IRC — Building



2019 GROUP B PROPOSED CHANGES TO THE I-CODES ALBUQUERQUE COMMITTEE ACTION HEARINGS

April 28 - May 8, 2019 Albuquerque Convention Center, Albuquerque, NM



2018-2019 Code Development Cycle, Group B (2019) Proposed Changes to the 2019 International Codes

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2019 GROUP B – PROPOSED CHANGES TO THE INTERNATIONAL RESIDENTIAL CODE - BUILDING

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TENTATIVE ORDER OF DISCUSSION 2019 PROPOSED CHANGES TO THE INTERNATIONAL RESIDENTIAL CODE –BUILDING

The following is the tentative order in which the proposed changes to the code will be discussed at the public hearings. Proposed changes which impact the same subject have been grouped to permit consideration in consecutive changes.

Proposed change numbers that are indented are those which are being heard out of numerical order. Indentation does not necessarily indicate that one change is related to another. Proposed changes may be grouped for purposes of discussion at the hearing at the discretion of the chair. Note that some RB code change proposals may not be included on this list, as they are being heard by another committee.

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ADM10-19 Part II	G12-19 Part II	RB64-19	EB101-19 Part II
CE17-19 Part II	RB26-19	RB65-19	RB102-19
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RD137-19 DD159 10	RD210-19 DD211 10	RD203-19 RD266-10	
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RB1-19

IRC®: R104.11, R104.11.1 (New), R104.11.1.1 (New), R104.11.1, R106.3.1.1 (New), 202 (New)

Proponent: Michael Savage, representing Compliance Code Action Committee (CCAC) (ccac@iccsafe.org)

2018 International Residential Code

R104.11 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code. The *building official* shall have the authority to approve an alternative material, design or method of construction upon application of the owner or the owner's authorized agent. The *building official* shall first find that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety. Compliance with the specific performance-based provisions of the International Codes shall be an alternative to the specific requirements of this code. Where the alternative material, design or method of construction is not *approved*, the *building official* shall respond in writing, stating the reasons why the alternative was not *approved*.

Add new text as follows:

R104.11.1 Research reports. Supporting data, where necessary to assist in the approval of materials or assemblies not specifically provided for in this code, shall consist of valid research reports from *approved* sources.

R104.11.1.1 Approved sources. Agencies conducting product certification or product evaluation shall be accredited by an accreditation body. The scope of accreditation shall include the acceptance criteria referenced in the research report, for the research report to be accepted for product approval.

Revise as follows:

R104.11.1 R104.11.2 Tests. Where there is insufficient evidence of compliance with the provisions of this code, or evidence that a material or method does not conform to the requirements of this code, or in order to substantiate claims for alternative materials or methods, the *building official* shall have the authority to require tests as evidence of compliance to be made at no expense to the *jurisdiction*. Test methods shall be as specified in this code or by other recognized test standards. In the absence of recognized and accepted test methods, the *building official* shall approve the testing procedures. Tests shall be performed by an *approved* agency. Reports of such tests shall be retained by the *building official* for the period required for retention of public records.

Add new text as follows:

R106.3.1.1 Third-party certification. Products and materials required by the code to be in compliance with a referenced standard shall be *certified* by a *third-party certification agency* as complying with the referenced standards. Products and materials shall bear the identification of the manufacturer and any markings required by the applicable referenced standards.

Add new definition as follows:

ACCREDITATION BODY. An approved, third-party organization that is independent of the grading, product certification and inspection agencies that initially accredit and subsequently monitors agencies conducting

building product certification or evaluation schemes on a continuing basis, including the competency and performance of a grading or inspection agency related to carrying out specific tasks.

Reason: The standard practice in building products conformity assessment involves accreditation of the agencies by an accreditation body such as ISO. Third party testing, manufacturing inspections and product certification or product evaluation provide a higher level of quality assurance on these activities for the building official. Approved sources that issue research reports must be accredited to the specific acceptance criteria referenced in the research report. This ensures that the approved sources have the requisite technical expertise and experience to conduct such activities on behalf of the building official. Harmonized language is proposed for inclusion a new Section R106.3.1.1 regarding third-party certification, and in Chapter 2 with a definition for accreditation body. A definition for Third-Party Certification Agency already exists in the IRC and remains unchanged. The language in the new Section R106.3.1.1 is identical to language in the International Plumbing Code Section 303.4. The added definition is the same as that proposed for inclusion in the International Building Code. These additions will improve the consistency and intent of the I-codes.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal coordinates the codes.

Proposal # 4997

RB1-19

RB2-19

IRC®: R105.2

Proponent: Lee Schwartz, representing Self (lee@hbaofmichigan.com)

2018 International Residential Code

Revise as follows:

R105.2 Work exempt from permit. Exemption from *permit* requirements of this code shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws or ordinances of this *jurisdiction*. *Permits* shall not be required for the following:

Building:

- 1. One-*story* detached *accessory structures,* provided that the floor area does not exceed 200 square feet (18.58 m²).
- 2. Fences not over 7 feet (2134 mm) high.
- 3. Retaining walls that are not over 4 feet (1219 mm) in height measured from the bottom of the footing to the top of the wall, unless supporting a surcharge.
- 4. Water tanks supported directly upon *grade* if the capacity does not exceed 5,000 gallons (18 927 L) and the ratio of height to diameter or width does not exceed 2 to 1.
- 5. Sidewalks and driveways.
- 6. Painting, papering, tiling, carpeting, cabinets, counter tops and similar finish work.
- 7. Prefabricated swimming pools that are less than 24 inches (610 mm) deep.
- 8. Swings and other playground equipment.
- 9. Window awnings supported by an exterior wall that do not project more than 54 inches (1372 mm) from the exterior wall and do not require additional support.
- 10. Decks not exceeding 200 square feet (18.58 m²) in area, that are not more than 30 inches (762 mm) above *grade* at any point, are not attached to a dwelling and do not serve the exit door required by Section R311.4.

Electrical:

- 1. *Listed* cord-and-plug connected temporary decorative lighting.
- 2. Reinstallation of attachment plug receptacles but not the outlets therefor.
- 3. Replacement of branch circuit overcurrent devices of the required capacity in the same location.
- 4. Electrical wiring, devices, *appliances,* apparatus or *equipment* operating at less than 25 volts and not capable of supplying more than 50 watts of energy.
- 5. Minor repair work, including the replacement of lamps or the connection of *approved* portable electrical *equipment* to *approved* permanently installed receptacles.

Gas:

- 1. Portable heating, cooking or clothes drying *appliances*.
- 2. Replacement of any minor part that does not alter approval of *equipment* or make such *equipment* unsafe.
- 3. Portable-fuel-cell *appliances* that are not connected to a fixed piping system and are not interconnected to a power grid.

Mechanical:

- 1. Portable heating *appliances*.
- 2. Portable ventilation *appliances*.
- 3. Portable cooling units.
- 4. Steam, hot- or chilled-water piping within any heating or cooling *equipment* regulated by this code.
- 5. Replacement of any minor part that does not alter approval of *equipment* or make such *equipment* unsafe.
- 6. Portable evaporative coolers.
- 7. Self-contained refrigeration systems containing 10 pounds (4.54 kg) or less of refrigerant or that are actuated by motors of 1 horsepower (746 W) or less.
- 8. Portable-fuel-cell *appliances* that are not connected to a fixed piping system and are not interconnected to a power grid.

Plumbing:

- 1. The stopping of leaks in drains, water, soil, waste or vent pipe; provided, however, that if any concealed trap, drainpipe, water, soil, waste or vent pipe becomes defective and it becomes necessary to remove and replace the same with new material, such work shall be considered as new work and a *permit* shall be obtained and inspection made as provided in this code.
- 2. The clearing of stoppages or the repairing of leaks in pipes, valves or fixtures, and the removal and reinstallation of water closets, provided such repairs do not involve or require the replacement or rearrangement of valves, pipes or fixtures.

Reason: The International Residential Code contains no definition of "fence", no listing of "fence" in the index and no sections or subsections specifically governing the material, design or method of construction for a fence. In short there are <u>no</u> specific code requirements for fences found in the International Residential Code. This leaves permit applicants to searching in vain thorough the entire IRC to find requirements for the construction of a fence when none exist. It also places inspectors in the unenivable position of having to inspect fences for which a permit was pulled without any criteria for approving the fence construction. How can a building official write a violation notice when there are no pertinent requirements to base the notice on?

While the IRC does contain an exemption for fences not over 7 feet high. This is an arbitrary number chosen for convenience and without without any data to back it up. Is a fence that is 7 feet two inches inherently more dangerous to the publis health, safety and general welfare than a fence that is 6 feet 11 1/2 inches?

The purpose of the code is to establish minimum <u>requirements</u> to safeguard the public safety, health and general welfare. Mandating the issuance of a construction permit for fences when <u>no</u> minimum requirements are specifically present in the code book does not safeguard the public safety, health and general welfare.

Requiring a permit for a fence, even with the under seven feet exeption, simply because the code states you must have a permit aqnd without any standards is exactly the type of overeach which leads to people not pulling permits on other, more critical, construction.

In most jurisdictions, requirements for fences have been treated as a zoning issue with zoning ordinances controlling the size, type, materials and manner of construction for a fence. The requirement for a fence permit should be totally removed from the IRC and left to local zoning.

Cost Impact: The code change proposal will decrease the cost of construction

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by eliminating an unnecessary permit and the fee for that permit.

Proposal # 4677

RB3-19

IRC®: [RB] 202

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Residential Code

Revise as follows:

[RB] APPROVED AGENCY. An established and recognized agency that is regularly engaged in conducting tests, furnishing inspection services or furnishing product certification, and has been *approved* by the building official. For the definition applicable in Chapter 11, see Section N1101.6.

Reason: This change removes the language that sends the user to chapter 11 and section 1101.6 of the document to find the definition of *Approved Agency* because, Section N1101.6 does not include the definition of Approved Agency. Also there is no need to add or repeat the definition in chapter 11 of the IRC as long as it is defined in Chapter 2 of the same IRC. This will save on printing costs as well as save energy.

Cost Impact: The code change proposal will not increase or decrease the cost of construction *The code change proposal will not increase the cost of construction.*

Proposal # 5378

RB3-19

RB4-19

IRC®: [RB] 202

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Residential Code

Revise as follows:

[RB] BUILDING. Any one- or two-family dwelling or portion thereof, including *townhouses*, <u>structure</u> used or intended to be used for human habitation, for living, sleeping, cooking or eating purposes, or any combination thereof, or any *accessory structure*. For the definition applicable in Chapter 11, see Section N1101.6. for supporting or sheltering any use or occupancy, including any mechanical HVAC systems, service water heating systems and electric power and lighting systems located on the building site and supporting the building.

Reason: The definition provided for "Building" is currently the definition used for "Dwelling" and "Dwelling Unit" in the IRC. The proposed language is the same used in the IRC Chapter 11 definitions and in the IECC Residential and Commercial codes IECC Energy Code definitions, and is in line with other ICC code documents including the IMC and IFGC. It is important to maintain a consistent definition of "Building" throughout the codes. There is no need to repeat the definition in the IRC, Chapter 11 since Chapter 2 definitions apply to the entire IRC

Cost Impact: The code change proposal will not increase or decrease the cost of construction There will be no cost impact with this change

Proposal # 5384

RB4-19

RB5-19

IRC®: 202 (New)

Proponent: Steven Mickley, representing American Institute of Building Design (steve.mickley@aibd.org)

2018 International Residential Code

Add new definition as follows:

BUILDING DESIGNER. The owner of the building or the person that contracts with the owner for the design of the building structural system or who is responsible for the preparation of the construction documents. Where required by the statutes of the jurisdiction in which the project is to be constructed, the building designer shall be a registered design professional.

Reason: The title "building designer" is currently used twice within the IRC, in Section R502.11.4 and Section R802.10.1. In each of the two sections, "building designer" refers to a person who is qualified and responsible for designing the size, connections, and anchorage of the permanent continuous lateral bracing. Therefore, a definition of the title providing the qualifications of the individual is necessary.

Furthermore, nearly every State allows for individuals other than "registered design professionals" to prepare construction drawings for those buildings covered under the scope of the IRC. Therefore, it is essential to the correct interpretation of the code that the title "building designer" is clarified by definition to avoid potential confusion and misinterpretation of the actual qualifications and prerequisites required of those individuals given the responsibility to design one- and two-family dwellings and townhouses.

Standard ANSI/TPI 1 includes a definition of "building designer" and this proposal largely mirrors the ANSI/TPI 1 definition with a small deviation to remain consistent with verbiage in Section R106.1.

Standard ANSI/TPI 1 is a nationally developed consensus standard referenced by the IRC. Therefore, it makes logical sense to include the currently accepted definition of "building designer" for clarity, for consistency, and to avoid referencing two separate documents for the same information.

References:

"ANSI/TPI 1, 2.2 Definitions:

Building Designer: The owner of the building or the Person that contracts with the Owner for the design of the Building Structural System and/or who is responsible for the preparation of the Construction Documents. When mandated by the Legal Requirements, the Building Designer shall be a Registered Design Professional."

"Section R106.1 Submittal Documents

...The construction documents shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed..."

"R502.11.4 Truss design drawings.

11. Maximum axial compression forces in the truss members to enable the **building designer** to design the size, connections and anchorage of the permanent continuous lateral bracing. Forces shall be shown on the truss drawing or on supplemental documents."

"R802.10.1 Truss design drawings.

11. Maximum axial compression forces in the truss members to enable the **building designer** to design the size, connections and anchorage of the permanent continuous lateral bracing. Forces shall be shown on the truss design drawing or on supplemental documents."

Bibliography: ANSI/TPI 1 - 2014, August 27, 2014, Truss Plate Institute, Alexandria, VA

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal does not change the current practice of building design, or who is qualified to perform the task.

Proposal # 5223

RB6-19

IRC®: [RB] 202

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Residential Code

Revise as follows:

[RB] BUILDING <u>CODE</u> **OFFICIAL.** The officer or other designated authority charged with the administration and enforcement of this code, or a duly authorized representative. For the definition applicable in Chapter 11, see Section N1101.6.

Reason: Using the term "Building Official", implies the code official is responsible for enforcement of only the building, does not include the building site, associated systems, and equipment. The term "Code Official" used in the IMC, IFGC, IECC Residential and Commercial codes, rather than "Building Official"; will create greater consistency with the IRC. *This will also remove the language that sends one to chapter 11 and section N1101.6.*

Cost Impact: The code change proposal will not increase or decrease the cost of construction No Cost will be added with this change

Proposal # 5383

RB6-19

RB7-19

IRC®: [RB] 202

Proponent: Lucas Pump, representing Self (I.pump@cedar-rapids.org)

2018 International Residential Code

Revise as follows:

[RB] CRAWL SPACE. An <u>unfinished</u> underfloor space that is not a basement.

Reason: The current definition for "crawl space" is too broad. According the current definition, I could walk into the main level of a 2-story house, and stand in the living room, and I could call that area a "crawl space". I would be under the floor of the second floor, and not in a basement, but I believe that we could all agree that this 1st floor is not a "crawl space". So, adding this additional language helps define the space better.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This is just clarification of the definition, and should not have a cost impact.

Proposal # 4712

RB8-19

IRC®: [RB] 202 (New); IEBC®: 202

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

[RB] EMERGENCY ESCAPE AND RESCUE OPENING. An operable exterior window, door or <u>other</u> similar device that provides for a means of escape and access for rescue in the event of an emergency. (See also <u>"Grade "Grade floor opening."</u> opening.")

2018 International Existing Building Code

Add new definition as follows:

EMERGENCY ESCAPE AND RESCUE OPENING. An operable exterior window, door or other similar device that provides for a means of escape and access for rescue in the event of an emergency.

Reason: The intent of this proposal is to coordinate the definitions for emergency escape and rescue openings between IBC, IRC, IEBC, IPMC, IFC. This change was approved as part of Group A for IBC, IFC, IPMC as G5-18 Part 1 and 2(AS/AM).

This is a series of proposal to coordinate the requirements for emergency escape and rescue openings in the IBC and IRC. While independent issues, if all the proposals are approved, the IRC section would appear as indicated below. Other related changes will refer back to the definition for this information.

This is what the EERO requirements would look like if all of the proposals are approved.

SECTION R310

EMERGENCY ESCAPE AND RESCUE OPENINGS

R310.1 General. Emergency escape and rescue openings shall comply with the requirements of this section.

R310.2 Where required. *Basements, habitable attics* and every sleeping rooms shall have no fewer than one emergency escape and rescue opening in accordance with this section. Where *basements* contain one or more sleeping rooms, an emergency escape and rescue opening shall be required in each sleeping room, but shall not be required in adjoining areas of the *basement*. Such openings shall open directly into a public way, or to a *yard* or court that opens to a public way.

Exceptions:

1. *Basements* with a ceiling height of less than 80 inches (2032 mm) shall not be required to have *emergency* escape and rescue openings.

2. Emergency escape and rescue openings are not required from basements or sleeping rooms that have an

exit door or exit access door that opens directly into a public way or to a yard, court or exterior egress balcony that opens to a public way.

3. Basements used only to house mechanical equipment and not exceeding a total floor area of 200 square feet (18.58 m2) shall not be required to have emergency escape and rescue openings.

4. Storm shelters are not required to comply with this section where the shelter is constructed in accordance with ICC 500.

5. Where the *dwelling* or *townhouse* is equipped with an automatic sprinkler system installed in accordance with Section P2904, sleeping rooms in *basements* shall not be required to have emergency escape and rescue openings provided that the *basement* has one of the following:

5.1. One means of egress complying with Section R311 and one emergency escape and rescue opening.

5.2. Two means of egress complying with Section R311.

R310.2.1 Operational constraints and opening control devices. Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys or tools. Window opening control devices and fall prevention devices complying with ASTM F2090 shall be permitted for use on windows serving as a required emergency escape and rescue opening.

R310.3 Emergency escape and rescue openings. Emergency escape and rescue openings shall have minimum dimensions in accordance with Section R310.3.1 through R310.3.3.

R310.3.1 Minimum size. Emergency and escape rescue openings shall have a net clear opening of not less than 5.7 square feet (0.530 m).

Exception: The minimum net clear opening for grade-floor emergency escape and rescue openings shall be 5 square feet (0.465 m).

R310.3.2 Minimum dimensions. The minimum net clear opening height dimension shall be 24 inches (610 mm). The minimum net clear opening width dimension shall be 20 inches (508 mm). The net clear opening dimensions shall be the result of normal operation of the opening.

R310.3.3 Maximum height from floor. Emergency escape and rescue openings, it shall have the bottom of the clear opening not greater than 44 inches (1118 mm) above the floor.

R310.4 Emergency escape and rescue doors. Where a door is provided as the required emergency escape and rescue opening, it shall be a swinging door or a sliding door.

R310.5 Area wells. An emergency escape and rescue opening with the bottom of the clear opening below the adjacent grade shall be provided with an area well in accordance with Sections R310.5.1 through R310.5.4.

R310.5.1 Minimum size. The horizontal area of the area well shall be not less than 9 square feet (0.9 m), with a horizontal projection and width of not less than 36 inches (914 mm). The area well shall allow the emergency escape and rescue opening to be fully opened.

Exception: The ladder or steps required by Section R310.5.2.1 shall be permitted to encroach not more than 6 inches (152 mm) into the required dimensions of the area well.

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R310.5.2 Ladder and steps. Area wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with a an approved permanently affixed ladder or steps. The ladder or steps shall not be obstructed by the emergency escape and rescue opening when the window or door is in the open position. Ladders or steps required by this section shall not be required to comply with Section R311.7.

R310.5.2.1 Ladders. Ladders or rungs shall have an inside width of at least 12 inches (305 mm), shall project at least 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center (o.c.) vertically for the full height of the area well.

R310.5.2.2 Steps. Steps shall have an inside width of at least 12 inches (305 mm), shall have minimum treads depth of 5 inches (127 mm) and a maximum riser height of 18 inches (457 mm) for the full height of the area well.

R310.5.3 Drainage. Area wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1.

Exception: A drainage system for area wells is not required where the foundation is on well-drained soil or sand gravel mixture soils in accordance with the United Soil Classification System, Group I Soils, as detailed in Table R405.1.

R310.5.4 Bars, grilles, covers and screens. Where bars, grilles, covers, screens or similar devices are placed over emergency escape and rescue openings, bulkhead enclosures, or area wells that serve such openings, the minimum net clear opening size shall comply with Sections R310.2 through R310.2.2 and R310.4.1. Such devices shall be releasable or removable from the inside without the use of a key or tool or force greater than that required for the normal operation of the escape and rescue opening.

R310.6 Emergency escape and rescue openings under decks and porches. Emergency escape and rescue openings installed under decks and porches shall be fully operable and provide a path not less than 36 inches (914 mm) in height to a yard or court.

R310.7 Replacement windows for emergency escape and rescue openings. Replacement windows installed in buildings meeting the scope of this code shall be exempt from Section R310.2 and R310.4, provided that the replacement window meets the following conditions:

1. The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening. The replacement window is of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window.

2. Where the replacement window is not part of a change of occupancy.

R310.8 Dwelling additions. Where *dwelling additions* contain sleeping rooms, an emergency escape and rescue opening shall be provided in each new sleeping room. Where *dwelling additions* have *basements*, an emergency escape and rescue opening shall be provided in the new *basement*.

Exceptions:

1. An emergency escape and rescue opening is not required in a new *basement* that contains a sleeping room with an emergency escape and rescue opening.

2. An emergency escape and rescue opening is not required in a new *basement* where there is an emergency escape and rescue opening in an existing *basement* that is *accessed* from the new *basement*.

3. An operable window complying with Section 310.9.1 shall be acceptable as an emergency escape and rescue opening.

R310.9 Alterations or repairs of existing basements. New sleeping rooms created in an existing *basement* shall be provided with emergency escape and rescue openings in accordance with Section R310.1. Other than new sleeping rooms, where existing *basements* undergo alterations or repairs an emergency escape and rescue opening is not required.

Exception: An operable window complying with Section 310.9.1 shall be acceptable as an emergency escape and rescue opening.

R310.9.1 Existing Emergency escape and rescue openings. Where a change of occupancy would require emergency escape and rescue opening in accordance with Section R310.1, operable windows serving as the emergency escape and rescue opening shall comply with the following:

1. An existing operable window shall provide a minimum net clear opening of 4 square feet (0.38 m2) with a minimum net clear opening height of 22 inches (559 mm) and a minimum net clear opening width of 20 inches (508 mm).

2. A replacement window where such window complies with both of the following:

2.1 The replacement window meets the size requirements in Item 1.

2.2 The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening. The replacement window shall be permitted to be of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as w ell as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal is editorial.

Proposal # 4141

RB8-19

RB9-19

IRC®: [RB] 202

Proponent: Marcelo M Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Revise as follows:

[RB] FIRE-RETARDANT-TREATED WOOD. Pressure-treated lumber and plywood that <u>Wood products that</u>, <u>when impregnated with chemicals by a pressure process or other means during manufacture</u>, exhibit reduced surface burning characteristics and resist propagation of fire.

Reason: The definition of fire retardant treated wood is being copied from the IBC, for consistency within ICC codes. Also, the existing definition states that fire retardant treated wood (FRTW) is pressure treated but the sub definitions (and the section on FRTW in chapter 8) point out that it can be made by pressure treatment or other means during manufacture.

The sub definitions of "other means during manufacture" and "pressure process" are being slightly revised for two reasons: to clarify that impregnation with a fire retardant formulation is the essential issue and to make them parallel to each other.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This corrects the definition and makes it consistent with the IBC.

Proposal # 4352

RB9-19

RB10-19

IRC®: [RB] 202

Proponent: Thomas Meyers, representing Self (codeconsultant@gmail.com)

2018 International Residential Code

Revise as follows:

[RB] FIRE SEPARATION DISTANCE. The distance measured from the building face to one of the following:

- 1. To the closest interior lot line.
- 2. To the centerline of a street, an alley or public way.
- 3. To an imaginary line between two buildings on the lot.

The distance shall be measured at a right angle from the face of the wall.

Reason: The definition for fire separation distance is identical to that in the IBC. Unlike the IBC, the IRC does not have a requirement to use an "imaginary line" for fire separation distance assessment. It's retention in the definition creates confusion and should therefore be eliminated.

Cost Impact: The code change proposal will decrease the cost of construction Elimination of unnecessary and confusing language may result in cost reductions where the imaginary line was erroneously applied.

Proposal # 5643

RB10-19

RB11-19

IRC®: (New)

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Residential Code

Add new definition as follows:

[RB] Flashing. A non-corrosive, water-resistant material, installed to resist water entry, and direct water away from or out of the building assembly.

Reason: There is a need to prevent water from seeping in and causing damage to the home's walls, ceilings and other assemblies. This water is causing structural damage to the home, or creating moisture and mold problems throughout the home. This form of protection is a necessary construction practice, and it's widely applied to commercial, residential and industrial structures within the industry. Therefore, there is a need to define flashing

Cost Impact: The code change proposal will not increase or decrease the cost of construction There is no Cost Impact with this Change

Proposal # 5386

RB11-19

RB12-19

IRC®: (New)

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Residential Code

Add new definition as follows:

[RB] FLOOR AREA. The calculated square footage of the floor within the inside perimeter of the exterior walls of the building under construction, without deduction for hallways, stairways, closets, the thickness of interior walls, columns or other features

Reason: The definition for "floor area" is added because that term is not defined by the 2018 IRC and it is necessary to establish uniform application of the Building Code. The proposed definition of "floor area" will be consistent with the definition of "floor area" as used in the 2018 IBC. It is therefore reasonable to add the definition of "floor area" to the proposed code to encourage uniform enforcement of the code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction There is no Cost Impact with this change

Proposal # 5387

RB12-19

RB13-19

IRC®: [RB] 202

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Residential Code

Revise as follows:

[RB] GRADE FLOOR OPENING. A window or other opening located such that the <u>sill height bottom</u> of the <u>clear</u> opening is not more than 44 inches (1118 mm) above or below the finished ground level adjacent to the opening. (See also "Emergency escape and rescue opening.")

Reason: The rationale for the code change stems from the inconsistent interpretation of the word "sill" in the industry, and also to give a clearer more uniform benchmark for where the height requirements in Sections R310 and R312 are measured to

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code change proposal will not increase the cost of construction as it is simply creating a clearer definition of what the terminology "Grade Floor Opening" means. In fact it may decrease cost of construction from delays that are created when a code coreection is written that slows down or stops construction. Time is money on a jobsite, and the delay of one day typically changes the construction Schedule which costs the builder Money.

Proposal # 5370

RB13-19

RB14-19

IRC®: [RB] 202 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

[RB] GRADE FLOOR EMERGENCY ESCAPE AND RESCUE OPENING. A window or other An

<u>emergency and escape and rescue</u> opening located such that the sill height <u>of the bottom</u> of the <u>clear</u> opening is not more than 44 inches (1118 mm) above or below the finished ground level adjacent to the opening. (See also "Emergency escape and rescue opening.")

Reason: This definition is used only in Section IRC R310.2.1. The change to the definition is so is matches how it will be used in the technical criteria. What is a 'sill' is not clear – the modification is for consistency with technical criteria. It is important to indicate that this is to the bottom of the opening (otherwise a below grade window could be very deep). See also revisions to IRC R310.2.1. There was a similar proposal approved for Group A for IBC - G4-18(AS).

This is one of a series of proposal to coordinate the requirements for emergency escape and rescue openings in the IBC and IRC. While independent issues, if all the proposals are approved, the IRC section would appear as indicated in the reason for the proposal to revise the definition – emergency escape and rescue openings.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as w ell as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This is a coordination item for requirements for EEROs already permitted between the codes.

Proposal # 4142

RB14-19

RB15-19

IRC®: [RB]

Proponent: Marcelo Hirschler, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Revise as follows:

[RB] INSULATING SHEATHING. An insulating board <u>A rigid panel or board insulation material</u> having a thermal resistance of not less than R-2 of the core material <u>with properties suitable for use on walls, floors,</u> roofs, or foundations.

For the definition applicable in Chapter 11, see Section N1101.6.

Reason: This change simply applies to the definition of insulating sheathing. The recent IBC G proposal G6 accepted as submitted the IBC definition, with the revised wording proposed here and consistency within ICC definitions is important.

Proposed definition will read:

A rigid panel or board insulation material having a thermal resistance of not less than R-2 of the core material with properties suitable for use on walls, floors, roofs, or foundations.

Cost Impact: The code change proposal will not increase or decrease the cost of construction Change in definition only.

Proposal # 5786

RB15-19

RB16-19

IRC: R202

Proponent: John Woestman, representing Extruded Polystyrene Foam Association (jwoestman@kellencompany.com)

2018 International Residential Code

SECTION R202 DEFINITIONS

Revise as follows:

[RB] INSULATING SHEATHING. An insulating board <u>A rigid panel or board insulation material</u> having a thermal resistance of not less than R-2 of the core material <u>with properties suitable for use on walls, floors, roofs, or foundations.</u>

Reason: This proposal for the IRC coordinates with G6-18 approved "As Submitted" during the 2018 ICC code development cycle for the 2021 IBC. This proposes the same definition for Insulating Sheathing for the IRC. Within the IRC, the term "insulating sheathing" is only in Chapter 7.

The proposal improves the definition to better fit context of use of this term and material in the IRC (and IBC). For example, the term "rigid panel" is added to recognize composite assemblies that are not homogenous. The clarification of us e in walls, floors, roofs, and foundations reflects common use of foam plastic insulating sheathing materials.

Although the first printing of the IRC had this term in Chapter 11, ICC Staff has indicated that the presence of term in Section N1106.2 and in the IEEC-RE Chapter 2 is errata. The term is not used in the code language and therefore should have been removed editorially before publication.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposed definition revision adds adds clarity to the meaning of the code and as such, is only editional in nature.

