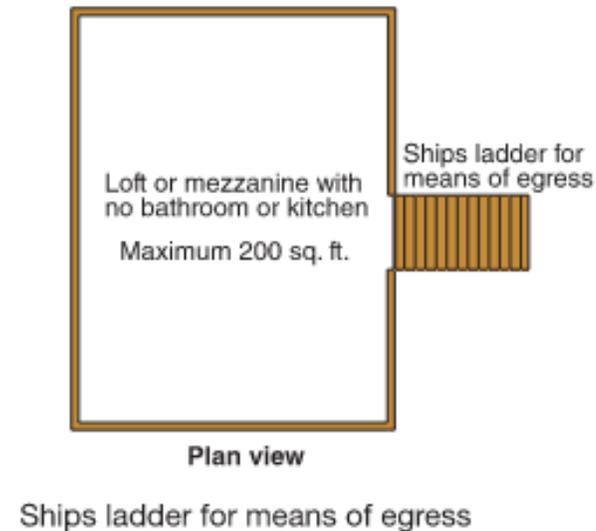
Code Section

Alternating Tread Devices and Ships Ladders

R311.7.11,
R311.7.12

IRC Changes:

- New exceptions added. Alternating tread devices and ship ladders are now allowed to be used as an element of a means of egress for lofts, mezzanines, and similar areas of 200 gross square feet or less provided there is not an exclusive kitchen or bathroom



2018 IRC – SIGNIFICANT CHANGES

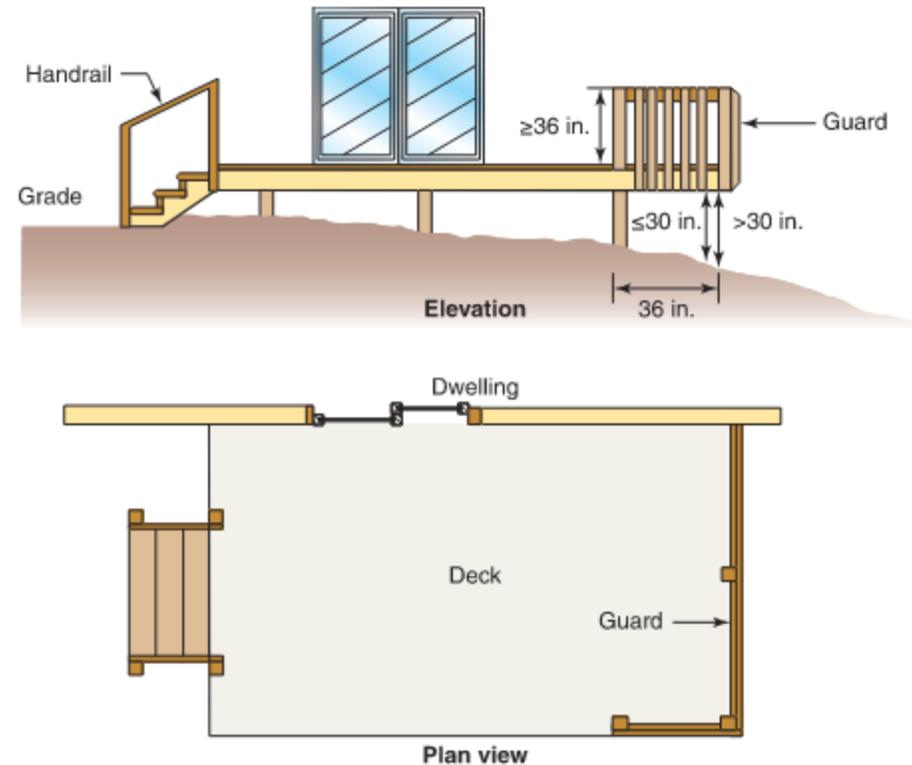
Code Section

Guards

R312.1

IRC Changes:

- Clarification to the code. Guard requirements only apply to the specific portion of a walking surface that exceeds 30” above grade.



Guard required at portions of deck greater than 30 inches above grade

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2021 IRC – SIGNIFICANT CHANGES

Code Section

Window Fall Protection

R312.2

IRC Changes:

R311.7 clarifies the measurement for determining the need for fall protection.

- The term “Top of sill” has been replaced with the term “bottom of clear opening”

2021 IRC – SIGNIFICANT CHANGES

Code Section

One- and two-family dwellings automatic sprinkler systems

R313.2

IRC Changes:

City of Houston amendment deletes Sections R313.2 and R313.2.1 which requires automatic sprinkler systems to be installed in one- and two-family dwellings.

2018 IRC – SIGNIFICANT CHANGES

Code Section

Smoke Alarms

R314

IRC Changes:

- Removed the exemption for interconnection of alarms during alterations based on feasibility.



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Interconnection is required for smoke alarms installed in existing buildings undergoing remodeling requiring a permit.

2021 IRC – SIGNIFICANT CHANGES

Code Section

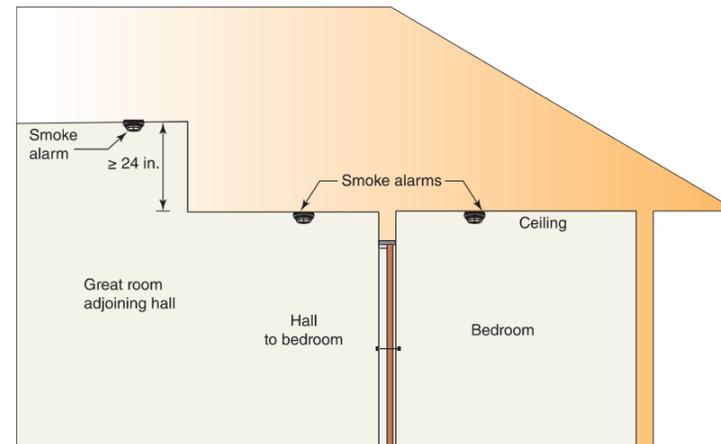
Smoke Alarm Locations

R314.3

IRC Changes:

The addition of Item 5 to R314.7 provides new location requirement for smoke alarms

- Item 5: In the hallway and in the room open to the hallway in dwelling units where the ceiling height of a room open to a hallway serving bedrooms exceeds that of the hallway by 24 inches or more.



2021 IRC – SIGNIFICANT CHANGES

Code Section

Smoke Alarm Locations

R314.3

IRC Changes:

The addition of Item 4 to R314.3.1 provides new requirement for where smoke alarms are not to be installed.

- Item 4: Smoke alarms listed and marked “helps reduce cooking nuisance alarms” shall not be installed less than 6 feet horizontally from a permanently installed cooking appliance.

2018 IRC – SIGNIFICANT CHANGES

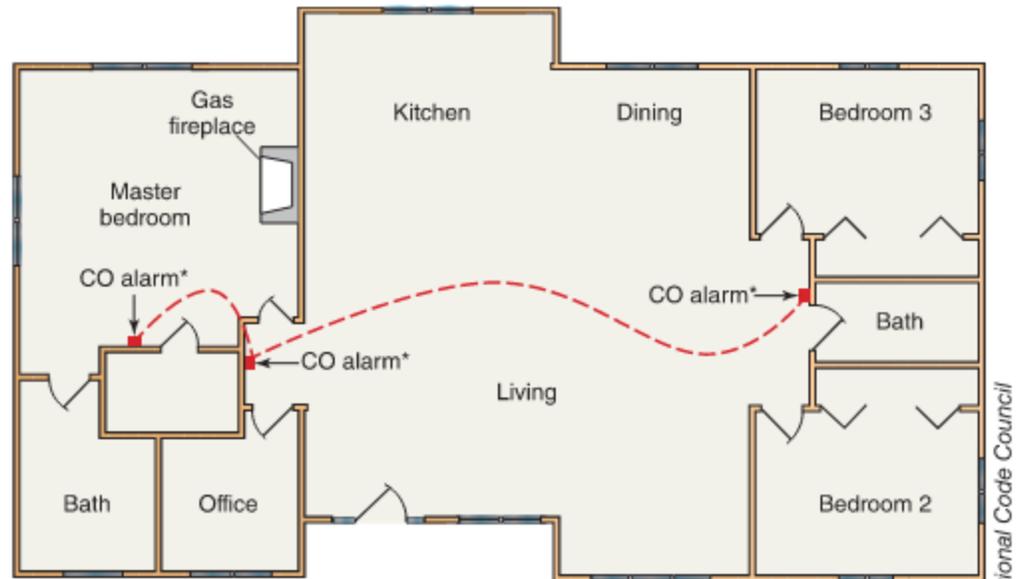
Code Section

Carbon Monoxide Alarms

R315

IRC Changes:

- New Section R315.2.2 Interconnection is required where multiple carbon monoxide alarms are required in a dwelling unit.
- Not required in existing areas where removal of interior finishes would be needed for the connection



*CO alarm may be a combination CO and smoke alarm

Interconnection is required where multiple carbon monoxide alarms are required in a dwelling unit.

2021 IRC – SIGNIFICANT CHANGES

Code Section

Carbon Monoxide Alarms

R315.2.2

IRC Changes:

New exception added to R315.2.2 that clarifies that repairs to an existing fuel-fired mechanical system now trigger the requirements for carbon monoxide alarms.



2018 IRC – SIGNIFICANT CHANGES

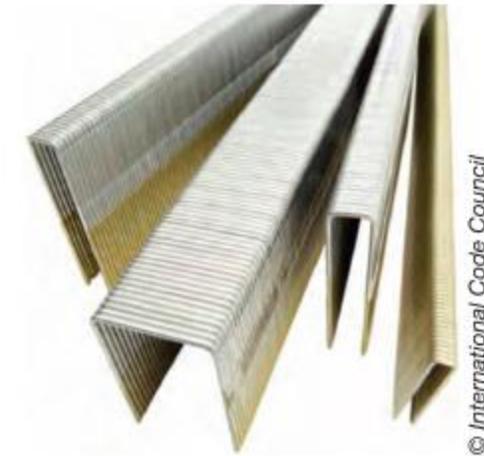
Code Section

Fasteners in Treated Wood

R317.3

IRC Changes:

- Staples in treated wood are now required to be made of stainless steel.



Stainless steel staples

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2021 IRC – SIGNIFICANT CHANGES

Code Section

Accessibility

R320,
R321

IRC Changes:

City of Houston amendment modifies R320.1

- Where there are four or more dwelling units or sleeping units in a single structure, the provisions of Texas Accessibility Standards contained within Texas Government Code, Chapter 469, as may be amended, shall apply.

City of Houston amendment modifies R321.3

- Elevators or platform lifts that are part of an accessible route shall comply with the Texas Accessibility Standards contained within Texas Government Code, Chapter 469, as may be amended.

2018 IRC – SIGNIFICANT CHANGES

Code Section

Coastal High-Hazard Flood Zones

R322.3.3

IRC Changes:

- New Section R322.3.4. Provides guidance for concrete slabs including dimensions and resistance to the elements.
- New Section R322.3.7. Provides guidance for stairways and ramps and how they should be constructed for the event of a flood. They are to be constructed so water flows through them and minimizes the load on the house for egress paths and to breakaway when not part of the means of egress.
- New Section R322.3.8. Provides guidance for decks and porches. Requirements include elevation requirements and structural requirements.



Collapsed dwelling in coastal high hazard flood zone

2021 IRC – SIGNIFICANT CHANGES

Code Section

Storm Shelters

R323

IRC Changes:

The addition of R323.1.1 provides guidance on the design of storm shelters.

- The construction documents for all structural components and impact protective systems of the storm shelter shall be prepared and sealed by a registered design professional indicating that the design meets the criteria of ICC-500.

Exception: Storm shelters, structural components and impact-protective systems that are listed and labeled to indicate compliance with ICC-500.

2018 IRC – SIGNIFICANT CHANGES

Code Section

Rooftop-Mounted Photovoltaic Systems

R324.4

IRC Changes:

- Moved the requirements from Section R907 and consolidated requirements into Section R324.4 including wind load and, fire classifications, roof penetrations, and structural requirements.
- Section R324.4.1.1 Modified to reference Sections R301.2 and R301.6. Section no longer describes live loads and added the following load requirements:
 - Dead load (including photovoltaic panel weight) plus snow load in accordance with Table R301.2(1).
 - Dead load (excluding photovoltaic panel weight) plus roof live load or snow load, whichever is greater, in accordance with Section R301.6.



Rooftop-mounted photovoltaic panels

2018 IRC – SIGNIFICANT CHANGES

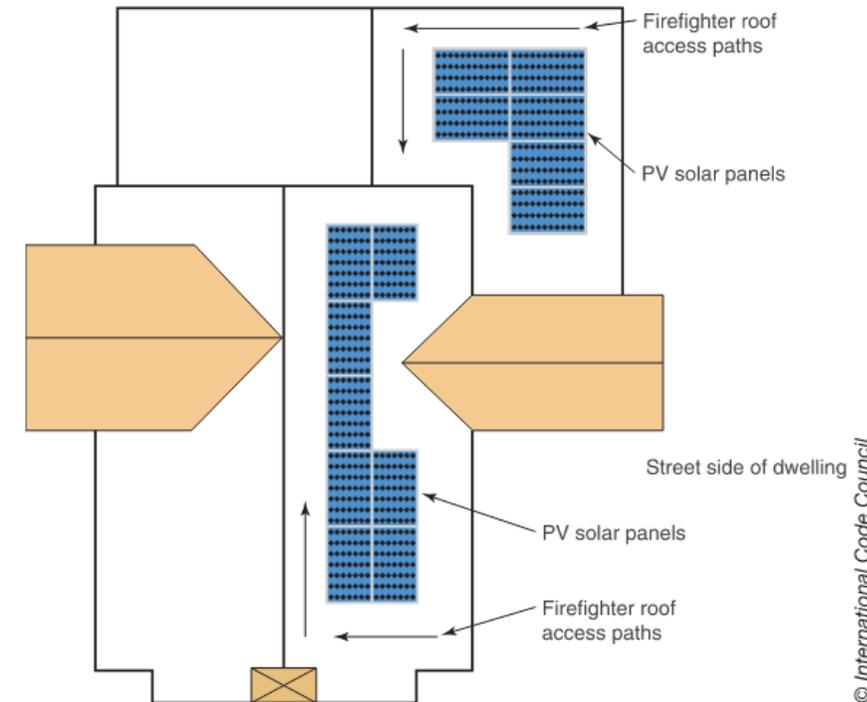
Code Section

Roof Access for Photovoltaic Solar Energy System

R324.6

IRC Changes:

- New Section R324.6. Roof access, pathways, and setback requirements shall be provided in accordance with Sections R324.6.1 through R324.6.2.1. Access and minimum spacing shall be required to provide emergency access to the roof, to provide pathways to specific areas of the roof, provide for smoke ventilation opportunity areas, and to provide emergency egress from the roof. Exceptions:
- Detached, nonhabitable structures.
- Where code official determined rooftop operations will not be employed
- Roofs with slopes of 2 units vertical in 12 units horizontal or less



Required roof access and pathways for firefighters for roof-mounted PV solar systems

2018 IRC – SIGNIFICANT CHANGES

Code Section

Roof Access for Photovoltaic Solar Energy System- continued.

R324.6.1

IRC Changes:

- New Section R324.6.1 Pathways. Not fewer than two pathways, on separate roof planes from lowest roof edge to ridge and not less than 36 inches wide, shall be provided on all buildings.
- Not fewer than one pathway shall be provided on the street or driveway side of the roof. For each roof plane with a photovoltaic array, a pathway not less than 36 inches wide shall be provided from the lowest roof edge to ridge on the same roof plane as the photovoltaic array, on an adjacent roof plane, or straddling the same and adjacent roof planes.
- Pathways shall be over areas capable of supporting fire fighters accessing the roof. Pathways shall be located in areas with minimal obstructions such as vent pipes, conduit, or mechanical equipment

2018 IRC – SIGNIFICANT CHANGES

Code Section

Roof Access for Photovoltaic Solar Energy System- continued.

R324.6.2

IRC Changes:

- **New Section R324.6.2 Setback at Ridge.** Where photovoltaic arrays occupying not more than 33 percent of the plan view total roof area, a minimum 18” clear setback is required on both side of a horizontal ridge.
- **New Section R324.6.2.1 Alternative setback at ridge.** Where an automatic sprinkler system is installed within the dwelling in accordance with NFPA 13D or Section P2904, setbacks at ridges shall comply with one of the following:
 - For photovoltaic arrays occupying not more than 66 percent of the plan view total roof area, not less than an 18-inch clear setback is required on both sides of a horizontal ridge.
 - For photovoltaic arrays occupying more than 66 percent of the plan view total roof area, not less than a 36-inch clear setback is required on both sides of a horizontal ridge.

TABLE 3-1 Minimum Ridge Setback

Array Percent of Roof Area	Fire Sprinkler System	Minimum Setback on Both Sides of Ridge (inches)
≤ 33 %	No	18
> 33%	No	36
≤ 66 %	Yes	18
> 66%	Yes	36

2021 IRC – SIGNIFICANT CHANGES

Code Section

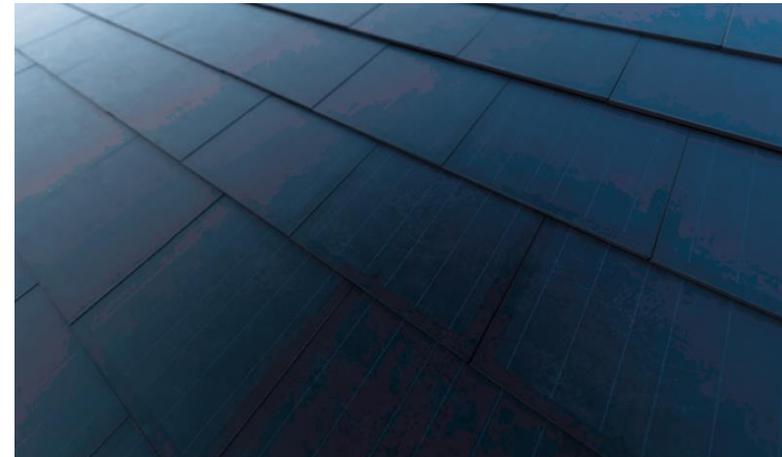
Photovoltaic Systems

R324.6

IRC Changes:

New exception to R324.6 allows Building-integrated Photovoltaic (BIPV) systems to be exempt from the R324.6 requirement to provide emergency access to the roof.

- Exception 4: BIPV systems listed in accordance with Section 690.12(B) (2) of NFPA 70, where the removal or cutting away of portions of the BIPV system during firefighting operations have been determined to not expose a firefighter to electrical shock hazard.



2018 IRC – SIGNIFICANT CHANGES

Code Section

Mezzanine Area Limitation

R325.3

IRC Changes:

- New exception added to R324.6.2.2 Area limitation.
- The aggregate area of a mezzanine located within a dwelling unit equipped with a fire sprinkler system in accordance with Section P2904 shall not be greater than one-half of the floor area of the room, provided that the mezzanine meets all of the following requirements:
 - Except for enclosed closets and bathrooms, the mezzanine is open to the room in which such mezzanine is located.
 - The opening to the room is unobstructed except for walls not more than 42 inches in height, columns and posts.
 - The exceptions to Section R325.5 are not applied.



A mezzanine is not considered a story.

IRC CHAPTER 4 FOUNDATIONS



2021 IRC – SIGNIFICANT CHANGES

Code Section

Foundations

R401

IRC Changes:

City of Houston amendment provides the new addition of R401.5 which provides requirements for foundation elevation.

2018 IRC – SIGNIFICANT CHANGES

Code Section

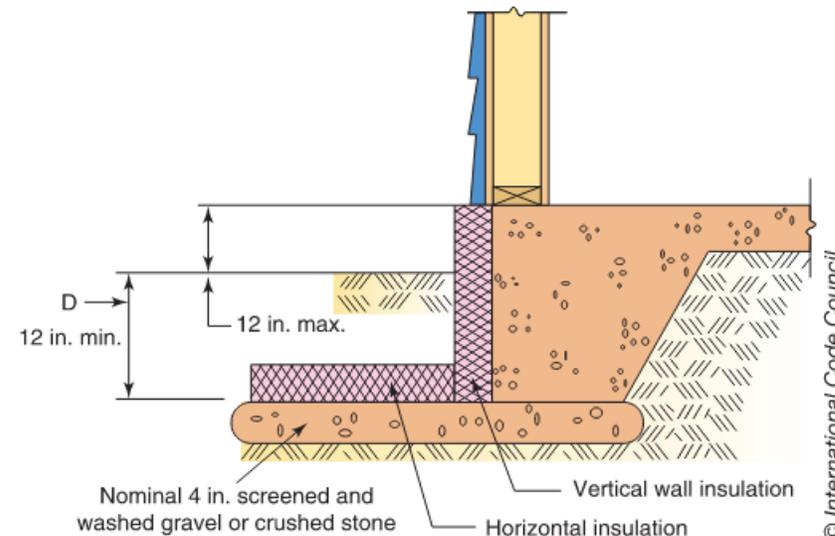
Insulation Requirements for Frost-Protected Footings

Table
R403.3(1)

IRC Changes:

- Modification to Table R403.3(1). Insulation thickness requirements for Type II and IX expanded polystyrene (EPS) have changed. The minimum R-value for specific types of EPS has been clarified while requirements for horizontal insulation were added. The following table summarizes the changes:

Expanded Polystyrene	Insulation Requirements (per inch)	
Type	Vertical	Horizontal
II	3.2 R	2.6 R
IX	3.4 R	2.8 R
IV, V, VI, VII, and X	4.5 R	4.0 R



EPS placement in a frost-protected shallow foundation

2018 IRC – SIGNIFICANT CHANGES

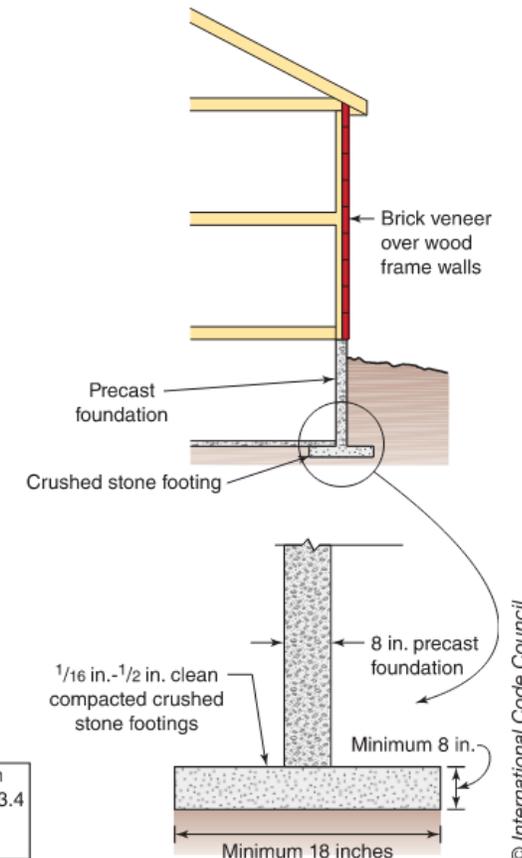
Code Section

Crushed Stone Footings

Table
R403.4

IRC Changes:

- Modification to Table R403.4. The table now includes minimum width requirements in addition to minimum depth requirements (some depth values were changed as well).
- Two footnotes have been added to the table that read as follows:
 - Crushed stone must be consolidated in 8-inch lifts with a plate vibrator.
 - Soil classes are in accordance with the Unified Soil Classification System. Refer to Table R404.5.1.