Proposal # 5186

RB16-19

RB17-19

IRC®: [RB] 202

Proponent: Samuel Steele, representing Seattle Department of Construction and Inspection (SDCI) (samuel.steele@seattle.gov)

2018 International Residential Code

Revise as follows:

[RB] LOT. A measured portion or parcel of land considered as a unit having fixed boundaries.

[RB] LOT LINE. A line dividing one *lot* from another, or from a street or any public place. The line that bounds a plot of ground described as a *lot* in the title to the property.

Reason: The current definitions lack information on what distinguishes a lot or parcel as a unit. A lot or parcel must be measured, have fixed boundaries, and be tied to the title of the property. Code enforcement officials work with these definitions on every project. Therefore, the definition of them needs to be clear and consistent for identifying lots and parcels of land.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This is simply a clarification of current definitions to assist with enforcement in the field. It will not have a cost impact.

Proposal # 4345

RB17-19

RB18-19

IRC®: [RB]

Proponent: Marcelo Hirschler, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

[RB] NONCOMBUSTIBLE MATERIAL. <u>Materials Material that pass passes the test procedure for defining</u> noncombustibility of elementary requirements for noncombustible materials set forth in ASTM E136.

Reason: This proposal simply addresses the definition of noncombustible materials. The recent set of proposals in the IBC (FS2 and FS3) made it clear that ASTM E136 (and the code) applies to materials that are noncombustible materials and are not elementary materials (since elementary materials are only those contained in the periodic table of elements). For example, neither steel nor cement are elementary materials but they are noncombustible materials. Thus, any material that passes the criteria set forth in ASTM E136 is considered a noncombustible material. ASTM E136 does not apply to laminated or coated materials. The proposed definition will read:

[RB] NONCOMBUSTIBLE MATERIAL. Material that passes the requirements for noncombustible materials set forth in ASTM E136.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This simply changes an incorrect definition.

Proposal # 5815

RB18-19

RB19-19

IRC®: [RB] 202

Proponent: Tim Earl, representing GBH International (tearl@gbhinternational.com)

2018 International Residential Code

Revise as follows:

[RB] NONCOMBUSTIBLE MATERIAL. Materials that pass the test procedure for defining noncombustibility of elementary materials set forth in <u>A material that passes</u> ASTM E136.

Reason: The current definition is incorrect in two ways:

The term "elementary materials" is misused here and was removed from ASTM E136 in 1973, and from the IBC during the 2018 Group A revision process.

There is no "test procedure for defining noncombustibility" in E136. Materials are simply reported as having passed E136. It is the codes which declare materials that pass E136 to be noncombustible.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This change simply corrects a definition which contains some technical flaws, so it will have no affect on construction costs.

Proposal # 4032

RB19-19

RB20-19

IRC®: (New)

Proponent: Donald Sivigny, State of Minnesota, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Residential Code

Add new definition as follows:

PORCH. An open, screened, or glazed, one story portion of a building that is separated by a thermal envelope, and has a space conditioning system exceeding 3.4 Btus or 1 watt of energy use at peak operation, or that is capable of being shut off without shutting off the space conditioning system to other areas of the building.

Reason: There is no industry standard language as to what a porch is defined as. Many times a deck becomes a porch and then actually becomes conditioned space. The code does define decks and conditioned spaces but not a porch. Therefor there is a need for a definition of what a porch actually is. This language is very similar to the same language used to define a sunroom, in the code with some modifications

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code change proposal will not increase the cost of construction and may actually decrease the costs because it creates a consistent definition of what a porch is, no longer do the code official and builder need to guess how it is going to be permitted, defined and built or what are the code requirements that need to be met.

Proposal # 5372

RB20-19

RB21-19

IRC®: [RB]

Proponent: Marcelo Hirschler, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

[RB] ROOF ASSEMBLY. A system designed to provide weather protection and resistance to design loads. The system consists of a roof covering and roof deck or a single component serving as both the roof covering and the roof deck. A roof assembly includes the roof deck, underlayment and *roof covering*, and can also include a can include an underlayment, thermal barrier, ignition barrier, insulation or a vapor retarder. For the definition applicable in Chapter 11, see Section N1101.6.

Reason: This proposal simply revises the definition of roof assembly. The recent action on WUI proposal WUIC 1 added into the IWUIC a definition based on the IBC definition of roof assembly and it is being proposed here as a revision, for consistency among ICC definitions. Furthermore this definition is more accurate since not all roof assemblies will include an underlayment and the sentence already states that it does include a roof deck and, therefore, stating that it "can include a roof deck" is not correct. The proposed definition reads as follows:

[RB] ROOF ASSEMBLY. A system designed to provide weather protection and resistance to design loads. The system consists of a roof covering and roof deck or a single component serving as both the roof covering and the roof deck. A roof assembly includes the roof deck, underlayment and roof covering, and can also include a can include an underlayment, thermal barrier, ignition barrier, insulation or a vapor retarder. For the definition applicable in Chapter 11, see Section N1101.6.

Cost Impact: The code change proposal will not increase or decrease the cost of construction Definition change only.

Proposal # 5814

RB21-19

RB22-19

IRC®: [RB] 202

Proponent: David Renn, PE, SE, City and County of Denver, representing Code Change Committee of Colorado Chapter of ICC (david.renn@denvergov.org)

2018 International Residential Code

Revise as follows:

[RB] TOWNHOUSE. A single-family dwelling unit constructed in a group of three or more attached units in which each unit extends from foundation to roof and with has a yard or public way on not less than two sides that extends at least 50 percent of the length of each of these two sides.

Reason: The definition of "townhouse" requires a yard or public way on not less than two sides, which is intended to provide some degree of independence from the other townhouse units in a building; however, the definition does not dictate the length required for the yard or public way. This proposal requires a minimum of 50% of the length of a side to have a yard or public way, which is a reasonable amount to provide the degree of independence intended and to provide fire department access. There is a need for this requirement as configurations of townhouses can create situations with a side that has a relatively small proportion of the wall length that has a yard or public way; for example, townhouses that are configured around the corner of a townhouse building per the drawing below.



Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal provides a clarification to the current code requirements so it should not increase or decrease the cost of construction.

Proposal # 4158

RB22-19

RB23-19

IRC®: [RB] 202

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing self (joe@buildingscience.com)

2018 International Residential Code

Revise as follows:

[RB] VAPOR DIFFUSION PORT. A passageway for conveying An assembly constructed or installed within a <u>roof assembly at an opening in the roof deck to convey</u> water vapor from an unvented *attic* to the outside atmosphere.

Reason: Objective: Provide consistency with IBC and improve clarity This code change provides consistency with the IBC and improves clarity.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This provides conistency with the IBC and provides an improved definition. It does not change costs.

Proposal # 5432

RB23-19

RB24-19

IRC®: [RB] 202

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing self (joe@buildingscience.com)

2018 International Residential Code

Revise as follows:

[RB] VAPOR PERMEABLE. The property of having a moisture vapor permeance rating of 5 perms (2.9×10^{-10} kg/Pa • s • m²) or greater, where tested in accordance with the desiccant method using Procedure A <u>or</u> <u>Procedure B</u> of ASTM E96. A vapor permeable material permits the passage of moisture vapor.

Reason: Objective: Define vapor permeable as 5 perms or greater using Procedure A or B Action: Amend IRC in Cycle B with same language submitter in Cycle A for IBC

Relying on only Procedure A is inaccurate and misleading. The existing code language limits the use of newer materials and systems such as "smart" materials that can be "tuned" to address moisture control issues in different climate zones. The existing definition applied to asphalt felts and Type D coated papers and dates back over a half a century. For Type D papers the original Federal Specification UUP-147 was issued in 1948. The technical rationale for this change can be found in the following link:

https://buildingscience.com/documents/building-science-insights/bsi-099-its-all-relative

Cost Impact: The code change proposal will not increase or decrease the cost of construction This adds a test procedure that is more appropriate for some products.

Proposal # 5404

RB24-19
RB25-19

IRC®: (New)

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Residential Code

Add new definition as follows:

WATERPROOFING. Treatment of a surface or structure that bridges nonstructural cracks, and is designed to resist the passage of water under hydrostatic pressure or through capillary action, which may penetrate the building assembly.

Reason: Damproofing in Section R406.1 is no longer commonly used in the code knowledgeable industry, as it is not an effective way to keep the buildings below grade foundation system, dry, durable and free from moisture and mold issues affecting homes and homeowners today. The typical damproofing, system will require additional steps such as parging, or other materials be applied to the foundation wall prior to the application of the damproofing product. This adds additional costs in materials and labor for the builder. This cost is passed along to the consumer. Knowledgeable builders of today understand the benefits of waterproofing and the overall cost savings in initial costs, and the reduction in costs associated with call backs and repairs of wet foundation systems. Therefore it is necessary to define waterproofing

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code change proposal will not increase the cost of construction as it is simply correcting the definition for clarity reasons. In fact this clarity may even reduce the costs of the code from delays that happen when code corrections are written for a specific job or building by more clearly defining what the code means by, Waterproofing . These delays caused by code corrections costs the builders money.

Proposal # 5392

RB25-19

RB26-19

IRC®: 202 (New), (New)

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Residential Code

Add new definition as follows:

202 Definitions. Window Clear Opening Height: The lowest part of the window opening of an operable window measured from the interior floor below.

WINDOW CLEAR OPENING HEIGHT. The lowest part of the window opening of an operable window measured from the interior floor below.

Reason: There is a need to define what window clear opening height is and where it is measured as referenced in the IRC Sections on Emergency Escape and Rescue and Window Fall Protection. This definition is necessary to clarify confusion about where the sill height is measured. The incorporation of this definition into the code is necessary to provide uniformity of construction, inspection and enforcement of the requirements within the code

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code change proposal will not increase the cost of construction as it is simply correcting the definition for clarity reasons. In fact this clarity may even reduce the costs of the code from delays that happen when code corrections are written for a specific job or building by more clearly defining what the code means by, Window Clear Opening . These delays caused by code corrections costs the builders money.

Proposal # 5393

RB26-19

RB27-19

IRC®: (New), R301.1.1, 44 ASABE (New), ASABE (New)

Proponent: Andy Williams, Association Management Center (afwilliams@Connect2amc.com)

2018 International Residential Code

Add new definition as follows:

POST FRAME BUILDING SYSTEM. A building system characterized by primary structural frames of wood posts as columns to support floors and trusses or rafters as roof framing. Roof framing is attached to the posts, either directly or indirectly through girders. Posts are embedded in the soil and supported on isolated footings, or are attached to the top of piers, concrete or masonry walls, or slabs-on-grade. Secondary framing members, purlins in the roof and girts in the walls, are attached to the primary members to provide lateral support and to transfer sheathing loads, both in-plane and out-of-plane, to the posts and roof framing.

R301.1.1 Alternative provisions. As an alternative to the requirements in Section R301.1, the following standards are permitted subject to the limitations of this code and the limitations therein. Where engineered design is used in conjunction with these standards, the design shall comply with the International Building Code

- 1. AWC Wood Frame Construction Manual (WFCM).
- 2. AISI Standard for Cold-Formed Steel Framing—Prescriptive Method for One- and Two-Family Dwellings (AISI S230).
- 3. ICC Standard on the Design and Construction of Log Structures (ICC 400).
- 4. <u>For post frame building systems : AWC National Design Specification for Wood Construction</u> (NDS), ASABE Diaphragm Design of Metal-clad, Wood-frame Rectangular Buildings (EP 484.3), ASABE Shallow-post and Pier aFoundation Design (EP 486.2) and ASABE Design Requirements and Bending Properties for Mechanically Laminated Wood Assemblies (EP 559.2), as applicable.

Add new standard(s) as follows:



American Society of Agricultural and Biological Engineers 2950 Niles Road St. Joseph MI 49085 US

American Society of Agricultural and Biological Engineers 2950 Niles Road St. Joseph MI 49085 US

EP 484.3 MON2016:: Daiphragm Design of Metal-clad, Wood-frame Rectangular Buildings......R301.1.1

Revise as follows:





American Society of Agricultural and Biological Engineers 2950 Niles Road St. Joseph MI 49085 US

EP 486.2 OCT 2012ED:: Shallow-post and Pier Foundation Design......R301.1.1

ASABE

American Society of Agricultural and Biological Engineers 2950 Niles Road St. Joseph MI 49085 US

Reason: Post frame design and construction has been recognized in the IBC and IRC as a popular building construction option for many years. The material and labor advantages are more often now being recognized in residential construction. Post frame is an engineered construction method that often requires significant design in the areas of isolated foundations; nail lamination of wood elements to create columns and headers; and diaphragm design for the transfer wind load throughout the structure. This definition specifically identifies to the reader that there are code recognized standards to be followed to ensure proper design.

Cost Impact: The code change proposal will not increase or decrease the cost of construction Addition of this definition will not change the requirements of the code but will further educate the code user.

Staff Analysis: The referenced standards, ASABE EP 484.3, ASABE EP 486.2 and ASABE EP 559.2, are currently referenced in other 2018 I-codes.

Proposal # 4214

RB27-19

RB28-19

IRC®: 202 (New), R301.1.1, UL Chapter 44 (New)

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Add new definition as follows:

[RB] 3D PRINTED BUILDING CONSTRUCTION. A process for fabricating buildings and structures from 3D model data using automated equipment that deposits construction material in a layer upon layer fashion.

Revise as follows:

R301.1.1 Alternative provisions. As an alternative to the requirements in Section R301.1, the following standards are permitted subject to the limitations of this code and the limitations therein. Where engineered design is used in conjunction with these standards, the design shall comply with the International Building Code

- 1. AWC Wood Frame Construction Manual (WFCM).
- 2. AISI Standard for Cold-Formed Steel Framing—Prescriptive Method for One- and Two-Family Dwellings (AISI S230).
- 3. ICC Standard on the Design and Construction of Log Structures (ICC 400).
- 4. <u>UL 3401 Outline of Investigation for 3D Printed Building Construction</u>.

Add new standard(s) as follows:

UL

UL LLC 333 Pfingsten Road Northbrook IL 60062

UL 3401 -19: Outline of Investigation for 3D Printed Building Construction

Reason: 3D building construction has moved from a conceptual stage to reality, and projects are being proposed in an increasing number of jurisdictions. Unfortunately the prescriptive design and construction requirements in the IRC are not applicable to 3D printed fabrication techniques, so code officials have to approve this construction based on limited equivalency evaluations that may not take into account variations in material properties introduced by the 3D printing process, or variances in the physical characteristics of the construction materials used.

The UL 3401 Outline of Investigation for 3D Printed Building Construction was developed to evaluate critical aspects of this construction process, and level the playing field so that 3D printed building techniques comply with an equivalent level of safety and performance as legacy construction techniques currently in the code.

This proposal introduces a definition for 3D Printed Building Construction and revises the alternate design methods in R301.1.1 to permit UL 3401 to be used to evaluate this construction. Note that a companion proposal introduces an Annex U covering this in more detail, which may be adopted by jurisdictions to use. These two proposals will work together, but each also stands on its own.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This is a new construction technique that simply provides an alternative to traditional construction methods and may possibly reduce the cost of construction. **Staff Analysis:** A review of the standard proposed for inclusion in the code, UL 3401, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4834

RB28-19

RB29-19

IRC®: R301.1.3

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations (stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

R301.1.3 Engineered design. Where a building of otherwise conventional construction contains structural elements exceeding the limits of Section R301 or otherwise not conforming to this code, these elements shall be designed in accordance with accepted engineering practice. The extent of such design need only demonstrate compliance of nonconventional elements with other applicable provisions and shall be compatible with the performance of the conventional framed system. The owner or owner's authorized agent shall confirm that the design is performed to the extent necessary to comply with the provisions of Section R301.1. Engineered design in accordance with the International Building Code is permitted for buildings and structures, and parts thereof, included in the scope of this code.

Reason: The IRC allows for specific, selected portions of a structure to be designed per the requirements of the IBC or other accepted standard, while the remaining portion of the structure remains governed by the prescriptive design methods contained in the IRC. When providing such an engineered design for a selected element in a system, it should be noted that the design of additional elements, outside the original specific scope, may be required in order to insure a continuous load path as directed by Section R301.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The modified language is intended to clarify the requirements of engineered designs which fall outside the conditional limits of the IRC.

Proposal # 4597

RB29-19

RB30-19

IRC®: SECTION R202, 202, R301.1.4 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

SECTION R202 DEFINITIONS

Add new text as follows:

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

R301.1.4 Intermodal shipping containers. Intermodal shipping containers shall be designed in accordance with the structural provisions in Section 3114 of the International Building Code.

Reason: This code change purpose is to introduce intermodal shipping containers into the International Residential Code based on requests by code officials in the U.S. Prior to this proposal, several jurisdictions had created their own individual regulations or ordinances, or had administered additional requirements beyond the code (e.g. Section R104.11 "Alternative Materials, design and methods of construction and equipment") so at to be comfortable to ensure a safe structure. This code change proposal is in response to those requests to develop a provision in order to establish a consistent set of provisions which cover the minimum safety requirements, but which do not duplicate existing code provisions.

The proposed definition is consistent with the successful code change proposal to the International Building Code, new Section 3114. For consistency, we are introducing that same definition here.

The reference to the International Building Code has been modeled after Sections R301.1.1 through R301.1.3. The BCAC Shipping Container Working Group chose not to duplicate the newly accepted shipping container structural design language in the International Building Code. This proposal is making a simple reference the new section in the IBC where the provisions for shipping container structural safety are contained. As Section R301.1 applies to structural design only, the other non-structural provisions of the International Residential Code would apply as required (e.g. energy, plumbing, mechanical, electrical, etc.). Also, because Section R301.1.1 deals with primarily alternative sources of structural design (e.g. independent reference standard structural design resources outside the codes), the BCAC shipping container Working Group determined it to be more appropriate to separate this reference to the IBC for clarity.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on theBCAC website at: https://www.iccsafe.org/codes-tech-support/codes/code-development-process/building-code-action-committee-bcac/.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code change proposal will decrease the cost of construction. This new code section will provide clarity on how to consistently design with, permit, and field inspect shipping containers that are repurposed for residential building construction. Current use of repurposed intermodal shipping containers requires the owner or builder to submit through the alternative means and methods administrative provisions.

Proposal # 4133

RB31-19

IRC®: FIGURE R301.2(2) - continued (New), FIGURE R301.2(3) - continued (New)

Proponent: Kelly Cobeen, Wiss Janney Elstner Associates, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (KCobeen@wje.com); Michael Mahoney, representing Federal Emergency Management Agency (mike.mahoney@fema.dhs.gov)

2018 International Residential Code

Revise as follows:



FIGURE R301.2(2) - continued SEISMIC DESIGN CATEGORIES



FIGURE R301.2(3) - continued ALTERNATE SEISMIC CATEGORIES

Reason: This proposal adds new maps addressing Seismic Design Categories for Guam, the Northern Mariana Islands, and American Samoa. This new information is provided in two new figures added to the existing map sets, one added to Figure R301.2(2) Seismic Design Category map set, and one to the Figure R301.2(3) Alternate Seismic Design Category map set. This change will make Seismic Design Category information more readily available and will make the geographic areas addressed by seismic hazard maps consistent between the IRC and the IBC..

Cost Impact: The code change proposal will not increase or decrease the cost of construction There is no cost impact.

RB31-19

RB32-19

IRC®: FIGURE R301.2(5)B

Proponent: T. Eric Stafford, representing Insurance Institute for Business and Home Safety (testafford@charter.net)

2018 International Residential Code

Revise as follows:





FIGURE R301.2(5)B REGIONS WHERE WIND DESIGN IS REQUIRED

Reason: This proposal corrects an error in the 2015 and 2018 IRC that became evident as result of the 2017 hurricanes that impacted the Caribbean and Southern United States. Puerto, Rico, Guam, Virgin Island, American Samoa, and Hawaii have been considered areas requiring wind design since the first edition of the IRC. When the Wind Design Required was introduced to the 2012 IRC, a note was provided on the figure indicating that Puerto Rico, Guam, Virgin Islands, American Samoa and Hawaii were other regions requiring wind design. The wind speed map and the wind design required map in the 2015 IRC were updated for consistency with ASCE 7-10. However, the note regarding Puerto Rico, Guam, Virgin Islands, American Samoa and Hawaii included on the 2012 wind design required map was inadvertently not included. The proposal simply restores that note.

Cost Impact: The code change proposal will not increase or decrease the cost of construction Will not impact cost as these locations have historically required wind design by all versions of the IRC prior to the 2015 Edition.

Proposal # 4366

RB32-19

RB33-19

IRC®: TABLE R301.2(1)

Proponent: Gil Rossmiller, representing Colorado Chapter ICC (gilrossmiller@coloradocode.net)

2018 International Residential Code

GROUND SNOW		WIND	DESIGN		SEISMIC	SUBJ	ECT TO D FROM	DAMAGE	WINTER	ICE BARRIER	FLOOD		MEANANNUAL
LOAD	Speed ^d (mph)	Topographic effects ^k	Special wind region ^l	Wind- bornedebris zone ^m	CATEGORY'	Weath -ering*	Frost line depth ^b	Termite	TEMP*	UNDERLAYMENT REQUIRED ^h	HAZARDS ⁹	INDEX	TEMP
1	10.2	200	10 -	1771			(100 C		100		5772	1.000	
Elevation			Lattitud e	Winter heating	Summer cooling	Altitude	e correctio	on factor ^e	Indoor design temperature	Design temperature	cooling	Heating temp	perature difference
—					-				-				—
Cooling terr	nperature d	lifference	Wind velocity heating	Wind velocity cooling	Coincident wet bulb		Daily rang	ge	Winter humidity	Summer hu	nidity		-
-	g temperature dimensione			-	-		-		-	-			-

TABLE R301.2(1) CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA

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

a. Where weathering requires a higher strength concrete or grade of masonry than necessary to satisfy the structural requirements of this code, the frost line depth strength required for weathering shall govern. The weathering column shall be filled in with the weathering index, "negligible," "moderate" or "severe" for concrete as determined from Figure R301.2(4). The grade of masonry un

b. Where the frost line depth requires deeper footings than indicated in Figure R403.1(1), the frost line depth strength required for weathering shall govern. The jurisdiction shall fill in the frost line depth column with the minimum depth of footing below finish grade.

c. The jurisdiction shall fill in this part of the table to indicate the need for protection depending on whether there has been a history of local subterranean termite damage.

d. The jurisdiction shall fill in this part of the table with the wind speed from the basic wind speed map [Figure R301.2(5)A]. Wind exposure category shall be determined on a site-specific basis in accordance with Section R301.2.1.4.

- e. The outdoor design dry-bulb temperature shall be selected from the columns of 97½ percent values for winter from Appendix D of the International Plumbing Code. Deviations from the Appendix D temperatures shall be permitted to reflect local climates or local weather experience as determined by the building official. [Also see Figure R301.2(1)
- f. The jurisdiction shall fill in this part of the table with the seismic design category determined from Section R301.2.2.1.
- g. The jurisdiction shall fill in this part of the table with (a) the date of the jurisdiction's entry into the National Flood Insurance Program (date of adoption of the first code or ordinance for management of flood hazard areas), (b) the date(s) of the Flood Insurance Study and (c) the panel numbers and dates of the currently effective FIRMs and FBFMs or other flood hazard map adopted by the authority having jurisdiction, as amended.
- h. In accordance with Sections R905.1.2, R905.4.3.1, R905.5.3.1, R905.6.3.1, R905.7.3.1 and R905.8.3.1, where there has been a history of local damage from the effects of ice damming, the jurisdiction shall fill in this part of the table with "YES." Otherwise, the jurisdiction shall fill in this part of the table with "NO."
- i. The jurisdiction shall fill in this part of the table with the 100-year return period air freezing index (BF-days) from Figure R403.3(2) or from the 100-year (99 percent) value on the National Climatic Data Center data table "Air Freezing Index-USA"
- Method (Base 32°F)."
- j. The jurisdiction shall fill in this part of the table with the mean annual temperature from the National Climatic Data Center data table "Air Freezing Index-USA Method (Base 32 °F)."
- k. In accordance with Section R301.2.1.5, where there is local historical data documenting structural damage to buildings due to topographic wind speed-up effects, the jurisdiction shall fill in this part of the table with "YES." Otherwise, the jurisdiction shall indicate "NO" in this part of the table.
- I. In accordance with Figure R301.2(5)A, where there is local historical data documenting unusual wind conditions, the jurisdiction shall fill in this part of the table with "YES" and identify any specific requirements. Otherwise, the jurisdiction shall indicate "NO" in this part of the table.
- m.In accordance with Section R301.2.1.2 the jurisdiction shall indicate the wind-borne debris wind zone(s). Otherwise, the jurisdiction shall indicate "NO" in this part of the table.
- 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).
- p. The jurisdiction shall fill in this section of the table to establish the design criteria using Table 10A from ACCA Manual J or established criteria as determined by the jurisdiction.

Reason: The overall change will help jurisdictions complete the manual J portion of the table and help plans examiners in completing reviews.

The upper portion of the table remains unchanged, except for the removal of the "WINTER DESIGN TEMP^e" column and footnote e. This currently creates a conflict within the table itself. Footnote e states the winter design temperature shall be selected from appendix D of the International Plumbing Code using the 97 ½ percent value. The Manual J portion states that the winter design come from table 1A which uses the 99 percent value. Removing the "WINTER DESIGN TEMP^e" column and footnote e eliminates this conflict.

The Manual J portion has been reformatted to clarify the design parameters and removed default values. We will take each cell and explain:

Wind Velocity Heating: Deleted from table

This value is not found in table 1A or 1B of Manual J. The default value in Manual J is 7.5mph. This is also the default value used in all Manual J software. For those who have a Manual J (version two) the explanation is on page 177 and is reprinted here for all to review:

"The default values for wind velocity are 15 MPH for heating and 7 ½ MPH for cooling. These velocities do not represent the most severe wind conditions that will be experienced when the outdoor temperature is at the winter or summer design temperature, but they do represent values that are compatible with normal weather patterns. If a location has a reputation for wind velocities that consistently exceed these defaults during nonstorm conditions, an appropriate set of velocity values may be substituted for the default values."

Wind Velocity Cooling: Deleted from table See reason above

Elevation: Unchanged

Altitude Correction Factor ^o: Added new footnote

Provides direction to the correct table in Manual J. This is the only value in the Manual J section that does not appear in table 1A or 1B

o. <u>The jurisdiction shall fill in this section of the table to establish the design criteria using Table 10A from ACCA</u> <u>Manual J or established criteria determined by the jurisdiction.</u>

Summer design grains: New

This was added to help the plans examiner during plan review. This is a critical design perimeter as this the one of the values used to calculate the latent load (moisture) for cooling. This is the value that designers will change to increase (artificially) the latent load for cooling and therefore the need for larger equipment. This value is plainly seen in Manual J reports. We have provided two examples below and a portion of Manual J table 1A.

Indoor winter design relative humidity: Modified

Was labeled 'Winter humidity' and was assumed that this was indoor design relative humidity. This change makes it clear.

Indoor winter design temperature: Modified

Was labeled 'Indoor design temperature' and was assumed to be the winter design as it was under the "WINTER DESIGN TEMP^e" column. With the above coulomb removed this change makes it clear the value should be the indoor winter design temperature.

Outdoor winter design temperature: Modified

Was labeled 'Winter heating' and was assumed that this was outdoor design temperature. This change makes it clear.

Heating temperature difference: Unchanged.

Latitude: Unchanged

Daily range: Unchanged

Coincident wet bulb: Unchanged

Indoor summer design relative humidity: Modified

Was labeled 'Summer humidity' and was assumed that this was the indoor design relative humidity. This change makes it clear.

Indoor summer design temperature: Modified

This was labeled as 'Design temperature cooling' and was assumed to be the indoor summer design temperature. This change makes it clear.

Cooling temperature difference: Unchanged

FOOTNOTES: The language of the footnotes remains unchanged. They were renumbered do to the removal of footnote e and a new footnote o.

Examples of a completed Manual J Table:

FOR DENVER, COLORADO

GROUND	WIND DESIGN Speed* Topographic Effects* Special wind Region* Windborne debris zone* state - ion Altitude correction factor * Summer design grains Indicate 3 0.84 -33 to -48			SEISMIC	SUBJECT	TO DAMAGE	FROM	ICE BARRIER UNDERLAYMENT REQUIRED®	FLOOD HAZARDS	AIR FREEZ	
LOAD"	Speed ^d (mph)	Topographic Effects	Special wind Region*	Windborne debris zone	CATEGORY*	Weathering*	Frost line depth ^b	<u>Termite</u>			
-	-	-	-	-		-	3. 	-	-		-
					MANU	AL J DESIGN C	RITERIA"				
Eleva	ation	Altitue	de factor °	<u>Summer</u> design grains	Indoor winter design relative humidity	Indoor te	r winter des mperature	lan	Outdoor winter design temperature	Heat	ing temp differer
52	83	0.84	6	-33 to -48	30%		70°		-3%		73°
Latit	tude	<u>Dailv ra</u>	nge	Coincident wet bulb	Indoor summer design relative humidity	Indoor te	summer de mperature	sian	Outdoor summer design temperature	tempe	<u>Coolir</u> erature d
3	9	н		59"	50%		75°		90*	1	15*

TABLE R301.2(1)

CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA

FOR St. AUGUSTINE, FLORIDA

TABLE R301.2(1) CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA ICE BARRIER FLOOD FREE WIND DESIGN SUBJECT TO DAMAGE FROM UNDERLAYMENT HAZARDS GROUND SEISMIC **REQUIRED®** INC SNOW DESIGN Special Speed Topographic Windborne Frost line LOAD CATEGORY" Weathering* Termite^c wind (mph) Effects debris zone depthb Region* --_ ----MANUAL J DESIGN CRITERIA" Indoor winter Indoor winter design Outdoor winter design Altitude Summer Heating ter Elevation design relative correction factor ° design grains differe temperature temperature humidity 10 1,00 59 to 72 30% 70° 35° 35 Indoor summer Outdoor summer Coincident Indoor summer design Cool Latitude **Daily range** design relative temperature wet bulb temperature design temperature humidity 75° 50% 29 M 78° 89° 15

Table 1A

Outdoor Design Conditions for the United States

Location	Elevation	Latitude	Winter			Sun	nmer	
	Feet	Degrees North	Heating 99% Dry Bulb	Cooling 1% Dry Bulb	Coincident Wet Bulb	Design Grains 55% RH	Design Grains 50% RH	4
St. Augustine	10	29	35	89	78	59	66	1
St. Petersburg	11	28	47	93	79	59	66	

As you can see from the tables above there is a large difference in the design grains from a dry climate like Denver, Colorado and humid climate like St. Augustine, Florida. You can also see from table 1A that depending on your indoor relative humidity design the design grains change. The key for reviewers is not to get stuck on an exact number, but to know that dry climates will always have a negative number and humid climates will have a positive number.

PARTIAL MANUAL J REPORT FROM WRIGHTSOFT SOFTWARE

		Design C	onditions	
Location: Denver, CO, US Elevation: 5331 ft Latitude: 40°N Outdoor:	Heating	Cooling	Indoor: Indoor temperature (°F) Design TD (°F) Relative humidity (%) Moisture difference (gr/lb)	Heatin 70 73 30 35.3
Dry bulb (°F) Daily range (°F) Wet bulb (°F) Wind speed (mph)	-3 - 15.0	90 27 (H) 59 7.5	Infiltration: Method Construction quality Fireplaces	Simplifie Average 0

PARTIAL MANUAL J REPORT FROM ELITE SOFTWARE

Design Data		
Reference City:		Denver, Colorado
Building Orientation:		Front door faces Southeast
Daily Temperature Range:		High
Latitude:	39	Degrees
Elevation:	5830	ft.
Altitude Factor:	0.807	
Elevation Sensible Adj. Factor:	1.000	
Elevation Total Adj. Factor:	1.000	
Elevation Heating Adj. Factor:	1.000	
Elevation Heating Adj. Factor:	1.000	

	Outdoor	Outdoor	Outdoor	Indoor	Indoor	G
	Dry Bulb	Wet Bulb	Rel.Hum	Rel.Hum	Dry Bulb	Differ
Winter:	-3	-3.7	80%	30%	70	3
Summer:	90	59	17%	50%	75	

The two reports above are both for Denver, Colorado and both are correct and yet you see the Grains Difference are not the same. This value will vary slightly depending on the weather data within the software. Again, small differences will not change the calculation significantly.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The revised table will not increase the heating or cooling loads. It may help for more accurate load calculations, therefore smaller equipment and possible reduced costs.

Proposal # 5232

RB33-19

RB34-19

IRC®: TABLE R301.2(1)

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn, RCQuinn Consulting, on behalf of Federal Emergency Management Agency, representing Federal Emergency Management Agency (rcquinn@earthlink.net)

2018 International Residential Code

Revise as follows:

GROUND SNOW		WIND	DESIGN		SEISMIC	SUBJ	ECT TO E FROM	DAMAGE	WINTER	ICE BARRIER	FLOOD		MEANANNUAL
LOAD	Speed ^d (mph)	Topographic effects ^k	Special wind region ^l	Wind- bornedebris zone ^m	CATEGORY'	Weath -ering ^a	Frost line depth ^b	Termite	TEMP	UNDERLAYMENT REQUIRED ^h	HAZARDS	INDEX	TEMP
1.00	10.0	200	() _	1775		2	(1 		577	100	<u>177</u>)	(
Elevation			Lattitud e	Winter heating	Summer cooling	Altitud	le correcti	on factor	Indoor design temperature	Design temperature	cooling	Heating temp	perature difference
-			-	-	-		-		-				-
Cooling terr	ooling temperature difference		velocity heating	Wind velocity cooling	Coincident wet bulb	8	Daily rang	ge	Winter humidity	Summer hu	midity		-
-				-	-		-		-	-			-

TABLE R301.2(1) CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA

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

a. Where weathering requires a higher strength concrete or grade of masonry than necessary to satisfy the structural requirements of this code, the frost line depth strength required for weathering shall govern. The weathering column shall be filled in with the weathering index, "negligible," "moderate" or "severe" for concrete as determined from Figure R301.2(4). The grade of masonry un

b. Where the frost line depth requires deeper footings than indicated in Figure R403.1(1), the frost line depth strength required for weathering shall govern. The jurisdiction shall fill in the frost line depth column with the minimum depth of footing below finish grade.

c. The jurisdiction shall fill in this part of the table to indicate the need for protection depending on whether there has been a history of local subterranean termite damage.

d. The jurisdiction shall fill in this part of the table with the wind speed from the basic wind speed map [Figure R301.2(5)A]. Wind exposure category shall be determined on a site-specific basis in accordance with Section R301.2.1.4.

- e. The outdoor design dry-bulb temperature shall be selected from the columns of 97:/z-percent values for winter from Appendix D of the International Plumbing Code. Deviations from the Appendix D temperatures shall be permitted to reflect local climates or local weather experience as determined by the building official. [Also see Figure R301.2(1)
- f. The jurisdiction shall fill in this part of the table with the seismic design category determined from Section R301.2.2.1.
- g. The jurisdiction shall fill in this part of the table with (a) the date of the jurisdiction's entry into the National Flood Insurance Program (date of adoption of the first code or ordinance for management of flood hazard areas);<u>and</u> (b) the <u>title and</u> date(s) of the <u>currently effective</u> Flood Insurance Study and (e) the panel numbers and dates of the currently effective FIRMs and FBFMs or other flood hazard map study and maps adopted by the authority having jurisdiction, as amended.In accordance with Sections R905.1.2, R905.4.3.1, R905.6.3.1, R905.6.3.1, R905.7.3.1 and R905.8.3.1, where there has been a history of local damage from the effects of ice damming, the jurisdiction shall fill in this part of the table with "YES." Otherwise, the jurisdiction shall fill in this part of the table with "NO."
- h. The jurisdiction shall fill in this part of the table with the 100-year return period air freezing index (BF-days) from Figure R403.3(2) or from the 100-year (99 percent) value on the National Climatic Data Center data table "Air Freezing Index-USA Method (Base 32 °F)."
- i. The jurisdiction shall fill in this part of the table with the mean annual temperature from the National Climatic Data Center data table "Air Freezing Index-USA Method (Base 32 °F)."
- j. In accordance with Section R301.2.1.5, where there is local historical data documenting structural damage to buildings due to topographic wind speed-up effects, the jurisdiction shall fill in this part of the table with "YES." Otherwise, the jurisdiction shall indicate "NO" in this part of the table.
- k. In accordance with Figure R301.2(5)A, where there is local historical data documenting unusual wind conditions, the jurisdiction shall fill in this part of the table with "YES" and identify any specific requirements. Otherwise, the jurisdiction shall indicate "NO" in this part of the table.
- I. In accordance with Section R301.2.1.2 the jurisdiction shall indicate the wind-borne debris wind zone(s). Otherwise, the jurisdiction shall indicate "NO" in this part of the table.
- m. 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.
- n. The jurisdiction shall fill in this section of the table using the Ground Snow Loads in Figure R301.2(6).

Reason: It is sufficient only to identify the title and date of the community's Flood Insurance Study. Flood Insurance Studies are official reports provided by the Federal Emergency Management Agency that include or contain the Flood Insurance Rate Maps (FIRM), the Flood Boundary and Floodway Map (FBFM), the water surface elevation of the *base flood* and supporting technical data.

The requirement to list the panel numbers and associated dates of all currently effective FIRMs and FBFMs is burdensome, especially in large jurisdictions with multiple panels. Additionally, some states permit communities to automatically adopt updated FISs and accompanying FIRMs. Requiring individual panel numbers and dates of newly updated FIRMs would require those communities to modify the list with issuance of each new FIRM and defeats the purpose of the auto-adopt mechanism.

This proposal brings the establishment of the flood hazard area in line with Section 1612.3 of the IBC, which requires only identification of the title and date of issuance of the FIS.

Cost Impact: The code change proposal will not increase or decrease the cost of construction No additional cost. The proposal eliminates an administrative burden on communities.

Proposal # 4431

RB34-19

RB35-19

IRC®: TABLE R301.2(2), TABLE R301.2(2) (New), TABLE R301.2(3), FIGURE R301.2(8), FIGURE R301.2(5)A, FIGURE R301.2(5)B

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org); Don Scott, representing Representing National Council of Structural Engieers Association (dscott@pcs-structural.com); T. Eric Stafford, Insurance Institute for Business and Home Safety, representing Insurance Institute for Business and Home Safety (testafford@charter.net)

2018 International Residential Code

Delete without substitution:

TABLE R301.2(2) COMPONENT AND CLADDING LOADS FOR A BUILDING WITH A MEAN ROOF HEIGHT OF 30 FEET LOCATED IN EXPOSURE B (ASD) (psf)*-b-c-d-e

Delete table in its entirety.

Add new text as follows:

			Ultin	mate	Desi	an W	/ind	Spee	d, V		501	(psi	1															2
	<u>Zone</u>	Effective Wind Areas (feet ²)	90		<u>95</u>	-912	<u>100</u>		<u>105</u>		<u>110</u>	5	<u>115</u>		<u>120</u>		<u>130</u>		<u>140</u>		<u>150</u>		<u>160</u>		<u>170</u>		<u>180</u>	
			Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neq
	1	10	3.6	<u>-13.9</u>	4.0	- 15.5	<u>4.4</u>	- 17.2	<u>4.8</u>	- 19.0	<u>5.3</u>	- 20.8	5.8	- 22.7	6.3	- 24.8	<u>7.4</u>	- 29.1	<u>8.6</u>	- 33.7	9.9	- 38.7	11.2	- 44.0	12.7	49.7	14.2	-55.7
	1	20	3.3	<u>-13.0</u>	<u>3.7</u>	- 14.5	<u>4.1</u>	- 16.0	<u>4.5</u>	- 17.7	<u>5.0</u>	- 19.4	5.4	<u>-</u> 21.2	<u>5.9</u>	- 23.1	7.0	- 27.1	<u>8.1</u>	- 31.4	9.3	- 36.1	10.5	- 41.1	11.9	46.4	13.3	-52.0
	1	<u>50</u>	3.0	-11.8	3.4	- 13.1	3.8	- 14.5	<u>4.1</u>	- 16.0	<u>4.5</u>	- 17.6	5.0	- 19.2	5.4	- 20.9	<u>6.3</u>	24.5	7.4	- 28.4	8.4	- 32.6	<u>9.6</u>	- 37.1	10.8	- 41.9	12.2	-47.0
	1	<u>100</u>	2.8	-10.8	<u>3.1</u>	- 12.1	3.5	- 13.4	<u>3.8</u>	- 14.7	4.2	- 16.2	4.6	- 17.7	5.0	- 19.2	<u>5.9</u>	- 22.6	<u>6.8</u>	- 26.2	7.8	- 30.0	<u>8.9</u>	- 34.2	10.0	38.6	11.3	-43.3
	2	<u>10</u>	3.6	<u>-18.4</u>	4.0	20.5	4.4	22.7	<u>4.8</u>	- 25.0	<u>5.3</u>	- 27.4	5.8	- 30.0	<u>6.3</u>	- 32.7	7.4	- 38.3	<u>8.6</u>	- 44.5	9.9	- 51.0	11.2	- 28.1	12.7	- 65.6	14.2	-73.5
Flat and Gable Roof	2	20	3.3	-17.2	<u>3.7</u>	- 19.2	<u>4.1</u>	<u>-</u> 21.2	<u>4.5</u>	- 23.4	5.0	- 25.7	5.4	<u>-</u> 28.1	<u>5.9</u>	- 30.6	<u>7.0</u>	<u>-</u> 35.9	<u>8.1</u>	- 41.6	<u>9.3</u>	- 47.8	10.5	- 54.3	11.9	- 61.4	13.3	-68.8
0 to 7 degrees	2	<u>50</u>	3.0	<u>-15.6</u>	<u>3.4</u>	- 17.4	<u>3.8</u>	- 19.3	<u>4.1</u>	- 21.3	<u>4.5</u>	- 23.3	5.0	- 25.5	5.4	- 27.8	<u>6.3</u>	- 32.6	7.4	- 37.8	8.4	- 43.4	9.6	- 49.4	10.8	- 55.8	12.2	-62.5
	2	100	2.8	-14.4	<u>3.1</u>	- 16.1	<u>3.5</u>	- 17.8	<u>3.8</u>	<u>-</u> 19.7	4.2	- 21.6	4.6	- 23.6	5.0	- 25.7	<u>5.9</u>	- 30.1	<u>6.8</u>	<u>-</u> 35.0	7.8	- 40.1	<u>8.9</u>	- 45.7	10.0	<u>-</u> 51.5	11.3	-57.8
	<u>3</u>	<u>10</u>	3.6	-25.0	4.0	- 27.9	4.4	<u>-</u> 30.9	<u>4.8</u>	- 34.1	<u>5.3</u>	- 37.4	5.8	- 40.9	6.3	- 44.5	<u>7.4</u>	- 52.2	<u>8.6</u>	- 60.6	9.9	- 69.6	11.2	- 79.1	12.7	- 89.4	14.2	- 100.2
	3	<u>20</u>	3.3	-22.6	<u>3.7</u>	- 25.2	<u>4.1</u>	<u>-</u> 28.0	<u>4.5</u>	<u>-</u> 30.8	<u>5.0</u>	- 33.8	5.4	- 37.0	<u>5.9</u>	- 40.3	<u>7.0</u>	- 47.2	<u>8.1</u>	- 54.8	9.3	- 62.9	10.5	<u>-</u> 71.6	11.9	80.8	13.3	-90.6
	3	<u>50</u>	3.0	-19.4	<u>3.4</u>	- 21.7	3.8	<u>-</u> 24.0	<u>4.1</u>	- 26.5	<u>4.5</u>	- 29.0	5.0	<u>-</u> 31.7	5.4	- 34.6	<u>6.3</u>	- 40.6	7.4	- 47.0	8.4	- 54.0	<u>9.6</u>	- 61.4	10.8	- 69.4	12.2	-77.8
	3	100	2.8	- 174.0	3.1	- 19.0	<u>3.5</u>	- 21.0	<u>3.8</u>	- 23.2	<u>4.2</u>	- 25.5	4.6	- 27.8	5.0	- 30.3	<u>5.9</u>	- 35.6	<u>6.8</u>	- 41.2	7.8	- 47.3	<u>8.9</u>	- 53.9	10.0	- 60.8	11.3	-68.2

TABLE R301.2(2) COMPONENT AND CLADDING LOADS FOR A BUILDING WITH A MEAN ROOF HEIGHT OF 30 FEET LOCATED IN EXPOSURE B (ASD) (psf) #Andeds

	<u>1, 2e</u>	<u>10</u>	<u>5.4</u>	-16.2	<u>6.0</u>	- 18.0	<u>6.7</u>	- 19.9	7.4	22.0	<u>8.1</u>	24.1	8.8	- 26.4	<u>9.6</u>	- 28.7	11.3	- 33.7	<u>13.1</u>	39.1	15.0	44.9	17.1	- 51.0	<u>19.3</u>	<u>-</u> 57.6	21.6	<u>-64.6</u>
	<u>1, 2e</u>	20	4.9	-16.2	<u>5.4</u>	- 18.0	<u>6.0</u>	- 19.9	6.6	- 22.0	7.2	- 24.1	<u>7.9</u>	- 26.4	8.6	- 28.7	10.1	- 33.7	11.7	- 39.1	13.5	- 44.9	15.3	- 51.0	17.3	- 57.6	19.4	-64.6
	<u>1, 2e</u>	<u>50</u>	4.1	-9.9	<u>4.6</u>	- 11.0	<u>5.1</u>	- 12.2	<u>5.6</u>	- 13.4	<u>6.1</u>	- 14.7	<u>6.7</u>	- 16.1	<u>7.3</u>	- 17.5	<u>8.6</u>	- 20.6	10.0	- 23.8	11.4	- 27.4	13.0	- 31.1	14.7	- 35.2	16.4	-39.4
	<u>1, 2e</u>	<u>100</u>	<u>3.6</u>	<u>-5.0</u>	<u>4.0</u>	<u>-5.6</u>	<u>4.4</u>	<u>-6.2</u>	<u>4.8</u>	-6.9	<u>5.3</u>	<u>-7.5</u>	<u>5.8</u>	<u>-8.2</u>	<u>6.3</u>	<u>-9.0</u>	<u>7.4</u>	- 10.5	<u>8.6</u>	- 12.2	<u>9.9</u>	- 14.0	11.2	- 15.9	12.7	- 18.0	14.2	-20.2
	<u>2n, 2r, 3e</u>	10	5.4	-23.6	<u>6.0</u>	- 26.3	<u>6.7</u>	- 29.1	7.4	- 32.1	<u>8.1</u>	- 35.2	8.8	<u>-</u> 38.5	<u>9.6</u>	- 41.9	11.3	- 49.2	13.1	<u>-</u> 57.0	15.0	- 65.4	17.1	- 74.5	19.3	<u>-</u> 84.1	21.6	-94.2
Gable Roof	<u>2n, 2r, 3e</u>	20	<u>4.9</u>	-20.3	<u>5.4</u>	22.7	<u>6.0</u>	- 25.1	<u>6.6</u>	27.7	<u>7.2</u>	- 30.4	<u>7.9</u>	- 33.2	<u>8.6</u>	- 36.2	10.1	- 42.4	<u>11.7</u>	- 49.2	13.5	- 56.5	15.3	- 64.3	17.3	- 72.6	19.4	<u>-81.4</u>
>7 to 20 degrees	<u>2n, 2r, 3e</u>	50	4.1	<u>-16.0</u>	<u>4.6</u>	- 17.9	<u>5.1</u>	- 19.8	<u>5.6</u>	- 21.8	<u>6.1</u>	- 24.0	<u>6.7</u>	- 26.2	7.3	- 28.5	<u>8.6</u>	- 33.5	10.0	- 38.8	11.4	- 44.6	13.0	- 50.7	14.7	- 57.2	16.4	<u>-64.2</u>
	<u>2n, 2r, 3e</u>	100	3.6	-12.8	4.0	- 14.3	4.4	- 15.8	4.8	17.4	<u>5.3</u>	- 19.1	<u>5.8</u>	20.9	6.3	22.8	<u>7.4</u>	- 26.7	<u>8.6</u>	- 31.0	9.9	- 35.6	11.2	- 40.5	12.7	- 45.7	14.2	-51.3
	<u>3r</u>	10	5.4	-28.0	<u>6.0</u>	- 30.2	<u>6.7</u>	<u>-</u> 34.6	7.4	- 38.1	<u>8.1</u>	- 41.8	<u>8.8</u>	- 45.7	<u>9.6</u>	- 49.8	11.3	- 58.4	13.1	- 67.8	15.0	- 77.8	17.1	- 88.5	19.3	- 99.9	21.6	- 112.0
	<u>3r</u>	<u>20</u>	<u>4.9</u>	-24.0	<u>5.4</u>	- 26.7	<u>6.0</u>	- 29.6	<u>6.6</u>	- 32.7	<u>7.2</u>	- 35.9	<u>7.9</u>	- 39.2	<u>8.6</u>	- 42.7	<u>10.1</u>	- 50.1	11.7	- 58.1	13.5	- 66.7	15.3	- 75.9	<u>17.3</u>	<u>-</u> 85.6	19.4	<u>-96.0</u>
	<u>3r</u>	<u>50</u>	4.1	18.7	4.6	- 20.8	<u>5.1</u>	<u>-</u> 23.1	<u>5.6</u>	<u>-</u> 25.4	<u>6.1</u>	<u>-</u> 27.9	6.7	<u>-</u> 30.5	7.3	33.2	8.6	<u>-</u> 39.0	10.0	<u>-</u> 45.2	11.4	<u>-</u> 51.9	13.0	- 59.0	14.7	<u>-</u> 66.6	16.4	-74.7
	<u>3r</u>	<u>100</u>	3.6	-14.7	4.0	- 16.3	4.4	- 18.1	<u>4.8</u>	- 20.0	<u>5.3</u>	- 21.9	5.8	- 24.0	<u>6.3</u>	- 26.1	7.4	- 30.6	<u>8.6</u>	- 35.5	<u>9.9</u>	- 40.8	11.2	- 46.4	12.7	- 52.3	14.2	-58.7
	<u>1, 2e</u>	<u>10</u>	<u>6.5</u>	-12.4	<u>7.3</u>	- 13.9	<u>8.0</u>	<u>-</u> 15.4	<u>8.9</u>	- 16.9	<u>9.7</u>	- 18.6	10.6	- 20.3	11.6	- 22.1	<u>13.6</u>	- 26.0	<u>15.8</u>	<u>-</u> 30.1	18.1	- 34.6	20.6	- 39.3	<u>23.3</u>	<u>-</u> 44.4	26.1	-49.9
	<u>1, 2e</u>	20	5.6	-12.4	<u>6.3</u>	- 13.9	7.0	- 15.4	7.7	- 16.9	<u>8.4</u>	- 18.6	<u>9.2</u>	- 20.3	10.0	22.1	11.7	26.0	13.6	- 30.1	15.6	- 34.6	17.8	- 39.3	20.1	- 44.4	22.5	-49.8
Gable Roof	<u>1, 2e</u>	50	4.4	-10.6	<u>5.0</u>	- 11.8	<u>5.5</u>	- 03.1	<u>6.1</u>	- 14.4	<u>6.6</u>	- 15.8	7.3	- 17.3	<u>7.9</u>	- 18.8	<u>9.3</u>	- 22.1	10.8	- 25.6	12.3	- 29.4	14.0	- 33.5	15.9	- 37.8	17.8	-42.4
>20 to 27 degrees	<u>1, 2e</u>	<u>100</u>	<u>3.6</u>	<u>-9.1</u>	<u>4.0</u>	- 10.2	<u>4.4</u>	<u>-</u> 11.3	<u>4.8</u>	<u>-</u> 12.4	<u>5.3</u>	- 13.6	<u>5.8</u>	<u>-</u> 14.9	<u>6.3</u>	- 16.2	<u>7.4</u>	- 19.0	<u>8.6</u>	<u>-</u> 22.1	<u>9.9</u>	- 25.3	11.2	- 28.8	12.7	<u>-</u> 32.5	14.2	<u>-36.5</u>
	<u>2n, 2r, 3e</u>	10	<u>6.5</u>	-19.9	7.3	- 22.1	<u>8.0</u>	- 24.5	<u>8.9</u>	- 27.0	<u>9.7</u>	- 29.7	10.6	- 32.4	11.6	- 35.3	13.6	- 41.4	15.8	- 48.0	18.1	- 55.2	20.6	- 62.8	23.3	- 70.8	26.1	-79.4
	<u>2n, 2r, 3e</u>	20	5.6	-17.4	<u>6.3</u>	- 19.4	<u>7.0</u>	- 21.5	7.7	- 23.7	<u>8.4</u>	- 26.0	9.2	- 28.4	10.0	- 31.0	11.7	- 36.3	13.6	- 42.1	15.6	- 48.4	17.8	- 55.0	20.1	<u>-</u> 62.1	22.5	-69.6

	<u>2n, 2r, 3e</u>	50	4.4	-14.2	<u>5.0</u>	- 15.8	<u>5.5</u>	- 17.5	<u>6.1</u>	- 19.3	<u>6.6</u>	- 21.1	<u>7.3</u>	- 23.1	7.9	- 25.2	<u>9.3</u>	- 29.5	10.8	<u>-</u> 34.2	12.3	- 39.3	14.0	- 44.7	15.9	- 50.5	17.8	-56.6
	<u>2n, 2r, 3e</u>	100	3.6	<u>-11.7</u>	<u>4.0</u>	- 13.0	4.4	- 14.5	4.8	- 15.9	<u>5.3</u>	- 17.5	<u>5.8</u>	- 19.1	6.3	20.8	7.4	- 24.4	8.6	- 28.3	9.9	- 32.5	11.2	- 37.0	12.7	- 41.8	14.2	-46.8
	<u>3r</u>	10	<u>6.5</u>	-23.6	7.3	- 26.3	<u>8.0</u>	- 29.1	<u>8.9</u>	- 32.1	<u>9.7</u>	- 35.2	10.6	- 38.5	11.6	- 41.9	13.6	- 49.2	15.8	- 57.0	18.1	- 65.4	20.6	- 74.5	23.3	- 84.1	26.1	-94.2
	<u>3r</u>	20	<u>5.6</u>	-19.9	<u>6.3</u>	22.1	<u>7.0</u>	- 24.5	<u>7.7</u>	- 27.0	<u>8.4</u>	- 29.7	<u>9.2</u>	- 32.4	10.0	- 35.3	11.7	- 41.4	13.6	- 48.0	15.6	- 55.2	17.8	- 62.8	20.1	- 70.8	22.5	-79.4
	<u>3r</u>	<u>50</u>	4.4	-14.7	<u>5.0</u>	- 16.3	<u>5.5</u>	- 18.1	<u>6.1</u>	- 20.0	<u>6.6</u>	- 21.9	<u>7.3</u>	<u>-</u> 24.0	7.9	- 26.1	<u>9.3</u>	- 30.6	10.8	<u>-</u> 35.5	12.3	- 40.8	14.0	- 46.4	15.9	<u>-</u> 52.3	17.8	-58.7
	<u>3r</u>	<u>100</u>	<u>3.6</u>	<u>-14.7</u>	<u>4.0</u>	- 16.3	<u>4.4</u>	- 18.1	<u>4.8</u>	- 20.0	<u>5.3</u>	- 21.9	<u>5.8</u>	- 24.0	<u>6.3</u>	- 26.1	7.4	- 30.6	<u>8.6</u>	- 35.5	9.9	- 40.8	11.2	- 46.4	12.7	- 52.3	14.2	-58.7
	<u>1, 2e, 2r</u>	<u>10</u>	<u>8.0</u>	-14.7	<u>8.9</u>	<u>-</u> 16.3	<u>9.9</u>	<u>-</u> 18.1	10.9	- 20.0	12.0	- 21.9	<u>13.1</u>	<u>-</u> 24.0	14.2	<u>-</u> 26.1	<u>16.7</u>	- 30.6	19.4	<u>-</u> 35.5	22.2	- 40.8	25.3	<u>-</u> 16.4	28.5	- 52.3	32.0	-58.7
	<u>1, 2e, 2r</u>	20	7.1	-12.4	<u>7.9</u>	- 13.9	<u>8.8</u>	- 15.4	<u>9.7</u>	- 16.9	10.6	- 18.6	11.6	20.3	12.6	22.1	14.8	- 26.0	17.2	- 30.1	19.8	- 34.6	22.5	- 39.3	25.4	- 44.4	28.5	-49.8
	<u>1, 2e, 2r</u>	<u>50</u>	<u>5.9</u>	<u>-9.5</u>	<u>6.6</u>	- 10.6	<u>7.3</u>	<u>-</u> 11.7	<u>8.1</u>	- 12.9	<u>8.9</u>	- 14.2	<u>9.7</u>	<u>-</u> 15.5	10.5	- 16.9	12.4	- 19.8	14.3	- 22.9	16.5	- 26.3	18.7	- 30.0	21.1	- 33.8	23.7	-37.9
	<u>1, 2e, 2r</u>	100	<u>5.0</u>	<u>-7.3</u>	<u>5.6</u>	<u>-8.1</u>	<u>6.2</u>	<u>-9.0</u>	<u>6.9</u>	<u>-9.9</u>	<u>7.5</u>	- 10.8	<u>8.2</u>	- 11.9	<u>9.0</u>	- 12.9	10.5	- 15.1	12.2	- 17.6	14.0	- 20.2	15.9	- 22.9	18.0	- 25.9	20.2	-29.0
	<u>2n, 3r</u>	<u>10</u>	<u>8.0</u>	-16.2	<u>8.9</u>	- 18.0	<u>9.9</u>	<u>-</u> 19.9	10.9	- 22.0	12.0	<u>-</u> 24.1	13.1	<u>-</u> 26.4	- 14.2	- 28.7	16.7	<u>-</u> 33.7	19.4	<u>-</u> 39.1	22.2	- 44.9	25.3	<u>-</u> 51.0	28.5	<u>-</u> 57.6	32.0	-64.6
Cable Boof	<u>2n, 3r</u>	20	7.1	-14.4	<u>7.9</u>	- 16.1	<u>8.8</u>	- 17.8	<u>9.7</u>	- 19.7	10.6	- 21.6	11.6	- 23.6	12.6	- 25.7	14.8	- 30.1	17.2	- 34.9	19.8	- 40.1	22.5	- 45.6	25.4	- 51.5	28.5	-57.8
>27 to 45 degrees	<u>2n, 3r</u>	<u>50</u>	<u>5.9</u>	-12.2	<u>6.6</u>	- 13.5	7.3	- 15.0	8.1	- 16.5	<u>8.9</u>	- 18.2	<u>9.7</u>	- 19.9	10.5	- 21.6	12.4	- 25.4	14.3	- 29.4	16.5	- 33.8	18.7	- 38.4	21.1	- 43.4	23.7	-48.6
	<u>2n, 3r</u>	<u>100</u>	5.0	-10.4	<u>5.6</u>	<u>-</u> 11.6	<u>6.2</u>	- 12.9	<u>6.9</u>	- 14.2	<u>7.5</u>	- 15.6	<u>8.2</u>	- 17.1	<u>9.0</u>	- 18.6	10.5	- 21.8	12.2	- 25.3	14.0	29.0	15.9	- 33.0	18.0	- 37.3	20.0	<u>-41.8</u>
	<u>3e</u>	<u>10</u>	<u>8.0</u>	-19.9	<u>8.9</u>	- 22.1	<u>9.9</u>	<u>-</u> 24.5	10.9	- 27.0	<u>12.0</u>	- 29.7	<u>13.1</u>	<u>.</u> 32.4	14.2	- 35.3	<u>16.7</u>	- 41.4	<u>19.4</u>	<u>-</u> 48.0	22.2	- 55.2	25.3	- 62.8	28.8	- 70.8	32.0	-79.4
	<u>3e</u>	20	7.1	<u>-17.6</u>	<u>7.9</u>	- 19.6	<u>8.8</u>	<u>-</u> 21.8	<u>9.7</u>	- 24.0	10.6	- 26.3	11.6	<u>-</u> 28.8	12.6	- 31.3	14.8	- 36.8	17.2	- 42.7	19.8	- 49.0	22.5	- 55.7	25.4	<u>-</u> 62.9	28.5	-70.5
	<u>3e</u>	<u>50</u>	<u>5.9</u>	-14.7	<u>6.6</u>	- 16.3	<u>7.3</u>	- 18.1	8.1	- 20.0	<u>8.9</u>	- 21.9	<u>9.7</u>	- 24.0	10.5	- 26.1	12.4	- 30.6	14.3	- 35.5	16.6	- 40.8	18.7	- 46.4	21.1	- 52.3	23.7	-58.7
	<u>3e</u>	100	5.0	-12.4	<u>5.6</u>	- 13.9	<u>6.2</u>	- 15.4	<u>6.9</u>	- 16.9	<u>7.5</u>	- 18.6	<u>8.2</u>	- 20.3	9.0	22.1	10.5	- 26.0	12.2	- 30.1	14.0	- 34.6	15.9	- 39.3	18.0	- 44.4	20.2	-49.8