Footing thickness and width determined from Table R403.4 based on an assumed soil load bearing of 2,000 PSF

Crushed stone footing

2021 IRC – SIGNIFICANT CHANGES

Code Section

Footings

R403

IRC Changes:

Tables R403.1(1), (2) and (3) are revised to more accurately reflect current practice.

R403.2 modified to remove Six-mil polyvinyl chloride and polyethylene fabrics from the list of approved waterproofing materials.



2018 IRC – SIGNIFICANT CHANGES

Code Section

Unvented Crawl Spaces

R408.3

IRC Changes:

- Modification to Section R408.3. Condition added to the section for additional requirements to allow an unvented crawl space. Condition 2.4 reads as follows:
- Dehumidification sized to provide 70 pints (33 liters) of moisture removal per day for every 1,000 square feet of crawl space floor area.



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An unvented crawlspace requires moisture removal

2021 IRC – SIGNIFICANT CHANGES

Code Section

Vapor Retarder in Crawlspace

R408.8

IRC Changes:

New addition of Section R408.8

- 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

IRC CHAPTER 5 FLOORS



2018 IRC – SIGNIFICANT CHANGES

Code Section

Cold-Formed Steel Joist Spans

Table
R505.3.2

IRC Changes:

- Maximum spans for cold-formed steel joists are updated for wind speeds up to 140 miles per hour in single or continuous spans. Footnote f is added to clarify that 33 and 43 mil thickness joists need to be single-span joists when using this prescriptive table

TABLE R505.3.2 Allowable Spans for Cold-Formed Steel Joists—Single or Continuous Spans

JOIST DESIGNATION	30 psf Live Load			
	Spacing (inches)			
	12	16	19.2	24
550S162-33	11'-7" 11'-8"	10'-7" 10'-4"	9'-6"9'-5"	8'-6"8'-5"
550S162-43	12'-8"	11'-6"	10'-10" 10'-8"	10'-2" 10'-5"
550S162-54	13'-7"	12'-4"	11'-7"	10'-9"
550S162-68	14'-7"	13'-3"	12'-6"	11'-7"
800S162-33	15'-8" 14'-6"	13'-11" 12'-6"	12'-9" 11'-5"	11'-5" 10'-3"
800S162-43	17'-4" 17'-0"	15'-6" 15'-1"	14'-7" 13'-9"	13'-7" 12'-4"
800S162-54	18'-4" 18'-3"	16'-8" 16'-7"	15'-8"	14'-7" 14'-6"
800S162-68	19'-9"	17'-11"	16'-10" 16'-11"	15'-8"

f. Table R505.3.2 is not applicable for 800S162-33 and 1000S162-43 continuous joist members.

(Only a portion of the table is shown for brevity and clarity.)

2021 IRC – SIGNIFICANT CHANGES

Code Section

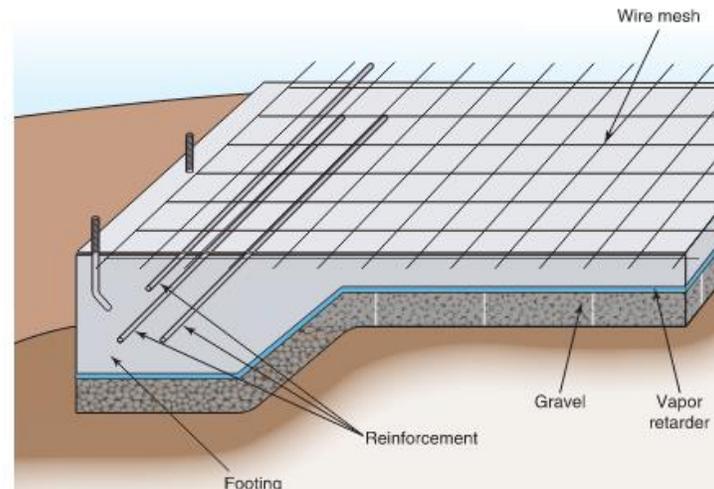
Vapor Retarders Under Concrete Slabs

R506.2.3

IRC Changes:

Modification to R506.2.3 requiring thicker vapor retarders below slabs-on-grade.

- Minimum 6-mil replaced with a minimum 10-mil requirement.
- Addition of the requirement that the vapor retarder conform to ASTM E1745 Class A requirements.



2018 IRC – SIGNIFICANT CHANGES

Code Section

Deck

R507.1
and
R507.2

IRC Changes:

- Section R507.1 Exterior Decks. The section is reorganized for ease of use and added design specifications for common deck materials.
- Section R507.2 Deck materials. All wood materials shall be No. 2 grade at a minimum. Materials must be in accordance with Sections R317 or R318.
- Section R507.2.1.1 Engineered wood products shall be in accordance with Section R502.
- Added section R507.2.3 and Table R507.2.3. Section and table add requirements for fasteners and connectors.
- Added Section R507.2.4 Flashing. Flashing must be corrosion resistant and have a minimum thickness of 0.019” or an approved non-metal material compatible with the used materials.
- Added Section R507.2.5 Alternate Materials. Permits the use of alternate materials including glass and metals.



Fasteners in wood decking must be of approved material

2018 IRC – SIGNIFICANT CHANGES

Code Section

Deck Footings

R507.3

IRC Changes:

- Added section R507.3. Footings are to be concrete or an approved structural system that can accommodate all loads in accordance with R301. Footing depth shall be in accordance with Section R403.1.4 Exception for decks with joists directly supported on grade over their entire length.
- Section R507.3.1. The minimum size of concrete footings shall be in accordance with Table R507.3.1 based on the tributary area and allowable soil-bearing pressure in accordance with Table R401.4.1.
- Section R507.3.2. the minimum depth shall extend below the frost line Specified in Table R301.2(1) in accordance with Section R403.1.4.1.

Exceptions:

- Freestanding decks where all the following are met:
The walking area is a maximum 20” above grade measured at any point within 36 “ from the edge, the area of the deck does not exceed 200 sf, and the joists bear directly in precast concrete blocks at grade without the support of beams or posts.



Freestanding deck

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2018 IRC – SIGNIFICANT CHANGES

Code Section

Deck Posts

R507.4

IRC Changes:

- Section reorganized so deck posts is in the middle of Section R507.4.
- Table R507.4 Deck Post Height added post size 8 x 8 with a maximum height of 14 feet and modified the allowed height of 4 x 4 beams to be 6' - 9'.
 - New foot note added so that the maximum height is based on a 40 psf live load.
 - New foot note added for posts sized 4 x 4 are limited to 8' in height for one-ply and two-play beams and a maximum 6'-9" for three-ply beams.
- Section R507.4.1 Deck post to deck footing connection. Connections must be in accordance with Section R403 and Figure R507.4.1 and permits the use of other footing systems.
- Exception: Where expansive, compressible, shifting, or other questionable soils are present, surrounding soils shall not be relied upon for lateral support.



Deck post with cap

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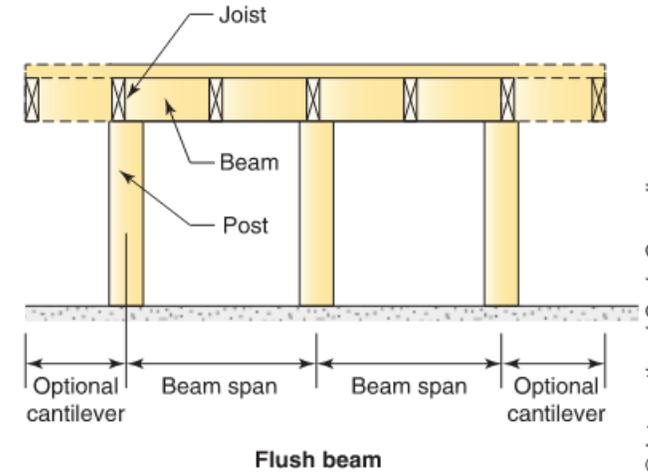
Code Section

Deck Beams

R507.5

IRC Changes:

- Verbiage added to Section R507.5 allowing other materials to be used when designed in accordance with accepted engineering practice. Cantilever beams are allowed to be $\frac{1}{4}$ of the allowable beam span, rather than the actual.
- Section R507.5.1 Deck beam bearing. Adds the requirement for multi-span beams on intermediate posts and adds a reference to Figures R507.1(1) and R507.5.1(2). Joists removed from the section.
- Section R507.5.2 Deck beam connection to supports. Deck beams are to be attached to supports in a way capable of transferring the vertical loads and resisting horizontal displacement. New references to R507.5.1(1) and R507.1(2).
- Table R507.5 included values for southern pine single ply 2 x 6 through 2 x 12.



2018 IRC – SIGNIFICANT CHANGES

Code Section

Deck Joists

R507.6

IRC Changes:

- Modification to Section R507.6 Joist spacing shall be limited by the material in accordance with Table R507.7. Cantilevers are allowed to be $\frac{1}{4}$ of the allowable joist span, rather than the actual.
- Section R507.6.1 Deck joist bearing. Adds the requirement for joist bearing on multiple ply beams or ledger to be fastened in accordance with Table R602.3(1). Beams were removed from the section.
- Section R507.6.2 Deck joist lateral restraint. Revised section title.
- Revised Table R507.6 Deck Joists Spans for Common Lumber Species adding maximum cantilever spacing.



Deck Joists

2018 IRC – SIGNIFICANT CHANGES

Code Section

Decking, Vertical, and Lateral Support

R507.7

IRC Changes:

- Modification to Section R507.7 Decking. Adds that other approved decking or fastener systems are to be installed in accordance with the manufacturer’s installation requirements.
- Modification to Table R507.7 Maximum joist spacing for decking adding the word decking to the table

TABLE R507.4 R507.7 Maximum joist spacing for decking

Decking material type and nominal size	Maximum on-center joist spacing	
	Decking perpendicular to joist	Decking diagonal to joist ^a
1¼-inch thick wood	16 inches	12 inches
2-inch thick wood	24 inches	16 inches
Plastic composite	In accordance with Section R507.2	In accordance with Section R507.2

For SI: 1 inch = 25.4 mm

a. Maximum angle of 45 degrees from perpendicular for wood deck boards

2018 IRC – SIGNIFICANT CHANGES

Code Section

Decking, Vertical, and Lateral Support

R507.8

IRC Changes:

- Modification to Section R507.8 Vertical and lateral supports. Removed the requirement for wood-framed decks and reorganized the section structure.
- Modification to Table R507.7 Maximum joist spacing for decking adding the word decking to the table



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Wood Deck

2018 IRC – SIGNIFICANT CHANGES

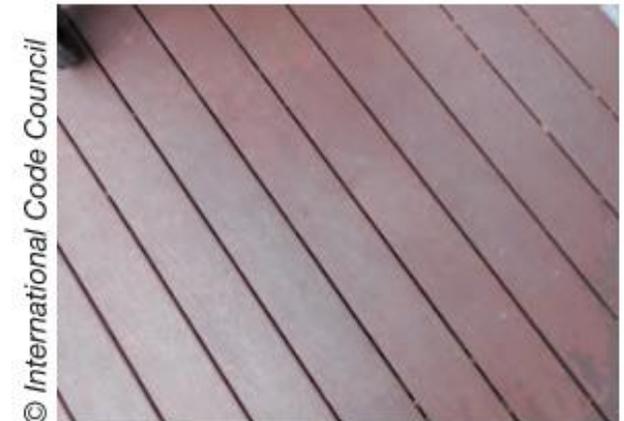
Code Section

Decking, Vertical, and Lateral Support

R507.9

IRC Changes:

- Added Section R507.9 Vertical and lateral supports at band joist. Section R507.9.1 required vertical loads to be transferred to band joists with ledgers.
- Moved Sections R507.2.1-R507.2.3 to Section 507.9.
- Section R507.9.1.2 allows for different wood to be used if the quality is higher and the band joist shall be supported by the primary structure cable of supporting all loads.
- Added Section R507.9.1.4 Alternate ledger details. Permits alternate framing configurations are permitted if they meet the load requirements of Section R301.5.



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Composite Deck

2018 IRC – SIGNIFICANT CHANGES

Code Section

Decking, Vertical, and Lateral Support

R507.9
(cont.)

IRC Changes:

- Moved Table R507.2 and R507.2.1 to Section R507.9.
- Moved Sections R507.2.1-R507.2.3 to Section 507.9.
- Revised Section R507.9.2 Lateral connection. Lateral loads are to be transferred to the ground or to a structure that can transfer the load to the ground.



Solid-sawn Wood Deck Ledger

2021 IRC – SIGNIFICANT CHANGES

Code Section

Deck Loads

R507

IRC Changes:

R507 modified to specify that decks shall be designed include live or the ground snow load indicated in Table R301.2 whichever is greater.



2021 IRC – SIGNIFICANT CHANGES

Code Section

Decks

R507

IRC Changes:

Modifications to various Deck Tables

- R507.4 Deck Post Height Table.
- R507.5 to split the Deck Beam Span Table into multiple tables.
- R507.6 Deck Joist Span Table.
- R507.7 Maximum Joist Spacing for Wood Decking table.

2021 IRC – SIGNIFICANT CHANGES

Code Section

Decks

R507

IRC Changes:

New addition of R507.10 which provides requirements for deck guards



IRC CHAPTER 6 WALL CONSTRUCTION



2021 IRC – SIGNIFICANT CHANGES

Code Section

Fasteners – Roof and Wall

Table R602.3(1)

IRC Changes:

Additional fastener options are added to the fastener table R602.3(1) for roof and walls.

Item	Description of Building Elements	Number and Type of Fastener ^{a,b,c,g}	Spacing and Location
Roof			
1	<u>Blocking between ceiling joists, or rafters or trusses to top plate or other framing below</u>	4-8d box (2½" × 0.113") nails	Toenail
		3-8d common (2½" × 0.131") nails	
		3-10d box (3" × 0.128") nails	
	<u>Blocking between rafters or truss not at the wall top plates, to rafter or truss</u>	3-(3" × 0.131") nails	Each end, toenail
		2-8d common (2½" × 0.131") nails	
		2-(3" × 0.131") nails	
<u>Flat blocking to truss and web filler</u>	2-16d common (3½" × 0.162") nails	End nail	
	3-(3" × 0.131") nails	6"o.c. face nail	
Wall			
12	<u>Adjacent full-height stud to end of header</u>	3-16d common (3½" × 0.162") nails	End nail
		4-16d box (3 ½" × 0.135") nails	
		4-10d box (3" × 0.128") nails	
		4-(3" × 0.131") nails	

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Code Section

Fasteners – Roof Sheathing

Table R602.3(1)

IRC Changes:

Additional fastener options are added to the fastener table R602.3(1) in the roof sheathing section while maximum field nailing is reduced

Item	Description of Building Elements	Number and Type of Fastener ^{a,b,c}	Spacing of Fasteners	
			Edges ^h (inches)	Intermediate supports ^{c,e} (inches)
Wood structural panels (WSP), subfloor, roof and interior wall sheathing to framing and particleboard wall sheathing to framing				
30-31	$\frac{3}{8}$" – $\frac{1}{2}$"	6d common or deformed (2" × 0.113" × 0.266" head) (subfloor, wall)ⁱ; 2³/₈" × 0.113" × 0.266" head nail (subfloor, wall)^l	6^f	12-6^f
		8d common (2½" × 0.131") (roof) RSRS-01 (2 ³ / ₈ " × 0.113") nail (roof) ^m	6 ^f	12-6 ^f
31-32	$\frac{19}{32}$" – $1\frac{1}{4}$"	8d common (2 – 2½" × 0.131") (subfloor, wall) Deformed 2³/₈" × 0.113" × 0.266" head (wall or subfloor)	6	12
		8d common (2½" × 0.131") nail (roof) RSRS-01 (2 ³ / ₈ " × 0.113") nail (roof) ^m	6 ^f	12-6 ^f
32-33	$1\frac{1}{8}$" $\frac{7}{8}$" – $1\frac{1}{4}$"	10d common (3" × 0.148") nail 8d (2½" × 0.131" × 0.281" head) deformed nail	6	12

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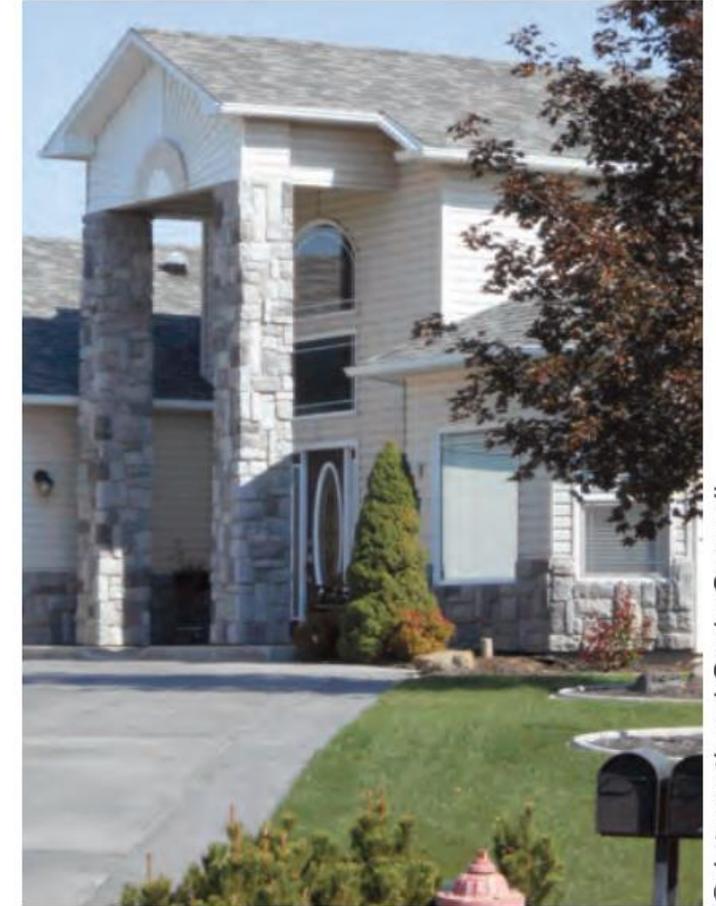
Code Section

Alternate Stud Height

R602.3(6)

IRC Changes:

- Exception 3 added to section. Exterior load-bearing studs not exceeding 12 feet in height are provided in accordance with Table R602.3(6). The minimum number of full-height studs adjacent to openings shall be in accordance with Section R602.7.5. The building shall be located in Exposure B, the roof live load shall not exceed 20 psf (0.96 kPa) and the ground snow load shall not exceed 30 psf (1.4 kPa). Studs and plates shall be No. 2 grade lumber or better.



Tall walls of up to 20-foot height allowed

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Code Section

Alternate Stud Height

R602.3(6)

IRC Changes:

Added Table R602.3(6) Alternate Wood Bearing Wall Stud Size, Height, and Spacing.

TABLE R602.3(6) Alternate Wood Bearing Wall Stud Size, Height and Spacing

Stud Height	Supporting	Stud Spacing ^a	Ultimate Design Wind Speed					
			115 mph		130 mph ^b		140 mph ^b	
			Maximum Roof/Floor Span ^c		Maximum Roof/Floor Span ^c		Maximum Roof/Floor Span ^c	
			12 ft.	24 ft.	12 ft.	24 ft.	12 ft.	24 ft.
11 ft.	Roof Only	12 in.	2 × 4	2 × 4	2 × 4	2 × 4	2 × 4	2 × 4
		16 in.	2 × 4	2 × 4	2 × 4	2 × 6	2 × 4	2 × 6
		24 in.	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6
	Roof and One Floor	12 in.	2 × 4	2 × 6	2 × 4	2 × 6	2 × 4	2 × 6
		16 in.	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6
		24 in.	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6
12 ft.	Roof Only	12 in.	2 × 4	2 × 4	2 × 4	2 × 6	2 × 4	2 × 6
		16 in.	2 × 4	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6
		24 in.	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6
	Roof and One Floor	12 in.	2 × 4	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6
		16 in.	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6
		24 in.	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6	DR

For SI: 1 inch = 25.4mm, 1 foot = 304.8 mm, 1 mph = 0.447 m/s

DR = Design Required

- Wall studs not exceeding 16 inches on center shall be sheathed with minimum ½-inch (12.7 mm) gypsum board on the interior and ¾-inch (9 mm) wood structural panel sheathing on the exterior. Wood structural panel sheathing shall be attached with 8d (2.5" × 0.131") (64 mm × 3.3 mm) nails spaced not greater than 6 inches (152 mm) on center along panel edges and 12 inches (305 mm) on center at intermediate supports, and all panel joints shall occur over studs or blocking.
- Where the ultimate design wind speed exceeds 115 mph (51.4 m/s), studs shall be attached to top and bottom plates with connectors having a minimum 300 pound (136 kg) capacity.
- The maximum span is applicable to both single- and multiple-span roof and floor conditions. The roof assembly shall not contain a habitable attic.

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Code Section

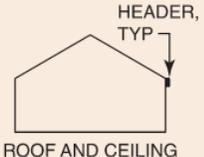
Girder and Header Spans

Table R602.7(1)
and R602.7(2)

IRC Changes:

- Girder and header spans are updated assuming No. 2 Southern pine rather than No. 1 Southern pine as used in the 2015 IRC. A footnote is added to clarify that headers and girders are assumed to be braced. For headers with pony walls above, a further reduction in span is taken for 2 x 8 and larger headers. Portion of table below.

TABLE R602.7(1) Girder Spans^a and Header Spans^a for Exterior Bearing Walls (Maximum spans for Douglas fir-larch, Hem-fir, Southern pine, and Spruce-pine-fir^b and required number of jack studs)

Header and Girder Supporting	Size	Ground Snow Load ^e (psf)											
		30						50					
		Building Width ^c (feet)											
		12		24		36		12		24		36	
		Span ^f	NJ ^d	Span ^f	NJ ^d	Span ^f	NJ ^d	Span ^f	NJ ^d	Span ^f	NJ ^d	Span ^f	NJ ^d
Roof and ceiling	1-2 × 6	4 - 0	1	3 - 1	2	2 - 7	2	3 - 5	1	2 - 8	2	2 - 3	2
	1-2 × 8	5 - 1	2	3 - 11	2	3 - 3	2	4 - 4	2	3 - 4	2	2 - 10	2
	1-2 × 10	6 - 0	2	4 - 8	2	3 - 11	2	5 - 2	2	4 - 0	2	3 - 4	3
	1-2 × 12	7 - 1	2	5 - 5	2	4 - 7	3	6 - 1	2	4 - 8	3	3 - 11	3
	2-2 × 4	4 - 0	1	3 - 1	1	2 - 7	1	3 - 5	1	2 - 7	1	2 - 2	1
	2-2 × 6	6 - 0	1	4 - 7	1	3 - 10	1	5 - 1	1	3 - 11	1	3 - 3	2
	2-2 × 8	7 - 7	1	5 - 9	1	4 - 10	2	6 - 5	1	5 - 0	2	4 - 2	2

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Code Section

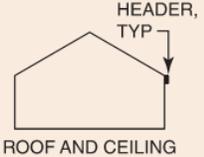
Girder and Header Spans

Table R602.7(1)
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IRC Changes:

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TABLE R602.7(1) Girder Spans^a and Header Spans^a for Exterior Bearing Walls (Maximum spans for Douglas fir-larch, Hem-fir, Southern pine, and Spruce-pine-fir^b and required number of jack studs)

		Ground Snow Load ^c (psf)												
		30						50						
		Building Width ^c (feet)												
Header and Girder Supporting		12		24		36		12		24		36		
		Span ^f	NJ ^d	Span ^f	NJ ^d	Span ^f	NJ ^d	Span ^f	NJ ^d	Span ^f	NJ ^d	Span ^f	NJ ^d	
	Roof and ceiling	1-2 × 6	4 - 0	1	3 - 1	2	2 - 7	2	3 - 5	1	2 - 8	2	2 - 3	2
		1-2 × 8	5 - 1	2	3 - 11	2	3 - 3	2	4 - 4	2	3 - 4	2	2 - 10	2
		1-2 × 10	6 - 0	2	4 - 8	2	3 - 11	2	5 - 2	2	4 - 0	2	3 - 4	3
		1-2 × 12	7 - 1	2	5 - 5	2	4 - 7	3	6 - 1	2	4 - 8	3	3 - 11	3
		2-2 × 4	4 - 0	1	3 - 1	1	2 - 7	1	3 - 5	1	2 - 7	1	2 - 2	1
		2-2 × 6	6 - 0	1	4 - 7	1	3 - 10	1	5 - 1	1	3 - 11	1	3 - 3	2
		2-2 × 8	7 - 7	1	5 - 9	1	4 - 10	2	6 - 5	1	5 - 0	2	4 - 2	2

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Code Section

Cripple Walls

R602.9

IRC Changes:

R602.9 clarifies that Cripple wall requirements apply only to exterior cripple walls.