	1	<u>10</u>	<u>6.5</u>	-14.7	<u>7.3</u>	- 16.3	<u>8.0</u>	- 18.1	<u>8.9</u>	20.0	<u>9.7</u>	21.9	10.6	- 24.0	11.6	- 26.1	13.6	- 30.6	15.8	<u>-</u> 35.5	18.1	- 40.8	20.6	- 46.4	23.3	- 52.3	26.1	<u>-58.7</u>
	1	20	<u>5.6</u>	-14.7	<u>6.3</u>	- 16.3	<u>7.0</u>	- 18.1	7.7	- 20.0	<u>8.4</u>	- 21.9	9.2	- 24.0	10.0	- 26.1	11.7	- 30.6	13.6	- 35.5	15.6	- 40.8	17.8	- 46.4	20.1	- 52.3	22.5	-58.7
	1	<u>50</u>	4.4	-11.3	<u>5.0</u>	- 12.6	<u>5.5</u>	- 14.0	<u>6.1</u>	- 15.4	<u>6.6</u>	- 16.9	7.3	- 18.5	7.9	- 20.2	<u>9.3</u>	- 23.7	10.8	- 27.4	12.3	- 31.5	14.0	- 35.8	15.9	- 40.4	17.8	-45.3
	1	<u>100</u>	<u>3.6</u>	<u>-8.7</u>	<u>4.0</u>	<u>-9.7</u>	<u>4.4</u>	- 10.8	<u>4.8</u>	- 11.9	<u>5.3</u>	- 13.1	<u>5.8</u>	- 14.3	<u>6.3</u>	- 15.5	<u>7.4</u>	- 18.2	<u>8.6</u>	- 21.2	<u>9.9</u>	- 24.3	11.2	- 27.6	12.7	- 31.2	14.2	-35.0
	<u>2r</u>	<u>10</u>	<u>6.5</u>	-19.1	7.3	- 21.3	<u>8.0</u>	<u>-</u> 23.6	<u>8.9</u>	- 26.0	<u>9.7</u>	<u>-</u> 28.6	10.6	<u>-</u> 31.2	11.6	- 34.0	13.6	- 39.9	15.8	- 46.3	18.1	- 53.1	20.6	- 60.4	23.3	- 68.2	26.1	-76.5
Hipped Roof	<u>2r</u>	20	<u>5.6</u>	-17.2	<u>6.3</u>	- 19.2	<u>7.0</u>	- 21.3	7.7	- 23.4	<u>8.4</u>	- 25.7	<u>9.2</u>	- 28.1	10.0	- 30.6	11.7	- 35.9	13.6	- 41.7	15.6	- 47.9	17.8	- 54.4	20.1	- 61.5	22.5	-68.9
>7 to 20 degrees9	<u>2r</u>	<u>50</u>	4.4	-14.7	<u>5.0</u>	- 16.4	<u>5.5</u>	- 18.2	<u>6.1</u>	- 20.0	<u>6.6</u>	- 22.0	<u>7.3</u>	<u>-</u> 24.0	<u>7.9</u>	- 26.1	<u>9.3</u>	- 30.7	10.8	<u>-</u> 35.6	12.3	- 40.9	14.0	- 46.5	15.9	- 52.5	17.8	- <u>58.8</u>
	<u>2r</u>	100	<u>3.6</u>	-12.8	<u>4.0</u>	14.3	<u>4.4</u>	- 15.8	<u>4.8</u>	17.4	<u>5.3</u>	- 19.1	<u>5.8</u>	20.9	<u>6.3</u>	22.8	<u>7.4</u>	- 26.7	<u>8.6</u>	- 31.0	<u>9.9</u>	- 35.6	11.2	- 40.5	12.7	- 45.7	14.2	-51.3
	<u>2e, 3</u>	<u>10</u>	<u>6.5</u>	-20.6	<u>7.3</u>	- 22.9	<u>8.0</u>	<u>-</u> 25.4	<u>8.9</u>	- 28.0	<u>9.7</u>	- 30.8	10.6	<u>-</u> 33.6	11.6	- 36.6	13.6	- 43.0	15.8	- 49.8	<u>18.1</u>	- 57.2	20.6	- 65.1	23.3	- 73.5	26.1	-82.4
	<u>2e. 3</u>	<u>20</u>	<u>5.6</u>	-18.5	<u>6.3</u>	20.6	<u>7.0</u>	22.9	7.7	- 25.2	<u>8.4</u>	- 27.7	<u>9.2</u>	- 30.3	10.0	- 32.9	<u>11.7</u>	- 38.7	13.6	- 44.8	15.6	- 51.5	17.8	- 58.6	<u>20.1</u>	- 66.1	22.5	-74.1
	<u>2e, 3</u>	<u>50</u>	4.4	-15.8	<u>5.0</u>	- 17.6	<u>5.5</u>	- 19.5	<u>6.1</u>	<u>-</u> 21.5	<u>6.6</u>	- 23.6	7.3	<u>-</u> 25.8	7.9	- 28.0	<u>9.3</u>	- 32.9	10.8	- 38.2	12.3	- 43.8	14.0	- 49.9	15.9	- 56.3	17.8	-63.1
2	<u>2e. 3</u>	<u>100</u>	<u>3.6</u>	-13.7	<u>4.0</u>	- 15.3	<u>4.0</u>	- 16.9	<u>4.8</u>	- 18.7	<u>5.3</u>	- 20.5	<u>5.8</u>	22.4	<u>6.3</u>	- 24.4	<u>7.4</u>	- 28.6	<u>8.6</u>	- 33.2	<u>9.9</u>	- 38.1	11.2	- 43.3	12.7	48.9	14.2	-54.8
	1	<u>10</u>	<u>6.5</u>	-11.7	<u>7.3</u>	- 13.0	<u>8.0</u>	<u>-</u> 14.5	<u>8.9</u>	- 15.9	<u>9.7</u>	- 17.5	10.6	- 19.1	11.6	- 20.8	13.6	- 24.4	15.8	- 28.3	18.1	- 32.5	20.6	- <u>37.0</u>	23.3	- 41.8	26.1	-46.8
1	1	20	<u>5.6</u>	-10.4	<u>6.3</u>	- 11.6	<u>7.0</u>	- 12.8	7.7	- 14.1	<u>8.4</u>	- 15.5	<u>9.2</u>	- 16.9	10.0	- 18.4	11.7	- 21.6	13.6	- 25.1	15.6	- 28.8	17.8	- 32.8	<u>20.1</u>	- 37.0	22.5	<u>-41.5</u>
Hipped Roof	1	<u>50</u>	<u>4.4</u>	<u>-8.6</u>	<u>5.0</u>	<u>-9.6</u>	<u>5.5</u>	- 10.6	<u>6.1</u>	- 11.7	<u>6.6</u>	- 12.8	7.3	- 14.0	<u>7.9</u>	- 15.3	<u>9.3</u>	- 17.9	10.8	- 20.8	12.3	- 23.9	14.0	- 27.2	15.9	- 30.7	17.8	-34.4
>20 to 27 degrees	1	<u>100</u>	<u>3.6</u>	<u>-7.3</u>	<u>4.0</u>	<u>-8.1</u>	<u>4.4</u>	<u>-9.0</u>	<u>4.8</u>	<u>-9.9</u>	<u>5.3</u>	- 10.8	<u>5.8</u>	<u>-1.9</u>	<u>6.3</u>	- 12.9	<u>7.4</u>	- 15.1	<u>8.6</u>	- 17.6	<u>9.9</u>	- 20.2	11.2	- 22.9	12.7	- 25.9	14.2	-29.0
	<u>2e. 2r. 3</u>	<u>10</u>	<u>6.5</u>	-16.2	<u>7.3</u>	- 18.0	<u>8.0</u>	- 19.9	<u>8.9</u>	- 22.0	<u>9.7</u>	- 24.1	10.6	- 26.4	11.6	- 28.7	13.6	- 33.7	15.8	- 39.1	18.1	- 44.9	20.6	- 51.0	<u>23.3</u>	- 57.6	<u>26.1</u>	-64.6
	<u>2e, 2r, 3</u>	20	<u>5.6</u>	-14.4	<u>6.3</u>	- 16.1	<u>7.0</u>	- 17.8	7.7	- 19.7	<u>8.4</u>	- 21.6	9.2	- 23.6	10.0	25.7	11.7	- 30.1	13.6	- 34.9	15.6	- 40.1	17.8	- 45.6	20.1	- 51.5	22.5	-57.8

	<u>2e. 2r. 3</u>	<u>50</u>	4.4	-12.2	<u>5.0</u>	- 13.5	<u>5.5</u>	<u>-</u> 15.0	<u>6.1</u>	- 16.5	<u>6.6</u>	- 18.2	<u>7.3</u>	<u>-</u> 19.9	<u>7.9</u>	- 21.6	<u>9.3</u>	- 25.4	<u>10.8</u>	<u>-</u> 29.4	12.3	- 33.8	14.0	- 38.4	15.9	<u>-</u> 43.4	17.8	-48.6
	<u>2e, 2r, 3</u>	100	<u>3.6</u>	-10.4	4.0	- 11.6	<u>4.4</u>	- 12.9	<u>4.8</u>	- 14.2	<u>5.3</u>	- 15.6	<u>5.8</u>	- 17.1	<u>6.3</u>	- 18.6	<u>7.4</u>	- 21.8	<u>8.6</u>	- 25.3	9.9	- 29.0	11.2	- 33.0	12.7	- 37.3	14.2	-41.8
	1	<u>10</u>	<u>6.2</u>	-12.4	<u>6.9</u>	- 13.9	<u>7.7</u>	<u>-</u> 15.4	<u>8.5</u>	- 16.9	<u>9.3</u>	- 18.6	10.2	<u>-</u> 20.3	11.1	22.1	13.0	<u>-</u> 26.0	15.1	- 30.1	17.3	- 34.6	19.7	- 39.3	22.2	- 44.4	24.9	-49.8
	1	20	<u>5.4</u>	-11.0	<u>6.0</u>	- 12.3	<u>6.7</u>	- 13.6	<u>7.4</u>	- 15.0	<u>8.1</u>	- 16.5	<u>8.9</u>	- 18.0	<u>9.6</u>	- 19.6	11.3	- 23.0	<u>13.1</u>	- 26.7	15.1	- 30.7	17.1	- 34.9	<u>19.4</u>	- 39.4	21.7	-44.2
	1	<u>50</u>	4.4	-9.2	<u>4.9</u>	- 10.2	5.4	- 11.3	<u>5.9</u>	- 12.5	<u>6.5</u>	- 13.7	7.1	<u>-</u> 15.0	7.7	- 16.3	<u>9.1</u>	- 19.2	10.5	22.2	12.1	25.5	13.8	- 29.0	15.5	<u>-</u> 32.8	17.4	-36.7
	1	<u>100</u>	<u>3.6</u>	-7.8	<u>4.0</u>	-8.7	<u>4.4</u>	<u>-9.6</u>	<u>4.8</u>	- 10.6	<u>5.3</u>	- 11.6	<u>5.8</u>	- 12.7	<u>6.3</u>	- 13.8	<u>7.4</u>	- 16.2	<u>8.6</u>	- 18.8	<u>9.9</u>	21.6	11.2	- 24.6	12.7	- 27.8	14.2	-31.1
	<u>2e</u>	<u>10</u>	6.2	-14.8	<u>6.9</u>	- 16.5	7.7	<u>-</u> 18.3	<u>8.5</u>	- 20.2	<u>9.3</u>	- 22.1	10.2	- 24.2	11.1	- 26.3	13.0	- 30.9	15.1	<u>-</u> 35.9	17.3	- 41.2	19.7	- 46.8	22.2	- 52.9	24.9	-59.3
	<u>2e</u>	20	<u>5.4</u>	-11.7	<u>6.0</u>	- 13.0	<u>6.7</u>	- 14.5	<u>7.4</u>	- 15.9	<u>8.1</u>	- 17.5	<u>8.9</u>	- 19.1	<u>9.6</u>	20.8	11.3	- 24.4	13.1	- 28.3	15.1	- 32.5	17.1	- 37.0	19.4	<u>-</u> 41.8	21.7	-46.8
	<u>2e</u>	<u>50</u>	4.4	-7.3	<u>4.9</u>	<u>-8.1</u>	<u>5.4</u>	<u>-9.0</u>	<u>5.9</u>	-9.9	<u>6.5</u>	- 10.8	<u>7.1</u>	<u>-</u> 11.9	7.7	- 12.9	<u>9.1</u>	- 15.1	10.5	- 17.6	12.1	20.2	13.8	- 22.9	15.5	<u>-</u> 25.9	17.4	-29.0
Hinned Roof	<u>2e</u>	100	<u>3.6</u>	-7.3	<u>4.0</u>	<u>-8.1</u>	<u>4.4</u>	<u>-9.0</u>	<u>4.8</u>	-9.9	<u>5.3</u>	- 10.8	<u>5.8</u>	- 11.9	<u>6.3</u>	- 12.9	<u>7.4</u>	- 15.1	<u>8.6</u>	- 17.6	<u>9.9</u>	- 20.2	11.2	- 22.9	12.7	<u>-</u> 25.9	14.2	-29.0
>27 to 45 degrees	<u>2r</u>	<u>10</u>	6.2	-18.7	<u>6.9</u>	- 20.9	7.7	<u>-</u> 23.1	<u>8.5</u>	<u>-</u> 25.5	<u>9.3</u>	<u>-</u> 28.0	10.2	<u>-</u> 30.6	11.1	<u>-</u> 33.3	13.0	<u>-</u> 39.1	15.1	<u>-</u> 45.4	17.3	- 52.1	19.7	- 59.2	22.2	<u>-</u> 66.9	24.9	-75.0
	<u>2r</u>	<u>20</u>	5.4	-15.7	<u>6.0</u>	- 17.5	<u>6.7</u>	- 19.4	<u>7.4</u>	- 21.4	<u>8.1</u>	- 23.5	<u>8.9</u>	- 25.7	9.6	- 28.0	11.3	- 32.8	13.1	- 38.1	15.1	43.7	17.1	- 49.8	19.4	- 56.2	21.7	-63.0
	<u>2r</u>	<u>50</u>	4.4	<u>-11.7</u>	<u>4.9</u>	- 13.1	<u>5.4</u>	<u>-</u> 14.5	<u>5.9</u>	- 16.0	<u>6.5</u>	<u>-</u> 17.5	7.1	- 19.2	7.7	- 20.9	<u>9.1</u>	- 24.5	10.5	- 28.4	12.1	- 32.6	13.8	<u>-</u> 37.1	15.5	- 41.9	17.4	-47.0
	<u>2r</u>	<u>100</u>	<u>3.6</u>	<u>-8.7</u>	<u>4.0</u>	<u>-9.7</u>	<u>4.4</u>	- 10.8	<u>4.8</u>	- 11.9	<u>5.3</u>	- 13.1	<u>5.8</u>	- 14.3	<u>6.3</u>	- 15.5	<u>7.4</u>	- 18.2	<u>8.6</u>	- 21.2	9.9	24.3	11.2	- 27.6	12.7	<u>-</u> 31.2	14.2	<u>-35.0</u>
	3	10	6.2	-20.0	<u>6.9</u>	- 22.3	7.7	- 24.7	<u>8.5</u>	27.2	<u>9.3</u>	- 29.9	10.2	- 32.7	11.1	- 35.6	13.0	- 41.7	15.1	- 48.4	17.3	- 55.6	19.7	- 63.2	22.2	- 71.4	24.9	-80.0
	<u>3</u>	20	<u>5.4</u>	<u>-15.0</u>	<u>6.0</u>	- 16.8	<u>6.7</u>	- 18.6	<u>7.4</u>	- 20.5	<u>8.1</u>	- 22.5	<u>8.9</u>	- 24.6	<u>9.6</u>	- 26.7	11.3	- 31.4	<u>13.1</u>	- 36.4	15.1	- 41.8	17.1	- 47.5	19.4	- 53.7	21.7	-60.2
	3	<u>50</u>	4.4	<u>-8.7</u>	<u>4.9</u>	<u>-9.7</u>	<u>5.4</u>	- 10.8	<u>5.9</u>	- 11.9	<u>6.5</u>	- 13.1	7.1	- 14.3	7.7	- 15.5	<u>9.1</u>	- 18.2	10.5	- 21.2	12.1	- 24.3	13.8	- 27.6	15.5	<u>-</u> 31.2	17.4	<u>-35.0</u>
	3	100	<u>3.6</u>	-8.7	<u>4.0</u>	-9.7	4.4	- 10.8	<u>4.8</u>	- 11.9	<u>5.3</u>	- 13.1	<u>5.8</u>	- 14.3	<u>6.3</u>	- 15.5	7.4	- 18.2	<u>8.6</u>	- 21.2	<u>9.9</u>	24.3	11.2	- 27.6	12.7	- 31.2	14.2	-35.0

Wall	4	<u>10</u>	<u>8.7</u>	<u>-9.5</u>	<u>9.7</u>	- 10.6	10.8	- 11.7	11.9	12.9	<u>13.1</u>	- 14.2	14.3	<u>-</u> 15.5	15.5	- 16.9	<u>18.2</u>	- 19.8	21.2	<u>-</u> 22.9	24.3	- 26.3	27.6	- 30.0	31.2	- 33.8	35.0	<u>-37.9</u>
	4	20	<u>8.3</u>	<u>-9.1</u>	<u>9.3</u>	- 10.1	10.3	- 11.2	11.4	12.4	12.5	- 13.6	13.6	- 14.8	14.8	- 16.2	17.4	- 19.0	20.2	- 22.0	23.2	- 25.3	26.4	- 28.7	29.8	- 32.4	33.4	-36.4
	4	<u>50</u>	<u>7.8</u>	<u>-8.6</u>	<u>8.7</u>	<u>-9.5</u>	<u>9.7</u>	- 10.6	10.7	- 11.7	11.7	- 12.8	12.8	- 14.0	13.9	- 15.2	<u>16.3</u>	- 17.9	18.9	- 20.7	21.7	23.8	24.7	- 27.1	27.9	- 30.6	31.3	-34.3
	<u>4</u>	<u>100</u>	<u>7.4</u>	<u>-8.2</u>	<u>8.3</u>	<u>-9.1</u>	<u>9.2</u>	- 10.1	10.1	- 11.1	11.1	- 12.2	12.1	- 13.3	13.2	- 14.5	<u>15.5</u>	- 17.1	18.0	- 19.8	20.6	22.7	23.5	- 25.8	26.5	29.2	29.7	-32.7
	<u>4</u>	<u>500</u>	<u>6.5</u>	-7.3	<u>7.3</u>	<u>-8,1</u>	8.0	-9.0	<u>8.9</u>	-9.9	<u>9.7</u>	- 10.8	10.6	- 11.9	11.6	- 12.9	13.5	- 15.1	15.8	- 17.6	18.1	- 20.2	20.6	22.9	23.3	25.9	26.1	-29.0
	<u>5</u>	<u>10</u>	8.7	<u>-11.7</u>	<u>9.7</u>	- 13.0	10.8	- 14.5	11.9	- 15.9	<u>13.1</u>	- 17.5	14.3	- 19.1	15.5	- 20.8	<u>18.2</u>	- 24.4	21.2	- 28.3	24.3	- 32.5	27.6	- 37.0	31.2	- 41.8	35.0	-46.8
	<u>5</u>	20	8.3	<u>-10.9</u>	<u>9.3</u>	- 12.2	10.3	<u>-</u> 13.5	11.4	- 14.9	12.5	- 16.3	13.6	- 17.8	14.8	- 19.4	17.4	- 22.8	20.2	<u>-</u> 26.4	23.2	- 30.3	26.4	- 34.5	29.8	- 39.0	33.4	-43.7
	<u>5</u>	<u>50</u>	7.8	<u>-9.9</u>	<u>8.7</u>	- 11.0	<u>9.7</u>	- 12.2	10.7	- 13.4	11.7	- 14.7	12.8	- 16.1	13.9	- 17.5	<u>16.3</u>	20.6	18.9	23.9	21.7	27.4	24.7	- 31.2	27.9	35.2	31.3	-39.5
	<u>5</u>	100	7.4	<u>-9.1</u>	<u>8.3</u>	- 10.1	<u>9.2</u>	<u>-</u> 11.2	10.1	12.4	11.1	- 13.6	12.1	- 14.8	13.2	- 16.1	15.5	- 19.0	18.0	- 22.0	20.6	25.2	23.5	- 28.7	26.5	- 32.4	29.7	-36.3
	<u>5</u>	500	<u>6.5</u>	<u>-7.3</u>	7.3	<u>-8.1</u>	<u>8.0</u>	<u>-9.0</u>	<u>8.9</u>	<u>-9.9</u>	<u>9.7</u>	- 10.8	10.6	- 11.9	11.6	- 12.9	13.6	- 15.1	15.8	- 17.6	18.1	- 20.2	20.6	- 22.9	23.3	25.9	26.1	-29.0

2

Revise as follows:

TABLE R301.2(3)HEIGHT AND EXPOSURE ADJUSTMENT COEFFICIENTS FOR TABLE R301.2(2)

	EXPOSURE								
	В	С	D						
15	<u>0.82 1.00 </u>	1.21	1.47						
20	<u>0.89 1.00 </u>	1.29	1.55						
25	<u>0.94 1.00</u>	1.35	1.61						
30	1.00	1.40	1.66						
35	1.05	1.45	1.70						
40	1.09	1.49	1.74						
45	1.12	1.53	1.78						
50	1.16	1.56	1.81						
55	1.19	1.59	1.84						
60	1.22	1.62	1.87						

Delete and substitute as follows:



For SI: 1 foot = 304.8 mm, 1 degree = 0.0175 rad.

Note: a = 4 feet in all cases.

FIGURE R301.2(8) COMPONENT AND CLADDING PRESSURE ZONES



Gable and Flat Roofs $\theta \leq 7^{\circ}$



Gable Roofs $7 < \theta \le 45^{\circ}$



For SI: 1 foot = 304.8 mm, 1 degree = 0.0175 rad.
FIGURE R301.2(8) COMPONENT AND CLADDING PRESSURE ZONES



FIGURE R301.2(5)A ULTIMATE DESIGN WIND SPEEDS



Notes:

Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10m) above ground for Exposure C category.
 Linear interpolation is permitted between contours. Point values are provided to aid with interpolation.
 Islands, coastal areas, and land boundaries outside the last contour shall use the last wind speed contour.
 Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.
 Wind encode areas (an encode areas (an

5. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (Annual Exceedance Probability = 0.00143, MRI = 700 Years).

6. Location-specific basic wind speeds shall be permitted to be determined using www.atcouncil.org/windspeed

FIGURE R301.2(5)A **ULTIMATE DESIGN WIND SPEEDS**

Revise as follows:





FIGURE R301.2(5)B REGIONS WHERE WIND DESIGN IS REQUIRED

Reason: This proposal coordinates the wind design criteria in the IRC with currently referenced 2016 edition of the loading standard *ASCE 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7-16).

There are two primary proposed changes to the IRC for coordination with the revised wind loading criteria in ASCE 7-16: (1) updated basic wind speed maps for Risk Category II buildings and (2) revised roof component and cladding loads for buildings with mean roof heights less than or equal to 60 feet.

(1) Updated Map:

In ASCE 7-16, wind speeds in non-hurricane prone areas of the contiguous United States have been revised using contours to better reflect the regional vairation in the extreme wind climate. Point values are provided to aid interpolation, in a style similar to that used for the other hazard maps in ASCE 7. Summaries of the datat and methods used to estiimate both the non-hurriane and hurricanewind speeds are provided in the Commentary to ASCE 7-16 Chpater 26 (attached to this proposal). The wind speeds in the hurricane-prone region have not changed from ASCE 7-10, the previous edition. Revised Figure R301.2(4)A is the wind speed map from ASCE 7-16 for Risk Category II Buildings.

Update to R301.2(4)B removes the notes, only.

(2) Revised Tables:

The simplified component and cladding loads in Table R301.2(2) are proposed to be revised for correlation with the new roof component and cladding loads for buildings with mean roof heights less than or equal to 60 feet. The roof zones and pressure coefficients in ASCE 7-16 Figure 30.4-2 (which includes Figures 30.4-2A through

30.4-2I) have been revised based on an analysis of an extensive wind tunnel database. All source data used in the study are publically accessible throught the National Institute of Standards and Technology (NIST) website. Compared to previous versions of ASCE 7, the pressure coefficients have been increased, and are now more consistent with coefficients for buildings higher than 60 feet. Roof zones sizes are also modified from those of earlier versions in order to minimize the increase of pressure coefficients in Zones 1 and 2. The data indicate that for these low-rise buildings, the size of the roof zones depend primarilly on the builing height, h. The GCp values given in ASCE 7-16 Figures 30.4-2A through 30.4-2I are associated with wind tunnel tests perfomed in both Exposure B and C. For ASCE 7-16 Figure 30.4-2A, the coefficients applly equally to Exposure B and C, based on wind tunnel data that show insignificant difference in (GCp) for Exposure B and C. Consequently, the truncation for Kz in Table 30.3-1 of ASCE 7-10 is not requiredfor building below 30 feet, and the lower Kz values may be used as hown revised in Figure R301.2(3) of the IRC. More explaination is found in the Commentary to ASCE 7-16 Chapter 30 (attached to this proposal).

NOTE: Due to cdpAccess functionality, the revised table was added as a NEW table, however, it is intended to replace the existing R301.2(2). Also, in the NEW table, only footnotes f and g are NEW. The footnotes a to e remain unchanged from previous IRC, but only look new due to cdpAccess legislative format editor.

Cost Impact: The code change proposal will increase the cost of construction

Component and cladding loads for roofs in buildings with mean roof heights less than or equalt to 60 feet are higher for some roof slopes and zones than for similar roof slopes in 2018 IRC. Construction costs will increase for roofing products and decking for some areas of the country in the hurricane-prone region. However, for much of the country outside the hurricane-prone region, the wind speeds are actually lower and therefore even with an increase in GCp, the loads do not change and there is no impact on costs. Also, loads for wall components such as windows, doors, siding, etc., are lower for mean roof height under 30 feet. Loads on Main Wind Force Resisting Systems, such as shear walls and diaphragms, are decreasing in areas where the design wind speed has decreased.

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IRC®: R301.2.1, TABLE R301.2.1.5.1, TABLE R602.10.1.3, TABLE R602.10.3(1), TABLE R602.10.6.4, TABLE R703.3.2, TABLE AH106.4(1), FIGURE AH106.4.1

Proponent: Jennifer Goupil, American Society of Civil Engineers (ASCE), representing American Society of Civil Engineers (ASCE) (jgoupil@asce.org); T. Eric Stafford, Insurance Institute for Business and Home Safety (testafford@charter.net); Don Scott, PCS Structural Solutions, representing Representing National Council of Structural Engieers Association (dscott@pcs-structural.com)

2018 International Residential Code

Revise as follows:

R301.2.1 Wind design criteria. Buildings and portions thereof shall be constructed in accordance with the wind provisions of this code using the ultimate design wind speed in Table R301.2(1) as determined from Figure R301.2(5)A. The structural provisions of this code for wind loads are not permitted where wind design is required as specified in Section R301.2.1.1. Where different construction methods and structural materials are used for various portions of a building, the applicable requirements of this section for each portion shall apply. Where not otherwise specified, the wind loads listed in Table R301.2(2) adjusted for height and exposure using Table R301.2(3) shall be used to determine design load performance requirements for wall coverings, curtain walls, roof coverings, exterior windows, skylights, garage doors and exterior doors. Asphalt shingles shall be designed for wind speeds in accordance with Section R905.2.4. A continuous load path shall be provided to transmit the applicable uplift forces in Section R802.11.1 from the roof assembly to the foundation. Where ultimate design wind speeds in Figure R301.2(4)A are less than the lowest wind speed indicated in the prescriptive provision of this code. the lowest wind speed indicated in the prescriptive provision of this code.

		AVERAGE SLOPE OF THE TOP HALF OF HILL, RIDGE OR ESCARPMENT (percent)										
	EROMFIGURE B301 2(5)A(mph)	0.10	0.125	0.15	0.175	0.20	0.23	0.25				
		Required ultimate design wind speed-up, modified for topographic wind speed-up (mph)										
<u>95</u>		<u>114</u>	<u>119</u>	<u>123</u>	<u>127</u>	<u>131</u>	<u>137</u>	<u>140</u>				
<u>100</u>		<u>120</u>	<u>125</u>	<u>129</u>	<u>134</u>	<u>138</u>	<u>144</u>	<u>147</u>				
<u>105</u>		<u>126</u>	<u>131</u>	<u>135</u>	<u>141</u>	<u>145</u>	<u>151</u>	<u>154</u>				
	110	132	137	142	147	152	158	162				
	115	138	143	148	154	159	165	169				
	120	144	149	155	160	166	172	176				
	130	156	162	168	174	179	NA	NA				
	140	168	174	181	NA	NA	NA	NA				
	150	180	NA	NA	NA	NA	NA	NA				

TABLE R301.2.1.5.1 ULTIMATE DESIGN WIND SPEED MODIFICATION FOR TOPOGRAPHIC WIND EFFECT^{a, b}

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

NA = Not Applicable.

- a. Table applies to a feature height of 500 feet or less and dwellings sited a distance equal or greater than half the feature height.
- b. Where the ultimate design wind speed as modified by Table R301.2.1.5.1 equals or exceeds 140 miles per hour, the building shall be considered as "wind design required" in accordance with Section R301.2.1.1.

			BRACED WALL LINE SPACING CRITERIA					
APPLICATION	CONDITION	BUILDING TYPE	Maximum Spacing	Exception to Maximum Spacing				
Wind bracing	Ultimate design wind speed 100 mphto < 140 mph	Detached,townhouse	60 feet	None				
	SDC A – C	Detached		Use wind bracing				
	SDC A – B	Townhouse	Use wind bracing					
	SDC C	Townhouse	35 feet	Up to 50 feet when length of required bracing per Table R602.10.3(3) is adjusted in accordance withTable R602.10.3(4).				
Seismic bracing	SDC D ₀ , D ₁ , D ₂	Detached,townhouses, one-and two-story only	25 feet	Up to 35 feet to allow for a single room not to exceed 900 square feet. Spacin of all other braced wall linesshall not exceed 25 feet.				
	SDC D ₀ , D ₁ , D ₂	, D ₂ Detached,townhouse		Up to 35 feet when length of required bracing per Table R602.10.3(3) is adjusted in accordance withTable R602.10.3(4).				

TABLE R602.10.1.3 BRACED WALL LINE SPACING

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m^2 , 1 mile per hour = 0.447 m/s.

TABLE R602.10.3(1)BRACING REQUIREMENTS BASED ON WIND SPEED

EXPOSURE CAT ROOF HEIGHT • BRAC	EGORY B 10-FOOT W ED WALL I	• 30-FOOT MEAN /ALL HEIGHT • 2 _INES	MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE ^a						
UltimateDesign Story Braced Wall Line I WindSpeed(mph) Location Spacing ^c (feet)			Method LIB ^b	Method GB	MethodsDWB, WSP, SFB,PBS, PCP, HPS,BV- WSP, ABW, PFH,PFC, CS- SFB	MethodsCS- WSP, CS- G,CS-PF			
		<u>10</u>	<u>2.5</u>	<u>2.5</u>	<u>1.5</u>	<u>1.5</u>			
		<u>20</u>	<u>4.5</u>	<u>4.5</u>	<u>2.5</u>	<u>2.5</u>			
	$\land \stackrel{\frown}{\blacksquare}$	<u>30</u>	<u>6.5</u>	<u>6.5</u>	<u>4.0</u>	<u>3.5</u>			
		<u>40</u>	<u>8.5</u>	<u>8.5</u>	<u>5.0</u>	<u>4.0</u>			
		<u>50</u>	<u>10.5</u>	<u>10.5</u>	<u>6.0</u>	<u>5.0</u>			

		60	12.5	12.5	7.0	6.0	
		10	5.0	5.0	3.0	2.5	
	~	20	<u>8.5</u>	<u>8.5</u>	5.0	<u>4.5</u>	
< 95 mph	$\land \square$	30	12.5	<u>12.5</u>	7.0	<u>6.0</u>	
< 95 mpn		40	16.0	16.0	<u>9.5</u>	8.0	
	64-33 Gb	<u>50</u>	20.0	20.0	<u>11.5</u>	<u>10.0</u>	
		<u>60</u>	<u>23.5</u>	<u>23.5</u>	<u>13.5</u>	<u>11.5</u>	
		<u>10</u>	<u>NP</u>	<u>7.0</u>	4.0	<u>3.5</u>	
	\bigtriangleup	20	NP	<u>13.0</u>	7.5	<u>6.5</u>	
		<u>30</u>	<u>NP</u>	<u>18.5</u>	<u>10.5</u>	<u>9.0</u>	
		<u>40</u>	<u>NP</u>	<u>24.0</u>	<u>13.5</u>	<u>11.5</u>	
		<u>50</u>	<u>NP</u>	<u>29.5</u>	17.0	<u>14.5</u>	
	201 621	<u>60</u>	<u>NP</u>	<u>35.0</u>	<u>20.0</u>	<u>17.0</u>	
		10	3.5	3.5	2.0	1.5	
		20	6.0	6.0	3.5	3.0	
		30	8.5	8.5	5.0	4.5	
		40	11.5	11.5	6.5	5.5	
		50	14.0	14.0	8.0	7.0	
		60	16.5	16.5	9.5	8.0	
		10	6.5	6.5	3.5	3.0	
	\wedge	20	11.5	11.5	6.5	5.5	
< 110		30	16.5	16.5	9.5	8.0	
_ 110		40	21.5	21.5	12.5	10.5	
		50	26.5	26.5	15.5	13.0	
		60	31.5	31.5	18.0	15.5	
		10	NP	9.5	5.5	4.5	
	\bigtriangleup	20	NP	17.0	10.0	8.5	
		30	NP	24.5	14.0	12.0	
		40	NP	32.0	18.5	15.5	
		50	NP	39.5	22.5	19.0	
		60	NP	46.5	26.5	23.0	
		10	3.5	3.5	2.0	2.0	
		20	6.5	6.5	3.5	3.5	
		30	9.5	9.5	5.5	4.5	
	~	40	12.5	12.5	7.0	6.0	
		50	15.0	15.0	9.0	7.5	
		60	18.0	18.0	10.5	9.0	

~ 115	\rightarrow	10	7.0	7.0	4.0	3.5
≤ 115	$ \uparrow $	20	12.5	12.5	7.5	6.5
		30	18.0	18.0	10.5	9.0
		40	23.5	23.5	13.5	11.5
		50	29.0	29.0	16.5	14.0
		60	34.5	34.5	20.0	17.0
		10	NP	10.0	6.0	5.0
	\bigtriangleup	20	NP	18.5	11.0	9.0
		30	NP	27.0	15.5	13.0
		40	NP	35.0	20.0	17.0
		50	NP	43.0	24.5	21.0
		60	NP	51.0	29.0	25.0
		10	4.0	4.0	2.5	2.0
		20	7.0	7.0	4.0	3.5
	\triangle	30	10.5	10.5	6.0	5.0
		40	13.5	13.5	8.0	6.5
		50	16.5	16.5	9.5	8.0
		60	19.5	19.5	11.5	9.5
		10	7.5	7.5	4.5	3.5
	\land	20	14.0	14.0	8.0	7.0
< 120	\triangle	30	20.0	20.0	11.5	9.5
3 120		40	25.5	25.5	15.0	12.5
		50	31.5	31.5	18.0	15.5
		60	37.5	37.5	21.5	18.5
	\bigcirc	10	NP	11.0	6.5	5.5
		20	NP	20.5	11.5	10.0
		30	NP	29.0	17.0	14.5
		40	NP	38.0	22.0	18.5
		50	NP	47.0	27.0	23.0
	-024	60	NP	55.5	32.0	27.0
		10	4.5	4.5	2.5	2.5
	~	20	8.5	8.5	5.0	4.0
	$ \ \ \ \ \ \ \ \ \ \ \ \ \ $	30	12.0	12.0	7.0	6.0
		40	15.5	15.5	9.0	7.5
		50	19.5	19.5	11.0	9.5
		60	23.0	23.0	13.0	11.0
		10	8.5	8.5	5.0	4.5
	(mark)	20	16.0	16.0	9.5	8.0
	$\land \land$	30	23.0	23.0	13.5	11.5
< 100		40	30.0	30.0	17.5	15.0
≤ 130						

		50	37.0	37.0	21.5	18.0
		60	44.0	44.0	25.0	21.5
	~	10	NP	13.0	7.5	6.5
	\rightarrow	20	NP	24.0	13.5	11.5
		30	NP	34.5	19.5	17.0
	1.1	40	NP	44.5	25.5	22.0
		50	NP	55.0	31.5	26.5
		60	NP	65.0	37.5	31.5
		10	5.5	5.5	3.0	2.5
		20	10.0	10.0	5.5	5.0
		30	14.0	14.0	8.0	7.0
		40	18.0	18.0	10.5	9.0
	24	50	22.5	22.5	13.0	11.0
		60	26.5	26.5	15.0	13.0
		10	10.0	10.0	6.0	5.0
	\wedge	20	18.5	18.5	11.0	9.0
- 140	\triangle	30	27.0	27.0	15.5	13.0
< 140		40	35.0	35.0	20.0	17.0
		50	43.0	43.0	24.5	21.0
		60	51.0	51.0	29.0	25.0
	97	10	NP	15.0	8.5	7.5
	\triangle	20	NP	27.5	16.0	13.5
		30	NP	39.5	23.0	19.5
		40	NP	51.5	29.5	25.0
		50	NP	63.5	36.5	31.0
		60	NP	75.5	43.0	36.5

2030

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

NP = Not Permitted.

- a. Linear interpolation shall be permitted.
- b. Method LIB shall have gypsum board fastened to not less than one side with nails or screws in accordance with Table R602.3(1) for exterior sheathing or Table R702.3.5 for interior gypsum board. Spacing of fasteners at panel edges shall not exceed 8 inches.
- c. Where three or more parallel braced wall lines are present and the distances between adjacent braced wall lines are different, the average dimension shall be permitted to be used for braced wall line spacing.

TABLE R602.10.6.4

TENSION STRAP CAPACITY FOR RESISTING WIND PRESSURES PERPENDICULAR TO METHODS PFH, PFG AND CS-PF BRACED WALL PANELS^a

Portions of table not shown remain unchanged.

MINIMUM WALL	MAXIMUM PONYWALL HEIGHT(feet)	MAXIMUMTOTAL WALLHEIGHT(feet)		TENSION STRAP CAPACITY REQUIR (pounds) ^a						
STUDFRAMING NOMINAL SIZE			MAXIMUMOPENINGWIDTH(feet)	Ultimate Design Wind Speed V _{ult} (mph)						
ANDGRADE				<u>≤</u> 110 115	130	<u>≤</u> 110	115 ⁻			
				Exposure	eΒ	Exp	osure			

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

DR = Design Required.

a. Straps shall be installed in accordance with manufacturer's recommendations.

MAXIMUM MEAN ROOF HEIGHT									
Illtimate Wind Speed(mph 2-second quet)	Ex	Exposure							
onimate wind Speed(inplit 5-second gust)	В	С	D						
<u>95</u>	<u>NL</u>	<u>NL</u>	<u>NL</u>						
100	<u>NL</u>	<u>NL</u>	<u>NL</u>						
105	<u>NL</u>	<u>NL</u>	<u>NL</u>						
<u>110</u>	<u>NL</u>	<u>NL</u>	<u>40'</u>						
115	NL	50′	20′						
120	NL	30′	DR						
130	60′	15′	DR						
140	35′	DR	DR						

TABLE R703.3.2 LIMITS FOR ATTACHMENT PER TABLE R703.3(1)

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

NL = Not Limited by Table R703.3.2, DR = Design Required.

TABLE AH106.4(1) DESIGN WIND PRESSURES FOR SCREEN ENCLOSURE FRAMING^{a, b, e, f, g, h}

	WALL	ULTIMATE DESIGN WIND SPEED, Vult(mph)											
CASE		90	<u>95</u>	100	105	110	120	130	140	150	160	170	180
UAGE			Exposure Category B Design Pressure (psf)										
Ac	Windward and leeward walls (flow thru) and windward wall (nonflow thru) L/W = 0-1	<u>5</u>	<u>6</u>	6	7	8	9	11	13	14	16	18	21

Ac	Windward and leeward walls (flow thru) and windward wall (nonflow thru) L/W = 2	<u>6</u>	<u>7</u>	7	8	9	11	12	14	16	19	21	24
Bd	Windward: Nongable roof	7	<u>8</u>	9	10	11	13	15	18	21	23	26	30
Bd	Windward: Gable roof	10	10	11	13	14	16	19	22	26	29	33	37
	ROOF												
All ^e	Roof-screen	2	<u>2</u>	2	3	3	3	4	4	5	6	7	7
All ^e	Roof-solid	<u>6</u>	<u>6</u>	7	8	8	10	12	13	15	18	20	22

For SI: 1 inch = 25.4 mm, 1 mile per hour = 0.44 m/s, 1 pound per square foot = 0.0479 kPa, 1 foot = 304.8 mm.

- a. Design pressure shall be not less than 10 psf in accordance with Section AH106.4.1.
- b. Loads are applicable to screen enclosures with a mean roof height of 30 feet or less in Exposure B. For screen enclosures of different heights or exposure, the pressures given shall be adjusted by multiplying the table pressure by the adjustment factor given in Table AH106.4(2).
- c. For Load Case A flow thru condition, the pressure given shall be applied simultaneously to both the upwind and downwind screen walls acting in the same direction as the wind. The structure shall be analyzed for wind coming from the opposite direction. For the nonflow thru condition, the screen enclosure wall shall be analyzed for the load applied acting toward the interior of the enclosure.
- d. For Load Case B, the table pressure multiplied by the projected frontal area of the screen enclosure is the total drag force, including drag on screen surfaces parallel to the wind, that must be transmitted to the ground. Use Load Case A for members directly supporting the screen surface perpendicular to the wind. Load Case B loads shall be applied only to structural members that carry wind loads from more than one surface.
- e. The roof structure shall be analyzed for the pressure given occurring both upward and downward.
- f. Table pressures are MWFRS loads. The design of solid roof panels and their attachments shall be based on component and cladding loads for enclosed or partially enclosed structures as appropriate.
- g. Table pressures apply to 20-inch by 20-inch by 0.013-inch mesh screen. For 18-inch by 14-inch by 0.013-inch mesh screen, pressures on screen surfaces shall be permitted to be multiplied by 0.88. For screen densities greater than 20 inches by 20 inches by 0.013 inch, pressures for enclosed buildings shall be used.
- h. Linear interpolation shall be permitted.





Notes:

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10m) above ground for Exposure C category.

2. Linear interpolation is permitted between contours. Point values are provided to aid with interpolation.

3. Islands, coastal areas, and land boundaries outside the last contour shall use the last wind speed contour.

4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

5. Wind speeds correspond to approximately a 15% probability of exceedance in 50 years (Annual Exceedance Probability = 0.00333, MRI = 300 Years).

6. Location-specific basic wind speeds shall be permitted to be determined using www.atcouncil.org/windspeed

Notes:

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10m) above ground for Exposure C category.

2. Linear interpolation between contours is permitted.

3. Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.

4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

5. Wind speeds correspond to approximately a 7% probability of exceedence in 50 years (Annual Exceedence Probability = 0.00143, MRI = 700 Years).

FIGURE AH106.4.1

ULTIMATE DESIGN WIND SPEEDS FOR PATIO COVERS AND SCREEN ENCLOSURES

Reason: This proposal is a coordination proposal to accompany the proposal to update the wind map in Figure R301.2(4)A to the currently referenced ASCE 7-16 standard. As has been stated, the ASCE 7-16 wind maps include many areas of the country where wind speeds decreased below the speeds of the previous maps. To coordinate the IRC with the areas of lower wind speeds, this proposal adds or modifies existing provisions to account for these lower speeds. This proposal includes several changes that are bundled together in one proposal because they all reflect the effort to accommodate for these lower speeds in the existing tables and

figures. Each change within this proposal is explained below.

R301.2.1 Wind design criteria.

The last sentence was added to acknowledge the lower speeds and permit use of the prescriptive provisions.

Table R301.2.1.5.1 Ultimate Design Wind Speed Modification for Topographic Wind Effect

Three new lines are added to this table to accommodate the lower wind speeds of 95, 100, and 105mph.

Table R602.10.1.3 Braced Wall Line Spacing

Revision to this table includes removing the lower boundary of 100 mph to account for lower speeds now included on the map.

Table R602.10.3(1) Bracing Requirements Based on Wind Speed

This additional data is added to accommodate the lower wind speeds of <95mph.

Table R602.10.6.4 Tension Strap Capacity for Resisting Wind Pressures Perpendicular to Methods PFH, PFG and CS-PF Braces Wall Panels

The small revision to this table is to add "<=" to the lowest wind speed of 110, for both Exposure B and C, to indicate this is appropriate for use with lower wind speeds.

Table R703.3.2 Limits for Attachment Per Table R703.3(1)

This table was updated to include new lines for lower wind speeds of 95, 100, 105, and 110.

Table AH106.4(1) Design Wind Pressures for Screen Enclosures Framing

This update adds columns for lower wind speeds of 90 and 95 mph.

Figure AH106.4.1 Ultimate Design Wind Speeds for Patio Covers and Screen Enclosures

This updates the map to the ASCE 7-16 RC I MRI=300 years map.

Cost Impact: The code change proposal will decrease the cost of construction

By updating and adding in prescriptive provisions to reflect the lower wind speeds that appear in some areas of the country, this proposal on its own will lower construction costs. However, as this is a coordination proposal, the impacts of this proposal will depend on the situation and overall design.

Proposal # 5476

RB36-19

RB37-19

IRC®: R301.2.1.1

Proponent: T. Eric Stafford, representing Insurance Institute for Business and Home Safety (testafford@charter.net)

2018 International Residential Code

Revise as follows:

R301.2.1.1 Wind limitations and wind design required. The wind provisions of this code shall not apply to the design of buildings where wind design is required in accordance with Figure R301.2(5)B, or where the <u>ultimate design wind speed</u>, V_{ult}, in Figure R301.2(5)A equals or exceeds 140 mph in a special wind region.

Exceptions:

- 1. For concrete construction, the wind provisions of this code shall apply in accordance with the limitations of Sections R404 and R608.
- 2. For structural insulated panels, the wind provisions of this code shall apply in accordance with the limitations of Section R610.
- 3. For cold-formed steel light-frame construction, the wind provisions of this code shall apply in accordance with the limitations of Sections R505, R603 and R804.

In regions where wind design is required in accordance with Figure R301.2(5)B <u>or where the ultimate</u> <u>design wind speed, V_{ult}, in Figure R301.2(5)A equals or exceeds 140 mph in a special wind region</u>, the design of buildings for wind loads shall be in accordance with one or more of the following methods:

- 1. AWC Wood Frame Construction Manual (WFCM).
- 2. ICC Standard for Residential Construction in High-Wind Regions (ICC 600).
- 3. ASCE Minimum Design Loads for Buildings and Other Structures (ASCE 7).
- 4. AISI Standard for Cold-Formed Steel Framing—Prescriptive Method For One- and Two-Family Dwellings (AISI S230).
- 5. International Building Code.

The elements of design not addressed by the methods in Items 1 through 5 shall be in accordance with the provisions of this code.

Where ASCE 7 or the International Building Code is used for the design of the building, the wind speed map and exposure category requirements as specified in ASCE 7 and the International Building Code shall be used.

Reason: This is one of a series of proposals to correct some errors regarding the applicability of the IRC to areas where wind speeds exceed the prescriptive provisions established by the IRC. Figure R301.2(5)B prohibits the use the prescriptive provisions in the IRC in the shaded areas of the map which are referred to as the "wind design required regions." The wind design required region in Figure R301.2(5)B essentially covers hurricane prone regions and other coastal areas where the wind speed exceeds 130 mph or 140 mph depending on location. However, the code does not explicitly prohibit the use of the prescriptive provisions in the IRC in special wind regions for any wind speed. This discrepancy is primarily due to changes in the 2015 IRC that introduced the strength design level wind speeds from ASCE 7-10 in Figure R301.2(5)A and coordinated with the wind design required map in Figure R301.2(5)B. The wind limitations in the 2012 IRC stated the following:

R301.2.1.1 Wind limitations and wind design required. The wind provisions of this code shall not apply to the design of buildings where wind design is required in accordance with Figure R301.2(4)B or where the basic wind speed from Figure R301.2(4) equals or exceeds 110 miles per hour (49 m/s).

By providing a wind speed limitation, in addition to the wind design required map, the prescriptive provisions of the IRC would have been prohibited in special wind regions where the wind speed exceeded 110 mph in the 2012 IRC. A similar limitation does not exist in the 2018 IRC. The current language in the 2018 IRC is in error and this proposal simply restores the limitation in the special wind regions that existed prior to the 2015 IRC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal will not increase the cost of construction as it simply corrects an error and restores a limitation that existed in the 2012 IRC and previous editions.

Proposal # 4711

RB38-19

IRC®: R301.2.1.1

Proponent: T. Eric Stafford, representing Insurance Institute for Business and Home Safety (testafford@charter.net)

2018 International Residential Code

Revise as follows:

R301.2.1.1 Wind limitations and wind design required. The wind provisions of this code shall not apply to the design of buildings where wind design is required in accordance with Figure R301.2(5)B.

Exceptions:

1. For concrete construction, the wind provisions of this code shall apply in accordance with the limitations of Sections R404 and R608.

2. For structural insulated panels, the wind provisions of this code shall apply in accordance with the limitations of Section R610.

3. For cold-formed steel light-frame construction, the wind provisions of this code shall apply in accordance with the limitations of Sections R505, R603 and R804.

In regions where wind design is required in accordance with Figure R301.2(5)B, the design of buildings for wind loads shall be in accordance with one or more of the following methods:

- 1. AWC Wood Frame Construction Manual (WFCM).
- 2. ICC Standard for Residential Construction in High-Wind Regions (ICC 600).
- 3. ASCE Minimum Design Loads for Buildings and Other Structures (ASCE 7).
- 4. AISI Standard for Cold-Formed Steel Framing—Prescriptive Method For One- and Two-Family Dwellings (AISI S230).
- 5. International Building Code.

The elements of design not addressed by the methods in Items 1 through 5 shall be in accordance with the provisions of this code.

Where ASCE 7 or the *International Building Code* is used for the design of the building, the wind speed map and exposure category requirements as specified in ASCE 7 and the *International Building Code* shall be used.

The prescriptive construction provisions of Chapters 4 through 9 of this code shall not apply to the design of buildings where wind design is required in accordance with Figure R301.2(5)B.

Exceptions:

- 1. For concrete construction, the provisions of this code apply in accordance with the limitations of Sections and R608.
- 2. For structural insulated panels, the provisions of this code shall apply in accordance with the limitations of Section R610.

- 3. For cold-formed steel light-frame construction, the provisions of this code shall apply in accordance with the limitations of Sections R505, R603 and R804.
- 4. For exterior wall coverings and soffits, the provisions of this code shall apply in accordance with the limitations of Section R703.3.2.
- 5. For roof coverings, the provisions of this code shall apply in accordance with Chapter 9.
- 6. For exterior windows and doors, the provisions of this code shall apply in accordance with Section R609.
- 7. <u>The seismic requirements of Chapters 4 through 9 apply in accordance with the scope of Section R301.2.2.</u>

Reason: This proposal is one of two proposals intended to clarify the wind limitations in the IRC. Currently, the IRC contains an assortment of requirements for wind loads scattered throughout the code. While Section R301.2.1.1 intends to limit the applicability of the IRC to areas where wind design is not required in accordance with Figure R301.2(5)B, it's not very clear what exactly applies in the IRC in regions where wind design is required. Current Section R301.2.1.1 states that the "wind provisions" of this code do not apply where wind design is required but is not clear anywhere in the code as to what the wind provisions in this code do apply to. The use of the phrase "wind provisions of this code" is very confusing. Clearly the prescriptive fastening schedule in Table R602.3(1) should not apply where wind design is required. However, it's not very clear that this table is actually part of the "wind provisions in this code." This proposal makes it clear that the prescriptive provisions in Chapters 4 through 9 do not apply where wind design is required. Provisions in the IRC that do apply to higher wind regions than indicated by Figure R301.2(5)B have been consolidated into the Exceptions to Section R301.2.1.1. The language that applies to elements of design not addressed by the methods in Items 1 through 5 of Section R301.2.1.1 is maintained by this proposal. Therefore, Section R405 (foundation drainage), Section R406 (dampproofing and waterproofing provisions), Section R702 (interior coverings), Section R806 (roof ventilation), Section R807 (attic access) and others would apply as specified in the code. Additionally, this proposal reorders the language so that the code tells the user directly what is required to be used when located in a wind design required region (WFCM, ICC 600, ASCE 7, AISI S230, and/or IBC). This improves the flow of the language and is similar to the approach used in the 2000, 2003, 2006 and 2009 IRC.

Lastly, a new exception is proposed to be added that clarifies that the seismic requirements in the code, including the scope as specified in Section R301.2.2, apply regardless.

This proposal is not intended to change any technical requirements in the IRC related to wind design. It is intended to simply clarify the wind limitations in the IRC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This code change proposal will not impact the cost of construction as it is simply a clarification.

Proposal # 4656

RB38-19

RB39-19

IRC®: R301.2.2.1.1

Proponent: Kelly Cobeen, Wiss Janney Elstner Associates, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (KCobeen@wje.com); Michael Mahoney, representing Federal Emergency Management Agency (mike.mahoney@fema.dhs.gov)

2018 International Residential Code

Revise as follows:

R301.2.2.1.1 Alternate determination of seismic design category. The seismic design categories and corresponding short-period design spectral response accelerations, S_{DS} , shown in Figure R301.2(2), are based on soil Site Class D, used as an assumed default, as defined in Section 1613.2.2 of the International Building Code. If soil conditions are determined by the building official to be Site Class A, B, or D, the seismic design category and short-period design spectral response accelerations, S_{DS} , for a site shall be allowed to be determined in accordance with Figure R301.2(3), or Section 1613.2 of the International Building Code. The value of S_{DS} determined in accordance with Section 1613.2 of the International Building Code is permitted to be used to set the seismic design category in accordance with Table R301.2.2.1.1, and to interpolate between values in Tables R602.10.3(3), R603.9.2(1) and other seismic design requirements of this code.

Reason: The intent of this change proposal is to delete unnecessary and potentially confusing language. The proponent of this change authored Section R301.2.2.1.1 in the last code update cycle. The wording being struck has since been identified by users to be confusing. The authors have determined that the wording being struck is commentary and is not needed for proper implementation of the IRC provisions.

Cost Impact: The code change proposal will not increase or decrease the cost of construction No cost impact as this is an editorial change to remove potential user confusion.

Proposal # 4581

RB39-19

RB40-19

IRC®: 202 (New), R301.2.2.6

Proponent: Kelly Cobeen, Wiss Janney Elstner Associates, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (KCobeen@wje.com); Julie Furr, Rimkus Consulting Group, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (jfurr@rimkus.com); Michael Mahoney, representing Federal Emergency Management Agency (mike.mahoney@fema.dhs.gov)

2018 International Residential Code

Add new definition as follows:

CRIPPLE WALL CLEAR HEIGHT. The vertical height of a *cripple wall* from the top of the foundation to the underside of floor framing above.

Revise as follows:

R301.2.2.6 Irregular buildings. The seismic provisions of this code shall not be used for structures, or portions thereof, located in Seismic Design Categories C, D_0 , D_1 and D_2 and considered to be irregular in accordance with this section. A building or portion of a building shall be considered to be irregular where one or more of the conditions defined in Items 1 through 7.8 occur. Irregular structures, or irregular portions of structures, shall be designed in accordance with accepted engineering practice to the extent the irregular features affect the performance of the remaining structural system. Where the forces associated with the irregularity are resisted by a structural system designed in accordance with accepted engineering practice, the remainder of the building shall be permitted to be designed using the provisions of this code.

Exceptions: Fireplaces, chimneys and masonry veneer in accordance with this code.

1. **Shear wall or braced wall offsets out of plane.** Conditions where exterior shear wall lines or *braced wall panels* are not in one plane vertically from the foundation to the uppermost story in which they are required.

Exception: For wood light-frame construction, floors with cantilevers or setbacks not exceeding four times the nominal depth of the wood floor joists are permitted to support *braced wall panels* that are out of plane with *braced wall panels* below provided that all of the following are satisfied:

- 1. Floor joists are nominal 2 inches by 10 inches (51 mm by 254 mm) or larger and spaced not more than 16 inches (406 mm) on center.
- 2. The ratio of the back span to the cantilever is not less than 2 to 1.
- 3. Floor joists at ends of *braced wall panels* are doubled.
- 4. For wood-frame construction, a continuous rim joist is connected to ends of cantilever joists. Where spliced, the rim joists shall be spliced using a galvanized metal tie not less than 0.058 inch (1.5 mm) (16 gage) and 1¹/₂ inches (38 mm) wide fastened with six 16d nails on each side of the splice; or a block of the same size as the rim joist and of sufficient length to fit securely between the joist space at which the splice occurs, fastened with eight 16d nails on each side of the splice.
- 5. Gravity loads carried at the end of cantilevered joists are limited to uniform wall and roof loads and the reactions from headers having a span of 8 feet (2438 mm) or less.

2. Lateral support of roofs and floors. Conditions where a section of floor or roof is not laterally supported by shear walls or *braced wall lines* on all edges.

Exception: Portions of floors that do not support shear walls, braced wall panels above, or roofs shall be permitted to extend not more than 6 feet (1829 mm) beyond a shear wall or *braced wall line*.

3.

Shear wall or braced wall offsets in plane. Conditions where the end of a braced wall panel occurs over an opening in the wall below and extends more than 1 foot (305 mm) horizontally past the edge of the opening. This provision is applicable to shear walls and braced wall panels offset in plane and to braced wall panels offset out of plane in accordance with the exception to Item 1.