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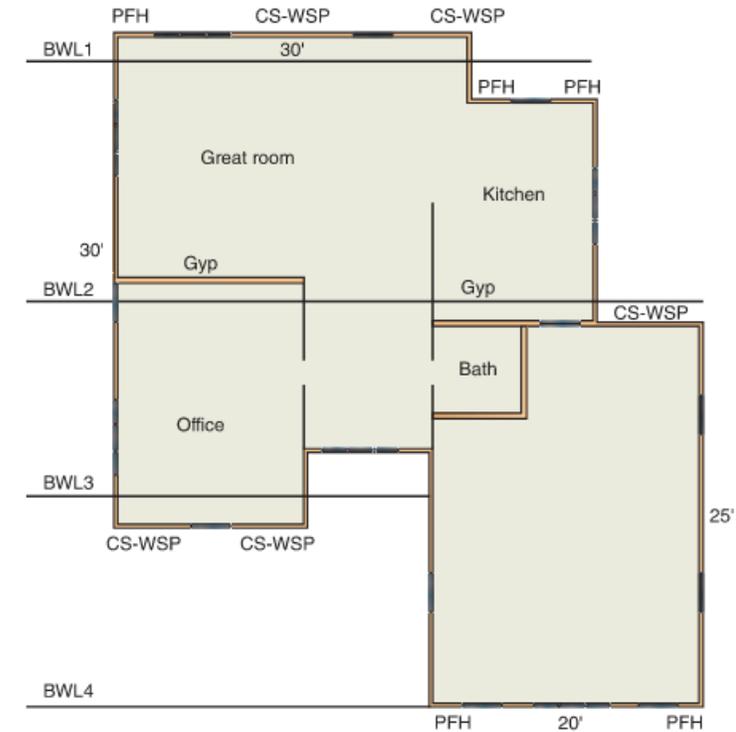
Code Section

Mixing Bracing Methods

R602.10.4.1

IRC Changes:

- Allowance for mixing methods of bracing altered condition 4 to read as the following: **Mixing of continuous sheathing methods CS-WSP, CS-G, and CS-PF along a braced wall line shall be permitted. Intermittent methods ABW, PFH, and PFG shall be permitted to be used along a braced wall line with continuous sheathed methods, provided that the length of required bracing for that braced wall line is determined in accordance with Table R602.10.3(1) or R602.10.3(3) using the highest value of the bracing methods used**



Braced wall lines with mixed methods

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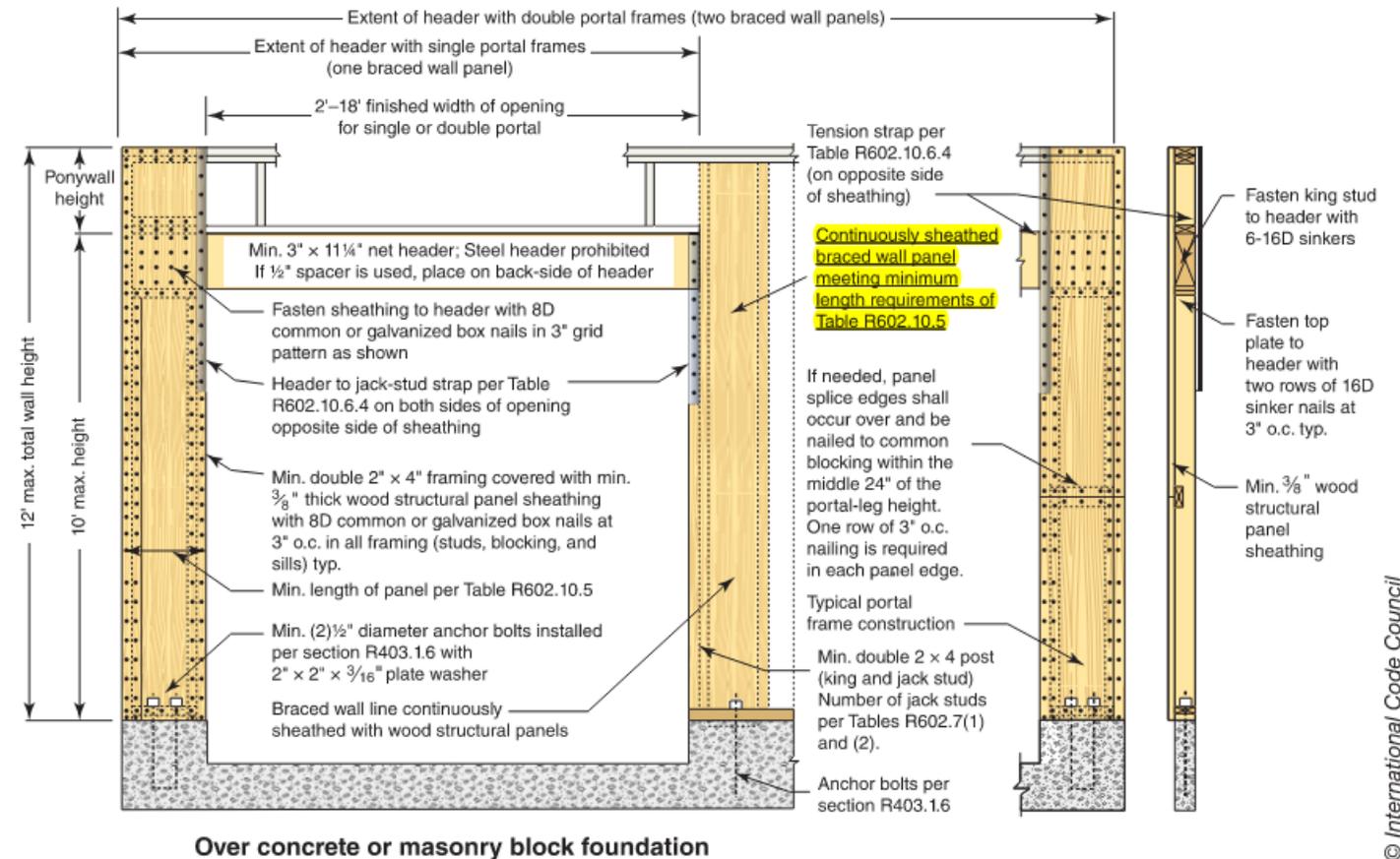
Code Section

Method CS-PF Continuously Sheathed Portal Frame

R602.10.6.4

IRC Changes:

- Added text to Figure R602.10.6.4.: Continuously sheathed braced wall panel meeting minimum length requirements of Table R602.10.5



2018 IRC – SIGNIFICANT CHANGES

Code Section

Method BV-WSP

R602.10.6.5

IRC Changes:

- Modification to Section R602.10.6.5 Wall bracing for dwellings with stone and masonry veneer in seismic design Categories D0, D1, and D2. Added information for detached one- or two-family dwellings with exterior veneer installed in accordance with Section R703.8 and are braced in accordance with Method WSP or CS-WSP.
 - Veneer permitted in the second story where the dwelling is a maximum of 2 stories above plane, veneer thickness is no more than 5 inches, the height of veneer on gable-end walls is a maximum of 8 feet above the bearing wall top plate elevation, and the total length of braced wall panel specified by Table R602.10.3(3) is multiplied by 1.2 for each first and second story braced wall line. Where all of the requirements are met the veneer shall be installed in accordance with one of the following methods :
 1. The total area of the veneer on the second-story exterior walls extends shall be permitted to extend up to 25 % of the occupied second floor area.
- OR
1. The veneer on the second-story exterior walls covers one side of the dwelling, including walls on bay windows and similar appurtenances within the one dwelling side.

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Code Section

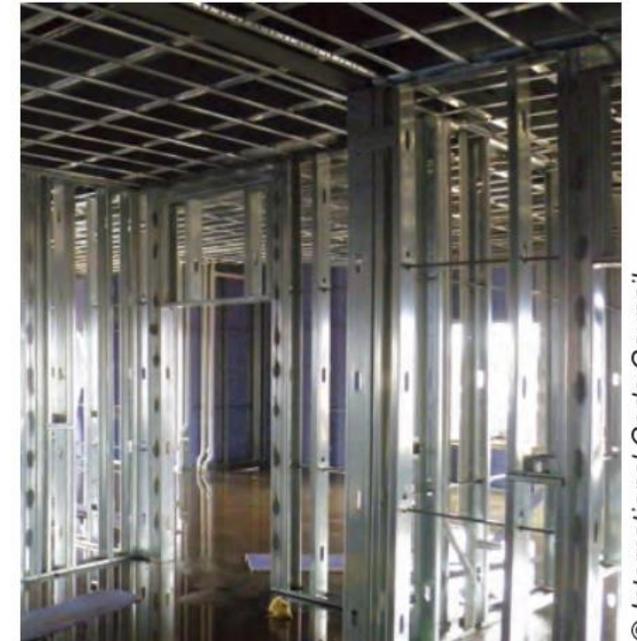
Cold-Formed Steel Wall Construction

Tables R603.3.1
and
R603.3.1.1(2)

IRC Changes:

Cold-formed steel connection tables are updated for wind speeds less than 140 miles per hour. Values in the IRC tables now match AISI S230, the Standard for cold-formed steel framing—prescriptive method for one- and two-family dwellings.

See code for full list of value changes.



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Walls built with cold-formed steel studs and gypsum board

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Code Section

Garage Doors

R609.4.1

IRC Changes:

New addition of R609.4.1. Garage doors must have a permanent label identifying:

- Garage door manufacturer.
- The garage door model/series number.
- The positive and negative design wind pressure rating.
- The installation instruction drawing reference number.
- Applicable test standard.

2018 IRC – SIGNIFICANT CHANGES

Code Section

Structural Insulated Panels

R610

IRC Changes:

- Section R602.1.11 and Section R610.4, Structural insulated panels (SIP) are now identified and manufactured in accordance with ANSI/APA PRS 610.1 and requirements deleted from the IRC.
- Section R610.5.3 Panel to Panel connection. SIPs are to be connected at the vertical in-plane joints in accordance with Figure R610.8 or by other approved methods.
- Section R610.5.4 Corner framing of SIP walls shall be constructed in accordance with Figure R610.5.4.
- Section R610.5.6 Thermal barrier. SIP walls are to be separated from the interior of a building in accordance with Section R316.4.



Structural insulated panels

Courtesy Federation of American Scientists

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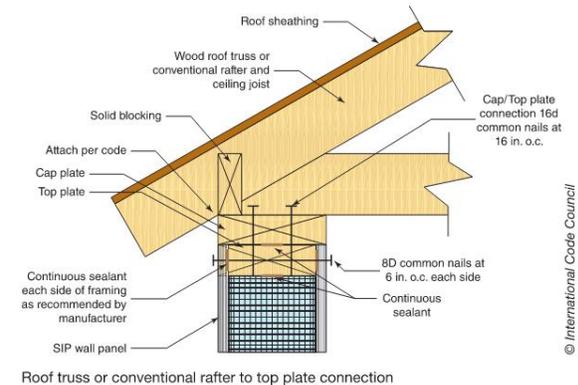
Code Section

Structural Insulated Panels

Table R610.8

IRC Changes:

- Table R610.8 Maximum Spans for 11 7/8 inch or deeper SIP headers
- Footnotes modified:
- N/A (not applicable) replaced with DR (Design Required)
- Maximum deflection now L/240
- Maximum ceiling live load of 20 psf added
- Maximum first floor dead load of 10 psf added
- Wind loads based on Table R301.2(2).
- Strength axis of facing material applied horizontally.
- Building width is in the direction of horizontal framing members supported by the header.
- The table provides for roof slopes between 3:12 and 12:12.
- The maximum roof overhang is 24 inches (610 mm).



IRC CHAPTER 7 WALL COVERING



2018 IRC – SIGNIFICANT CHANGES

Code Section

Water-Resistive Barrier

R703.2

IRC Changes:

- No. 15 Asphalt felt is the specified material to be applied horizontally
- Other approved materials are to be installed in the manufacturer's instructions
- Detached accessory buildings now to have a water-resistive barrier



Water resistive barrier

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Code Section

Water-Resistive Barriers

R703.2,
R703.7.3

IRC Changes:

Modification to R703.2 and R703.7.3 clarifying language for water-resistive barriers with wet or dry climate specific requirements provided.



2021 IRC – SIGNIFICANT CHANGES

Code Section

Alternative Plaster Applications

R703.7.2.2

IRC Changes:

City of Houston amendment adds new Section R703.7.2.2.

- When approved by the building official, plaster products and applications not covered in Section R703.7.2 shall be provided and installed in accordance with the manufacturer's approved instructions and approved design. Products and applications approved by ICC-ES Evaluation reports are considered approved unless specifically prohibited by the building official

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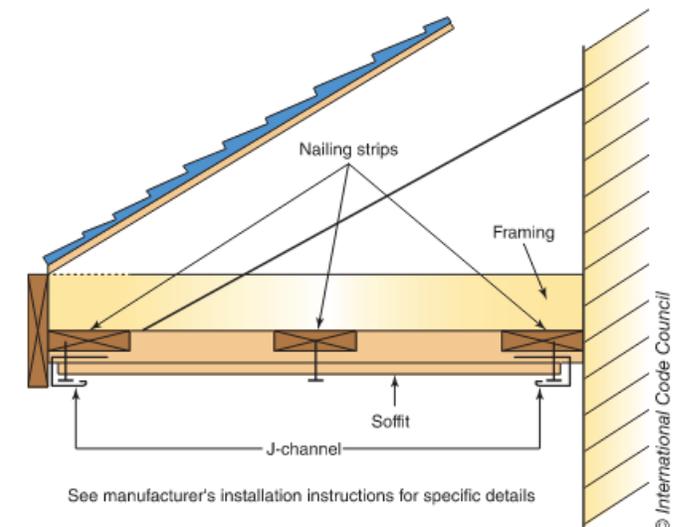
Code Section

Soffit Installation

R703.3.1

IRC Changes:

- Added Section R703.3.1 soffits to comply with Sections R703.1.1 and R703.3.1.2 or manufacturer's installation instructions.
- Added Section R703.1.1 Wood structural panel soffit. The minimum thickness shall be 3/8 inch and fastened to framing or nailing strips with 2-inch by 0.099-inch nails. Fasteners shall be spaced at a maximum of 6 inches on center at panel edges and 12 inches on center at intermediate supports.
- Section R703.11.1.4 moved to Section R703.3.1.2. Soffit panels to be supported at the fascia and wall ends and to intermediate nailing strips as necessary to ensure no unsupported span is greater than 16 inches or as specified by the manufacturer.
- Section R703.3.2 Wind limitations include soffits in the section



Soffit installation

2018 IRC – SIGNIFICANT CHANGES

Code Section

Veneer Anchorage through Insulation

R703.8.4

IRC Changes:

- Modification to Section R703.8.4 now references Table R703.8.4(1).
- For masonry veneer tie attachment through insulating sheathing not greater than 2 inches in thickness to not less than 7/16 performance category wood structural panel, see Table R703.8.4(2).
- Added table R703.8.4(2) Required Brick Tie Spacing for Direct Application to Wood Structural Panel Sheathing. A portion of Table is shown below.

TABLE R703.8.4(2) Required Brick Tie Spacing for Direct Application to Wood Structural Panel Sheathing^{a,b,c}

Fastener type ^d	Size (Diameter or Screw #)	Required Brick-tie Spacing (Vertical-tie Spacing/Horizontal-tie Spacing) (in./in.)					
		110 mph V _{ult}			115 mph V _{ult}		
		Zone 5, Exposure B	Zone 5, Exposure C	Zone 5, Exposure D	Zone 5, Exposure B	Zone 5, Exposure C	Zone 5, Exposure D
Ring Shank Nails	0.091	16/16,	16/12,	12 × 12	16/16,	16/12,	12/12
		16/12,	12/16,		16/12,	12/16,	
		12/16,	12/12	12/16,	12/12		
		12/12		12/12			
Ring Shank Nails	0.148	24/16,			24/16,		
		16/24,	16/16,	16/16,	16/24,	16/16,	16/16,
		16/16,	16/12,	16/12,	16/16,	16/12,	16/12,
		16/12,	12/16,	12/16,	16/12,	12/16,	12/16,
		12/16,	12/12	12/12	12/16,	12/12	12/12
	12/12		12/12		12/12		

2021 IRC – SIGNIFICANT CHANGES

Code Section

Veneer Attachment

Table R703.8.4(1)

IRC Changes:

Table R703.8.4(1) revised with larger air gaps behind veneer to accommodate thicker continuous insulation

TABLE R703.8.4(1) Tie Attachment and Airspace Requirements

Backing and Tie	Minimum Tie	Minimum Tie Fastener ^a	Airspace ^b	
Wood stud backing with corrugated sheet metal	22 U.S. gage (0.0299 in.) × 7/8 in. wide	8d common nail ^{b,c} (2½ in. × 0.131 in.)	Nominal 1 in. between sheathing and veneer	
Wood stud backing with adjustable metal strand wire	W1.7 (No. 9 U.S. gage; 0.148 in. dia.) with hook embedded in mortar joint ^d	8d common nail ^{b,c} (2½ in. × 0.131 in.)	Minimum nominal 1 in. between sheathing and veneer	Maximum 4½ 4 ⁵ / ₈ in. between backing and veneer
Wood stud backing with adjustable metal strand wire	W2.8 (0.187 in. dia.) with hook embedded in mortar joint ^{e,f}	8d common nail ^c (2½ in. × 0.131 in.)	Greater than 4 ⁵ / ₈ in. between backing and veneer	Maximum 6 ⁵ / ₈ in. between backing and veneer
Cold-formed steel stud backing with adjustable metal strand wire	W1.7 (No. 9 U.S. gage; 0.148 in. dia.) with hook embedded in mortar joint ^d	No. 10 screw extending through the steel framing a minimum of three exposed threads	Minimum nominal 1 in. between sheathing and veneer	Maximum 4½ 4 ⁵ / ₈ in. between backing and veneer
Cold-formed steel stud backing with adjustable metal strand wire	W2.8 (0.187 in. dia.) with hook embedded in mortar joint ^{e,f}	No. 10 screw extending through the steel framing a minimum of three exposed threads	Greater than 4 ⁵ / ₈ in. between backing and veneer	Maximum 6 ⁵ / ₈ in. between backing and veneer

^a. All fasteners shall have rust-inhibitive coating suitable for the installation in which they are being used or be manufactured from material not susceptible to corrosion.

^b. An airspace that provides drainage shall be permitted to contain mortar from construction.

^c. In Seismic Design Category D₀, D₁ or D₂, the minimum tie fastener shall be an 8d ring-shank nail (2½ in. × 0.131 in.) or a No. 10 screw extending through the steel framing a minimum of three exposed threads.

^d. Adjustable tie pintles shall include not fewer than 1 pintle leg of wire size W2.8 (MW18) with a maximum offset of 1-1/4 in.

^e. Adjustable tie pintles shall include not fewer than 2 pintle legs with a maximum offset of 1¼ in. Distance between inside face of brick and end of pintle shall be a maximum of 2 in.

^f. Adjustable tie backing attachment components shall consist of one of the following: eyes with minimum wire W2.8 (MW18), barrel with minimum ¼ in. outside dia., or plate with minimum thickness of 0.074 in. and minimum width of 1¼ in.

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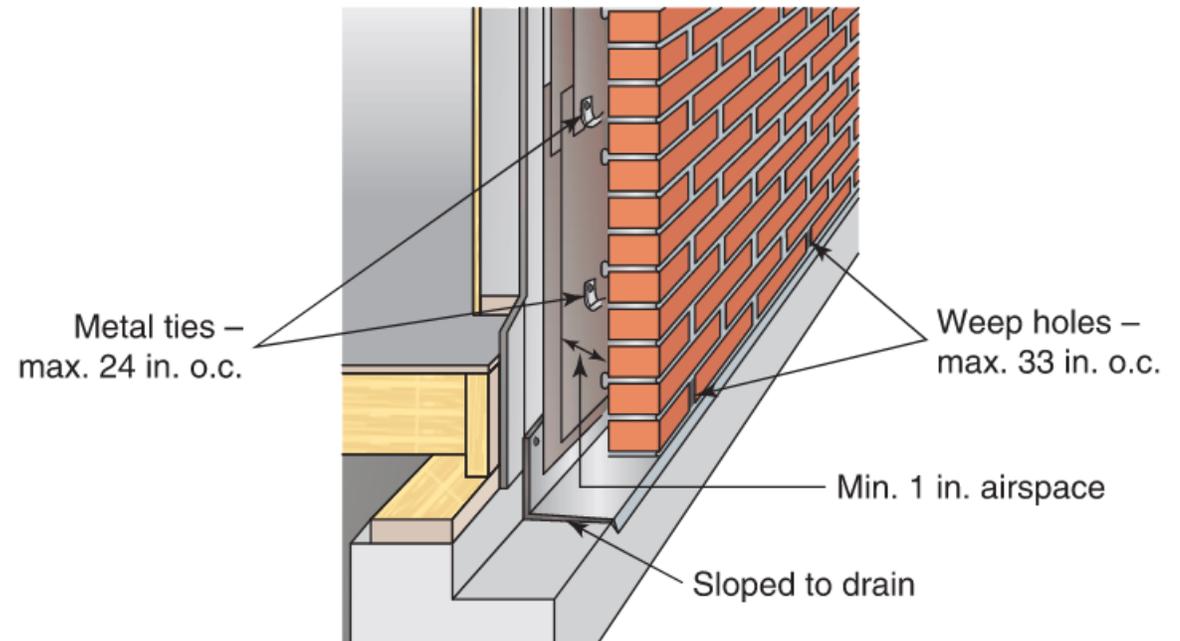
Code Section

Airspace Requirements

Table
R703.8.4(1)

IRC Changes:

- Added footnote to Table R703.8.4(1): “An airspace that provides drainage shall be permitted to contain mortar from construction”



Drainage airspace behind veneer

2018 IRC – SIGNIFICANT CHANGES

Code Section

Vinyl Siding Installation Over Foam Plastic

R703.11.2

IRC Changes:

- Modified Section R703.11.2 clarifying the use of vinyl or insulated siding installed over foam plastic is to be in accordance with Section R703.11
- Removed Sections R703.11.2.1-R703.11.2.3 and consolidated information into Table R703.11.2
- New Table R703.11.2 gives design wind pressures for vinyl siding resisting all wind loads without reliance on wood structural panel sheathing below. New exceptions added:

2. Where the vinyl siding manufacturer's product specifications provide an approved design wind pressure rating for installation over foam plastic sheathing, use of this design wind pressure rating shall be permitted, and the siding shall be installed in accordance with the manufacturer's instructions.

3. Where the foam plastic sheathing and its attachment have a design wind pressure resistance complying with Sections R316.8 and R301.2.1, the vinyl siding shall be installed in accordance with Sections R703.3.3 and R703.11.1.



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Construction beneath vinyl siding

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Code Section

Vinyl Siding Installation Over Foam Plastic Sheathing

R703.11.2

IRC Changes:

Wind pressure ratings for vinyl siding are decreased.

TABLE R703.11.2 Adjusted-Required Minimum Wind Load Design Wind-Pressure Requirement Rating for Vinyl Siding Installed over Foam Plastic Sheathing Alone

Ultimate Design Wind Speed (mph)	Adjusted Minimum Design Wind Pressure (ASD) (psf) ^{a,b}					
	Case 1: With interior gypsum wallboard ^c			Case 2: Without interior gypsum wallboard ^c		
	Exposure			Exposure		
	B	C	D	B	C	D
≤95	-30.0	-33.2	-39.4	-33.9	-47.4	-56.2
100	-30.0	-36.8	-43.6	-37.2	-52.5	-62.2
105	-30.0	-40.5	-48.1	-41.4	-57.9	-68.6
110	-44.0	-61.6	-73.1	-62.9	-88.1	-104.4
	-31.8	-44.5	-52.8	-45.4	-63.5	-75.3
115	-49.2	-68.9	-81.7	-70.3	-98.4	-116.7
	35.5	-49.7	-59.0	-50.7	-71.0	-84.2
120	-51.8	-72.5	-86.0	-74.0	-103.6	-122.8
	-37.4	-52.4	-62.1	-53.4	-74.8	-88.6
130	-62.2	-87.0	-103.2	-88.8	-124.3	-147.4
	-44.9	-62.8	-74.5	-64.1	-89.7	-106
> 130	See Footnote d Not Allowed ^d					

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 square foot = 0.0929 m², 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa.

- Linear interpolation is permitted.
- The table values are based on a maximum 30-foot mean roof height, and effective wind area of 10 square feet Wall Zone 5 (corner), and the ASD design component and cladding wind pressure from Table R301.2.1(1), adjusted for exposure in accordance with Table R301.2.1(2), multiplied by the following adjustment factors: 2.6 1.87 (Case 1) and 3.7 2.67 (Case 2) for wind speeds less than 130 mph and 3.7 (Case 2) for wind speeds greater than 130 mph.
- Gypsum wallboard, gypsum panel product or equivalent.
- For the indicated wind speed condition, and where foam sheathing is the only sheathing on the exterior of frame walls with vinyl siding, is not allowed unless the vinyl siding complies with an adjusted minimum design wind pressure requirement as determined in accordance with Note b and the wall assembly is shall be capable of resisting an impact without puncture at least equivalent to that of a wood frame wall with minimum 7/16-inch OSB sheathing as tested in accordance with ASTM E1886. The vinyl siding shall comply with an adjusted design wind pressure requirement in accordance with Note b, using an adjustment factor of 2.67.

2021 IRC – SIGNIFICANT CHANGES

Code Section

Soffits

R704

IRC Changes:

- New Section in IRC for Soffits based on design wind pressure.
- Design wind pressure of 30 psf or less requires compliance with R704.2.1, R704.2.2, R704.2.3 or R704.2.4. Specifies material type and installation specifics.
- Design wind pressure of greater than 30 psf requires compliance with R704.3.1, R704.3.2, R704.3.3 or R704.3.4. Specifies material type and installation specifics.

IRC CHAPTER 8 ROOF CEILING CONSTRUCTION



2018 IRC – SIGNIFICANT CHANGES

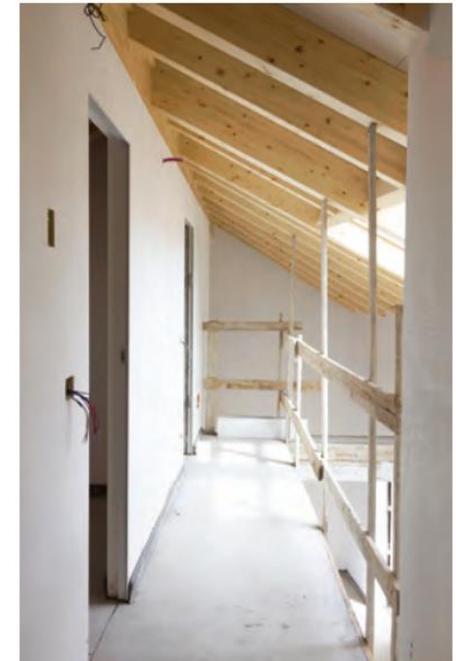
Code Section

Roof Framing

R802

IRC Changes:

- Section R802, design and construction of roofs, has been clarified by dividing the content into three separate sections on roof ridges, rafters, and ceiling joists. Little material is added in the revised section although wording has been slightly changed for clarity.
- Section R802.3 Roof ridge, Section R802.4 Rafters, and Section R802.5 Ceiling joists.
- Section R802.5.2.1 Ceiling joists lapped. Added that a cantilever shall not be more than 9 inches beyond the gable end wall unless supported by gable overhang framing.



iStock.com/tostphoto

Stick built roof

2021 IRC – SIGNIFICANT CHANGES

Code Section

Wood Roof Framing

R802

IRC Changes:

R802 modified to clarify ridge beam and ceiling joist requirements.



2018 IRC – SIGNIFICANT CHANGES

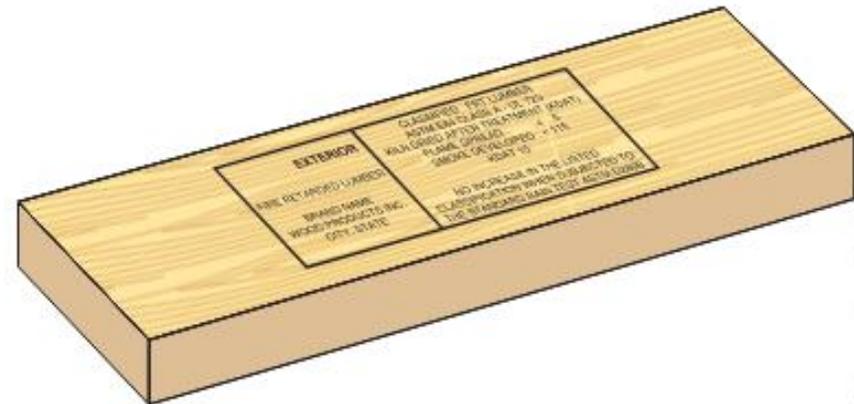
Code Section

Labeling

R802.1.5.4

IRC Changes:

- Modifies the section to require that in addition to the labels required by Section 802.1.1 for sawn lumber and Section 803.2.1 for wood structure panels shall be labeled in accordance with the requirement listed in the Section R802.1.5.4.



Fire-retardant treated lumber

BRAND NAME TREATED WOOD PRODUCTS INC. (PLANT LOCATION)	CLASSIFIED UL TREATED PLYWOOD 17PO R7003
ESR-XXXX KDAT MONITORED BY TIMBER PRODUCTS INSPECTION STD. 2200P AA-696	SPECIES SURFACE BURNING CHARACTERISTICS FLAMESPREAD: SMOKE DEVELOPED: 30 MINUTE TEST

FRT plywood

© International Code Council

© International Code Council

2021 IRC – SIGNIFICANT CHANGES

Code Section

Heel Joint Connections

Table
R802.5.2(1)

IRC Changes:

Table R802.5.2(1) modified for 24- and 36-foot roof spans and a 19.2-inch rafter spacing.

TABLE R802.5.2(1) Rafter/Ceiling Joist Heel Joint Connections^a

RAFTER SLOPE	RAFTER SPACING (inches)	GROUND SNOW LOAD (psf)											
		Roof span (feet)											
		20 ^b			30			50			70		
		12	24	36	12	24	36	12	24	36	12	24	36
Required number of 16d common nails per heel joint splice ^{a,b,c,d,f}													
3:12	12	3	5	8	3	6	9	5	9	13	6	12	17
	16	4	7	10	4	8	12	6	12	17	8	15	23
	19.2	4	8	12	5	10	14	7	14	21	9	18	27
	24	5	10	15	6	12	18	9	17	26	12	23	34
4:12	12	3	4	6	3	5	7	4	7	10	5	9	13
	16	3	5	8	3	6	9	5	9	13	6	12	17
	19.2	3	6	9	4	7	11	6	11	16	7	14	21
	24	4	8	11	5	9	13	7	13	19	9	17	26
5:12	12	3	3	5	3	4	6	3	6	8	4	7	11
	16	3	4	6	3	5	7	4	7	11	5	9	14
	19.2	3	5	7	3	6	9	5	9	13	6	11	17
	24	3	6	9	4	7	11	6	11	16	7	14	21
7:12	12	3	3	4	3	3	4	3	4	6	3	5	8
	16	3	3	5	3	4	5	3	5	8	4	7	10
	19.2	3	4	5	3	4	6	3	6	9	4	8	12
	24	3	5	7	3	5	8	4	8	11	5	10	15
9:12	12	3	3	3	3	3	3	3	3	5	3	4	6
	16	3	3	4	3	3	4	3	4	6	3	5	8
	19.2	3	3	4	3	4	5	3	5	7	3	6	9
	24	3	4	5	3	4	6	3	6	9	4	8	12
12:12	12	3	3	3	3	3	3	3	3	4	3	3	5
	16	3	3	3	3	3	3	3	3	5	3	4	6
	19.2	3	3	3	3	3	4	3	4	6	3	5	7
	24	3	3	4	3	3	5	3	5	7	3	6	9

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.
^a 16d common (3" x 0.148") nails shall be permitted to be substituted for 16d common (3-1/2" x 0.162") nails where the required number of nails is taken as 1.2 times the required number of 16d common nails, rounded up to the next full nail. ~~40d box nails shall be permitted to be substituted for 16d common nails.~~
^b Nailing requirements shall be permitted to be reduced 25 percent if nails are clinched.
^c Heel joint connections are not required where the ridge is supported by a load-bearing wall, header or ridge beam.
^d Where intermediate support of the rafter is provided by vertical struts or purlins to a load-bearing wall, the tabulated heel joint connection requirements shall be permitted to be reduced proportionally to the reduction in span.
^e Equivalent nailing patterns are required for ceiling joist to ceiling joist lap splices.
^f Applies to roof live load of 20 psf or less.
^g Tabulated heel joint connection requirements assume that ceiling joists or rafter ties are located at the bottom of the attic space. Where ceiling joists or rafter ties are located higher in the attic, heel joint connection requirements shall be increased by the adjustment factors in Table R802.5.2(2).
 g. Tabulated requirements are based on 10 psf roof dead load in combination with the specified roof snow load and roof live load.

2021 IRC – SIGNIFICANT CHANGES

Code Section

Rafter Bearings

R802.6

IRC Changes:

- Where the roof pitch is greater than or equal to 3 units vertical in 12 units horizontal (25-percent slope), and ceiling joists or rafter ties are connected to rafters to provide a continuous tension tie in accordance with Section R802.5.2, vertical bearing of the top of the rafter against the ridge board shall satisfy this bearing requirement.

2018 IRC – SIGNIFICANT CHANGES

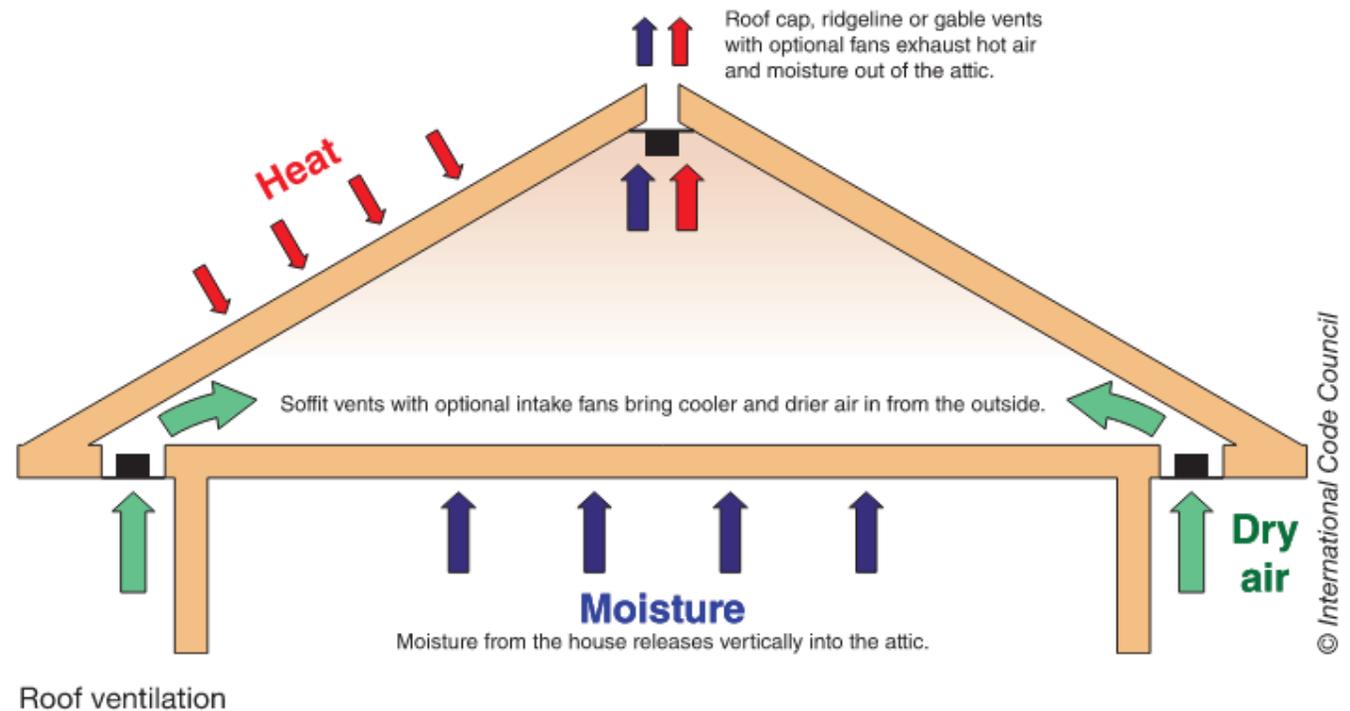
Code Section

Minimum Vent Area

R806.2

IRC Changes:

- Both conditions of the exception need to be met for the exception to apply.
- Condition 2 adjusted that the required ventilation shall be located in the bottom third of the attic space.



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2018 IRC – SIGNIFICANT CHANGES

Code Section

Unvented Attics

R806.5

IRC Changes:

- Item 5.2 is added as an alternative path for un-vented attics and rafter assemblies to the requirements of Item 5.1. The new option is limited to warm climates and has 10 requirements to address in the installation of air-permeable insulation.
- In climate zones 1, 2, and 3 air-permeable insulation installed in unvented attics shall meet the following requirements:
 1. An approved vapor diffusion port shall be installed at a maximum of 12 inches from the roof's highest point to the lower edge.
 2. Port area is a minimum 1:600 of the ceiling area. For multiple ports, the areas shall be summed together.
 3. The vapor permeable membrane shall have a permanence rating a minimum of 20 perms when tested in accordance with Procedure A of ASTM E 96.
 4. Vapor diffusion port shall serve as an air barrier between the attic and the exterior of the building.
 5. The vapor diffusion port shall protect the attic from the entrance of water and snow
 6. Framing members and blocking shall not block the free flow of water vapor to the port. A minimum 2-inch clearance would be provided between blocking and roof sheathing. Air-permeable insulation shall be permitted within that space.

IRC CHAPTER 9 ROOF ASSEMBLY



2018 IRC – SIGNIFICANT CHANGES

Code Section

Underlayment Requirements of Photovoltaic Shingles

Tables R905.1.1(1)
and R905.1.1(2)

IRC Changes:

- Underlayment requirements for photovoltaic (PV) shingles are revised for consistency with other roofing materials and moved to the Tables R905.1.1(1) and R905.1.1(2) for underlayment.

TABLE R905.1.1(1) Underlayment Types

Roof Covering	Section	Maximum Ultimate Design Wind Speed, $V_{ult} < 140$ mph	Maximum Ultimate Design Wind Speed, $V_{ult} \geq 140$ mph
<u>Photovoltaic shingles</u>	<u>R905.16</u>	<u>ASTM D 4869 Type I, II, III or IV</u> <u>ASTM D 6757</u>	<u>ASTM D 4869 Type III or IV</u> <u>ASTM D 6757</u>



PV shingles

iStock.com/laremenko

2018 IRC – SIGNIFICANT CHANGES

Code Section

Underlayment Requirements of Photovoltaic Shingles

Tables R905.1.1(1) and R905.1.1(2) (cont.)

IRC Changes:

- Underlayment requirements for photovoltaic (PV) shingles are revised for consistency with other roofing materials and moved to the Tables R905.1.1(1) and R905.1.1(2) for underlayment.

TABLE R905.1.1(2) Underlayment Application

Roof Covering	Section	Maximum Ultimate Design Wind Speed, $V_{ult} < 140$ mph	Maximum Ultimate Design Wind Speed, $V_{ult} \geq 140$ mph
Photovoltaic Shingles	R905.16	<p>For roof slopes from two units vertical in 12 units horizontal (2:12), up to four units vertical in 12 units horizontal (4:12), underlayment shall be two layers applied in the following manner: apply a 19-inch strip of underlayment felt parallel to and starting at the eaves. Starting at the eave, apply 36-inch-wide sheets of underlayment, overlapping successive sheets 19 inches. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. End laps shall be 4 inches and shall be offset by 6 feet.</p> <p>For roof slopes of four units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied in the following manner: underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 2 inches. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. End laps shall be 4 inches and shall be offset by 6 feet.</p>	Same as Maximum Ultimate Design Wind Speed, $V_{ult} < 140$ mph except all laps shall be not less than 4 inches.

(Table rows without changes and deleted section text not shown for brevity and clarity.)

2018 IRC – SIGNIFICANT CHANGES

Code Section

Building Integrated Photovoltaic Panels

R905.17
and R202

IRC Changes:

- Added definition of Building-integrated photovoltaic Roof panel (BipV Roof panel): A photovoltaic panel that functions as a component of the building envelope.
- Addition to the code Section R905.17 BIPV roof panels applied directly to the roof deck. The installation of BIPV roof panels shall comply with NFPA 70 and Sections R905.17 and R324
- Section R905.17.1 Deck requirements. BIPV roof panels shall be applied to a solid or closely-fitted deck, except where the roof covering is specifically designed to be applied over spaced sheathing.
- R905.17.2 Deck slope. BIPV roof panels shall be used only on roof slopes of two units vertically in 12 units horizontally or greater.
- R905.17.3 Underlayment. Underlayment shall comply with Section R905.1.1.
- R905.17.3.1 Ice barrier. When required, an ice barrier shall comply with Section R905.1.2.

2018 IRC – SIGNIFICANT CHANGES

Code Section

Building Integrated Photovoltaic Panels (BIPV)

R905.17
(cont.)

IRC Changes:

- R905.17.4 Ice barrier. In areas where there has been a history of ice forming along the eaves causing a backup of water, as designated in Table R301.2(1), an ice barrier that consists of not less than two layers of underlayment cemented together or of a self-adhering polymer modified bitumen sheet shall be used in lieu of normal underlayment and extend from the lowest edges of all roof surfaces to a point not less than 24 inches inside the exterior wall line of the building. Exception: Detached accessory structures that do not contain conditioned floor area.
- R905.17.5 Material standards. BIPV roof panels shall be listed and labeled in accordance with UL 1703.
- R905.17.6 Attachment. BIPV roof panels shall be attached in accordance with the manufacturer's installation instructions.
- R905.17.7 Wind resistance. BIPV roof panels shall be tested in accordance with UL 1897. BIPV roof panel packaging shall bear a label to indicate compliance with UL 1897.



Building integrated photovoltaic panels

2021 IRC – SIGNIFICANT CHANGES

Code Section

Requirements for Roof Coverings

R905

IRC Changes:

New addition of R905.4.4.1 and Table R905.4.4.1 which provides requirements for metal shingle wind resistance.

Modification of 905.7 to provide requirements for wood shingles and wooden shakes

- Wood shingles and wooden shakes shall not be used in new construction. Wood shingles or wooden shakes in existing construction shall not be replaced with other wood shingles or wooden shakes unless the replacement wood shingles or wooden shakes are fire-retardant-treated in accordance with Section R902.2 and installed in accordance with this section.

2021 IRC – SIGNIFICANT CHANGES

Code Section

Wind Resistance of Metal Roof Shingles

R905.4.4.1

IRC Changes:

- Metal roof shingles applied to a solid or closely fitted deck shall be tested in accordance with ASTM D3161, FM 4474, UL 580 or UL 1897. Metal roof shingles tested in accordance with ASTM D3161 shall meet the classification requirements of Table R905.4.4.1 for the appropriate maximum basic wind speed and the metal shingle packaging shall bear a label to indicate compliance with ASTM D3161 and the required classification in Table R905.2.4.1.

IRC CHAPTER 10 CHIMNEYS AND FIREPLACES



2018 IRC – SIGNIFICANT CHANGES

Code Section

Chimney Insulation Shield

R1005.8

IRC Changes:

- Added Section R1005.8 Insulation shield.
- A steel insulation shield with a minimum thickness of 0.0187 inches (No. 26 gage) is to be installed for clearance between a factory-built chimney and insulation material.
- Installation must be in accordance with the manufacture's instructions.
- Where chimneys pass through attic space, the shield shall terminate not less than 2 inches (51 mm) above the insulation materials and shall be secured in place



Insulation shield

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IRC APPENDIX LOCAL AMENDMENTS



2021 IRC – SIGNIFICANT CHANGES

Code Section

**Conventional Light Frame
Wood Construction For Single
Family Residential
Construction In High Wind
Areas**

**Appendix
AL**

IRC Changes:

City of Houston modifies the content within Appendix AL. The appendix formerly contained information on Permit Fees. The information within this appendix has been deleted in its entirety and renamed Appendix AL: Conventional Light Frame Wood Construction For Single Family Residential Construction In High Wind Areas.