Exception: For wood light-frame wall construction, one end of a *braced wall panel* shall be permitted to extend more than 1 foot (305 mm) over an opening not more than 8 feet (2438 mm) in width in the wall below provided that the opening includes a header in accordance with all of the following:

- 1. The building width, loading condition and framing member species limitations of Table R602.7(1) shall apply.
- 2. The header is composed of:
 - 2.1. Not less than one 2×12 or two 2×10 for an opening not more than 4 feet (1219 mm) wide.
 - 2.2. Not less than two 2×12 or three 2×10 for an opening not more than 6 feet (1829 mm) in width.
 - 2.3. Not less than three 2 × 12 or four 2 × 10 for an opening not more than 8 feet (2438 mm) in width.
- 3. The entire length of the *braced wall panel* does not occur over an opening in the wall below.
- 4. Floor and roof opening. Conditions where an opening in a floor or roof exceeds the lesser of 12 feet (3658 mm) or 50 percent of the least floor or roof dimension.
- 5. Floor level offset. Conditions where portions of a floor level are vertically offset.

Exceptions:

- 1. Framing supported directly by continuous foundations at the perimeter of the building.
- 2. For wood light-frame construction, floors shall be permitted to be vertically offset where the floor framing is lapped or tied together as required by Section R502.6.1.
- 6. Perpendicular shear wall and wall bracing. Conditions where shear walls and *braced wall lines* do not occur in two perpendicular directions.
- 7. Wall bracing in stories containing masonry or concrete construction. Conditions where stories above *grade plane* are partially or completely braced by wood wall framing in accordance with Section R602 or cold-formed steel wall framing in accordance with Section R603 include masonry or concrete construction. Where this irregularity applies, the entire story shall be designed in accordance with accepted engineering practice.

Exception: Fireplaces, chimneys and masonry veneer in accordance with this code. <u>8. Hillside Light-Frame Construction. Light-frame construction in which both Items 1 and 2 below apply:</u>

- 1. <u>The grade slope exceeds 1 vertical in 5 horizontal where averaged across the full</u> <u>length of any side of the dwelling, and</u>
- 2. The tallest cripple wall clear height exceeds 7'-0", or where a post and beam

system occurs at the dwelling perimeter, the post and beam system tallest post clear height exceeds 7'-0".

Exception : Light-frame construction in which the lowest framed floor is supported directly on concrete or masonry walls over the full length of all sides except the downhill side of the dwelling need not be considered an irregular dwelling under Item 8.

Reason: As part of work contributing to FEMA P-1100 (Vulnerability-Based Seismic Assessment and Retrofit of One- and Two-Family Dwellings Volume 1 - Prestandard), it was identified that for light-frame dwellings on steep hillsides (Figure 1), adequate seismic performance does not occur when seismic design is based on typical seismic force distribution assumptions (tributary area, flexible diaphragm). Whether loading is in the cross-slope or out-of-hill direction (Figure 2), seismic forces follow the stiffest load path to the uphill foundation, rather than distributing uniformly to all the bracing walls in the way assumed in development of IRC seismic bracing provisions. For this reason, design using the IRC bracing provisions will not provide adequate seismic performance. This change proposal triggers an engineered lateral force design for hillside dwellings by adding the hillside dwelling configuration to the already existing list of configurations deemed to be irregular for seismic design purposes.

This dwelling configuration was illustrated to be vulnerable in the 1994 Northridge, California Earthquake. The Earthquake Spectra Northridge Earthquake Reconnaissance Report (Volume 2, EERI, 1996) reported 117 significantly damaged hillside dwellings of the bearing wall type and 40 of the post and beam (stilt) type. Fifteen dwellings were reported to have collapsed or were so near collapse that they were immediately demolished and another fifteen came close to collapsing. HUD (1994) also reported significant damage to hillside dwellings. As examples of vulnerable hillside dwelling performance, Figure 3 illustrates a dwelling that pulled about six inches away from the uphill foundation, but did not collapse, and Figure 4 illustrates one of the collapsed dwellings.

Blaney et. Al (2018), illustrates results from numerical studies used in development of FEMA P-1100. Figure 18 of this reference indicates that for a studied hillside dwelling, the probability of collapse in the risk-adjusted maximum considered earthquake (MCE_R) was reduced by more than a factor of seven by changing from typical prescriptive bracing practice to an engineered methodology that considered the seismic response. More background on dwelling past performance and the numerical studies are found in FEMA P-1100.

The Item 1 grade slope trigger is used to limit applicability of this irregularity to dwellings that are on sites with a significant slope (Figure 5). Averaging the grade slope along the side of the dwelling is intended to focus on the overall drop in grade elevation across the dwelling and not trigger the irregularity based only on limited areas of higher grade slope. This is consistent with the numerical studies that form the basis of this proposal. For most dwellings this criterion will be evaluated by looking at each of the four primary elevations. For large and more complex dwellings, additional "sides" will need to be evaluated.

Item 2 adds a second trigger of downhill cripple wall height greater than 7'-0" (Figure 6) or downhill post clear height in post and pier dwelling (Figure 7) based on the FEMA P-1100 numerical studies. Both Items 1 and 2 need to be triggered in order to qualify for dwelling to be qualified as irregular. These triggers were observed to be the points at which damage and displacements at the uphill foundation were thought to significantly increase the likelihood of collapse.

The exception scopes out of irregularity Item 8 dwellings that have full-height concrete or masonry walls (Figure 8) because this configuration was not part of the numerical studies that form the basis of this proposal. For a dwelling with a simple rectangular floor plan, full height concrete or masonry walls would need to occur on three sides to qualify for the exception. For a more complex dwelling plan configuration, additional concrete or masonry walls would be required to qualify for the exception. Dwellings with doors and windows in the concrete or masonry walls still qualify for the exception. In all dwellings the concrete or masonry walls will need to conform to applicable IRC provisions.



Figure 1 Hillside light-frame structure. Figure 2. Hillside structure cross-slope and out-of-hill loading.



Figure 3. Hillside dwelling pulled away from uphill foundation in the 1994 Northridge, California Earthquake (Credit: City of Los Angeles Department of Building and Safety). Red arrow shows location where floor framing has pulled six to eight inches away from the uphill foundation.



Figure 4. Hillside dwelling collapsed in the 1994 Northridge, California Earthquake (Credit: City of Los Angeles Department of Building and Safety).



Figure 5. Grade slope triggering the hillside dwelling irregularity exceeds 1 vertical in 5 horizontal across the full width of any side of the dwelling.



Figure 6. Downhill cripple wall height triggering the hillside dwelling irregularity.



Figure 7. Downhill post height triggering the hillside dwelling irregularity.



Figure 8. Concrete or masonry wall configuration that does not tripper the hillside dwelling irregularity.

Bibliography: FEMA, 2018. *Vulnerability-Based Seismic Assessment and Retrofit of One- and Two-Family Dwellings Volume 1 - Prestandard (FEMA P-1100)*, Federal Emergency Management Agency, Washington, DC. Blaney et. Al., 2018. "Prestandard for Seismic Assessment and Retrofit of One- and Two-Family Dwellings (FEMA P-1100, ATC-110 Project)," Proceedings of the 2018 SEAOC Convention, SEAOC, Sacramento, CA.

EERI, 1996. 1994 Northridge California Earthquake. The Earthquake Spectra Northridge Earthquake Reconnaissance Report, EERI, Oakland, CA.

HUD, 1994. Performance of HUD-Assisted Properties During the January 17, 1994 Northridge Earthquake, U.S. Department of Housing and Urban Development, Washington, D.C.

Cost Impact: The code change proposal will increase the cost of construction

This proposal is anticipated to increase the number of dwellings required to have an engineered lateral force design for moderately steep to very steep sites. In regions where these dwellings are believed to already be predominantly engineered, the cost impact is thought to be negligible. In other regions where these dwellings are not predominantly engineered, additional costs will be incurred for engineered design and more robust anchorage to the foundation.

Proposal # 4575

RB40-19

RB41-19

IRC®: R301.2.2.7

Proponent: Kelly Cobeen, Wiss Janney Elstner Associates, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (KCobeen@wje.com); Julie Furr, Rimkus Consulting Group, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (jfurr@rimkus.com); Michael Mahoney, representing Federal Emergency Management Agency (mike.mahoney@fema.dhs.gov)

2018 International Residential Code

Revise as follows:

R301.2.2.7 Height limitations. Wood-framed buildings shall be limited to three stories above *grade plane* or the limits given in Table R602.10.3(3). Wood-framed buildings in Seismic Design Category D_2 exceeding two stories shall be designed for wind and seismic loads in accordance with accepted engineering practice. Cold-formed steel-framed buildings shall be limited to less than or equal to three stories above *grade plane* in accordance with AISI S230. Mezzanines as defined in Section R202 that comply with Section R325 shall not be considered as stories. Structural insulated panel buildings shall be limited to two stories above *grade plane*.

Reason: This proposal adds language in the seismic scopeing provisions of Section R301.2.2 to clearly communicate that three-story dwellings in SDC D2 are beyond the scope of the IRC wall bracing provisions. This limitation already exists based on the Sectioin R602.10 bracing tables, however it is more appropriate for this to be in a text provision, and it is more beneficial to the user to make this limit clear in Chapter 3 so as to remove all ambuguity prior to reading Chapter 6.

Cost Impact: The code change proposal will not increase or decrease the cost of construction No cost impact. This is an editorial clarification of the intent of current provisioins.

Proposal # 4578

RB41-19

RB42-19

IRC®: R301.2.2.10

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations (stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

R301.2.2.10 Anchorage of water heaters. In Seismic Design Categories D₀, D₁ and D₂, and in townhouses in <u>Seismic Design Category C</u>, water heaters <u>and thermal storage units</u> shall be anchored against movement and overturning in accordance with Section <u>M1307.2</u>, <u>M1307.2</u> or P2801.8.

Reason: In Section M1307.2, appliances consist of both water heaters and thermal storage tanks. Also, Section M1307.2 applies not only to Seismic Design Categories D0, D_1 and D_2 , but also to townhouses in Seismic Design Category C. This code change is presented to coordinate Sections R301.2.2.10 and M1307.2.

Cost Impact: The code change proposal will not increase or decrease the cost of construction Clarifying language only, no change to actual design or construction requirements for appliance bracing.

Proposal # 4598

RB43-19

IRC®: R301.3

Proponent: Cesar Lujan, representing National Association of Home Builders (clujan@nahb.org); Gary Ehrlich, National Association of Home Builders, representing National Association of Home Builders (gehrlich@nahb.org)

2018 International Residential Code

Revise as follows:

R301.3 Story height. The wind and seismic provisions of this code shall apply to buildings with *story heights* not exceeding the following:

- For wood wall framing, the *story height* shall not exceed 11 feet 7 inches (3531 mm) and the laterally unsupported bearing wall stud height permitted by Table R602.3(5).
 Exception: A story height not exceeding 13 feet 7 inches is permitted provided the maximum wall stud clear height does not exceed 12 feet (3658 mm), the wall studs are in accordance with Exception 2 or Exception 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.
- 2. For cold-formed steel wall framing, the *story height* shall be not more than 11 feet 7 inches (3531 mm) and the unsupported bearing wall stud height shall be not more than 10 feet (3048 mm).
- 3. For masonry walls, the *story height* shall be not more than 13 feet 7 inches (4140 mm) and the bearing wall clear height shall be not more than 12 feet (3658 mm).

Exception: An additional 8 feet (2438 mm) of bearing wall clear height is permitted for gable end walls.

- 4. For insulating concrete form walls, the maximum story height shall not exceed 11 feet 7 inches (3531 mm) and the maximum unsupported wall height per *story* as permitted by Section R608 tables shall not exceed 10 feet (3048 mm).
- 5. For structural insulated panel (SIP) walls, the story height shall be not more than 11 feet 7 inches (3531 mm) and the bearing wall height per *story* as permitted by Section R610 tables shall not exceed 10 feet (3048 mm).

For walls other than wood-framed walls. Individual walls or wall studs shall be permitted to exceed these limits as permitted by Chapter 6 provisions, provided that <u>the</u> *story heights* <u>of</u> this section are not exceeded. An engineered design shall be provided for the wall or wall framing members where the limits of Chapter 6 are exceeded. Where the *story height* limits of this section are exceeded, the design of the building, or the noncompliant portions thereof, to resist wind and seismic loads shall be in accordance with the International Building Code .

Reason: The purpose of this code change is to finally address a long-standing conflict and point of confusion in the IRC story height provisions and restore the original intent of the IRC.

In the 2003 through 2006 IRC, the default provisions of Section R301.3 specified wood-frame buildings could have a maximum bearing wall stud height of 10 feet supporting framing members not exceeding 16" in depth. An exception allowed a maximum bearing wall stud height of 12 feet provided an engineered design for the wall and studs was provided for everything other than the wall bracing for wind and seismic loads, which could be determined per Section R602.10 with adjustment factors to increase the bracing amounts for the higher walls.

For the 2009 IRC, a successful proposal from SBCA revised Section R301.3 to allow floor framing members (e.g. I-joists or trusses) deeper than 16" to be used if the bearing wall stud height was less than 10 feet. This

was accomplished by specifying an overall story height limit of 11'-7", or the sum of a 10'-0" tall stud, 2x top and bottom plates, and 16" deep framing.

This technically overrode the exception allowing bearing wall studs up to 12 feet with wall bracing per the Section R602.10 adjustment factors and engineering design otherwise, not to mention conflicting with the 12 foot bearing wall height limit for masonry walls and additional 8 feet allowed for gable end walls. However, to our recollection this was not brought up in floor testimony, committee discussion, or in public comments, and the change passed.

For the 2015 IRC, the BCAC further revised this section by deleting the 11'-7" story height limit from the final paragraph of Section R301.3 and placing it in each of the individual items to which it applied. This addressed the conflict with masonry walls but still did not fix the conflict with Section R602.10. To make matters worse, former members of the ICC Ad-Hoc Wall Bracing Committee advanced a proposal to delete the entire exception for bearing wall studs up to 12 feet out of a concern code users would double-count the multipliers on the wall bracing, which are reflected in the respective tables of adjustment factors for wind and seismic bracing. Neither the BCAC nor the former AHC-WB members provided a fix for the conflict between the story height limits and the wall bracing provisions.

For the 2018 IRC, NAHB added the new Table R602.3(6) allowing bearing wall studs up to 12 feet in height for limited cases. We still did not directly address the conflict between the story height limits and the wall bracing provisions, let alone the conflict with the new table. In essence, NAHB (and others modifying Section R301.3) have relied on the statement in the last paragraph that invididual walls or wall studs could exceed the limits of R301.3 as long as overall story heights were not exceeded.

This proposal generally restores the exception present in the 2000 through 2012 IRC stating "the wall stud clear height used to determine the maximum permitted story height may be increased to 12 feet without requiring an engineered design for the building wind and seismic force resisting systems" provided R602.10 is complied with, including mandated increases for stud heights up to 12 feet. At the same time, language is added pointing to the two exceptions to 10 foot bearing wall heights under Section R602.3, including the exception leading to the new Table R602.3(6). This will provide a critical link to both exceptions that is currently missing in the 2018 IRC. The requirement to use engineering design for studs in these tall walls not otherwise complying with one of the two exceptions to Section R602.3 is maintained.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code change will not increase cost for builders in jurisdictions making a jump from the 2006 IRC or earlier directly to the 2021 IRC. The code change will also not increase cost for builders using subsequent editions and interpreting the language allowing individual walls or wall studs to exceed the limits of Section R301.3 to permit certain walls (e.g. foyers, great rooms, garages) to exceed the 11'-7" story height limit provided the average story height remains within the limit. The code change may decrease the cost of construction for builders who have been forced to hire structural engineers to design the lateral force-resisting system for houses with 11 or 12 foot bearing walls that would have met the 2000 through 2006 IRC but were excluded from the structural provisions of the IRC due to a strict interpretation of the language in the 2009 IRC and subsequent editions.

Proposal # 4713

RB43-19

RB44-19

IRC®: R301.5, TABLE R301.5, R502.3, R502.3.1, R502.3.2, R502.3.3

Proponent: Gary Ehrlich, National Association of Home Builders, representing National Association of Home Builders (gehrlich@nahb.org)

2018 International Residential Code

R301.5 Live load. The minimum uniformly distributed live load shall be as provided in Table R301.5.

Revise as follows:

TABLE R301.5 MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS (in pounds per square foot)

USE	LIVE LOAD
Uninhabitable attics without storage ^b	10
Uninhabitable attics with limited storage ^{b, g}	20
Habitable attics and attics served with fixed stairs	30
Balconies (exterior) and decks ^e	40
Fire escapes	40
Guards and handrails ^d	200 ^h
Guard in-fill components ^f	50 ^h
Passenger vehicle garages ^a	50 ^a
Areas Rooms other than sleeping areas rooms	40
Sleepin <u>g areas</u> -rooms	30
Stairs	40 ^c

For SI: 1 pound per square foot = 0.0479 kPa, 1 square inch = 645 mm^2 , 1 pound = 4.45 N.

- a. Elevated garage floors shall be capable of supporting a 2,000-pound load applied over a 20square-inch area.
- b. Uninhabitable attics without storage are those where the clear height between joists and rafters is not more than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.
- c. Individual stair treads shall be designed for the uniformly distributed live load or a 300-pound concentrated load acting over an area of 4 square inches, whichever produces the greater stresses.
- d. A single concentrated load applied in any direction at any point along the top.
- e. See Section R507.1 for decks attached to exterior walls.
- f. Guard in-fill components (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot. This load need not be assumed to act concurrently with any other live load requirement.
- g. Uninhabitable attics with limited storage are those where the clear height between joists and

rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. The live load need only be applied to those portions of the joists or truss bottom chords where all of the following conditions are met:

- 1. The attic area is accessed from an opening not less than 20 inches in width by 30 inches in length that is located where the clear height in the attic is not less than 30 inches.
- 2. The slopes of the joists or truss bottom chords are not greater than 2 inches vertical to 12 units horizontal.
- 3. Required insulation depth is less than the joist or truss bottom chord member depth.

The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot.

h. Glazing used in handrail assemblies and guards shall be designed with a safety factor of 4. The safety factor shall be applied to each of the concentrated loads applied to the top of the rail, and to the load on the in-fill components. These loads shall be determined independent of one another, and loads are assumed not to occur with any other live load.

R502.3 Allowable joist spans. Spans for floor joists shall be in accordance with Tables R502.3.1(1) and R502.3.1(2). For other grades and species and for other loading conditions, refer to the AWC STJR.

R502.3.1 Sleeping areas and attic joists. Table R502.3.1(1) shall be used to determine the maximum allowable span of floor joists that support sleeping areas and *attics* that are accessed by means of a fixed stairway in accordance with Section R311.7 provided that the design live load does not exceed 30 pounds per square foot (1.44 kPa) and the design dead load does not exceed 20 pounds per square foot (0.96 kPa). The allowable span of ceiling joists that support *attics* used for limited storage or no storage shall be determined in accordance with Section R802.5.

R502.3.2 Other floor joists. Table R502.3.1(2) shall be used to determine the maximum allowable span of floor joists that support other areas of the building, other than sleeping <u>rooms areas</u> and *attics*, provided that the design live load does not exceed 40 pounds per square foot (1.92 kPa) and the design dead load does not exceed 20 pounds per square foot (0.96 kPa).

R502.3.3 Floor cantilevers. Floor cantilever spans shall not exceed the nominal depth of the wood floor joist. Floor cantilevers constructed in accordance with Table R502.3.3(1) shall be permitted where supporting a light-frame bearing wall and roof only. Floor cantilevers supporting an exterior balcony are permitted to be constructed in accordance with Table R502.3.3(2).

Reason: The purpose of this code change is to align the IRC with the IBC and ASCE 7 for live loads on dwelling floors. Questions have been raised about the fact Table R301.5 refers to "sleeping rooms" and whether this means the bathrooms, closets, hallways, and other non-bedroom spaces on the floor of a dwelling need to be designed for a 40 psf live load even if the total area of bedrooms predominates.

Table 1607.1 of the IBC and Table 4.3-1 of ASCE 7 both apply the 30 psf live load to "habitable attics and **sleeping areas**". The IBC applies the 40 psf load to "all other areas", ASCE 7 applies it to "all other areas except stairs". Both the IBC and ASCE 7 require 40 psf for stairs in one- and two-family dwellings, as does the existing Table R301.5. There is no reason for the IRC to be more stringent than the IBC and ASCE 7. Further, it is not the intent of the IRC to require the builder to apply a patchwork of different live loads across a floor primarily consisting of bedrooms and wind up with different joist sizes and spacings just because some joists happen to pass under bathrooms and closets as well as bedroom spaces and some do not.

This change also aligns Table R301.5 with Section R502.3.1 and R502.3.2 and the respective Tables

ICC COMMITTEE ACTION HEARINGS ::: April, 2019

R502.3.1(1) and R502.3.1(2) for floor joists. Section R502.3.1 and Table R502.3.1(1), which is based on the 30 psf live load, refers specifically to "sleeping areas". Table R502.3.1(3) refers to "living areas" and is based on a 40 psf live load. While not explicitly stated as such, the intent of "living areas" is clearly the same as "areas other than sleeping areas". However, Section R502.3.2 appears to be an outlier in referring to "sleeping rooms", and this proposal makes the correlating change to "sleeping areas".

Further, this change aligns with both the traditional bearing wall footing table that was present in the 2000 through 2012 IRC and the revised and expanded tables in the 2015 and 2018 IRC. Both sets of tables apply a 40 psf load uniformly across the ground floor where dining rooms, living rooms, dens, etc. are typically located and 30 psf uniformly across the upper floor or floors that are dominated by bedrooms (i.e. sleeping rooms).

This change does not preclude a builder, building designer or registered design professional from conservatively designing all floors of the home to 40 psf regardless of whether a floor mostly consists of bedrooms used primarily for sleeping or rooms used primarily for dining, recreation, entertainment and other purposes. Many do so for serviceability (i.e. reduce deflections or "bounce" on the bedroom floors) or for the ease of design and potential economy of using the same floor framing sizes and layouts for all the floors. However, the IRC is intended to be a minimum code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code change is primarily a clarification and maintains current minimum practice for the design of one- and two-family dwellings.

Proposal # 5074

RB44-19

RB45-19

IRC®: TABLE R301.5 (New)

Proponent: Robert Rice C.B.O., Northwest Code Professionals, representing Southern Oregon Chapter-ICC (RobertR@nwcodepros.com)

2018 International Residential Code

Revise as follows:

TABLE R301.5 MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS (in pounds per square foot)

USE	LIVE LOAD
Uninhabitable attics without storage ^b	10
Uninhabitable attics with limited storage ^{b, g}	20
Habitable attics and attics served with fixed stairs	30
Balconies (exterior) and decks ^e	40
Fire escapes	40
Guards and handrails ^d	200 ^h
Guard in-fill components ^f	50 ^h
Passenger vehicle garages ^a	50 ^a
Rooms other than sleeping rooms	40
Sleeping rooms	30
Stairs	40 ^c

For SI: 1 pound per square foot = 0.0479 kPa, 1 square inch = 645 mm^2 , 1 pound = 4.45 N.

- a. Elevated garage floors shall be capable of supporting a 2,000-pound load applied over a 20square-inch area.
- b. Uninhabitable attics without storage are those where the clear height between joists and rafters is not more than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.
- c. Individual stair treads shall be designed for the uniformly distributed live load or a 300-pound concentrated load acting over an area of 4 square inches, whichever produces the greater stresses.
- d. A single concentrated load applied in any direction at any point along the top.
- e. See Section R507.1 for decks attached to exterior walls.
- f. Guard in-fill components (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot. This load need not be assumed to act concurrently with any other live load requirement.
- g. Uninhabitable attics with limited storage are those where the clear height between joists and rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses.
The live load need only be applied to those portions of the joists or truss bottom chords where all of the following conditions are met:

- 1. The attic area is accessed from an opening not less than 20 inches in width by 30 inches in length that is located where the clear height in the attic is not less than 30 inches.
- 2. The slopes of the joists or truss bottom chords are not greater than 2 inches units vertical to 12 units horizontal.
- 3. Required insulation depth is less than the joist or truss bottom chord member depth.

The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot.

h. Glazing used in handrail assemblies and guards shall be designed with a safety factor of 4. The safety factor shall be applied to each of the concentrated loads applied to the top of the rail, and to the load on the in-fill components. These loads shall be determined independent of one another, and loads are assumed not to occur with any other live load.

Reason: This code change is intended to merely clean up a technical error in the existing language.

Item 2 of footnote "g" is technically incorrect. As currently written, it mixes "units" with "inches" which would be undefined. It should either say, "..2 **inches** vertical to 12 **inches** horizontal." or "...2 **units** vertical to 12 **units** horizontal.". The preferred option would be to use units as shown in the proposal.

Cost Impact: The code change proposal will not increase or decrease the cost of construction .This proposal does not add or remove any existing code requirements. Therefore, there is no cost impact.

Proposal # 4088

RB45-19

RB46-19

IRC®: TABLE R301.5

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

TABLE R301.5 MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS (in pounds per square foot)

USE	LIVE LOAD
Uninhabitable attics without storage ^b	10
Uninhabitable attics with limited storage ^{b, g}	20
Habitable attics and attics served with fixed stairs	30
Balconies (exterior) and decks ^e	40
Fire escapes	40
Guards and handrails ^d i	200 ^{h<u>,i</u>}
Guard in-fill components ^f	50 ^h
Handrails ^d	<u>200^h</u>
Passenger vehicle garages ^a	50 ^a
Rooms other than sleeping rooms	40
Sleeping rooms	30
Stairs	40 ^c

For SI: 1 pound per square foot = 0.0479 kPa, 1 square inch = 645 mm^2 , 1 pound = 4.45 N.

- a. Elevated garage floors shall be capable of supporting a 2,000-pound load applied over a 20square-inch area.
- b. Uninhabitable attics without storage are those where the clear height between joists and rafters is not more than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.
- c. Individual stair treads shall be designed for the uniformly distributed live load or a 300-pound concentrated load acting over an area of 4 square inches, whichever produces the greater stresses.
- d. A single concentrated load applied in any direction at any point along the top.
- e. See Section R507.1 for decks attached to exterior walls.
- f. Guard in-fill components (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot. This load need not be assumed to act concurrently with any other live load requirement.
- g. Uninhabitable attics with limited storage are those where the clear height between joists and rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24

inches in width, or greater, within the plane of the trusses. The live load need only be applied to those portions of the joists or truss bottom chords where all of the following conditions are met:

- 1. The attic area is accessed from an opening not less than 20 inches in width by 30 inches in length that is located where the clear height in the attic is not less than 30 inches.
- 2. The slopes of the joists or truss bottom chords are not greater than 2 inches vertical to 12 units horizontal.
- Required insulation depth is less than the joist or truss bottom chord member depth.
 The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot.
- h. Glazing used in handrail assemblies and guards shall be designed with a safety factor of 4. The safety factor shall be applied to each of the concentrated loads applied to the top of the rail, and to the load on the in-fill components. These loads shall be determined independent of one another, and loads are assumed not to occur with any other live load.
- i. For a guard system not required to serve as a handrail, a single concentrated load applied at any point along the top, in the vertical downward direction and in the horizontal direction toward the lower surface. For a guard also serving as a handrail, a single concentrated load applied in any direction at any point along the top.

Reason: The purpose of this proposal is to revise the load on guard systems for one- and two-family dwellings to align with common industry practice. Extensive discussion has occurred in recent code cycles on load requirements and details for guard systems on decks accessory to one- and two-family dwellings. In particular, the directions in which the 200 pound guard load needs to be applied has been a topic of debate. The IRC and IBC define a guard as "a building component or a system of building components located near the open sides of elevated walking surfaces that minimizes the possibility of a fall from the walking surface to the lower level." The ASCE definition of a guardrail system is very similar. Clearly, a fall from the edge of an unprotected deck to the ground, which can be as much as 10 feet or more, carries a much greater risk of injury than a fall backwards onto the surface of the deck, which is only a few feet.

Further, a guard system can be constructed without a handrail, as under both the IRC and IBC a handrail is only required at a flight of stairs, a ramp, a stepped aisle, or a ramped aisle. Nor is the top rail of a guard system required to be graspable by occupants of a deck or other elevated walking surface, unless the guard is specifically designed to also serve as a handrail. In fact, a guard need not even have a top rail unless specifically required by the codes or the reference standards for guard systems, or desired as part of the design of the guard system.

As such, industry standards such as ASTM D7032 for wood and plastic composite decks boards and guards (referenced in both the IBC and IRC) and code evaluation acceptance criteria such as ICC-ES AC 174 for deck boards and guardrails, call for applying the 200 pound load in the outward and downward directions only, not inward or upward and certainly not parallel to the guard. Despite this apparent deviation from the IRC, IBC and ASCE 7 load requirements, thousands of guard systems, when designed, tested, and constructed in accordance with these industry standards and acceptance criteria and used properly, have performed exceptionally well and have protected occupants of decks against falls from the deck.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code change will recognize existing practices in the design and testing of guard systems as specified in ASTM D7032, ICC-ES AC 174 and other industry standards for guard systems and components. Manufacturers with existing products designed and tested to those standards will remain compliant with the IRC and will not need to conduct additional engineering or testing. If this change is not approved, manufacturers may eventually be required to test or design their products for additional load directions, which would substantially increase

Proposal # 4044

RB46-19

RB47-19

IRC®: TABLE R301.5

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

TABLE R301.5 MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS (in pounds per square foot)

USE	LIVE LOAD
Uninhabitable attics without storage ^b	10
Uninhabitable attics with limited storage ^{b, g}	20
Habitable attics and attics served with fixed stairs	30
Balconies (exterior) and decks ^e	40
Fire escapes	40
Guards and handrails^d	200 ^h
Guard in-fill components ^f	50 ^h
Handrails ^d	<u>200^h</u>
Passenger vehicle garages ^a	50 ^a
Rooms other than sleeping rooms	40
Sleeping rooms	30
Stairs	40 ^c

For SI: 1 pound per square foot = 0.0479 kPa, 1 square inch = 645 mm^2 , 1 pound = 4.45 N.