- The new Appendix AL will contain requirements that apply to regular-shaped single family residential buildings that are not more than three stories in height and are of conventional light-frame construction

2021 CITY OF HOUSTON AMENDMENTS





2021 SIGNIFICANT AMENDMENT CHANGES - UNVENTED HEATERS AND COMPOSTING TOILETS

1

Removes historic Houston amendments that prohibit these installations

2

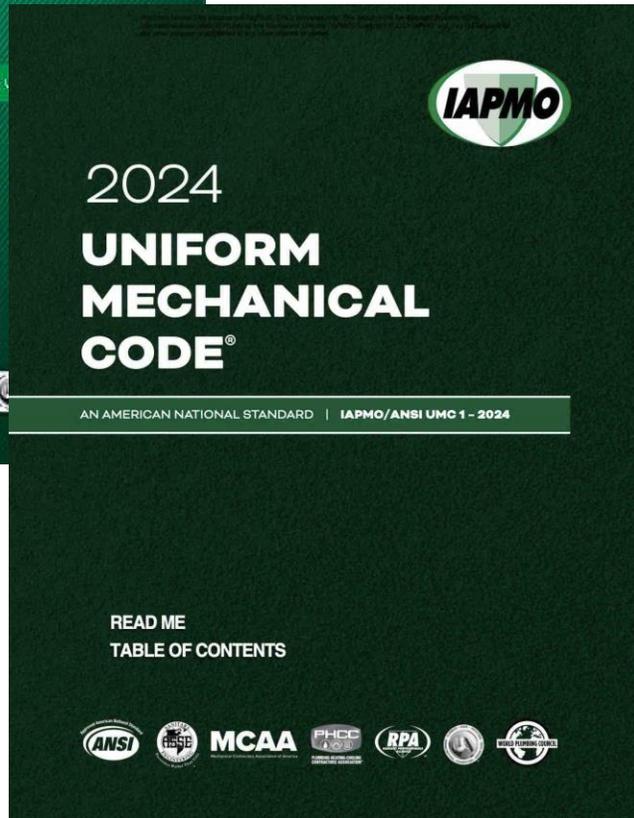
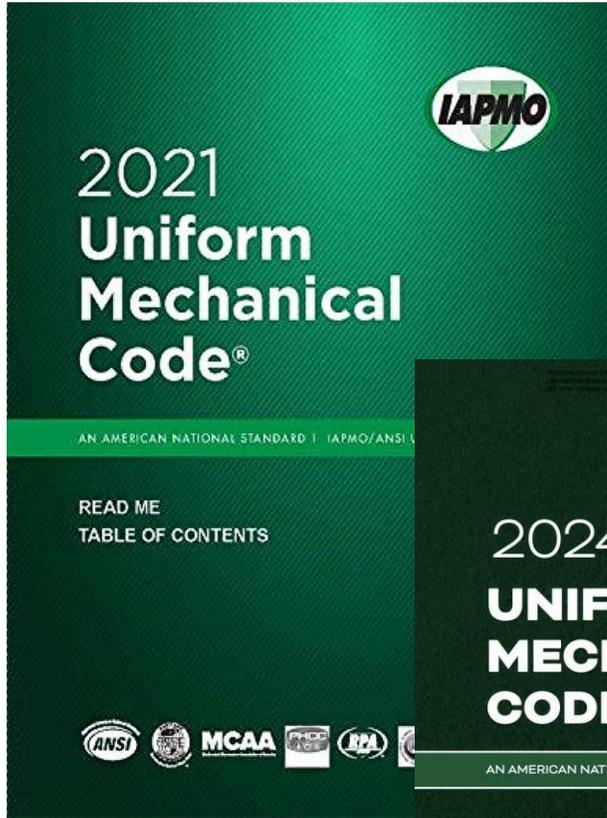
Changes occur in IRC, as well as UMC and UPC

3

Heaters and toilets will need to comply with appropriate referenced standards



2021 SIGNIFICANT AMENDMENT CHANGES – A2L REFRIGERANT



1

Updates A2L Refrigerant language to 2024 UMC

2

Updates ASHRAE Standard 15 and 34 to the latest editions

3

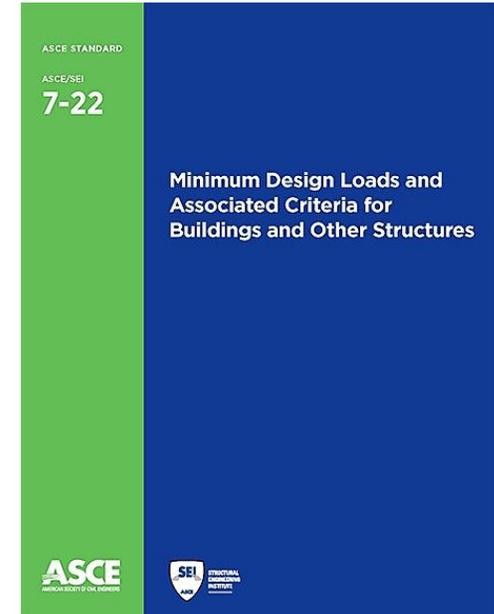
Ensures compliance with Texas state law for substitute refrigerants

ASCE 7-22

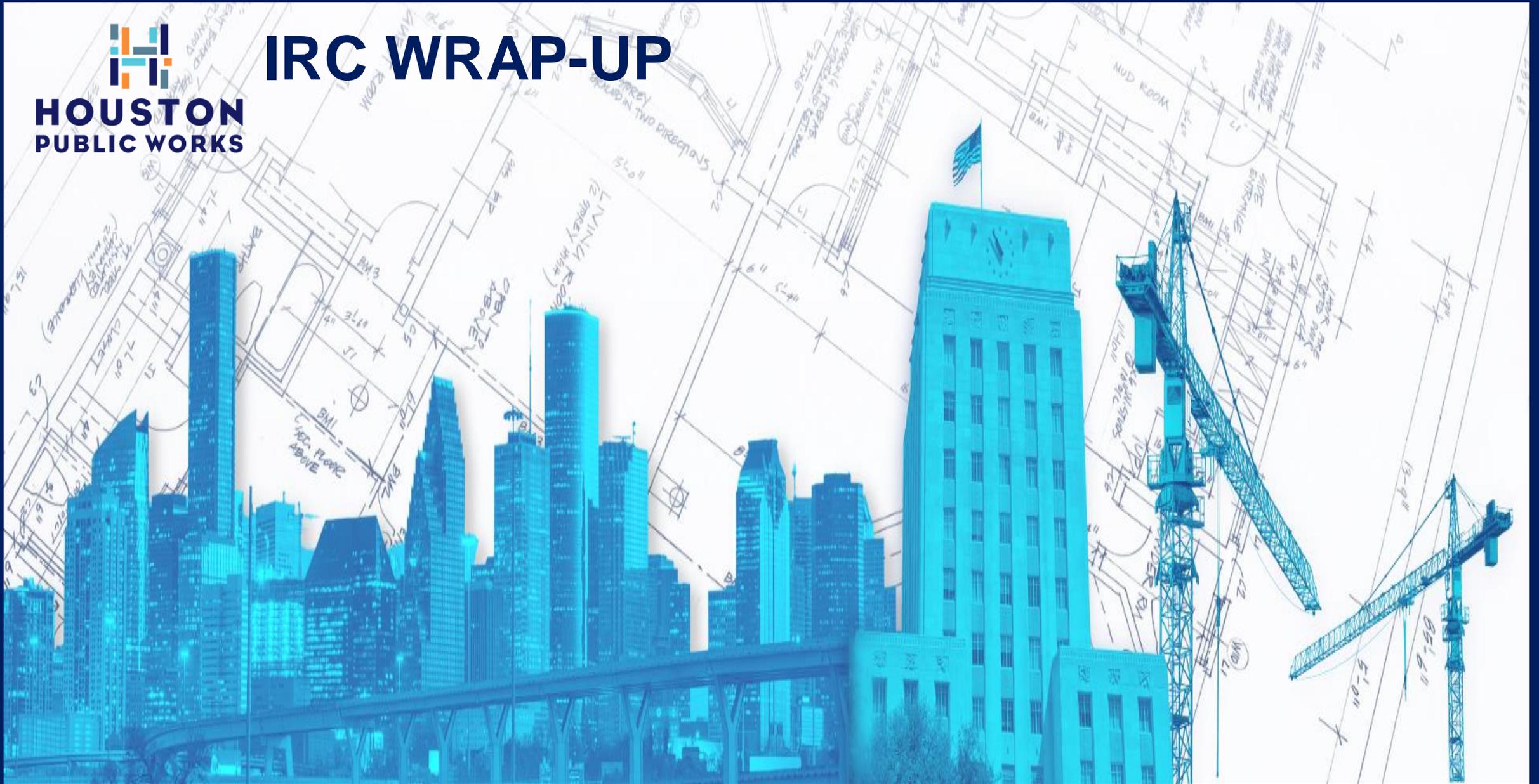
Houston Amendment: 2022 reference for ASCE 7

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

- Supports new windloading requirements
- Supports new structural roof and framing requirements
- Supports flood control requirements
- Updated Risk Categories



IRC WRAP-UP

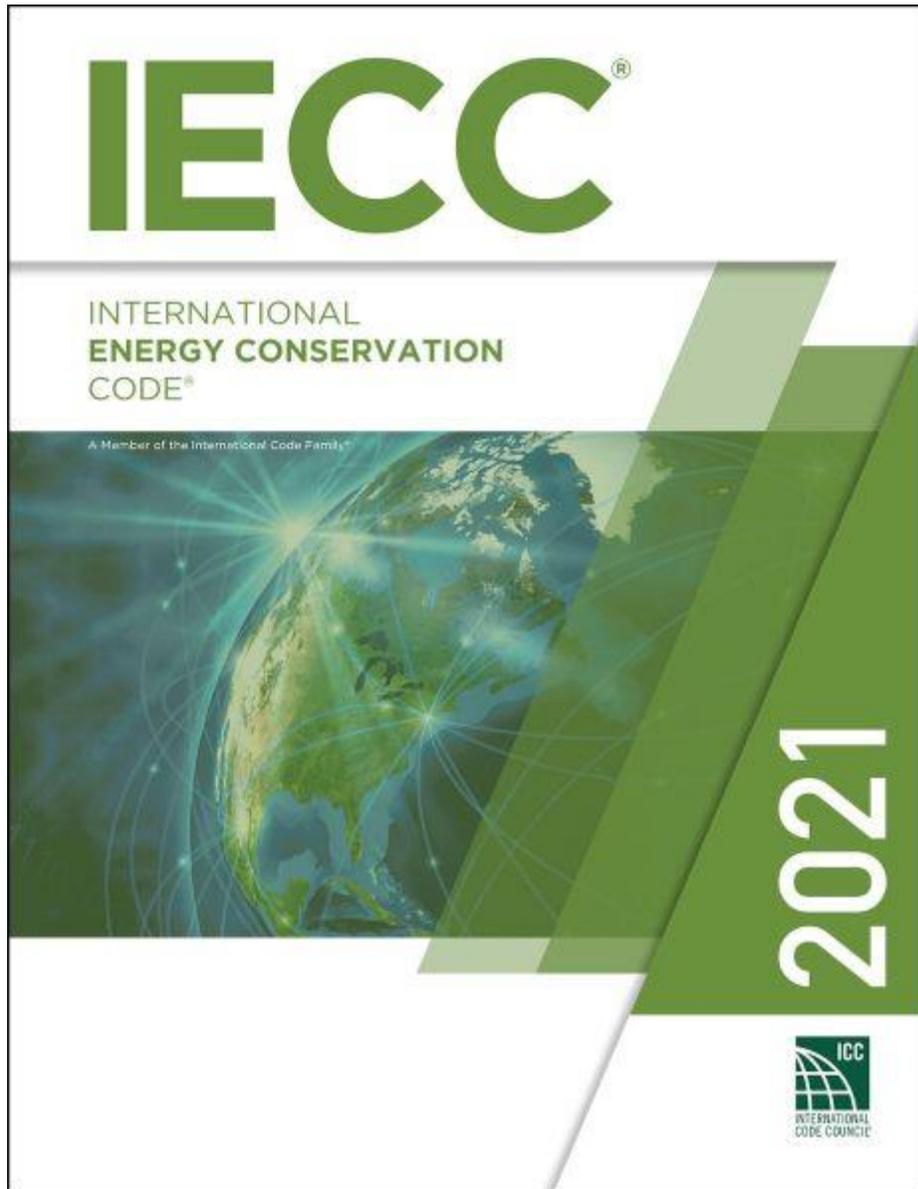




CITY OF HOUSTON'S SIGNIFICANT CHANGES TO THE 2021 RESIDENTIAL ENERGY CONSERVATION CODE

PRESENTATION TO AIA FEBRUARY 7, 2024





INTERNATIONAL ENERGY CONSERVATION CODE (IECC)

1

Residential Properties Consume 22% of the U.S. Energy Consumption

2

The avg. savings for a new home built in Texas under this code will save 8.9%

3

The avg. savings for a new home built in Texas under this code will save 8.9%

4

Additional Efficiency Package Options in Residential

HEALTH AND SAFETY CODE

TITLE 5. SANITATION AND ENVIRONMENTAL QUALITY

SUBTITLE C. AIR QUALITY

CHAPTER 388. TEXAS BUILDING ENERGY PERFORMANCE STANDARDS

**THE ENERGY CODE IS ABOUT
HEALTH, SAFETY & WELFARE.**

**THAT'S WHY THE STATE OF TEXAS HAS
A STATE ENERGY CODE.**

DOES RESIDENTIAL ENERGY MATTER?

Thursday,
March 24, 2016
5:00 p.m.
ERCOT Load: 33,597 MW
Temperature
in Dallas: 62°



Thursday, Aug. 11, 2016
5:00 p.m.
ERCOT Load: 71,093 MW
Temperature in Dallas: 106°

The previous all-time record of 80,148 MWs was set on July 20, 2022

The current all-time record is 85,464 MWs from August 10, 2023.

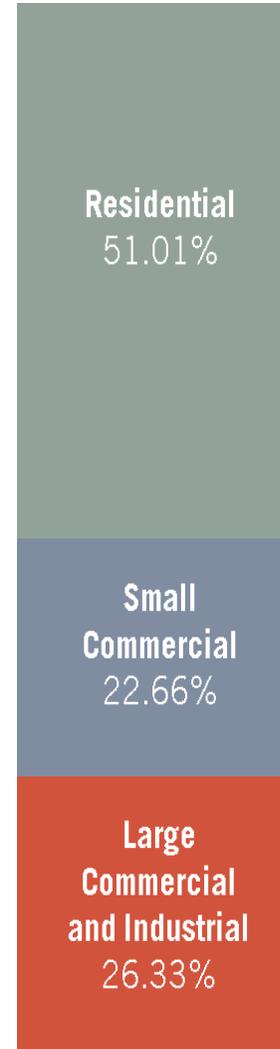
Summer Weather Impacts on GRID by Customer Type

DOES RESIDENTIAL ENERGY MATTER?

Thursday,
Nov. 16, 2017
7:15 a.m.
ERCOT Load: 36,795 MW
Temperature in Dallas: 63°



← Wednesday, Jan. 17, 2018
7:15 a.m.
ERCOT Load: 65,904 MW
Temperature in Dallas: 15°

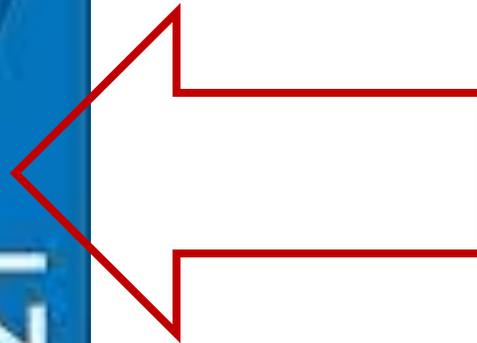
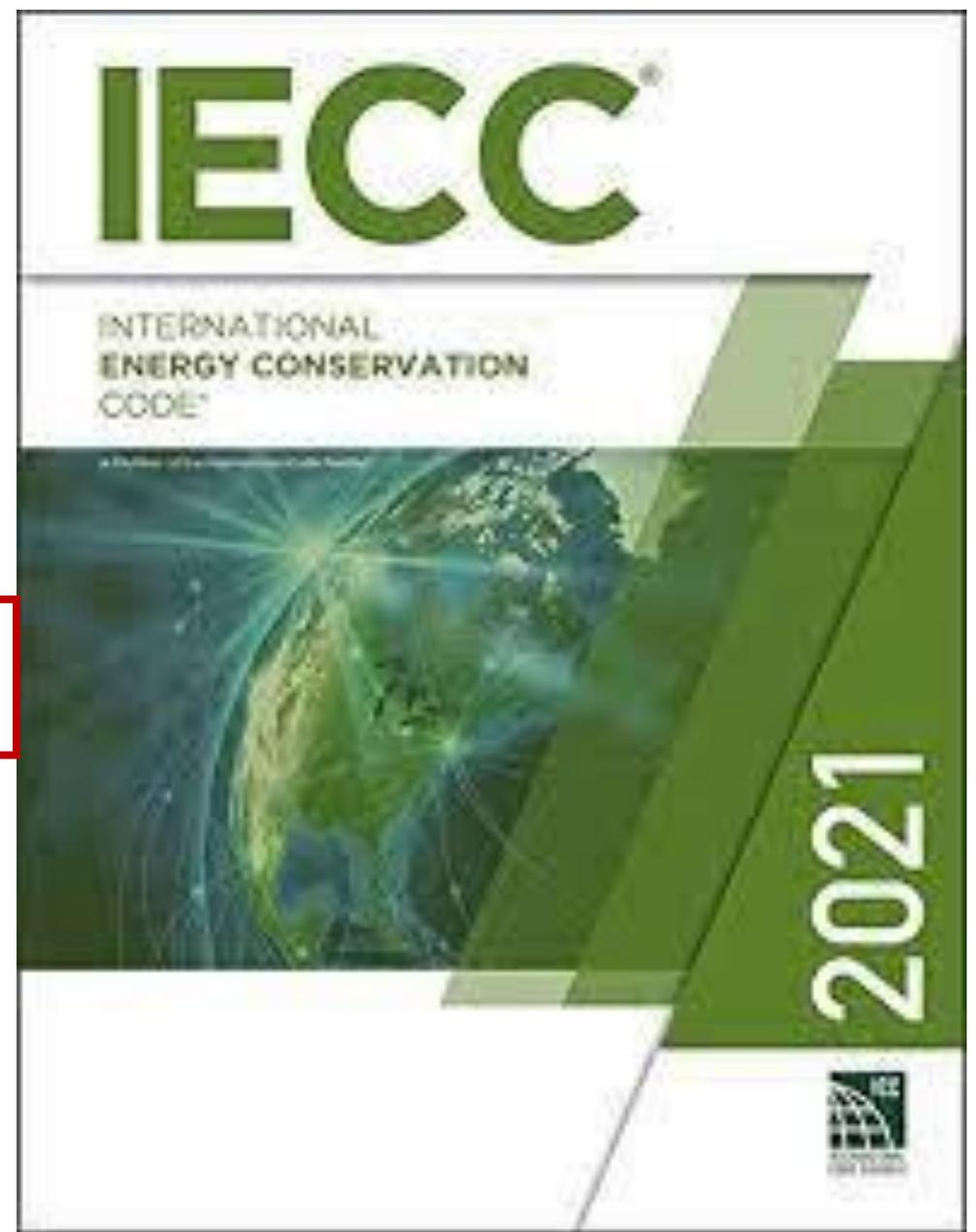


Monday, Feb. 15, 2021
8:15 a.m.

ERCOT Load: 75,000 MW

Temperature in Houston:
15°

Winter Weather Impacts on GRID by Customer Type





About ENERGY STAR

About ENERGY STAR

ENERGY STAR Impacts ▶

How ENERGY STAR Works ▶

How ENERGY STAR Protects the Environment ▶

Federal Tax Credits ▼

Tax Credit Legislation

Definitions

Tax Credits FAQs

Tax Credits for Homeowners ▶

Tax Credits for Home Builders

Tax Deductions for Commercial Buildings

Historical Tax Credit Information ▶

Newsroom ▶

Federal Tax Credits for Energy Efficiency

The Inflation Reduction Act of 2022 empowers Americans to make homes and buildings more energy-efficient by providing federal tax credits and deductions that will help reduce energy costs and demand, as we transition to cleaner energy sources.

[Tax Credits for Home Builders](#)
[Tax Deductions for Commercial Buildings](#)

Homeowners Can Save Up to \$3,200 Annually on Taxes for Energy Efficient Upgrades

Through 2032, federal income tax credits are available to homeowners, that will allow up to \$3,200 annually to lower the cost of energy efficient home upgrades by up to 30 percent.

In addition to the energy efficiency credits, homeowners can also take advantage of the modified and extended Residential Clean Energy credit, which provides a 30 percent income tax credit for clean energy equipment, such as rooftop solar, wind energy, geothermal heat pumps and battery storage through 2032, stepping down to 22 percent for 2033 and 2034.

ENERGY STAR provides the following information to help you learn:

- [How the Tax Credits Work for Homeowners](#)
- [How to Claim the Federal Tax Credits](#)
- [Strategies to Maximize Your Federal Tax Savings](#)

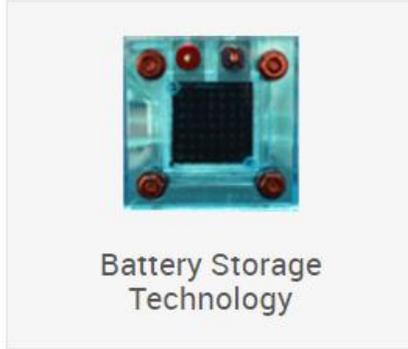
How the Tax Credits Work for Homeowners

Save Up to \$2,000 on Costs of Upgrading to Heat Pump Technology

These energy efficient home improvement credits are available for 30% of costs - up to \$2,000 - and can be combined with credits up to \$1,200 for other qualified upgrades made in one tax year.

Save 30% on Residential Clean Energy Equipment Upgrades

This credit can be claimed for the following qualifying expenditures incurred for either an existing home or a newly constructed home.



How to Claim the Federal Tax Credits

These credits are managed by the U.S. Internal Revenue Service (IRS) and can be claimed with your federal income taxes for the year in which the upgrades are made.

- Claim the credits using the [IRS Form 5695](#).
- [Instructions for Form 5695](#)

Details for Claiming the Energy Efficiency Home Improvement Credit:

Form **5695** **Residential Energy Credits** OMB No. 1545-0074
 Department of the Treasury Attach to Form 1040, 1040-SR, or 1040-NR. **2023**
 Internal Revenue Service Go to www.irs.gov/Form5695 for instructions and the latest information. Attachment Sequence No. **75**
 Name(s) shown on return Your social security number

Part I Residential Clean Energy Credit (See instructions before completing this part.)

Note: Skip lines 1 through 11 if you only have a **credit carryforward from 2022**.

Enter the complete address of the home where you installed the property and/or technology associated with lines 1 through 4 and 5b. For more than one home, see instructions.

Number and street	Unit no.	City or town	State	ZIP code
1			1	
2			2	
3			3	
4			4	
5a	Qualified battery storage technology. Does the qualified battery storage technology have a capacity of at least 3 kilowatt hours? (See instructions.) If you checked the "No" box, you cannot claim a credit for qualified battery storage technology			<input type="checkbox"/> Yes <input type="checkbox"/> No
5b	b If you checked the "Yes" box, enter the qualified battery technology costs			
6a	Add lines 1 through 5b			6a
6b	b Multiply line 6a by 30% (0.30)			6b
7a	Qualified fuel cell property. Was qualified fuel cell property installed on, or in connection with, your main home located in the United States? (See instructions.) If you checked the "No" box, you cannot claim a credit for qualified fuel cell property. Skip lines 7b through 11.			<input type="checkbox"/> Yes <input type="checkbox"/> No
7b	Enter the complete address of the main home where you installed the fuel cell property.			
	Number and street	Unit no.	City or town	State ZIP code
8	Qualified fuel cell property costs			8
9	Multiply line 8 by 30% (0.30)			9
10	Kilowatt capacity of property on line 8 above x \$1,000			10
11	Enter the smaller of line 9 or line 10			11
12	Credit carryforward from 2022. Enter the amount, if any, from your 2022 Form 5695, line 16			12
13	Add lines 6b, 11, and 12			13
14	Limitation based on tax liability. Enter the amount from the Residential Clean Energy Credit Limit Worksheet. (See instructions.)			14
15	Residential clean energy credit. Enter the smaller of line 13 or line 14. Also include this amount on Schedule 3 (Form 1040), line 5a			15
16	Credit carryforward to 2024. If line 15 is less than line 13, subtract line 15 from line 13			16

For Paperwork Reduction Act Notice, see your tax return instructions. Cat. No. 13540P Form **5695** (2023)

Residential Energy Credits

Attach to Form 1040, 1040-SR, or 1040-NR.

Go to www.irs.gov/Form5695 for instructions and the latest information.

Name(s) shown on return

Your social security number

Part I Residential Clean Energy Credit (See instructions before completing this part.)

Note: Skip lines 1 through 11 if you only have a **credit carryforward from 2022**.

Enter the complete address of the home where you installed the property and/or technology associated with lines 1 through 4 and 5b. For more than one home, see instructions.

Number and street	Unit no.	City or town	State	ZIP code
1 Qualified solar electric property costs			1	
2 Qualified solar water heating property costs			2	
3 Qualified small wind energy property costs			3	
4 Qualified geothermal heat pump property costs			4	
5a Qualified battery storage technology. Does the qualified battery storage technology have a capacity of at least 3 kilowatt hours? (See instructions.) If you checked the "No" box, you cannot claim a credit for qualified battery storage technology			5a	<input type="checkbox"/> Yes <input type="checkbox"/> No

If you checked the "No" box, you cannot claim a credit for qualified fuel cell property. Skip lines 7b through 11.

b Enter the complete address of the main home where you installed the fuel cell property.

	Number and street	Unit no.	City or town	State	ZIP code		
8	Qualified fuel cell property costs				8		
9	Multiply line 8 by 30% (0.30)				9		
10	Kilowatt capacity of property on line 8 above x \$1,000				10		
11	Enter the smaller of line 9 or line 10						11
12	Credit carryforward from 2022. Enter the amount, if any, from your 2022 Form 5695, line 16						12
13	Add lines 6b, 11, and 12						13
14	Limitation based on tax liability. Enter the amount from the Residential Clean Energy Credit Limit Worksheet. (See instructions.)						14
15	Residential clean energy credit. Enter the smaller of line 13 or line 14. Also include this amount on Schedule 3 (Form 1040), line 5a						15
16	Credit carryforward to 2024. If line 15 is less than line 13, subtract line 15 from line 13				16		

For Paperwork Reduction Act Notice, see your tax return instructions.

Cat. No. 13540P

Form **5695** (2023)

[Ceiling Insulation](#)[Heating and Cooling](#)[High Efficiency Homes™ Program](#)[Home Efficiency Programs](#) >[LED Lighting](#)[Smart Thermostat Instant Discount](#)[Variable Speed Pool Pump](#)

Electric efficiency programs

Learn about the Electric Energy Efficiency program offerings from CenterPoint Energy



From weatherization programs to smart thermostats – CenterPoint Energy offers great savings on a collection of energy and money-saving programs and products to help increase your home's energy efficiency.



INFLATION REDUCTION ACT REBATES AND TAX CREDITS

The Inflation Reduction Act (IRA) provides support for clean energy through these programs:

Inflation Reduction Act Rebates

Rebates from the Home Energy Performance-Based, Whole House (HOMES) Rebate program and the Home Electrification and Application (HEAR) Rebate program funded through the Inflation Reduction Act are not currently available.

The State Energy Conservation Office (SECO) is reviewing federal guidance for these rebate programs to determine whether it is feasible for the office to administer them, including through a third party program administrator. SECO will provide more information as soon as it is available.

Check out these resources to learn more:

- U.S. Department of Energy's [Home Energy Rebate Programs Frequently Asked Questions](#)
- Internal Revenue Service's [Frequently Asked Questions About Energy Efficient Home Improvements and Residential Clean Energy Property Credits](#) (PDF)



Rebates from the Home Energy Performance-Based, Whole House (HOMES) Rebate program and the Home Electrification and Application (HEAR) Rebate program funded through the Inflation Reduction Act are not currently available.

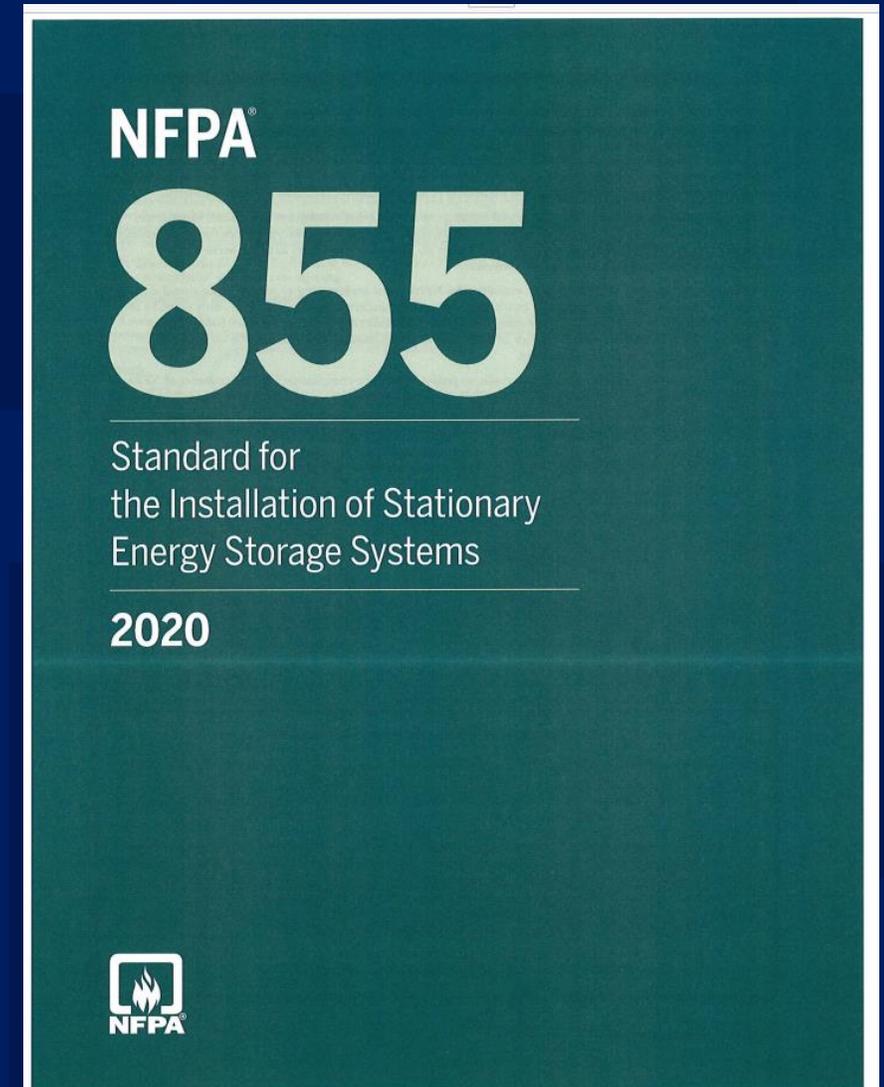
The State Energy Conservation Office (SECO) is reviewing federal guidance for these rebate programs to determine whether it is feasible for the office to administer them, including through a third party program administrator. SECO will provide more information as soon as it is available.

Check out these resources to learn more:

- U.S. Department of Energy's [Home Energy Rebate Programs Frequently Asked Questions](#)
- Internal Revenue Service's [Frequently Asked Questions About Energy Efficient Home Improvements and Residential Clean Energy Property Credits](#) (PDF)

ESS: ENERGY STORAGE SYSTEMS

1. THIS IS THE CODE.
2. PLANS ARE NEEDED.
3. MANUFACTURER'S
INSTALLATION INSTR.
4. COMMISSIONED



4.1.2 Construction Documents.

4.1.2.1 General.

4.1.2.1.1 The plans and specifications associated with an ESS and its intended installation, replacement or renewal, commissioning, and use shall be submitted to the AHJ for approval and include the following:

- (1) Location and layout diagram of the room or area in which the ESS is to be installed
- (2) Details on hourly fire-resistant-rated assemblies provided or relied upon in relation to the ESS
- (3) The quantities and types of ESS units
- (4) Manufacturer's specifications, ratings, and listings of ESS
- (5) Description of energy storage management systems and their operation
- (6) Location and content of required signage
- (7) Details on fire suppression, smoke or fire detection, gas detection, thermal management, ventilation, exhaust, and deflagration venting systems, if provided
- (8) Support arrangement associated with the installation, including any required seismic support

15.3 Installation. ESS shall be installed in accordance with the manufacturer's instructions and their listing.

15.4 Commissioning.

15.4.1 ESS installed in one- and two-family dwellings and townhouse units shall be commissioned as follows:

- (1) Verify that the system is installed in accordance with the approved plans and manufacturer's instructions and is operating properly
- (2) Provide a copy of the manufacturer's installation, operation, and maintenance instructions provided with the listed system
- (3) Provide training on the proper operation and maintenance of the system to the system owner
- (4) Provide a label on the installed system containing the contact information for the qualified maintenance and service providers

Chapter 6 Commissioning

6.1 System Commissioning.

6.1.1 ESS shall be evaluated and confirmed for proper operation by the system owner or their designated agent in accordance with a commissioning plan prepared in accordance with 6.1.2 and 6.1.3.

6.1.2 System commissioning shall be conducted in accordance with 6.1.2.1 and 6.1.2.2 after the installation is complete but prior to final inspection and approval.

15.5 ESS Spacing. Individual ESS units shall be separated from each other by a minimum of 3 ft (914 mm) unless smaller separation distances are documented to be adequate as approved by the AHJ, based on large-scale fire testing complying with 4.1.5.

MINIMUM 24" ABOVE 500 YR FLOOD PLAIN PER COH ORDINANCE

3 FT SPACING & ABOVE FLOOD

15.6 Location.

15.6.1 ESS shall only be installed in the following locations:

- (1) In attached garages separated from the dwelling unit living area and sleeping units in accordance with the local building code
- (2) In detached garages and detached accessory structures
- (3) Outdoors on exterior walls or on the ground located a minimum of 3 ft (914 mm) from doors and windows
- (4) In enclosed utility closets and storage or utility spaces



WHAT'S WRONG WITH THIS PICTURE?

IS THERE 3' CLEARANCE FROM THE DOOR AND WINDOW?

NO: IT'S NON-COMPLIANT.

AND: IS THE HOUSE 24" ABOVE 500 YR FLOOD PLAIN?



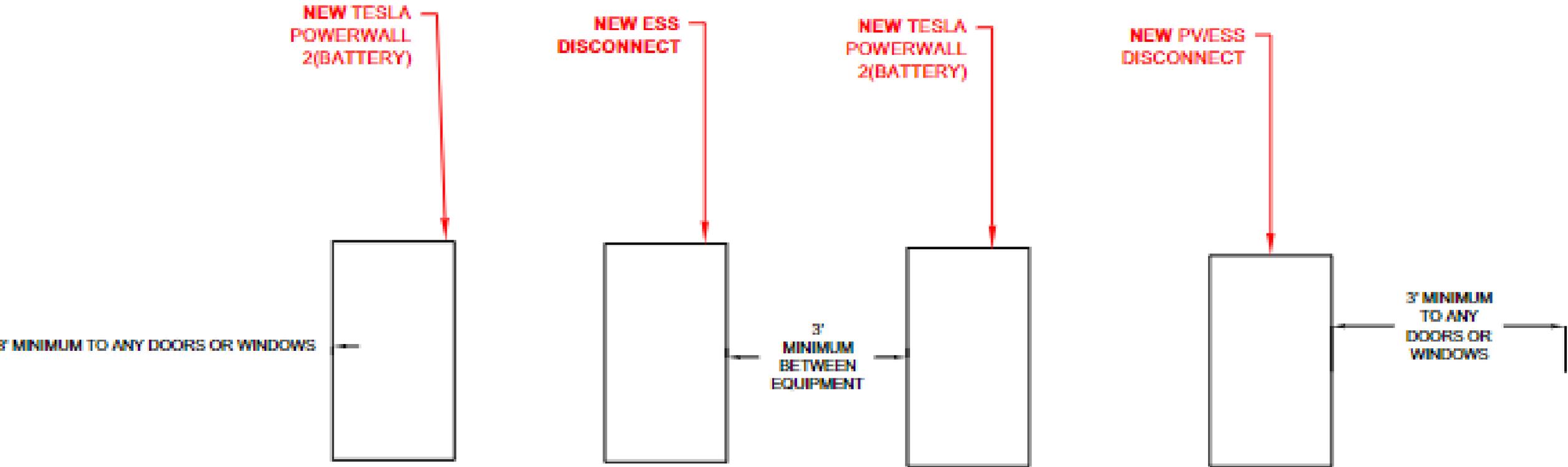
**SHOULD THIS BE APPROVED
IN THE FIELD?**

**IT SHOULD NOT. IT SHOULD
BE REINSTALLED IN
COMPLIANCE WITH THE
CODE.**

**P.S. IT DID NOT GO THROUGH
FLOOD BECAUSE IT'S NOT IN
THE 500 YR FLOODPLAIN.**

EQUIPMENT WALL

EAST EXTERIOR WALL OF GARAGE



ALL TESLA BATTERIES MUST BE INSTALLED WITH A MINIMUM OF 3' FROM FOLLOWING: OTHER EQUIPMENT, DOORS, WINDOWS.

4.3.7.4* For residential garages, ESS shall not be installed in a location where subject to damage from impact by a motor vehicle.

15.10 Protection from Impact. Stationary storage battery systems installed in a location subject to vehicle damage shall be protected by approved barriers.

15.6.2 ESS shall not be installed in living area of dwelling units or in sleeping units other than within utility closets and storage or utility spaces.

15.7 Energy Ratings. Individual ESS units shall have a maximum stored energy of 20 kWh.

15.7.1 The aggregate rating amount within a dwelling, garage, or accessory structure shall not exceed the following:

- (1) 40 kWh within utility closets and storage or utility spaces
- (2) 80 kWh in attached or detached garages and detached accessory structures
- (3) 80 kWh on exterior walls
- (4) 80 kWh in outdoor installations

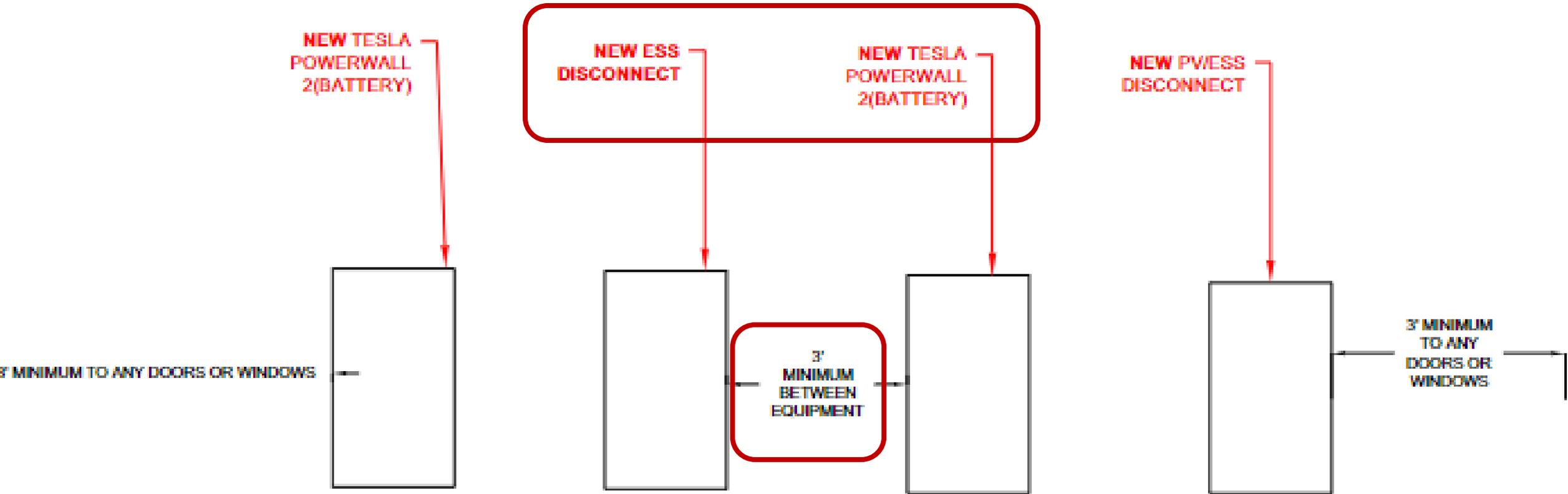
15.9 Fire Detection.

15.9.1 Interconnected smoke alarms shall be installed throughout the dwelling, including in rooms, attached garages, and areas in which ESS are installed in compliance with local building code.

15.9.2 Where ESS are installed in an attached garage or an area in which smoke alarms cannot be installed in accordance with their listing, an interconnected listed heat alarm shall be installed and be connected to the smoke alarm system required by the local building code.

EQUIPMENT WALL

EAST EXTERIOR WALL OF GARAGE



ALL TESLA BATTERIES MUST BE INSTALLED WITH A MINIMUM OF 3' FROM FOLLOWING: OTHER EQUIPMENT, DOORS, WINDOWS.

R103.2 Information on construction documents.

Construction documents shall be drawn to scale on suitable material. Electronic media documents are permitted to be submitted where *approved* by the *code official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the *building*, systems and equipment as herein governed. Details shall include the following as applicable:

1. Energy compliance path.
2. Insulation materials and their *R-values*.
3. Fenestration *U-factors* and *solar heat gain coefficients* (SHGC).
- ✓ 4. Area-weighted *U-factor* and *solar heat gain coefficients* (SHGC) calculations.
5. Mechanical system design criteria.
6. Mechanical and service water-heating systems and equipment types, sizes and efficiencies.
7. Equipment and system controls.
8. Duct sealing, duct and pipe insulation and location.
9. Air sealing details.

R103.2.1 Building thermal envelope depiction. The *building thermal envelope* shall be represented on the construction documents.

NOT NEW

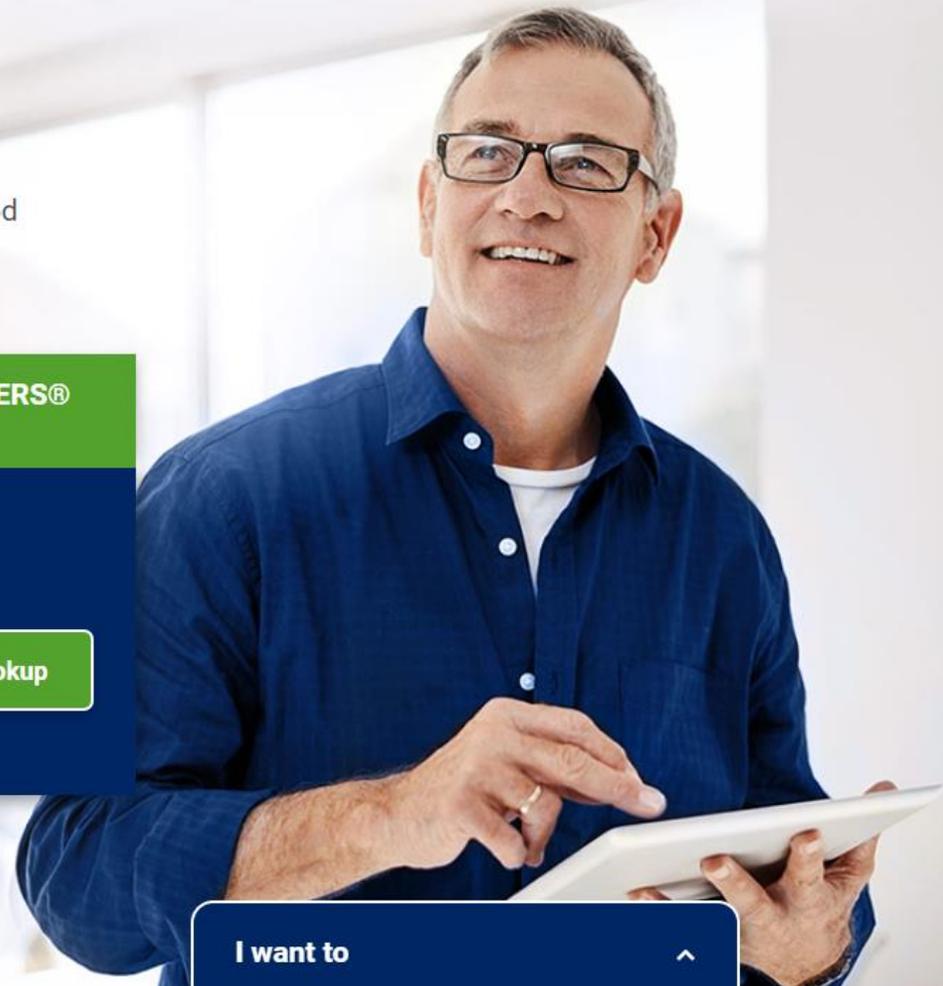
NEW

#4. LET THE SOFTWARE CALCULATE

NOT NEW

RESNET National Registry

Verify that your HERS® Rater or Rating Field Inspector is in good standing with RESNET.



Certified RESNET HERS® Raters

Certified RESNET HERS® RFIs

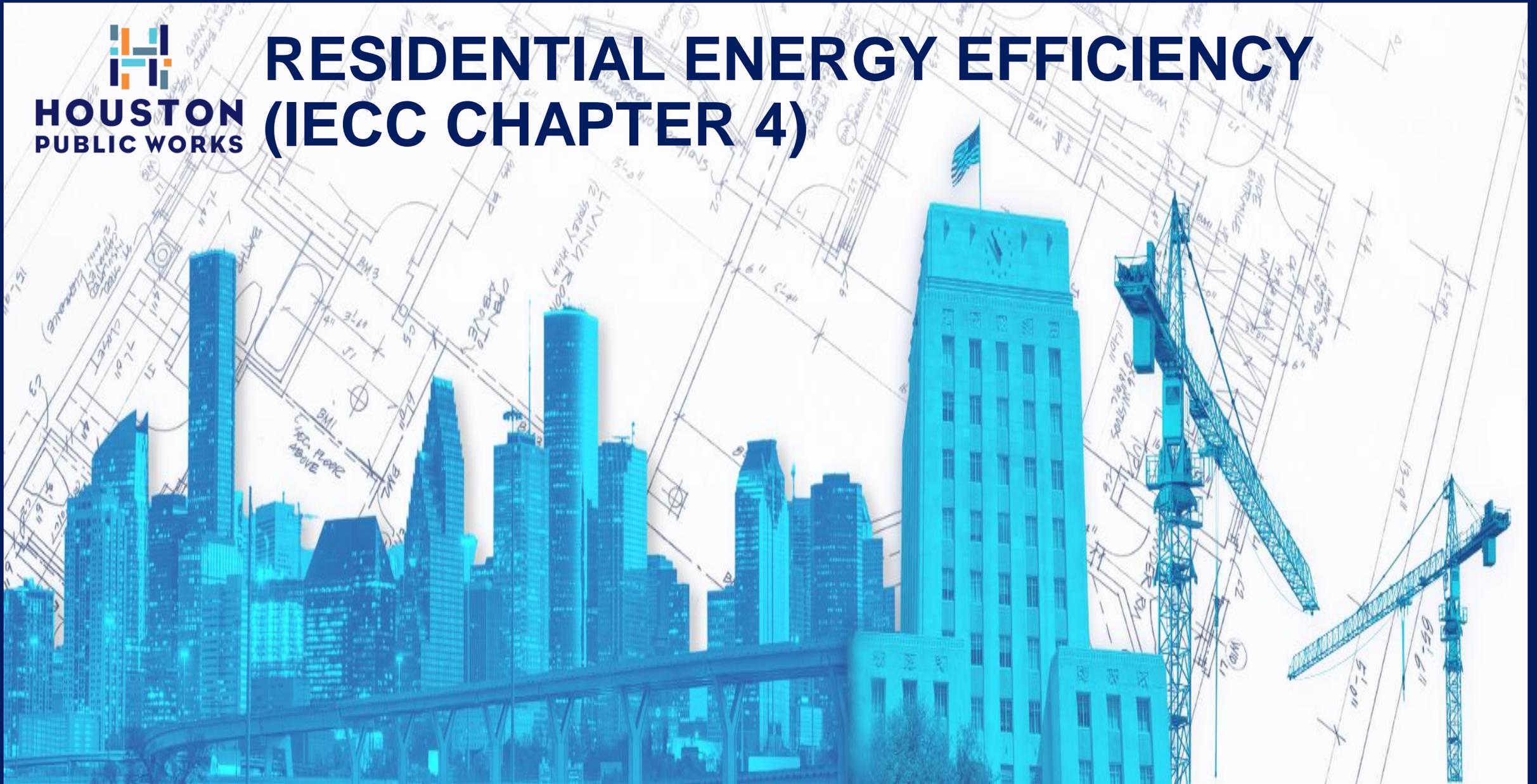
Enter a rater's first and/or last name to look up his/her certification information:

Lookup



I want to

RESIDENTIAL ENERGY EFFICIENCY (IECC CHAPTER 4)



BUILDING THERMAL ENVELOPE: R402

- Revisions in Table R402.1.2 Footnote f:
- Allows fenestration U-Factor of 0.32 for residences located above 4,000 ft in elevation in Climate Zones 5 - 8

- f. A maximum *U*-factor of 0.32 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located either:
 1. Above 4,000 feet in elevation above sea level, or
 2. In windborne debris regions where protection of openings is required by Section R301.2.1.2 of the *International Residential Code*.