- a. Elevated garage floors shall be capable of supporting a 2,000-pound load applied over a 20square-inch area.
- b. Uninhabitable attics without storage are those where the clear height between joists and rafters is not more than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.
- c. Individual stair treads shall be designed for the uniformly distributed live load or a 300-pound concentrated load acting over an area of 4 square inches, whichever produces the greater stresses.
- d. A single concentrated load applied in any direction at any point along the top. For a guard not required to serve as a handrail, the load need not be applied to the top element of the guard in a direction parallel to such element.
- e. See Section R507.1 for decks attached to exterior walls.
- f. Guard in-fill components (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot. This load need not be assumed to act concurrently with any other live load requirement.
- g. Uninhabitable attics with limited storage are those where the clear height between joists and

rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. The live load need only be applied to those portions of the joists or truss bottom chords where all of the following conditions are met:

- 1. The attic area is accessed from an opening not less than 20 inches in width by 30 inches in length that is located where the clear height in the attic is not less than 30 inches.
- 2. The slopes of the joists or truss bottom chords are not greater than 2 inches vertical to 12 units horizontal.
- Required insulation depth is less than the joist or truss bottom chord member depth.
 The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot.
- h. Glazing used in handrail assemblies and guards shall be designed with a safety factor of 4. The safety factor shall be applied to each of the concentrated loads applied to the top of the rail, and to the load on the in-fill components. These loads shall be determined independent of one another, and loads are assumed not to occur with any other live load.

Reason: The purpose of this proposal is to revise the load on guard systems for one- and two-family dwellings to align with common industry practice. Extensive discussion has occurred in recent code cycles on load requirements and details for guard systems on decks accessory to one- and two-family dwellings. In particular, the directions in which the 200 pound guard load needs to be applied has been a topic of debate. The IRC and IBC define a guard as "a building component or a system of building components located near the open sides of elevated walking surfaces that minimizes the possibility of a fall from the walking surface to the lower level." The ASCE 7 definition of a guardrail system is very similar. Clearly, a fall from the edge of an unprotected deck to the ground, which can be as much as 10 feet or more, carries a much greater risk of injury than a fall backwards onto the surface of the deck, which is only a few feet.

Further, a guard system can be constructed without a handrail, as under both the IRC and IBC a handrail is only required at a flight of stairs, a ramp, a stepped aisle, or a ramped aisle. Nor is the top rail of a guard system required to be graspable by occupants of a deck or other elevated walking surface, unless the guard is specifically designed to also serve as a handrail. In fact, a guard need not even have a top rail unless specifically required by the codes or the reference standards for guard systems, or desired as part of the design of the guard system.

As such, industry standards such as ASTM D7032 for wood and plastic composite decks boards and guards (referenced in both the IBC and IRC) and code evaluation acceptance criteria such as ICC-ES AC 174 for deck boards and guardrails, call for applying the 200 pound load in the outward and downward directions only, representing the most significant loads on a guard and the most significant directions in which a fall need be prevented. Since by code a guard need not meet the requirements of a handrail, these standards and criteria do not require the 200 pound load be applied in-line along the top of the rail. Despite this apparent deviation from the IRC, IBC and ASCE 7 load requirements, thousands of guard systems, when designed, tested, and constructed in accordance with these industry standards and acceptance criteria and used properly, have performed exceptionally well and have protected occupants of decks against falls from the deck.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code change will recognize existing practices in the design and testing of guard systems as specified in ASTM D7032, ICC-ES AC 174 and other industry standards for guard systems and components. Manufacturers with existing products designed and tested to those standards will remain compliant with the IRC and will not need to conduct additional engineering or testing. If this change is not approved, manufacturers may eventually be required to test or design their products for additional load directions, which would substantially increase

Proposal # 4125

RB47-19

RB48-19

IRC®: TABLE R301.5

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations (stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

TABLE R301.5

MINIMUM UNIFORMLY DISTRIBUTED AND CONCENTRATED LIVE LOADS (in pounds per square foot)

	UNIFORM LIVE LOAD	CONCENTRATED LOAD
OCCUPANCY OR USE		
	<u>(psf)</u>	<u>(lbs)</u>
Uninhabitable attics without storage ^b	10	<u>-</u>
Uninhabitable attics with limited storage ^{b, g}	20	<u>-</u>
Habitable attics and attics served with fixed stairs	30	-
Balconies (exterior) and decks ^e	40	-
Fire escapes	40	<u>-</u>
Guards and handrails ^d	200	<u>200^h</u>
Guard in-fill components ^f	50	<u>50^h</u>
Passenger vehicle garages ^a	50 ^a	<u>2,000^a</u>
Rooms other than sleeping rooms	40	-
Sleeping rooms	30	-
Stairs	40 ^c	<u>300^c</u>

For SI: 1 pound per square foot = 0.0479 kPa, 1 square inch = 645 mm^2 , 1 pound = 4.45 N.

- a. Elevated garage floors shall be capable of supporting <u>the uniformly distributed live load or</u> a 2,000-pound load applied over a 20-square-inch area. <u>concentrated load applied on an area of 4</u> <u>1/2 inches by 4 1/2 inches, whichever produces the greater stresses.</u>
- b. Uninhabitable attics without storage are those where the clear height between joists and rafters is not more than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.
- c. Individual stair treads shall be designed for <u>capable of supporting</u> the uniformly distributed live load or a 300-pound concentrated load acting over <u>applied on</u> an area of 4 square <u>2 inches by 2</u> inches, whichever produces the greater stresses.
- d. A single concentrated load applied in any direction at any point along the top.
- e. See Section R507.1 for decks attached to exterior walls.
- f. Guard in-fill components (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1

square foot. This load need not be assumed to act concurrently with any other live load requirement.

g. Uninhabitable attics with limited storage are those where the clear height between joists and rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses.

The live load need only be applied to those portions of the joists or truss bottom chords where all of the following conditions are met:

- 1. The attic area is accessed from an opening not less than 20 inches in width by 30 inches in length that is located where the clear height in the attic is not less than 30 inches.
- 2. The slopes of the joists or truss bottom chords are not greater than 2 inches vertical to 12 units horizontal.
- 3. Required insulation depth is less than the joist or truss bottom chord member depth.

The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot.

h. Glazing used in handrail assemblies and guards shall be designed with a safety load adjustment factor of 4. The safety load adjustment factor shall be applied to each of the concentrated loads applied to the top of the rail, and to the load on the in-fill components. These loads shall be determined independent of one another, and loads are assumed not to occur with any other live load.

Reason: As currently presented, the title of Table R301.5 states that loads shown are uniformly distributed and are listed in pounds per square foot. This is incorrect as the guardrail and handrail loads shown are intended as concentrated loads. By splitting the loads into two columns, the Live Load table will more accurately represent the necessary information. It will also allow for loads only previously noted in the footnotes to be incorporated into the body of the table. These changes will make the IRC Live Load table more closely match the format and values of the ASCE7 and IBC Live Load tables.

The language added to the footnote regarding garage slab design is intended to reiterate that both the uniform load condition as well as the concentrated load condition must be evaluated to determine the most severe case. This footnote will now more closely match that of the similar note indicated for determining the proper design load conditions for stair treads.

The has been much confusion regarding the use of of the words 'safety factor' when dealing with glazing used as handrails, guards, and infill components. 'Safety factors' and the use of them can be confusing as to whether you are using them from the load side or from the material strength side of the design. By changing the word 'safety' to 'load adjustment', it should be more apparent that the intent is to multiply the minimum design load found in the table by the factor indicated.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The modified language is only intended to clarify existing requirements.

Proposal # 4600

RB48-19

RB49-19

IRC®: TABLE R301.5

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations (stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

TABLE R301.5

MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS (in pounds per square foot, unless otherwise noted)

USE	LIVE LOAD
Uninhabitable attics without storage ^b	10
Uninhabitable attics with limited storage ^{b, g}	20
Habitable attics and attics served with fixed stairs	30
Balconies (exterior) and decks ^e	40
Fire escapes	40
Guards and handrails ^d	200 ^h
Guard in-fill components ^f	50 ^h
Passenger vehicle garages ^a	50 ^a
Rooms other than sleeping rooms	40
Sleeping rooms	30
Stairs	40 ^c

For SI: 1 pound per square foot = 0.0479 kPa, 1 square inch = 645 mm², 1 pound = 4.45 N.

- Elevated garage floors shall be capable of supporting <u>the uniformly distributed live load or</u> a
 2,000-pound load applied over a 20-square inch area. <u>concentrated load applied on an area of 4</u> <u>1/2 inches by 4 1/2 inches, whichever produces the greater stresses.</u>
- b. Uninhabitable attics without storage are those where the clear height between joists and rafters is not more than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.
- Individual stair treads shall be designed for capable of supporting the uniformly distributed live load or a 300-pound concentrated load acting over applied on an area of 4 square 2 inches by 2 inches, whichever produces the greater stresses.
- d. A single concentrated load applied in any direction at any point along the top.
- e. See Section R507.1 for decks attached to exterior walls.
- f. Guard in-fill components (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot. This load need not be assumed to act concurrently with any other live load requirement.

g. Uninhabitable attics with limited storage are those where the clear height between joists and rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses.

The live load need only be applied to those portions of the joists or truss bottom chords where all of the following conditions are met:

- 1. The attic area is accessed from an opening not less than 20 inches in width by 30 inches in length that is located where the clear height in the attic is not less than 30 inches.
- 2. The slopes of the joists or truss bottom chords are not greater than 2 inches vertical to 12 units horizontal.
- 3. Required insulation depth is less than the joist or truss bottom chord member depth.

The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot.

Glazing used in handrail assemblies and guards shall be designed with a safety load adjustment factor of 4. The safety load adjustment factor shall be applied to each of the concentrated loads applied to the top of the rail, and to the load on the in-fill components. These loads shall be determined independent of one another, and loads are assumed not to occur with any other live load.

Reason: The language added to the title of the Table simply indicates that the table contains values other than 'pounds per square foot'.

The language added to the footnote regarding garage slab design is intended to reiterate that both the uniform load condition as well as the concentrated load condition must be evaluated to determine the most severe case. This footnote will now more closely match that of the similar note indicated for determining the proper design load conditions for stair treads.

The has been much confusion regarding the use of of the words 'safety factor' when dealing with glazing used as handrails, guards, and infill components. 'Safety factors' and the use of them can be confusing as to whether you are using them from the load side or from the material strength side of the design. By changing the word 'safety' to 'load adjustment', it should be more apparent that the intent is to multiply the minimum design load found in the table by the factor indicated.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The modified language is only intended to clarify existing requirements.

Proposal # 4599

RB49-19

RB50-19

IRC®: TABLE R301.5

Proponent: Jonathan Siu, representing City of Seattle Department of Construction and Inspections (Jon.Siu@seattle.gov)

2018 International Residential Code

Revise as follows:

TABLE R301.5

MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS (in pounds per square foot)

Portions of table not shown remain unchanged.

USE	LIVE LOAD
Balconies (exterior) and decks ^e	40 <u>60ⁱ</u>

For SI: 1 pound per square foot = 0.0479 kPa, 1 square inch = 645 mm^2 , 1 pound = 4.45 N.

- a. Elevated garage floors shall be capable of supporting a 2,000-pound load applied over a 20square-inch area.
- b. Uninhabitable attics without storage are those where the clear height between joists and rafters is not more than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.
- c. Individual stair treads shall be designed for the uniformly distributed live load or a 300-pound concentrated load acting over an area of 4 square inches, whichever produces the greater stresses.
- d. A single concentrated load applied in any direction at any point along the top.
- e. See Section R507.1 for decks attached to exterior walls.
- f. Guard in-fill components (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot. This load need not be assumed to act concurrently with any other live load requirement.
- g. Uninhabitable attics with limited storage are those where the clear height between joists and rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. The live load need only be applied to those portions of the joists or truss bottom chords where all of the following conditions are met:
 - 1. The attic area is accessed from an opening not less than 20 inches in width by 30 inches in length that is located where the clear height in the attic is not less than 30 inches.
 - 2. The slopes of the joists or truss bottom chords are not greater than 2 inches vertical to 12 units horizontal.
 - 3. Required insulation depth is less than the joist or truss bottom chord member depth.

The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot.

- h. Glazing used in handrail assemblies and guards shall be designed with a safety factor of 4. The safety factor shall be applied to each of the concentrated loads applied to the top of the rail, and to the load on the in-fill components. These loads shall be determined independent of one another, and loads are assumed not to occur with any other live load.
- i. <u>Where structural tables in Section R507 only specify snow loads, the values corresponding to 70</u> psf snow loads shall be used.

Reason: The purpose of this code change proposal is to align the IRC deck and balcony live load with the IBC and ASCE 7.

The new Footnote i is intended to coordinate this proposal with new tables for deck structure (beams, columns, and footings) we understand are being proposed by others. It is based on a discussion with one of the people who was involved with the development of the new tables.

While we realize this is a controversial issue, it is our opinion and judgment that there is no reason why the IRC should <u>not</u> align with IBC and ASCE 7, for the reasons following. For those who have not participated in the history of the issue, a summary of how we got to where we are is also below.

- ASCE 7 is the proper forum to debate and deliberate what live loads should be—they are the acknowledged experts. Deviating from ASCE 7 is substituting ICC's judgment for the experts' judgment.
- ASCE determined through their deliberative process 1.5 times the live load served is the prudent design live load.
- For all intents and purposes, what the IRC is doing is amending the reference standard—a practice that is frowned on in this process, unless it's absolutely necessary.
- Deviating from ASCE 7 in this case is the beginnings of a slippery slope for other cases—on what basis do we decide to maintain or amend the current live load values for other areas of the building?
- Opposing arguments essentially revolve around "show me the bodies—we don't have a history of failures." Our counter to that is, this is a life-safety issue. Do we need or want to have bodies to show before we fix it?

History: For the first 3 versions of the IBC and IRC (2000 through 2006), deck and balcony live loads were separate items. In the IRC, decks were designed for 40 psf, and balconies were designed for 60 psf. The difference between decks and balconies was their supporting structure—decks were supported by posts, and balconies were cantilevered from the building.

In the 2009 IBC and IRC, through code change S9-06/07, the difference in live loads between decks and balconies was eliminated on the basis that how a structure is used should dictate the live load, not the support condition. Although several live loads were proposed for decks and balconies, through the code development process, both the IBC and the IRC ended up with a requirement for 40 psf.

During the development of the 2010 version of ASCE 7, in an attempt to keep IBC/IRC and ASCE 7 aligned, we submitted a proposal to the ASCE process to consolidate the deck and balcony loads into one item, and to change the deck and balcony live load to 40 psf. In their deliberative process, it became clear that in the professional judgment of many members of the relevant ASCE 7 committees, 40 psf was too low. While several live load proposals were suggested and debated, the proposal that everyone could agree on set deck and balcony live loads at 1.5 times the live load of the area served.

For the 2018 IBC, code change S85-16, submitted by ASCE, realigned the IBC deck and balcony loading with ASCE 7. For the 2018 IRC, the City of Seattle Department of Construction and Inspections (SDCI) and the Washington Association of Building Officials Technical Code Development Committee (WABO TCD) submitted proposals to realign IRC deck and balcony live loads with ASCE 7. Code change proposal R26-16 (SDCI's

submittal) set the live load at 1.5 times the area served, exactly as determined through the ASCE 7 process. Code change proposal R27-16 (WABO TCD's proposal) took a more simplified approach and set the live load at 60 psf—1.5 times the normal residential live load of 40 psf. The IRC-Building Committee gave direction that the more simplified approach was preferred, but disapproved R27-16 as well, partly because the prescriptive tables for deck/balcony structure had not been updated. SDCI and WABO TCD submitted a public comment on R27-16 to update the relevant tables, which received the necessary 2/3 majorities on the two votes to approve the modified item at the Public Comment Hearings. However, the proposal was ultimately disapproved through the subsequent online vote.



Cost Impact: The code change proposal will increase the cost of construction

As stated, increasing the live load will increase costs. The question is, how much? A full parametric study of every size, shape, and configuration of decks is not practical, as there are too many variables. However, there are several ways to show what the differences might be between a 40 psf design and a 60 psf design, which then leads to costs.

Case Studies

Using the tables in the 2018 IRC and the tables being proposed by others for the deck structure, I looked at two very simple designs, and compared the results for 40 psf live load with a 60 psf live load (= 70 psf ground snow load).

- Case 1 (see Fig. 1) 10'x20' elevated deck. Height = 9'. Joists span 8', with a 2' cantilever. Two beams each spanning 10' support the cantilevered end of the joists. The other end of the joists is supported by a ledger with ½" through-bolts and assume 1" of sheathing. Wood species assumed to be Hem-Fir (typical in the Pacific Northwest).
- **Case 2 (see Fig. 2)** 10'x15' elevated deck. Everything is the same as Case 1, except instead of using two beams spanning 10' between posts, a single beam spans 10' between posts with 2'-6" cantilevers at each end to support the cantilevered end of the joists.

[INSERT FIGURES HERE] Results:

Case 1

	40 psf Live Load	60 psf Live Load/ 70 psf Ground Snow Load
Joists	2x8 @ 24" o.c.	2x8 @ 24" o.c.
Beams	3-2x10	3-2x12
Ledger bolt	36" o.c.	26" o.c.
spacing		
Posts		
Outer	4x4	4x4
Center	4x4	4x6 ¹
Footings		
Outer	14" x 14" x 6"	18" x 18" x 6"
Center	17" x 17" x 6"	21" x 21" x 8"

1. Max. height for 4x4 = 7'-11''.

Case 2

	40 psf Live Load	60 psf Live Load/ 70 psf Ground Snow Load
Joists	2x8 @ 24" o.c.	2x8 @ 24" o.c.
Beams	3-2x10	3-2x12
Ledger bolt	36" o.c.	26" o.c.
spacing		
Posts	4x4	4x4
Footings	14" x 14" x 6"	18" x 18" x 6"

Conclusions:

For these two case studies, the biggest impacts are to ledger bolt spacing and footing sizes. Other differences are nominal, and in a few cases, no change in structure is required.

Another way to look at cost impacts is to compare what would be allowed for the various components allowable beam and joist spans, required ledger connection spacing, allowable post heights, and required footing sizes. Based on the IRC and proposed tables by others:

Maximum Joist Spans:

To get the same maximize joist spans as allowed for 40 psf live loads, in general, the increased live load would require either one joist size larger, or one step tighter spacing. For example, a 2x8 HF joist is allowed

to span 9'-1" at 24" o.c. when loaded at 40 psf. For 60 psf, the joists would need to be upsized to a 2x10 at 24" o.c., or 2x8s at 16" o.c. could be used. Note that tighter spacing may already be required for allowable deck board spans.

Maximum Beam Spans:

In general, at 60 psf, larger beam depths or more members will be required to achieve the same spans as for 40 psf loads. For example, a beam needed to span 8' between supports and supporting the 9'-1 span allowed for 2x8 HF joists at 40 psf would need to be a 3-2x10. A 3-2x12 would be required at 60 psf.

Ledger Bolt Spacing

Given the table structure, there's not much that can be done to match ledger bolt spacing between 40 and 60 psf loads. The only way to match them is to reduce joist spans or sheathing thickness under 60 psf loads, neither of which is practical.

Allowable Post Heights

To achieve the same post heights for 40 psf when designing for 60 psf, in most cases, either post size must increase or tributary area must be decreased (=> add more posts). However, as post sizes get larger, fewer adjustments are needed. For example, a 4x4 HF post is allowed up to a 9'-3" height, at 40 psf with a tributary area of 80 square feet. At 60 psf, a 6x6 is required if the tributary remains the same, but 4x4s can still be used if the tributary area is halved. A 4x6 post with 60 square feet of tributary area will also work at 60 psf. Other combinations of post size increases and reduced tributary areas can be used.

Footing Size

Given the table structure, similar to posts, tributary areas must be reduced (=> more footings) in order for footings supporting 60 psf to be a similar size as those supporting 40 psf loads. The amount of reduction varies considerably, depending on the tributary area and the soil bearing allowable. For example, a footing supporting 60 square feet of tributary area at 40 psf load and 1500 psf bearing is required to be 17"x17"x6". At 60 psf live load, a 18"x18"x6" footing is required for 40 square feet of tributary area.

Conclusions:

If the desire is for a 60 psf live load design to maintain the maximum spans and heights for 40 psf live load, as well as the minimum footing sizes, member sizes or numbers of members will need to be increased. How much depends on the particulars of the design.

Proposal # 4343

RB50-19

RB51-19

IRC®: R301.6

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations (stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

R301.6 Roof load. The roof shall be designed for the live load indicated in Table R301.6 or the <u>ground</u> snow load indicated in Table R301.2(1), whichever is greater.

Reason: Table R301.2(1) lists only a value for 'ground snow load', not 'snow load', nor does a method exist to make the conversion between the two values and to direct the user to the proper value.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The modified language is intended to coordinate the two sections.

Proposal # 4602

RB51-19

RB52-19

IRC®: TABLE R301.7

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations (stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

TABLE R301.7 ALLOWABLE DEFLECTION OF STRUCTURAL MEMBERS^{b, c}

STRUCTURAL MEMBER	ALLOWABLEDEFLECTION
Rafters having slopes greater than 3:12 with finished ceiling not attached to rafters	L/180
Interior walls and partitions	H/180
Floors	L/360
Ceilings with brittle finishes (including plaster and stucco)	L/360
Ceilings with flexible finishes (including gypsum board)	L/240
All other structural members	L/240
Exterior walls—wind loads ^a with plaster or stucco finish	H/360
Exterior walls—wind loads ^a with other brittle finishes	H/240
Exterior walls—wind loads ^a with flexible finishes	H/120 ^d
Lintels supporting masonry veneer walls ^e	L/600

Note: L = span length, H = span height.

- a. For the purpose of the determining deflection limits herein, the wind load shall be permitted to be taken as 0.7 times the component and cladding (ASD) loads obtained from Table R301.2(2).
 b For cantilever members, *L* shall be taken as twice the length of the cantilever.
- c. For aluminum structural members or panels used in roofs or walls of sunroom additions or patio covers, not supporting edge of glass or sandwich panels, the total load deflection shall not exceed L/60. For continuous aluminum structural members supporting edge of glass, the total load deflection shall not exceed L/175 for each glass lite or L/60 for the entire length of the member, whichever is more stringent. For sandwich panels used in roofs or walls of sunroom additions or patio covers, the total load deflection shall not exceed L/120.
- d. Deflection for exterior walls with interior gypsum board finish shall be limited to an allowable deflection of *H*/180.
- e. Refer to Section R703.8.2. <u>Dead load of supported materials shall be included when calculating</u> the deflection of these members.

Reason: The section which references this Table (Section R301.7) indicates that the Table contains the deflection limits when a member is subjected to live, snow, and/or wind loads. However, the section referenced by footnote 'e' (Section R703.8.2) notes that the weight of the material shall be considered in the design and limits the member deflection to L/600. The addition to the footnote simply clarifies the requirement in this specific case and eliminates conflicting information.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The modified language is only intended to clarify existing requirements.

Proposal # 4603

RB53-19

IRC®: R302.1, [RB] 202

Proponent: David Renn, PE, SE, City and County of Denver, representing Code Change Committee of Colorado Chapter of ICC (david.renn@denvergov.org)

2018 International Residential Code

Revise as follows:

R302.1 Exterior walls. Construction, projections, openings and penetrations of *exterior walls* of *dwellings*. <u>townhouses</u> and accessory buildings shall comply with Table R302.1(1); or *dwellings* and <u>townhouses</u> equipped throughout with an *automatic sprinkler system* installed in accordance with Section P2904 shall comply with Table R302.1(2).

Exceptions:

- 1. Walls, projections, openings or penetrations in walls perpendicular to the line used to determine the *fire separation distance*.
- 2. Walls of *individual dwelling units* and their *accessory structures* located on the same *lot*.
- 3. Detached tool sheds and storage sheds, playhouses and similar structures exempted from permits are not required to provide wall protection based on location on the *lot*. Projections beyond the *exterior wall* shall not extend over the *lot line*.
- 4. Detached garages accessory to a *dwelling <u>or townhouse</u>* located within 2 feet (610 mm) of a *lot line* are permitted to have roof eave projections not exceeding 4 inches (102 mm).
- 5. Foundation vents installed in compliance with this code are permitted.

[RB] FIRE SEPARATION DISTANCE. The distance measured from the building face to one of the following:

- 1. To the closest interior *lot line*.
- 2. To the centerline of a street, an alley or public way.
- 3. To an imaginary line between two buildings <u>or *townhouses*</u> on the *lot*.

The distance shall be measured at a right angle from the face of the wall.

Reason: Prior to the 2015 IRC, Section R302.2 required each townhouse to be considered a separate building and be separated by fire-resistance-rated walls meeting requirements for exterior walls, with an exception to provide a fire-resistance-rated common wall. The 2015 IRC revised this section to only deal with common walls and a reference to exterior walls was removed. Since R302.1 only requires fire-resistance-rated exterior walls for *dwellings* and accessory buildings, all townhouse exterior wall requirements were essentially removed from the code since a townhouse does not meet the definition of a *dwelling*. Prior to 2015 IBC, an imaginary line would be established between each townhouse since they were considered separate buildings and fire separation distance would be measured to the imaginary line, and it is believed that most juristictions still enforce this way.

This proposal brings back the 2012 townhouse exterior wall requirements that are assumed to have been inadvertently removed from the code. It does this by adding townhouses to the scoping of R302.1 for exterior walls and by revising the definition of fire separation distance to include imaginary lines between townhouses (rather than calling townhouses separate buildings, which they are not). Townhouse exterior walls that are adjacent to lot lines would meet exterior wall requirements based on fire separation distance to the lot lines. Townhouse exterior walls that are adjacent to other townhouses, would meet exterior wall requirements based on fire separation distance to the imaginary line between two townhouses. See Figures 1 and 2 below for

application examples for this proposal. This proposal is necessary to fill the current hole in the code regarding exterior wall requirements for townhouses.



FIGURE 1 - IMAGINARY LINES BETWEEN TOWNHOUSES



A = FSD FOR WALL G1 B = FSD FOR WALL G2 C = FSD = 0 FOR WALL H1 D = FSD FOR WALL H2 E = FSD FOR EXTENDING STORY WALL G3 F = FSD FOR EXTENDING STORY WALL G4 G = FSD FOR EXTENDING STORY WALL H3 H = FSD = 0 FOR WALL G5

FIGURE 2 - EXAMPLE FIRE SEPARATION DISTANCES

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal brings back previous code requirements that I believe are currently being enforced due to the lack of specific townhouse exterior wall requirements in the current code, so there should be no increase or decrease in the cost of construction.

Proposal # 4161

RB53-19

RB54-19

IRC®: R302.1

Proponent: Ronald Clements Jr, representing Chesterfield County (clementsro@chesterfield.gov)

2018 International Residential Code

Revise as follows:

R302.1 Exterior walls. Construction, projections, openings and penetrations of *exterior walls* of *dwellings* and accessory buildings shall comply with Table R302.1(1); or *dwellings* equipped throughout with an *automatic sprinkler system* installed in accordance with Section P2904 shall comply with Table R302.1(2).

Exceptions:

- 1. Walls, projections, openings or penetrations in walls perpendicular to the line used to determine the *fire separation distance*.
- 2. Walls of *individual dwelling units* and their *accessory structures* located on the same *lot*.
- 3. Detached tool sheds and storage sheds, playhouses and similar structures exempted from permits are not required to provide wall protection based on location on the *lot*. Projections beyond the *exterior wall* shall not extend over the *lot line*.
- 4. Detached garages accessory to a *dwelling* located within 2 feet (610 mm) of a *lot line* are permitted to have roof eave projections not exceeding 4 inches (102 mm).
- 5. Foundation vents installed in compliance with this code are permitted.
- 6. Walls of dwellings and accessory structures located on lots in subdivisions or zoning districts where building setbacks established by local ordinance prohibit the walls of the structures on adjacent lots from being closer than 10 feet (3048 mm) to each other at any point along the exterior walls.

Reason: It has become a routine process to issue building code modifications on a sub-division wide basis to allow dwellings on adjacent lots to be constructed without the fire-resistance rating required by R302 because the local zoning ordinance prohibits dwellings from being closer than 10 feet from each other. The zoning ordinance established set-backs effectively satisfy the intent of the code.

Cost Impact: The code change proposal will decrease the cost of construction

There is no cost impact for localities already allowing this through code modification. For localities not allowing through modification I would estimate \$1000 to \$5000

depending on the size and configuration of the wall required to be fire rated.

Proposal # 5608

RB54-19

RB55-19

IRC®: R302.1, TABLE R302.1(1)

Proponent: Terry Kozlowski, representing Southern Nevada Chapter; Amanda Moss, representing SN-ICC Member; Cassidy Wilson, representing SN-ICC Member; Valarie Evans, representing Southern Nevada Chapter

2018 International Residential Code

Revise as follows:

R302.1 Exterior walls. Construction, projections, openings and penetrations of *exterior walls* of *dwellings* and accessory buildings shall comply with Table R302.1(1); or *dwellings* equipped throughout with an *automatic sprinkler system* installed in accordance with Section P2904 shall comply with Table R302.1(2). For use of this Table, fire separation distance in the field shall be measured from the lot line to the foundation.

Exceptions:

- 1. Walls, projections, openings or penetrations in walls perpendicular to the line used to determine the *fire separation distance*.
- 2. Walls of *individual dwelling units* and their *accessory structures* located on the same *lot*.
- 3. Detached tool sheds and storage sheds, playhouses and similar structures exempted from permits are not required to provide wall protection based on location on the *lot*. Projections beyond the *exterior wall* shall not extend over the *lot line*.
- 4. Detached garages accessory to a *dwelling* located within 2 feet (610 mm) of a *lot line* are permitted to have roof eave projections not exceeding 4 inches (102 mm).
- 5. Foundation vents installed in compliance with this code are permitted.