BUILDING THERMAL ENVELOPE: R402 CONTINUED

- Revisions in Table R402.1.3:
- Increase wood frame wall R-values by R-5 in Climate Zones 4 & 5

TABLE R402.1.2 TABLE R402.1.3
INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT*

CLIMATE ZONE	FENESTRATION U-FACTOR ^{a,1}	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b,2}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE ^b	MASS WALL R-VALUE ^b	FLOOR R-VALUE	BASEMENT ^{c,3} WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^{e,4} WALL R-VALUE
0	NR	0.75	0.25	30	13 or 0 + 10	3/4	13	0	0	0
1	NR	0.75	0.25	30	13 or 0 + 10	3/4	13	0	0	0
2	0.40	0.65	0.25	38 49	13 or 0 + 10	4/6	13	0	0	0
3	0.32/30	0.55	0.25	38 49	20 or 13 + 5 ^b 13 + 5ci or 0 + 15	8/13	19	5/13 ^c 5ci or 13 ^f	10ci, 2 ft	5/13 ^c 5ci or 13 ^f
4 except Marine	0.32/30	0.55	0.40	49 60	20 + 5 or 13 + 5 ^b 13 + 10ci or 0 + 15	8/13	19	10/13 ^c 10ci or 13	10ci, 24 ft	10/13 ^c 10ci or 13
5 and Marine 4	0.30 ^f	0.55	NR/0.40	49 60	20 + 5 or 13 + 5 ^b 13 + 10ci or 0 + 15	13/17	30	15/19 ^c 15ci or 19 or 13 + 5ci	10ci, 24 ft	15/19 ^c 15ci or 19 or 13 + 5ci
6	0.30 ^f	0.55	NR	49 60	20 + 5 or 13 + 4 ^b 20 + 5ci or 13 + 10ci or 0 + 20	15/20	30	15/19 ^c 15ci or 19 or 13 + 5ci	10ci, 4 ft	15/19 ^c 15ci or 19 or 13 + 5ci
7 and 8	0.30 ^f	0.55	NR	49 60	20 + 5 or 13 + 4 ^b 20 + 5ci or 13 + 10ci or 0 + 20	19/21	38	15/19 ^c 15ci or 19 or 13 + 5ci	10ci, 4 ft	15/19 ^c 15ci or 19 or 13 + 5ci

BUILDING THERMAL ENVELOPE: R402 CONTINUED

- Revisions in Table R402.1.3:
- New R-10 slab insulation at 2 ft depth for Climate Zone 3
- Increase slab depth to 4 ft for Climate Zone 4 & 5

TABLE R402.1.2 TABLE R402.1.3
INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT*

CLIMATE ZONE	FENESTRATION U-FACTOR ^{a,1}	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b,2}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE ^d	MASS WALL R-VALUE ^e	FLOOR R-VALUE	BASEMENT ^{c,g} WALL R-VALUE	SLAB ^f R-VALUE & DEPTH	CRAWL SPACE ^{c,g} WALL R-VALUE
0	NR	0.75	0.25	30	13 or 0 + 10	3/4	13	0	0	0
1	NR	0.75	0.25	30	13 or 0 + 10	3/4	13	0	0	0
2	0.40	0.65	0.25	38 49	13 or 0 + 10	4/6	13	0	0	0
3	0.32/30	0.55	0.25	38 49	20 or 13 + 5ci or 0 + 15	8/13	19	5/13 ^f 5ci or 13 ^f	10ci, 2 ft	5/13 ^f 5ci or 13 ^f
4 except Marine	0.32/30	0.55	0.40	49 60	20 + 5 or 13 + 5ci or 0 + 15	8/13	19	10/13 ^f 10ci or 13	10ci, 2 ft	10/13 ^f 10ci or 13
5 and Marine 4	0.30 ^g	0.55	NR/0.40	49 60	20 + 5 or 13 + 5ci or 0 + 15	13/17	30	15/19 ^f 15ci or 19 or 13 + 5ci	10ci, 2 ft	15/19 ^f 15ci or 19 or 13 + 5ci
6	0.30 ^g	0.55	NR	49 60	20 + 5 or 13 + 10ci or 0 + 20	15/20	30	15/19 ^f 15ci or 19 or 13 + 5ci	10ci, 4 ft	15/19 ^f 15ci or 19 or 13 + 5ci
7 and 8	0.30 ^g	0.55	NR	49 60	20 + 5 or 13 + 40 20 + 5ci or 13 + 10ci or 0 + 20	19/21	38	15/19 ^f 15ci or 19 or 13 + 5ci	10ci, 4 ft	15/19 ^f 15ci or 19 or 13 + 5ci

BUILDING THERMAL ENVELOPE: R402 CONTINUED

- Revisions in Table R402.1.3:
- Increase ceiling insulation from R-38 to R-49 in Climate Zones 2 & 3

TABLE R402.1.2 TABLE R402.1.3
INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT*

CLIMATE ZONE	FENESTRATION U-FACTOR ^{a,1}	SKYLIGHT ^a U-FACTOR	GLAZED FENESTRATION SHGC ^{a,2}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE ^a	MASS WALL R-VALUE ^a	FLOOR R-VALUE	BASEMENT ^{a,3} WALL R-VALUE	SLAB ^a R-VALUE & DEPTH	CRAWL SPACE ^{a,4} WALL R-VALUE
0	NR	0.75	0.25	30	13 or 0 + 10	3/4	13	0	0	0
1	NR	0.75	0.25	30	13 or 0 + 10	3/4	13	0	0	0
2	0.40	0.65	0.25	38 49	13 or 0 + 10	4/6	13	0	0	0
3	0.32 0.30	0.55	0.25	38 49	20 or 13 + 5ci or 0 + 15	8/13	19	5/13 ^f 5ci or 13 ^f	10ci, 2 ft	5/13 ^f 5ci or 13 ^f
4 except Marine	0.32 0.30	0.55	0.40	49 60	20 + 5 or 13 + 10ci or 0 + 15	8/13	19	40/13 ^f 10ci or 13	10ci, 24 ft	40/13 ^f 10ci or 13
5 and Marine 4	0.30 ^f	0.55	NR 0.40	49 60	20 + 5 or 13 + 10ci or 0 + 15	13/17	30	15/19 ^f 15ci or 19 or 13 + 5ci	10ci, 24 ft	15/19 ^f 15ci or 19 or 13 + 5ci
6	0.30 ^f	0.55	NR	49 60	20 + 5 or 13 + 10ci or 0 + 20	15/20	30	15/19 ^f 15ci or 19 or 13 + 5ci	10ci, 4 ft	15/19 ^f 15ci or 19 or 13 + 5ci
7 and 8	0.30 ^f	0.55	NR	49 60	20 + 5 or 13 + 10ci or 0 + 20	19/21	38	15/19 ^f 15ci or 19 or 13 + 5ci	10ci, 4 ft	15/19 ^f 15ci or 19 or 13 + 5ci

BUILDING THERMAL ENVELOPE: R402 CONTINUED

- Revisions in Table R402.1.3:
- Increase ceiling insulation from R-49 to R-60 in Climate Zones 4 - 8

TABLE R402.1.2 TABLE R402.1.3
INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT*

CLIMATE ZONE	FENESTRATION U-FACTOR ^{a,1}	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b,2}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE ^g	MASS WALL R-VALUE ^h	FLOOR R-VALUE	BASEMENT ^{c,3} WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^{c,3} WALL R-VALUE
0	NR	0.75	0.25	30	13 or 0 + 10	3/4	13	0	0	0
1	NR	0.75	0.25	30	13 or 0 + 10	3/4	13	0	0	0
2	0.40	0.65	0.25	38 49	13 or 0 + 10	4/6	13	0	0	0
3	0.32 0.30	0.55	0.25	38 49	20 or 13 + 5 ^{ci} or 0 + 15	8/13	19	5/13 ^{ci} or 13 ^f	10 ^{ci} , 2 ft	5/13 ^{ci} or 13 ^f
4 except Marine	0.32 0.30	0.55	0.40	49 60	20 + 5 or 13 + 10 ^{ci} or 0 + 15	8/13	19	10/13 ^{ci} or 13	10 ^{ci} , 24 ft	10/13 ^{ci} or 13
5 and Marine 4	0.30 ^g	0.55	NR 0.40	49 60	20 + 5 or 13 + 10 ^{ci} or 0 + 15	13/17	30	15/19 ^{ci} or 19 or 13 + 5 ^{ci}	10 ^{ci} , 24 ft	15/19 ^{ci} or 19 or 13 + 5 ^{ci}
6	0.30 ^g	0.55	NR	49 60	20 + 5 or 13 + 10 ^{ci} or 0 + 20	15/20	30	15/19 ^{ci} or 19 or 13 + 5 ^{ci}	10 ^{ci} , 4 ft	15/19 ^{ci} or 19 or 13 + 5 ^{ci}
7 and 8	0.30 ^g	0.55	NR	49 60	20 + 5 or 13 + 40 20 + 5 ^{ci} or 13 + 10 ^{ci} or 0 + 20	19/21	38	15/19 ^{ci} or 19 or 13 + 5 ^{ci}	10 ^{ci} , 4 ft	15/19 ^{ci} or 19 or 13 + 5 ^{ci}

BUILDING THERMAL ENVELOPE: R402 CONTINUED

- Revisions in Table R402.1.3:
- Reduce fenestration U-Factors to 0.30 in Climate Zones 3 & 4

TABLE R402.1.2 TABLE R402.1.3
INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT*

CLIMATE ZONE	FENESTRATION U-FACTOR ^{b,1}	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b,*}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE ^c	MASS WALL R-VALUE ^b	FLOOR R-VALUE	BASEMENT ^{a,8} WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^{e,9} WALL R-VALUE
0	NR	0.75	0.25	30	13 or 0 + 10	3/4	13	0	0	0
1	NR	0.75	0.25	30	13 or 0 + 10	3/4	13	0	0	0
2	0.40	0.65	0.25	38 49	13 or 0 + 10	4/6	13	0	0	0
3	0.32 0.30	0.55	0.25	38 49	20 or 13 + 5ci or 0 + 15	8/13	19	5/13 ^f 5ci or 13 ^f	10ci, 2 ft	5/13 ^f 5ci or 13 ^f
4 except Marine	0.32 0.30	0.55	0.40	49 60	20 + 5 or 13 + 5ci or 0 + 15	8/13	19	10/13 ^f 10ci or 13	10ci, 24 ft	10/13 ^f 10ci or 13
5 and Marine 4	0.30 ^f	0.55	NR 0.40	49 60	20 + 5 or 13 + 5ci or 0 + 15	13/17	30	15/19 ^f 15ci or 19 or 13 + 5ci	10ci, 24 ft	15/19 ^f 15ci or 19 or 13 + 5ci
6	0.30 ^f	0.55	NR	49 60	20 + 5 or 13 + 10ci or 0 + 20	15/20	30	15/19 ^f 15ci or 19 or 13 + 5ci	10ci, 4 ft	15/19 ^f 15ci or 19 or 13 + 5ci
7 and 8	0.30 ^f	0.55	NR	49 60	20 + 5 or 13 + 5ci or 13 + 10ci or 0 + 20	19/21	38	15/19 ^f 15ci or 19 or 13 + 5ci	10ci, 4 ft	15/19 ^f 15ci or 19 or 13 + 5ci

BUILDING THERMAL ENVELOPE: R402 CONTINUED

- Revisions in Table R402.1.3:
- Sets required SHGC for Climate Zones 4C & 5 to 0.40

TABLE R402.1.2 TABLE R402.1.3
INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT*

CLIMATE ZONE	FENESTRATION U-FACTOR ^{b,1}	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b,2}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE ^b	MASS WALL R-VALUE ^b	FLOOR R-VALUE	BASEMENT ^{c,g} WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^{c,g} WALL R-VALUE
0	NR	0.75	0.25	30	13 or 0 + 10	3/4	13	0	0	0
1	NR	0.75	0.25	30	13 or 0 + 10	3/4	13	0	0	0
2	0.40	0.65	0.25	38 49	13 or 0 + 10	4/6	13	0	0	0
3	0.32 0.30	0.55	0.25	38 49	20 or 13 + 5ci or 0 + 15	8/13	19	5/13 ^f 5ci or 13 ^f	10ci, 2 ft	5/13 ^f 5ci or 13 ^f
4 except Marine	0.32 0.30	0.55	0.40	49 60	20 + 5 or 13 + 10ci or 0 + 15	8/13	19	10ci or 13	10ci, 24 ft	10ci or 13
5 and Marine 4	0.30 ^f	0.55	NR 0.40	49 60	20 + 5 or 13 + 10ci or 0 + 15	13/17	30	15ci or 19 or 13 + 5ci	10ci, 24 ft	15ci or 19 or 13 + 5ci
6	0.30 ^f	0.55	NR	49 60	20 + 5 or 13 + 10ci or 0 + 20	15/20	30	15ci or 19 or 13 + 5ci	10ci, 4 ft	15ci or 19 or 13 + 5ci
7 and 8	0.30 ^f	0.55	NR	49 60	20 + 5 or 13 + 10ci or 0 + 20	19/21	38	15ci or 19 or 13 + 5ci	10ci, 4 ft	15ci or 19 or 13 + 5ci

BUILDING THERMAL ENVELOPE: R402 CONTINUED

- Revisions in Table R402.1.3:
- Basement wall alternative prescription options

TABLE R402.1.2 TABLE R402.1.3
INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT*

CLIMATE ZONE	FENESTRATION U-FACTOR ^{b,1}	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b,2}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE ^d	MASS WALL R-VALUE ^b	FLOOR R-VALUE	BASEMENT ^{c,3} WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^{c,3} WALL R-VALUE
0	NR	0.75	0.25	30	13 or 0 + 10	3/4	13	0	0	0
1	NR	0.75	0.25	30	13 or 0 + 10	3/4	13	0	0	0
2	0.40	0.65	0.25	38 49	13 or 0 + 10	4/6	13	0	0	0
3	0.32 0.30	0.55	0.25	38 49	20 or 13 + 5ci or 0 + 15	8/13	19	5/13 5ci or 13'	10ci, 2 ft	5/13 5ci or 13'
4 except Marine	0.32 0.30	0.55	0.40	49 60	20 + 5 or 13 + 10ci or 0 + 15	8/13	19	10/13 10ci or 13	10ci, 24 ft	10/13 10ci or 13
5 and Marine 4	0.30 ^f	0.55	NR 0.40	49 60	20 + 5 or 13 + 10ci or 0 + 15	13/17	30	15/19 15ci or 19 or 13 + 5ci	10ci, 24 ft	15/19 15ci or 19 or 13 + 5ci
6	0.30 ^f	0.55	NR	49 60	20 + 5 or 13 + 10ci or 0 + 20 13 + 10ci or 20 + 5ci or 13 + 10ci or 0 + 20	15/20	30	15/19 15ci or 19 or 13 + 5ci	10ci, 4 ft	15/19 15ci or 19 or 13 + 5ci
7 and 8	0.30 ^f	0.55	NR	49 60	20 + 5 or 13 + 10ci or 0 + 20 13 + 10ci or 20 + 5ci or 13 + 10ci or 0 + 20	19/21	38	15/19 15ci or 19 or 13 + 5ci	10ci, 4 ft	15/19 15ci or 19 or 13 + 5ci

BUILDING THERMAL ENVELOPE: R402 CONTINUED

- Revisions in Table R402.1.3:
- Above grade wall alternative prescriptive options

TABLE R402.1.2 TABLE R402.1.3
INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT*

CLIMATE ZONE	FENESTRATION U-FACTOR ^{a,1}	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b,2}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE ^d	MASS WALL R-VALUE ^b	FLOOR R-VALUE	BASEMENT ^{c,3} WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^{c,3} WALL R-VALUE
0	NR	0.75	0.25	30	13 or 0 + 10	3/4	13	0	0	0
1	NR	0.75	0.25	30	13 or 0 + 10	3/4	13	0	0	0
2	0.40	0.65	0.25	38 49	13 or 0 + 10	4/6	13	0	0	0
3	0.32 0.30	0.55	0.25	38 49	20 or 13 + 5ci or 0 + 15	8/13	19	5/13 ^f 5ci or 13 ^f	10ci, 2 ft	5/13 ^f 5ci or 13 ^f
4 except Marine	0.32 0.30	0.55	0.40	49 60	20 + 5 or 13 + 5ci or 0 + 15	8/13	19	40/13 ^f 10ci or 13	10ci, 2 ft	40/13 ^f 10ci or 13
5 and Marine 4	0.30 ^d	0.55	NR 0.40	49 60	20 + 5 or 13 + 5ci or 0 + 15	13/17	30	15/19 ^f 15ci or 19 or 13 + 5ci	10ci, 2 ft	15/19 ^f 15ci or 19 or 13 + 5ci
6	0.30 ^d	0.55	NR	49 60	20 + 5 or 13 + 5ci or 0 + 15 20 + 5 or 13 + 5ci or 10ci or 0 + 20	15/20	30	15/19 ^f 15ci or 19 or 13 + 5ci	10ci, 4 ft	15/19 ^f 15ci or 19 or 13 + 5ci
7 and 8	0.30 ^d	0.55	NR	49 60	20 + 5 or 13 + 5ci or 0 + 15 40 20 + 5ci or 13 + 10ci or 0 + 20	19/21	38	15/19 ^f 15ci or 19 or 13 + 5ci	10ci, 4 ft	15/19 ^f 15ci or 19 or 13 + 5ci

BUILDING THERMAL ENVELOPE: R402 CONTINUED

- Revision in section of Table R402.4.1.1:

TABLE R402.4.1.1
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION^a

Rim joists	Rim joists shall include the exterior air barrier. ^b The junctions of the rim board to the sill plate and the rim board and the subfloor shall be air sealed.	Rim joists shall be insulated so that the insulation maintains permanent contact with the exterior rim board. ^b
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BUILDING THERMAL ENVELOPE: R402 CONTINUED

- Revisions in R402.4.1.2:

R402.4.1.2 Testing. The *building or dwelling unit* shall be tested ~~and verified as~~ having an air leakage rate not exceeding five air changes per hour in *Climate Zones 1 and 2*, and three air changes per hour in *Climate Zones 3 through 8* for air leakage. The maximum air leakage rate for any *building or dwelling unit* under any compliance path shall not exceed 5.0 air changes per hour or 0.28 cubic feet per minute (CFM) per square foot [0.0079 m³/(s × m²)] of dwelling unit enclosure area. Testing shall be conducted in accordance with **ANSI/RESNET/ICC 380**, **ASTM E779** or **ASTM E1827** and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope* have been sealed.

Exception: For heated, attached private garages and heated, detached private garages accessory to one- and two-family dwellings and townhouses not more than three stories above *grade plane* in height, building envelope tightness and insulation installation shall be considered acceptable where the items in **Table R402.4.1.1**, applicable to the method of construction, are field verified. Where required by the *code official*, an *approved* third party independent from the installer shall inspect both air barrier and insulation installation criteria. Heated, attached private garage space and heated, detached private garage space shall be thermally isolated from all other habitable, *conditioned spaces* in accordance with **Sections R402.2.12** and **R402.3.5**, as applicable.

BUILDING THERMAL ENVELOPE: R402 CONTINUED

- Revisions in R402.4.1.2:

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous ventilation systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.
6. Supply and return registers, where installed at the time of the test, shall be fully open.

Exception: When testing individual *dwelling units*, an air leakage rate not exceeding 0.30 cubic feet per minute per square foot [$0.008 \text{ m}^3/(\text{s} \times \text{m}^2)$] of the dwelling unit enclosure area, tested in accordance with **ANSI/RESNET/ICC 380**, **ASTM E779** or **ASTM E1827** and reported at a pressure of 0.2 inch w.g. (50 Pa), shall be an accepted alternative permitted in all climate zones for:

1. Attached single-family and multiple-family building *dwelling units*.
2. Buildings or *dwelling units* that are 1,500 square feet (139.4 m^2) or smaller.

BUILDING THERMAL ENVELOPE: R402 CONTINUED

- Addition in R402.4.6:

R402.4.6 Electrical and communication outlet boxes (air-sealed boxes). Electrical and communication outlet boxes installed in the building thermal envelope shall be sealed to limit air leakage between conditioned and unconditioned spaces. Electrical and communication outlet boxes shall be tested in accordance with **NEMA OS 4, Requirements for Air-Sealed Boxes for Electrical and Communication Applications**, and shall have an air leakage rate of not greater than 2.0 cubic feet per minute (0.944 L/s) at a pressure differential of 1.57 psf (75 Pa). Electrical and communication outlet boxes shall be marked "NEMA OS 4" or "OS 4" in accordance with **NEMA OS 4**. Electrical and communication outlet boxes shall be installed per the manufacturer's instructions and with any supplied components required to achieve compliance with **NEMA OS 4**.

BUILDING THERMAL ENVELOPE: R402 CONTINUED

- Revisions in R402.5:
- Decreases mandatory backstops for fenestration U-Factors and SHGCs
 - Sets area-weighted average maximum fenestration U-factor to 0.40 in Climate Zones 4 & 5
 - Sets area-weighted average maximum fenestration U-factor to 0.35 in Climate Zones 6 - 8
 - Sets area-weighted average maximum fenestration SHGC to 0.40 in Climate Zones 1 - 3

R402.5 Maximum fenestration U-factor and SHGC (Mandatory). The area-weighted average maximum fenestration *U*-factor permitted using tradeoffs from **Section R402.1.5** or **R405** shall be 0.48 in Climate Zones 4 and 5 and 0.40 in Climate Zones 6 through 8 for vertical fenestration, and 0.75 in Climate Zones 4 through 8 for skylights. The area-weighted average maximum fenestration SHGC permitted using tradeoffs from **Section R405** in *Climate Zones 4* through 3 shall be ~~0.50~~ **0.40**.

Exception: The maximum *U*-factor and solar heat gain coefficient (SHGC) for fenestration shall not be required in storm shelters complying with **ICC 500**.

SYSTEMS: R403

- Revisions in R403.3.2:

~~R403.3.7~~**R403.3.2** Ducts located in conditioned space. For ~~ducts~~ **ductwork** to be considered ~~as~~ inside a *conditioned space*, ~~such ducts~~ **it** shall comply with ~~either one~~ of the following:

1. The duct system shall be located completely within the *continuous air barrier* and within the building thermal envelope.
2. ~~The ducts shall~~ **Ductwork in ventilated attic spaces shall** be buried within ceiling insulation in accordance with **Section R403.3.3** and all of the following conditions shall exist:
 - 2.1. The air handler is located completely within the *continuous air barrier* and within the *building thermal envelope*.
 - 2.2. The duct leakage, as measured either by a rough-in test of the ducts or a post-construction total system leakage test to outside the *building thermal envelope* in accordance with **Section R403.3.6**, is less than or equal to 1.5 cubic feet per minute (42.5 L/min) per 100 square feet (9.29 m²) of *conditioned floor area* served by the duct system.
 - 2.3. The ceiling insulation *R*-value installed against and above the insulated duct is greater than or equal to the proposed ceiling insulation *R*-value, less the *R*-value of the insulation on the duct.

SYSTEMS: R403 CONTINUED

- Additions in R403.3.2:
 3. Ductwork in floor cavities located over unconditioned space shall comply with all of the following:
 - 3.1. A *continuous air barrier* installed between unconditioned space and the duct.
 - 3.2. Insulation installed in accordance with **Section R402.2.7**.
 - 3.3. A minimum R-19 insulation installed in the cavity width separating the duct from unconditioned space.
 4. Ductwork located within *exterior walls* of the *building thermal envelope* shall comply with the following:
 - 4.1. A *continuous air barrier* installed between unconditioned space and the duct.
 - 4.2. Minimum R-10 insulation installed in the cavity width separating the duct from the outside sheathing.
 - 4.3. The remainder of the cavity insulation shall be fully insulated to the drywall side.

SYSTEMS: R403 CONTINUED

- Revisions in R403.3.5:

~~R403.3.3~~ **R403.3.5 Duct testing (Mandatory)**. Ducts shall be pressure tested in accordance with **ANSI/RESNET/ICC 380** or **ASTM E1554** to determine air leakage by one of the following methods:

1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. Registers shall be taped or otherwise sealed during the test.
2. Postconstruction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Registers shall be taped or otherwise sealed during the test.

~~Exceptions:~~ **Exception:**

- ~~1. A duct air-leakage test shall not be required where the ducts and air handlers are located entirely within the *building thermal envelope*.~~
2. A duct air-leakage test shall not be required for ducts serving ~~heat or energy recovery ventilators~~ **heating, cooling or ventilation systems** that are not integrated with ducts serving heating or cooling systems.

SYSTEMS: R403 CONTINUED

- Revisions in R403.6 and R403.6.2, and addition in R403.6.1:

R403.6 Mechanical ventilation (Mandatory). ~~The building~~ *Buildings and dwelling units* shall be provided with **mechanical ventilation** that complies with the requirements of the International Residential Code or *International Mechanical Code*, as applicable, or with other *approved* means of *ventilation*. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the *ventilation* system is not operating.

R403.6.1 Heat or energy recovery ventilation. *Dwelling units* shall be provided with a heat recovery or energy recovery ventilation system in Climate Zones 7 and 8. The system shall be balanced with a minimum sensible heat recovery efficiency of 65 percent at 32°F (0°C) at a flow greater than or equal to the design airflow.

~~R403.6.1~~ **R403.6.2 Whole-house dwelling mechanical ventilation system fan efficacy.** Fans used to provide whole-house dwelling mechanical ventilation shall meet the efficacy requirements of **Table R403.6.2** at one or more rating points. Fans shall be tested in accordance with **HVI 916** and listed. The airflow shall be reported in the product listing or on the label. Fan efficacy shall be reported in the product listing or shall be derived from the input power and airflow values reported in the product listing or on the label. Fan efficacy for fully ducted HRV, ERC, balanced, and in-line fans shall be determined at a static pressure of not less than 0.2 inch w.c. (49.85 Pa). Fan efficacy for ducted range hoods, bathroom and utility room fans shall be determined at a static pressure of not less than 0.1 inch w.c. (24.91 Pa).

Exception:

~~Where an air handler that is integral to tested and listed HVAC equipment is used to provide whole-house mechanical ventilation, the air handler shall be powered by an electronically commutated motor.~~

SYSTEMS: R403 CONTINUED

- Revisions in Table R403.6.2:

~~TABLE R403.6.1~~ **TABLE R403.6.2**
WHOLE-HOUSE DWELLING MECHANICAL VENTILATION SYSTEM FAN EFFICACY^a

FAN LOCATION	AIRFLOW RATE MINIMUM (CFM)	MINIMUM EFFICACY (CFM/WATT)	AIR FLOW RATE MAXIMUM (CFM)
HRV, or ERV	Any	1.2 cfm/watt	Any
Range hoods	Any	2.8 cfm/watt	Any
In-line supply or exhaust fan	Any	3.8 2.8 cfm/watt	Any
Bathroom, utility room Other exhaust fan	40 < 90	2.8 1.4 cfm/watt	< 90
Bathroom, utility room Other exhaust fan	≥ 90	3.5 2.8 cfm/watt	Any
Air-handler that is integrated to tested and listed HVAC equipment	Any	1.2 cfm/watt	

For SI: 1 cubic foot per minute = 28.3 L/min.

- When tested in accordance with HVI Standard 916. Design outdoor airflow rate/watts of fan used.

SYSTEMS: R403 CONTINUED

- Addition in R403.6.3:

R403.6.3 Testing. Mechanical ventilation systems shall be tested and verified to provide the minimum ventilation flow rates required by **Section R403.6**. Testing shall be performed according to the ventilation *equipment* manufacturer's instructions, or by using a flow hood or box, flow grid, or other airflow measuring device at the mechanical ventilation fan's inlet terminals or grilles, outlet terminals or grilles, or in the connected ventilation ducts. Where required by the code official, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official.

Exception: Kitchen range hoods that are ducted to the outside with 6-inch (152 mm) or larger duct and not more than one 90-degree (1.57 rad) elbow or equivalent in the duct run.

ELECTRICAL POWER AND LIGHTING SYSTEMS: R404

- Revisions in R404.1 and addition of R404.1.1:

R404.1 Lighting equipment (Mandatory). Not less than 90 percent of the All permanently installed lighting fixtures, excluding kitchen appliance lighting fixtures, shall contain only high-efficacy lighting sources lamps.

R404.1.1 Exterior lighting. Connected exterior lighting for residential buildings shall comply with Section C405.4.

Exceptions:

1. Detached one- and two- family dwellings.
2. Townhouses.
3. Solar-powered lamps not connected to any electrical service.
4. Luminaires controlled by a motion sensor.
5. Lamps and luminaires that comply with Section R404.1.

ELECTRICAL POWER AND LIGHTING SYSTEMS: R404 CONTINUED

- Additions of R404.2 and R404.3:

R404.2 Interior lighting controls. Permanently installed lighting fixtures shall be controlled with either a dimmer, an occupant sensor control or other control that is installed or built into the fixture.

Exception: Lighting controls shall not be required for the following:

1. Bathrooms.
2. Hallways.
3. Exterior lighting fixtures.
4. Lighting designed for safety or security.

R404.3 Exterior lighting controls. Where the total permanently installed exterior lighting power is greater than 30 watts, the permanently installed exterior lighting shall comply with the following:

1. Lighting shall be controlled by a manual on and off switch which permits automatic shut-off actions.

Exception: Lighting serving multiple *dwelling units*.

2. Lighting shall be automatically shut off when daylight is present and satisfies the lighting needs.
3. Controls that override automatic shut-off actions shall not be allowed unless the override automatically returns automatic control to its normal operation within 24 hours.

TOTAL BUILDING PERFORMANCE: R405

- Revision of R405.2:

R405.2 Mandatory requirements Performance-based compliance. Compliance with this section based on total building performance requires that a *proposed design* meets all of the following: the mandatory provisions identified in Section R401.2 be met. Supply and return ducts not completely inside the *building thermal envelope* shall be insulated to an *R*-value of not less than R-6.

1. The requirements of the sections indicated within **Table R405.2**.
2. The building thermal envelope greater than or equal to levels of efficiency and solar heat gain coefficients in Table R402.1.1 or R402.1.3 of the 2009 *International Energy Conservation Code*.
3. An annual energy cost that is less than or equal to the annual energy cost of the *standard reference design*. Energy prices shall be taken from a source *approved* by the *code official*, such as the Department of Energy, Energy Information

Administration's State Energy Data System Prices and Expenditures reports. Code officials shall be permitted to require time-of-use pricing in energy cost calculations.

Exception: The energy use based on source energy expressed in Btu or Btu per square foot of *conditioned floor area* shall be permitted to be substituted for the energy cost. The source energy multiplier for electricity shall be 3.16. The source energy multiplier for fuels other than electricity shall be 1.1.

TOTAL BUILDING PERFORMANCE: R405 CONTINUED

- Revision of Table R405.4.2(1):

TABLE R405.5.2(1) [IRC N1105.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN																			
Service water heating ^{d, g}	<p>As proposed.</p> <p>Use: same as proposed design. Use, in units of gal/day = $30 + (10 \times N_{br})$</p> <p>where:</p> <p>N_{br} = number of bedrooms.</p>	<p>As proposed</p> <p>Use, in units of gal/day = $30 + 25.5 + (10 \times 8.5 \times N_{br})$ $30 + 8.5 \times N_{br} \times (1 - HWDS)$</p> <p>where:</p> <p>$N_{br}$ = number of bedrooms.</p> <p>$HWDS$ = factor for the compactness of the hotwater distribution system.</p>																			
		<table border="1"> <thead> <tr> <th colspan="2">Compactness ratio¹ factor</th> <th>HWDS</th> </tr> </thead> <tbody> <tr> <td>1 story</td> <td>2 or more stories</td> <td></td> </tr> <tr> <td>> 60%</td> <td>> 30%</td> <td>0</td> </tr> <tr> <td>> 30% to ≤ 60%</td> <td>> 15% to ≤ 30%</td> <td>0.05</td> </tr> <tr> <td>> 15% to ≤ 30%</td> <td>> 7.5% to ≤ 15%</td> <td>0.10</td> </tr> <tr> <td>< 15%</td> <td>< 7.5%</td> <td>0.15</td> </tr> </tbody> </table>		Compactness ratio ¹ factor		HWDS	1 story	2 or more stories		> 60%	> 30%	0	> 30% to ≤ 60%	> 15% to ≤ 30%	0.05	> 15% to ≤ 30%	> 7.5% to ≤ 15%	0.10	< 15%	< 7.5%	0.15
		Compactness ratio ¹ factor		HWDS																	
		1 story	2 or more stories																		
		> 60%	> 30%	0																	
		> 30% to ≤ 60%	> 15% to ≤ 30%	0.05																	
		> 15% to ≤ 30%	> 7.5% to ≤ 15%	0.10																	
< 15%	< 7.5%	0.15																			

TOTAL BUILDING PERFORMANCE: R405 CONTINUED

- Revision of Table R405.4.2(1):

TABLE R405.5.2(1) [IRC N1105.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

Portions of table not shown remain unchanged.

Dehumidistat	<p>Where a mechanical ventilation system with latent heat recovery is not specified in the proposed design:</p> <p>None.</p> <p>Where the proposed design utilizes a mechanical ventilation system with latent heat recovery:</p> <p>Dehumidistat type: manual, setpoint = 60% relative humidity.</p> <p>Dehumidifier: whole-dwelling with integrated energy factor = 1.77 liters/kWh.</p>	Same as standard reference design.
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ENERGY RATING INDEX COMPLIANCE ALTERNATIVE: R406

- Addition of R406.3.1 and R406.3.2:

R406.3.1 On-site renewables are not included. Where on-site renewable energy is not included for compliance using the ERI analysis of **Section R406.4**, the proposed total building thermal envelope UA, which is sum of *U*-factor times assembly area, shall be less than or equal to the building thermal envelope UA using the prescriptive *U*-factors from **Table R402.1.2** multiplied by 1.15 in accordance with **Equation 4-1**. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

$$UA_{\text{Proposed design}} = 1.15 \times UA_{\text{Prescriptive reference design}} \quad (\text{Equation 4-1})$$

R406.3.2 On-site renewables are included. Where on-site renewable energy is included for compliance using the ERI analysis of **Section R406.4**, the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in **Table R402.1.2** or **Table R402.1.4** of the 2015 *International Energy Conservation Code*.

ENERGY RATING INDEX COMPLIANCE ALTERNATIVE: R406

- Revision of R406.4:

R406.3R406.4 Energy Rating Index. The Energy Rating Index (ERI) shall be determined in accordance with **RESNET/ICC 301** except for buildings covered by the *International Residential Code*, the ERI reference design ventilation rate shall be in accordance with **Equation 4-2**.

Ventilation rate, CFM = $(0.01 \times \text{total square foot area of house}) + [7.5 \times (\text{number of bedrooms} + 1)]$

Energy used to recharge or refuel a vehicle used for transportation on **4 (Equation 4-2)** roads that are not on the building site shall not be included in the *ERI reference design* or the *rated design*. **For compliance purposes, any reduction in energy use of the rated design associated with on-site renewable energy shall not exceed 5 percent of the total energy use.**

ENERGY RATING INDEX COMPLIANCE ALTERNATIVE: R406

- Revision of Table R406.5:

~~TABLE R406.4~~ **TABLE R406.5**
MAXIMUM ENERGY RATING INDEX

CLIMATE ZONE	ENERGY RATING INDEX ^a
0-1	57 -52
2	57 -52
3	57 -51
4	62 -54
5	61 -55
6	61 -54
7	58 -53
8	58 -53

ADDITIONAL EFFICIENCY PACKAGE OPTIONS: R408

- Addition of R408.2.1 and R408.2.2:

R408.2.1 Enhanced envelope performance option. The total *building thermal envelope* UA, the sum of *U*-factor times assembly area, shall be less than or equal to 95 percent of the total UA resulting from multiplying the *U*-factors in **Table R402.1.2** by the same assembly area as in the proposed building. The UA calculation shall be performed in accordance with **Section R402.1.5**. The area-weighted average SHGC of all glazed fenestration shall be less than or equal to 95 percent of the maximum glazed fenestration SHGC in **Table R402.1.2**.

R408.2.2 More efficient HVAC equipment performance option. Heating and cooling *equipment* shall meet one of the following efficiencies:

1. Greater than or equal to 95 AFUE natural gas furnace and 16 SEER air conditioner.
2. Greater than or equal to 10 HSPF/16 SEER air source heat pump.
3. Greater than or equal to 3.5 COP ground source heat pump.

For multiple cooling systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the cooling design load. For multiple heating systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the heating design load.

ADDITIONAL EFFICIENCY PACKAGE OPTIONS: R408 CONTINUED

- Addition of R408.2.3 and R408.2.4:

R408.2.3 Reduced energy use in service water-heating option. The hot water system shall meet one of the following efficiencies:

1. Greater than or equal to 82 EF fossil fuel service water-heating system.
2. Greater than or equal to 2.0 EF electric service water-heating system.
3. Greater than or equal to 0.4 solar fraction solar water-heating system.

R408.2.4 More efficient duct thermal distribution system option. The thermal distribution system shall meet one of the following efficiencies:

1. 100 percent of ducts and air handlers located entirely within the *building thermal envelope*.
2. 100 percent of ductless thermal distribution system or hydronic thermal distribution system located completely inside the *building thermal envelope*.
3. 100 percent of duct thermal distribution system located in *conditioned space* as defined by **Section R403.3.2**.

ADDITIONAL EFFICIENCY PACKAGE OPTIONS: R408 CONTINUED

- Addition of R408.2.5:

R408.2.5 Improved air sealing and efficient ventilation system option. The measured air leakage rate shall be less than or equal to 3.0 ACH50, with either an Energy Recovery Ventilator (ERV) or Heat Recovery Ventilator (HRV) installed. Minimum HRV and ERV requirements, measured at the lowest tested net supply airflow, shall be greater than or equal to 75 percent Sensible Recovery Efficiency (SRE), less than or equal to 1.1 cubic feet per minute per watt (0.03 m³/min/watt) and shall not use recirculation as a defrost strategy. In addition, the ERV shall be greater than or equal to 50 percent Latent Recovery/Moisture Transfer (LRMT).

ZERO ENERGY RESIDENTIAL BUILDING PROVISIONS: APPENDIX RC

APPENDIX RC ZERO ENERGY RESIDENTIAL BUILDING PROVISIONS

The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.

User note:

About this appendix: This appendix provides requirements for residential buildings intended to result in net zero energy consumption over the course of a year. Where adopted by ordinance as a requirement, **Section RC101** language is intended to replace **Section R401.2**.

SECTION RC101 COMPLIANCE

RC101.1 Compliance. Existing residential buildings shall comply with Chapter 5. New residential buildings shall comply with **Section RC102**.

SECTION RC102 ZERO ENERGY RESIDENTIAL BUILDINGS

RC102.1 General. New residential buildings shall comply with **Section RC102.2**.

RC102.2 Energy Rating Index zero energy score.

Compliance with this section requires that the rated design be shown to have a score less than or equal to the values in **Table RC102.2** when compared to the Energy Rating Index (ERI) reference design determined in accordance with **RESNET/ICC 301** for both of the following:

1. ERI value not including on-site power production (OPP) calculated in accordance with **RESNET/ICC 301**.
2. ERI value including on-site power production calculated in accordance with **RESNET/ICC 301** with the OPP in Equation 4.1.2 of **RESNET/ICC 301** adjusted in accordance with Equation RC-1.

Adjusted OPP = OPP + CREF + REPC

(Equation RC-1)

where:

CREF = Community Renewable Energy Facility power production—the yearly energy, in kilowatt hour equivalent (kWh_{eq}), contracted from a community renewable energy facility that is qualified under applicable state and local utility statutes and rules, and that allocates bill credits to the rated home.

REPC = Renewable Energy Purchase Contract power production—the yearly energy, in kilowatt hour equivalent (kWh_{eq}), contracted from an energy facility that generates energy with photovoltaic, solar thermal, geothermal energy or wind systems, and that is demonstrated by an energy purchase contract or lease with a duration of not less than 15 years.

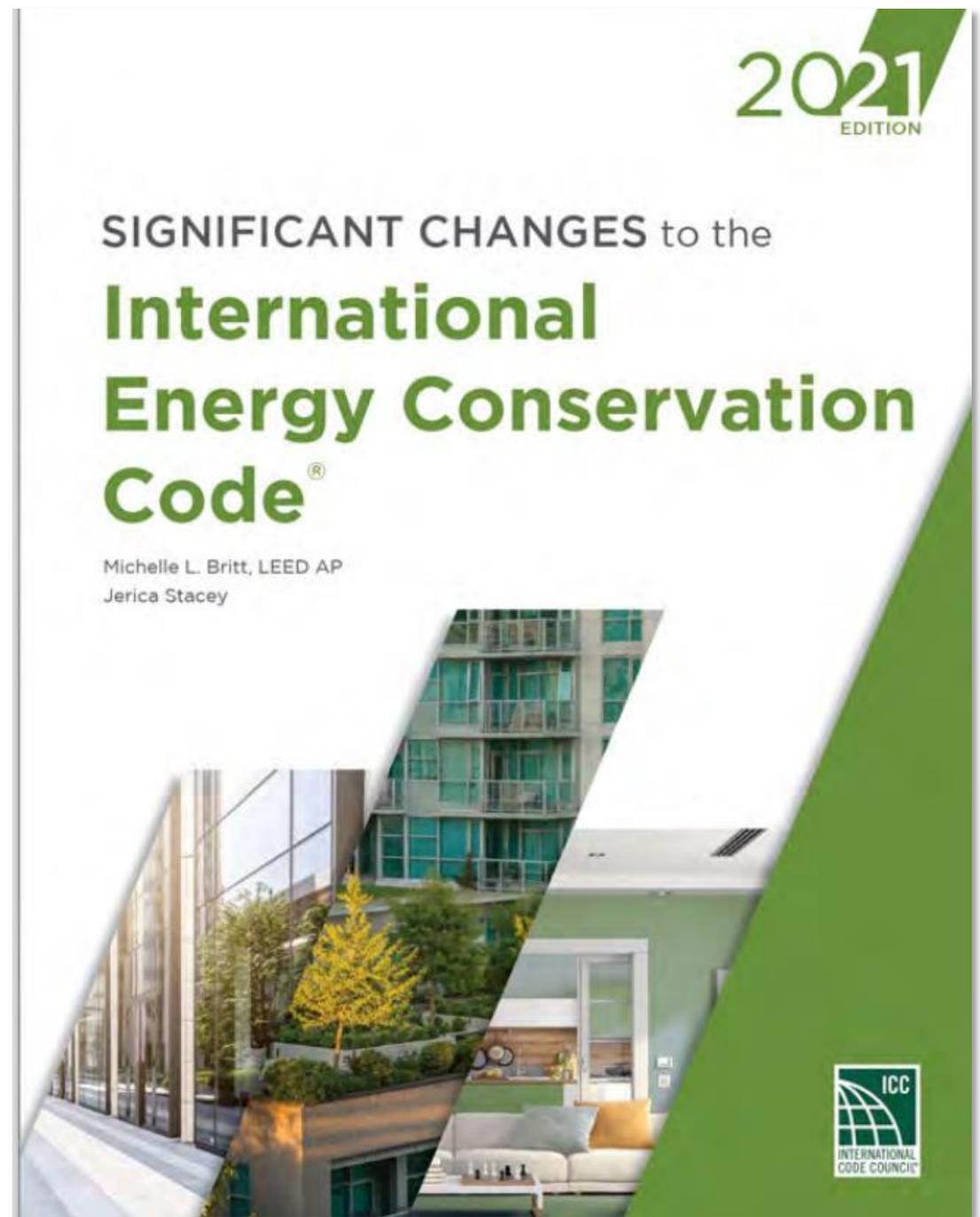
TABLE RC102.2
MAXIMUM ENERGY RATING INDEX*

CLIMATE ZONE	ENERGY RATING INDEX NOT INCLUDING OPP	ENERGY RATING INDEX INCLUDING ADJUSTED OPP (as proposed)
1	43	0
2	45	0
3	47	0
4	47	0
5	47	0
6	46	0
7	46	0
8	46	0

- a. The building shall meet the requirements of **Table R406.2**, and the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in **Table R402.1.2** or **R402.1.3**.

MORE ENERGY CHANGES

- **2021 IECC Effective 01.01.24**
- **Since September 2023, Building Code Enforcement has received extensive trainings about these changes.**
- **Mid-February you can find a copy of this presentation**



Customer Service

Community Trainings

- **Feb. 07: AIA (½ Day Commercial and ½ Day Residential)**
- **Feb. 14: General Public (Commercial)**
- **Feb. 21: IAPMO – UPC Half Day**
- **Feb. 22: American Wood Council presents
“Understanding Tall Mass Timber Code Changes”**
- **Feb. 28: IEC, NECA and IBEW – NEC Half Day**
- **TBD: IAPMO – UMC Half Day**

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Save The Date

2023 Infrastructure Design Manual Roll Out Webinar



Monday,
February 12, 2024



12:00 P.M. - 3:30 P.M.

Register here: bit.ly/2023IDM



Thank you!



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