EXTERIO ELEN	R WALL IENT	MINIMUMFIRE-RESISTANCE RATING	MINIMUM FIRESEPARATION DISTANCE
Walls	Fire- resistance rated	1 hour—tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code with exposure from both sides	0 feet
vvalis	Not fire- resistance rated	0 hours	≥ 5 feet
	Not allowed	NA	< 2 feet
Projections	Fire- resistance rated	1 hour on the underside, or heavy timber, or fire-retardant- treated wood ^{a, b}	≥ 2 feet to < 5 feet
	Not fire- resistance rated	0 hours ^c	≥ 5 feet
	Not allowed	NA	< 3 feet

TABLE R302.1(1) EXTERIOR WALLS

Oneninas in

walls	25% maximum of wall area	0 hours	3 feet
	Unlimited	0 hours	5 feet
Depatrationa	A II	Comply with Section R302.4	< 3 feet
renetrations	All	None required	3 feet

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

- a. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave overhang if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
- b. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the rake overhang where gable vent openings are not installed.
- c. <u>Non rated exterior walls finishes shall not project more than 4 inches into the fire separation</u> <u>distance.</u>

Reason: Footnote (c) allows for non-rated exterior wall finishes to project not more than 4 inches into the fire separation distance. Chapter 2 – Defines exterior wall covers as "A material or assembly of materials applied on the exterior side of exterior walls for the purpose of providing a weather-resistive barrier, insulation or for aesthetics, including but not limited to, veneers, siding, exterior insulation and finish systems, architectural trim and embellishments such as cornices, soffits, and fascias."

Chapter 2 defines "fire separation distance" and requires the measurements to be taken from the lot line to the building face. For use of this table, field measurements shall be taken from the lot line to the foundation and not the building face.

This proposed amendment changes Table 302.1 (1) to provide a specific dimension to building face in footnote (c).

This proposed amendment will allow builders who have parcels with 5 foot building setbacks to the property line to construct buildings without the requirement for fire-resistant construction.

Cost Impact: The code change proposal will not increase or decrease the cost of construction .This code proposal does not increase or decrease the cost of construction. It only provides clarity on the intent of the code language.

Proposal # 4339

RB55-19

RB56-19

IRC®: R302.2.2

Proponent: David Renn, PE, SE, City and County of Denver, representing City and County of Denver (david.renn@denvergov.org)

2018 International Residential Code

Revise as follows:

R302.2.2 Common walls. Common walls separating *townhouses* shall be assigned a fire-resistance rating in accordance with Item 1 or 2. <u>2</u> and shall be rated for fire exposure from both sides. Common walls shall extend to and be tight against the exterior sheathing of the exterior walls, or the inside face of exterior walls without stud cavities, and the underside of the roof sheathing. The common wall shared by two *townhouses* shall be constructed without plumbing or mechanical equipment, ducts or vents in the cavity of the common wall. The wall shall be rated for fire exposure from both sides and shall extend to and be tight against exterior walls and the underside of the roof sheathing. Electrical installations shall be in accordance with Chapters 34 through 43. Penetrations of the membrane of common walls for electrical outlet boxes shall be in accordance with Section R302.4.

- 1. Where a fire sprinkler system in accordance with Section P2904 is provided, the common wall shall be not less than a 1-hour fire-resistance-rated wall assembly tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code.
- 2. Where a fire sprinkler system in accordance with Section P2904 is not provided, the common wall shall be not less than a 2-hour fire-resistance-rated wall assembly tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code.

Exception: Common walls are permitted to extend to and be tight against the inside of the exterior walls if the cavity between the end of the common wall and the exterior sheathing is filled with a minimum of two two-inch nominal thickness wood studs.

Reason: The code currently allows a townhouse common wall to stop at the interior face of the exterior wall, which can create a path for a fire to spread from one townhouse to the next through the exterior wall. A typical common wall construction is two layers of gypsum board in metal H-studs that are connected to stud walls on either side for stability only, with a gap between the gypsum board and the stud walls. With the gap in this configuration, there is a path a fire can take that is only protected by two layers of 1/2" non-classified gypsum board (or other sheathing) - one on the stud wall adjacent to the common wall on the fire side and one on the same wall of the adjacent townhouse. Two layers of 1/2" gypsum board only provides approximately 30 minutes of fire protection until a fire can spread to the next townhouse. See figure below for clarification of this type of common wall construction.

This proposal requires common walls to continue to the exterior sheathing of the exterior wall, which will eliminate the path of fire described above and will provide the intended fire rating duration of the common wall. For solid exterior walls, such as concrete or masonry, this proposal allows common walls to stop at the inside face since a path for fire to spread from townhouse to townhouse doesn't exist in a solid exterior wall. The exception allows (2) 2x wood studs to be used to extend the common wall through the exterior wall stud cavity. Typical wood studs have a char rate of approximately 1.5" per hour, so this provides the required fire-resistance rating of the common wall.



Cost Impact: The code change proposal will not increase or decrease the cost of construction The common wall extent requirement in this proposal is the typical way common walls are constructed, so there should be no change in construction or cost of construction.

Proposal # 4297

RB56-19

RB57-19

IRC®: R302.2

Proponent: Jeffrey Shapiro, P.E., representing Self (jeff.shapiro@intlcodeconsultants.com)

2018 International Residential Code

Revise as follows:

R302.2 Townhouses. Walls separating townhouse units shall be constructed in accordance with Section R302.2.1 or R302.2.2, and shall comply with Sections 302.2.3 through 302.2.5.

Reason: Sections 302.2.3 through 302.2.5 also apply to townhouse wall construction. It is appropriate for these sections to be referenced by the introductory section on townhouses, which is focused on townhouse walls.

Cost Impact: The code change proposal will not increase or decrease the cost of construction Clarifies existing requirements.

Proposal # 5692

RB57-19

RB58-19

IRC®: TABLE R302.1(1), TABLE R302.1(2)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

EXTERIC	OR WALL MENT	MINIMUMFIRE-RESISTANCE RATING	MINIMUM FIRESEPARATION DISTANCE
	Fire- resistance rated	1 hour—tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code with exposure from both sides	0 feet
vvaiis	Not fire- resistance rated	0 hours	≥ 5 feet
	Not allowed	NA	< 2 feet
Projections	Fire- resistance rated	1 hour on the underside, or heavy timber, or fire-retardant- treated wood ^{a, b}	≥ 2 feet to < 5 feet
	Not fire- resistance rated	0 hours	≥ 5 feet
	Not allowed	NA	< 3 feet
Openings in walls	25% maximum of wall area	0 hours	3 feet
	Unlimited	0 hours	5 feet
Popotrationa	All	Comply with Section R302.4	< 3 feet
Penetrations	All	None required	3 feet

TABLE R302.1(1) EXTERIOR WALLS

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

- a. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave overhang if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
- b. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the rake overhang where gable vent openings are not installed in the overhang or in any gable end walls that are common to attic areas.

TABLE R302.1(2) EXTERIOR WALLS—DWELLINGS WITH FIRE SPRINKLERS

EXTERIO ELEM	R WALL ENT	MINIMUMFIRE-RESISTANCE RATING	MINIMUM FIRESEPARATION DISTANCE
Walla	Fire- resistance rated	1 hour—tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code with exposure from the outside	0 feet
Walls	Not fire- resistance rated	it fire- stance 0 hours ated	
	Not allowed	NA	< 2 feet
Projections	Fire- resistance rated	1 hour on the underside, or heavy timber, or fire-retardant- treated wood ^{b, c}	2 feet ^a
	Not fire- resistance rated	0 hours	3 feet
Openings in walls	Not allowed	NA	< 3 feet
	Unlimited	0 hours	3 feet ^a
Penetrations	A 11	Comply with Section R302.4	< 3 feet
		None required	3 feet ^a

For SI: 1 foot = 304.8 mm.

NA = Not Applicable.

- a. For residential subdivisions where all dwellings are equipped throughout with an automatic sprinkler system installed in accordance with Section P2904, the fire separation distance for exterior walls not fire-resistance rated and for fire-resistance-rated projections shall be permitted to be reduced to 0 feet, and unlimited unprotected openings and penetrations shall be permitted, where the adjoining lot provides an open setback yard that is 6 feet or more in width on the opposite side of the property line.
- b. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave overhang if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
- c. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the rake overhang where gable vent openings are not installed in the overhang or in any gable end walls that are common to attic areas.

Reason: Staff continues to get questions regarding these footnotes. The existing language remains unclear, despite recent attempts to fix it. Ray Allshouse, the proponent of the code change that brought this language into the code, was contacted. He indicated that the intent was that if there were no vents at the underside of the overhang, or in any gable end walls (both of which would allow fire to freely move into attic areas), then there should be no requirement to rate the underside of the overhang. Mr. Allshouse also indicated that this concept could be applied gable, hip and any other roof style with overhangs. Where additional attic ventilation is required to make up for the loss of vents at overhangs where fire-separation distance is an issue in accordance these tables and footnotes, additional vents could be added at the underside of eaves in other areas of the dwelling

where the fire-separation distance is not an issue, or at roof ridges.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on theBCAC website at: https://www.iccsafe.org/codes-tech-support/codes/code-development-process/building-code-action-committee-bcac/.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This code change is a clarification of current code requirements.

Proposal # 4132

RB59-19

IRC®: R302.2.3.1 (New)

Proponent: Kirk Nagle, representing Myself (knagle@auroragov.org)

2018 International Residential Code

Add new text as follows:

R302.2.3.1 Occupied Roof Rated Separation. Townhome separation, where the roof is intended to be occupied, shall continue the common wall between units to a height of 8 feet above the walking surface with a minimum one hour fire-resistance-rated wall assembly tested in accordance with ASTM E119, UL 263 or Section 703.3 of the *International Building Code* and shall have noncombustable faces for the uppermost 18 inches (457 mm), including counterflashing and coping materials.

Reason: Occupied roofs are a new building element that has the potiential to cause connected townhomes to be at a significant risk of fire hazard. In reviewing plans and looking at the current code requirements, the potiential for risk of fire conflagration to involve connected townhome units does not seem to be addressed by the 2018 IRC. Fire data from the NFPA related to fires caused by gas grills alone would suggest that not having some protection to connected units leaves the occupants at risk.People will have the gas grills, charcoal grills and other fire related uses to occur on the occupied roofs. Even when fire sprinklers are installed the potiential fire propagation from one unit to another is not addressed. Loss of life or even just losing the use of a home after a fire is significant. This proposal would help increase the chance that the fire would no involve connect units and allow the fire department response to contain the fire on the original unit. NFPA Report fact sheet U.S. Home Fires Involving Grills

From 2011–2015, U.S. fire departments responded to an average of 9,600 home1 fires involving grills, hibachis, or barbecues

per year. That number included an average of 4,100 structure fires and 5,500 outside or unclassified fires. These 9,600 fires

caused annual averages of 10 civilian deaths, 160 reported civilian injuries, and \$133 million in direct property damage.

ffAlmost all the losses resulted from structure fires.

ffJuly (17%) was the peak month for grill fires, followed by May (14%), June (14%), and August (13%). Three percent of

the fires occurred in each of the winter months of December, January, and February.

Causes of Grill Fires

Gas vs. Solid-Fuel Grills

Five out of six (82%) grills involved in home fires were fueled by gas, while 14% used charcoal or other solid fuel.

Gas grills were involved in an average of 7,900 home fires per year, including 3,300 structure fires and 4,700 outdoor

fires annually. Leaks or breaks were primarily a problem with gas grills. Twelve percent of gas grill structure fires and

24% of outside gas grill fires were caused by leaks or breaks.

Charcoal or other solid-fuel grills were involved in 1,300 home fires per year, including 600 structure fires and 700

outside fires annually.

Fire and Non-Fire Emergency Room Visits Due to Grills

From 2012–2016, an average of 16,600 patients per year went to emergency rooms because of injuries

involving grills.2

Half (8,200 or 49%) of the injuries were thermal burns, including burns both from fire and from contact with hot objects.

About 4,500 of the thermal burns were caused by such contact or other non-fire events.

Children under age 5 accounted for an average of 1,600 or one-third (35%) of the contact-type burns. The burns typically

occurred when someone, often a child, bumped into, touched, or fell on the grill, grill part, or hot coals. Keep children away

from the grill.

Cost Impact: The code change proposal will increase the cost of construction

The cost of construction will be increased but the ammount is not static because it is based on the varibles of the finishes and type of construction.

Proposal # 5671

RB59-19

RB60-19

IRC®: R302.2.6

Proponent: Jeffrey Shapiro, P.E., representing Self (jeff.shapiro@intlcodeconsultants.com)

2018 International Residential Code

Revise as follows:

R302.2.6 Structural independence. Each individual townhouse shall be structurally independent.

Exceptions:

- 1. Foundations supporting *exterior walls* or common walls.
- 2. Structural roof and wall sheathing from each unit fastened to the common wall framing.
- 3. Nonstructural wall and roof coverings.
- 4. Flashing at termination of roof covering over common wall.
- 5. *Townhouses* separated by a common wall as provided in Section R302.2.2, Item 1 or 2.
- 6. *Townhouses* protected by a fire sprinkler system complying with Section P2904 or NFPA 13D.

Reason: The IBC now allows townhouses to be built without structural independence provided that height and area limits for the overall townhouse building are not exceeded. This is true because the firewall requirement to separate units is no longer applicable in such cases. Therefore, only the 1-hour dwelling unit requirement applies, and that assembly is a fire barrier, which has no structural independence requirement. For reference IBC Section 706.1.1, Exception 2 states:

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

It makes no sense for the IRC to be more restrictive than the IBC with respect to requiring structural independence when townhouses are sprinklered.

Disclosure: although I am a consultant to the National Fire Sprinkler Association, this proposal is submitted on my own behalf and was not reviewed or endorsed by NFSA prior to submittal.

Cost Impact: The code change proposal will decrease the cost of construction Construction costs are reduced, consistent with the IBC, based on the allowance to not require structural independence of townhouse units.

Proposal # 5691

RB60-19

RB61-19

IRC®: R302.2.6

Proponent: David Renn, PE, SE, City and County of Denver, representing self (david.renn@denvergov.org)

2018 International Residential Code

Revise as follows:

R302.2.6 Structural independence. Each individual townhouse shall be structurally independent.

Exceptions:

- 1. Foundations supporting *exterior walls* or common walls.
- 2. Structural roof and wall sheathing from each unit fastened to the common wall framing.
- 3. Nonstructural wall and roof coverings.
- 4. Flashing at termination of roof covering over common wall.
- 5. *Townhouses* separated by a common wall as provided in Section R302.2.2, Item 1 or 2.

Reason: The current Exception 2 is for sheathing fastened to common wall framing, which is not necessary since Exception 5 completely exempts townhouses separated by a common wall. In other words, if the townhouse is exempt, the sheathing is also exempt, so Exception 2 is not needed.

Note that there is another proposal to revise Exception 5 to only apply to structural common walls. If this proposal is approved, the deletion of Exception 2 is still valid since there is no reason to fasten sheating to a nonstructural common wall. For this condition, there will be structural framing adjacent to the non-structural common wall to fasten the sheathing to.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal is simply a deletion of a non-relevant exception, so there should be no change to the cost of construction.

Proposal # 5655

RB61-19
RB62-19

IRC®: R302.2.6

Proponent: David Renn, PE, SE, City and County of Denver, representing Code Change Committee of Colorado Chapter of ICC (david.renn@denvergov.org)

2018 International Residential Code

Revise as follows:

R302.2.6 Structural independence. Each individual *townhouse* shall be structurally independent.

Exceptions:

- 1. Foundations supporting *exterior walls* or common walls.
- 2. Structural roof and wall sheathing from each unit fastened to the common wall framing.
- 3. Nonstructural wall and roof coverings.
- 4. Flashing at termination of roof covering over common wall.
- 5. *Townhouses* separated by a <u>structural</u> common wall as provided in Section R302.2.2, Item 1 or 2.

Reason: A regularly used townhouse common wall consists of two layers of 1" thick gypsum panels installed between steel H-studs and these H-studs are connected to stud walls of each townhouse for stability only - the fire-resistance rating is achieved entirely by the two layers of gypsum panels between steel H-studs. This type of common wall is a non-structural wall and for this condition there is no reason to exempt the townhouses from structural independence since floor and roof framing are supported on separate stud walls within each unit.

Cost Impact: The code change proposal will increase the cost of construction

This proposal typically will not change the cost of construction since it clarifies a condition that provides structural independence without cost. However, if the current exemption is used to share lateral loads (wind and seismic) between townhouses, a slight increase in cost may be realized since separate lateral systems will be required for each townhouse.

Proposal # 5103

RB62-19

RB63-19

IRC®: TABLE R302.1(1), TABLE R302.1(2), 302.2.6 (New), 302.2.6.1 (New)

Proponent: Matthew Dobson, representing Suburban Exterior Fire Work Group (mdobson@vinylsiding.org)

2018 International Residential Code

Revise as follows:

EXTERIOR WALL ELEMENT		MINIMUMFIRE-RESISTANCE RATING	MINIMUM FIRESEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code with exposure from both sides	0 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Projections	Not allowed	NA	< 2 feet
	Fire-resistance rated	1 hour on the underside, or heavy timber, or fire- retardant-treated wood ^{a, b}	≥ 2 feet to < 5 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Openings in walls	Not allowed	NA	< 3 feet
	25% maximum of wall area	0 hours	3 feet
	Unlimited	0 hours	5 feet
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	3 feet
<u>Soffits</u> Above Exterior Doors ^c	Fire-resistance rated or comply with Section R302.2.6	1 Hour on underside or prescriptive vented protected soffit complying with Section R302.2.6.1	See footnote c

TABLE R302.1(1) EXTERIOR WALLS

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

- a. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave overhang if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
- b. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the rake overhang where gable vent openings are not installed.
- c. Applies to soffits constructed outside of exterior doors, including garage doors. Applies to the soffit area over doors and extending 3 feet horizontally in both directions from the vertical edges of doors.

TABLE R302.1(2) EXTERIOR WALLS—DWELLINGS WITH FIRE SPRINKLERS

EXTERIOR WALL ELEMENT		MINIMUMFIRE-RESISTANCE RATING	MINIMUM FIRESEPARATION DISTANCE
Walls	Fire- resistance rated	1 hour—tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code with exposure from the outside	0 feet
	Not fire- resistance rated	0 hours	3 feet ^a
Projections	Not allowed	NA	< 2 feet
	Fire- resistance rated	1 hour on the underside, or heavy timber, or fire-retardant- treated wood ^{b, c}	2 feet ^a
	Not fire- resistance rated	0 hours	3 feet
Openings in walls	Not allowed	NA	< 3 feet
	Unlimited	0 hours	3 feet ^a
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	3 feet ^a
<u>Soffits</u> <u>Above</u> <u>Exterior</u> <u>Doors^d</u>	<u>Soffits Outside</u> of Exterior <u>Doors^d</u>	<u>1 hour on underside</u> , or prescriptive vented protected soffit complying with Section R302.2.6.1	See footnote c

For SI: 1 foot = 304.8 mm.

NA = Not Applicable.

- a. For residential subdivisions where all dwellings are equipped throughout with an automatic sprinkler system installed in accordance with Section P2904, the fire separation distance for exterior walls not fire-resistance rated and for fire-resistance-rated projections shall be permitted to be reduced to 0 feet, and unlimited unprotected openings and penetrations shall be permitted, where the adjoining lot provides an open setback yard that is 6 feet or more in width on the opposite side of the property line.
- b. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave overhang if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
- c. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the rake overhang where gable vent openings are not installed.
- d. <u>Applies to soffits constructed outside of exterior doors, including garage doors. Applies to the</u> soffit area over doors and extending 3 feet horizontally in both directions from the vertical edges of doors.

Add new text as follows:

302.2.6 Protected Soffit. Soffit projections above exterior doors shall be 1-hour fire-resistance-rated on the soffit underside or constructed in accordance with Section R302.2.6.1.

302.2.6.1 Prescriptive Vented Protected Soffit. Soffits shall be constructed in accordance with one of the following:

- 1. Fasten one layer of Type X 5/8" gypsum panel attached to the underside of bottom of truss bottom chord or soffit framing member. Bottom panel shall have a venting space not more than 4" from the fascia board.
- 2. Fasten one layer of Type X 5/8" gypsum panel to the top of truss bottom chord or soffit framing member. Top panel shall have venting space not more than 4" from the top plate of the wall.

Ventilation cut into panels should not align vertically. Ventilation space shall have mesh applied with both panels in accordance with Section R806.1.

Reason: Recent trends in smoker habits have led to fires starting on the outside of homes and residences. Smokers are now discarding their cigarettes outside of entrances and into combustible mulch or trash cans with combustible materials in them. This change would provide an added protection in these areas where the fire risk has been identified.

There has been concern that by creating this fire block, ventilation at the soffit could become an issue. In exploratory testing by the Suburban Exterior Fire Work Group, it was found that by creating a chamber at the soffit, the assembly still provides ventilation but also creates an environment that slows down the movement of the fire due to lack of oxygen.

Here are photos of the test assemblies:





As proposed a 1 hour rated assembly can be used and ventilation would be found in other areas of the roof assembly or a prescriptive vented protected soffit could be constructed. Below is a abstract sketch of a profile of this assembly.



Cost Impact: The code change proposal will increase the cost of construction This change will add labor and material costs associated with the added protection gypsum panels, fasteners, and mesh.

Proposal # 5538

RB63-19

RB64-19

IRC®: R302.3, NFPA Chapter 44

Proponent: Jeffrey Shapiro, P.E., International Code Consultants, representing Self (jeff.shapiro@intlcodeconsultants.com)

2018 International Residential Code

Revise as follows:

R302.3 Two-family dwellings. *Dwelling units* in two-family dwellings shall be separated from each other by wall and floor assemblies having not less than a 1-hour fire-resistance rating where tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code. Fire-resistance-rated floor/ceiling and wall assemblies shall extend to and be tight against the *exterior wall*, and wall assemblies shall extend from the foundation to the underside of the roof sheathing.

Exceptions:

NFPA

- 1. A fire-resistance rating of 1/2 hour shall be permitted in buildings equipped throughout with an automatic sprinkler system installed in accordance with <u>Section P2904 or NFPA 13. 13D.</u>
- 2. Wall assemblies need not extend through *attic* spaces where the ceiling is protected by not less than ⁵/₈-inch (15.9 mm) Type X gypsum board, an *attic* draft stop constructed as specified in Section R302.12.1 is provided above and along the wall assembly separating the *dwellings* and the structural framing supporting the ceiling is protected by not less than ¹/₂-inch (12.7 mm) gypsum board or equivalent.

National Fire Protection Association 1 Batterymarch Park Quincy MA 02169-7471

13—16: Standard for Installation of Sprinkler Systems

Reason: The current exception will never be used because the cost of installing a full NFPA 13 system (typically associated with commercial structures) in a duplex will far outweigh savings associated with reducing the separation wall rating from one-hour to 30 minutes. From a parity perspective, it makes no sense to allow Section P2904 or NFPA 13D protection as a basis for reducing townhouse separations but require NFPA 13 for duplexes.

Perhaps the logic associated with the current provision was intending to gain sprinkler protection in the attic (which would typically be required by NFPA 13) as a basis of qualifying for the reduced fire rating. But, townhouse separations are allowed to be reduced in unsprinklered attics of sprinklered townhouses, recognizing that the vast majority of residential fires start in occupied spaces, where sprinklers are present to control a fire before extension into the attic. True, a reduced townhouse separation maintains a one-hour rating, versus 30 minutes in a duplex, but 30 minutes is still a sufficient separation rating to accommodate fire department response and setup at a duplex.

Note that IRC Section R313 only requires NFPA 13D for duplexes, so this change will allign with Section R313. Also, the reference to NFPA 13 is proposed for deletion since this is the only place in the IRC where that standard is referenced.

Disclosure: although I am a consultant to the National Fire Sprinkler Association, this proposal is submitted on

my own behalf and was not reviewed or endorsed by NFSA prior to submittal.

Cost Impact: The code change proposal will decrease the cost of construction The change allows a reduction from NFPA 13 to NFPA 13D for duplex separation wall rating reduction.

Proposal # 5595

RB64-19

RB65-19

IRC®: R302.3

Proponent: Jeffrey Shapiro, P.E., International Code Consultants, representing IRC Fire Sprinkler Coalition (jeff.shapiro@intlcodeconsultants.com)

2018 International Residential Code

Revise as follows:

R302.3 Two-family dwellings. *Dwelling units* in two-family dwellings shall <u>extend from foundation to roof, shall</u> have a yard or public way on not less than three sides, and shall be separated from each other by wall and floor assemblies having not less than a 1-hour fire-resistance rating where tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code. Fire-resistance-rated floor/ceiling and wall assemblies shall extend to and be tight against the *exterior wall*, and wall assemblies shall extend from the foundation to the underside of the roof sheathing.

Exceptions:

- 1. A fire-resistance rating of 1/2 hour shall be permitted in buildings equipped throughout with an automatic sprinkler system installed in accordance with <u>Section P2904 or NFPA 13. 13D.</u>
- 2. Wall assemblies need not extend through *attic* spaces where the ceiling is protected by not less than ⁵/₈-inch (15.9 mm) Type X gypsum board, an *attic* draft stop constructed as specified in Section R302.12.1 is provided above and along the wall assembly separating the *dwellings* and the structural framing supporting the ceiling is protected by not less than ¹/₂-inch (12.7 mm) gypsum board or equivalent.
- 3. <u>Dwelling units in two-family dwellings shall be permitted to be stacked vertically where both</u> <u>dwelling units are equipped with an automatic sprinkler system installed in accordance with</u> <u>Section P2904 or NFPA 13D. The floor/ceiling assembly separating the dwelling units shall</u> <u>be permitted to have a fire-resistance rating of 1/2 hour where tested in accordance with</u> <u>ASTM E119, UL 263 or Section 703.3 of the International Building Code.</u>

Reason: Stacked duplexes are much more hazardous than side-by-side duplexes for several reasons. An upstairs unit is significantly more dangerous because smoke, heat and flames from a fire in the first-floor unit will attempt to travel vertically into the upstairs unit. Smoke alarms are not interconnected between duplex units and there is no fire alarm. So the upstairs occupant warning will be delayed until a fire in the lower has grown significantly, particularly if the downstairs unit occupant is not home or is home but doesn't or is unable to warn the upstairs unit occupant

The IRC does not require the floor/ceiling fire separation to be a smoke barrier, so once the fire is large enough, the upstairs unit will flood with smoke. The smoke alarm in the upstairs unit may not provide adequate warning time for escape because smoke alarms are designed to provide escape from fires detected in incipient stages, not well-developed fires. Further, the IRC does not provide a rated enclosure for egress from the upper unit, so the means of egress might go directly through the rated floor/ceiling assembly and directly into the fire and smoke below. Even an outside stair is of questionable adequacy because windows and doors are often stacked vertically. Once a fire breaks out of the lower unit, upper unit escape windows and stairs can be quickly compromised.

The prevelence of stacked duplexes is increasing in some areas, and the associated fire risk is being amplified by the fact that such units can be two stories with an additional story and an occupied attic above (essentially a 4 story structure). This begs the question of why townhouses aren't allowed to include stacked units. The answer is that such designs become multifamily occupancies and are required to be constructed in accordance with the IBC in response to the increased fire risk.

It isn't feasible to expect that a duplex could be built with a fire-resistive means of egress for upstairs units, a smoke-rated floor ceiling assembly and opening protectives and listed penetration smoke seals and fire stops to protect the upstairs unit, so this proposal recommends that fire sprinklers be specifically provided for stacked duplex buildings.

Cost Impact: The code change proposal will not increase or decrease the cost of construction Technically, the IRC requires all buildings to be sprinklered, so this doesn't have a cost impact with respect to the model code. However, in jurisdictions that choose to amend the IRC by removing the sprinkler requirement, there would be a cost increase.

Proposal # 5685

RB66-19

IRC®: R302.3

Proponent: Stephen Thomas, representing Himself (sthomas@coloradocode.net)

2018 International Residential Code

Revise as follows:

R302.3 Two-family dwellings. *Dwelling units* in two-family dwellings shall be separated from each other by wall and floor assemblies having not less than a 1-hour fire-resistance rating where tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code. <u>Such separation shall be provided regardless of whether a lot line exists between the two dwelling units or not.</u> Fire-resistance-rated floor/ceiling and wall assemblies shall extend to and be tight against the *exterior wall*, and wall assemblies shall extend from the foundation to the underside of the roof sheathing.

Exceptions:

- 1. A fire-resistance rating of 1/2 hour shall be permitted in buildings equipped throughout with an automatic sprinkler system installed in accordance with NFPA 13.
- 2. Wall assemblies need not extend through *attic* spaces where the ceiling is protected by not less than ⁵/₈-inch (15.9 mm) Type X gypsum board, an *attic* draft stop constructed as specified in Section R302.12.1 is provided above and along the wall assembly separating the *dwellings* and the structural framing supporting the ceiling is protected by not less than ¹/₂-inch (12.7 mm) gypsum board or equivalent.

Reason: The intent of this proposal is to clarify the separation between the dwelling units in a two-family dwelling. A proposal (RB52-16) was submitted last cycle that required two 1-hour walls between the units if a lot line existed and a single wall if a lot line was not present. The committee disapproved the change because they felt that the revised language complicated the existing requirements in the code. The proposal intends to simplify the requirements. The presence of a lot line betweent the dwelling units does not change the impact of fire spread from one unit to another. The fire does not know whether there is a lot line there or not. This issue has been raised for many years. That indicates that there is a serious problem with this requirement. The proposal clearly indicates that the one-hour separation is required regardless of the presence of a lot line. Many people, including the commentary, state that if there is a lot line between the two units, that two 1-hour walls are required. I challenge anyone to show me where in Section 302.3 it states that. This section only requires a single 1-hour wall. There is also no requirement that states that the two units are separate buildings similar to what we used to do with townhouses. So, the application of Section 302.1 is not referenced in this section. The definition of dwelling states that it is any building that contains one or two dwelling units... It is a single building, not two separate buildings as some would like to say.

Cost Impact: The code change proposal will decrease the cost of construction Since many jurisdictions are requiring two 1-hour walls when a lot line is present, the cost of the separation will be reduced with this change.

Proposal # 5499

RB66-19

RB67-19

IRC®: R302.4.1

Proponent: Jeffrey Shapiro, P.E., representing Self (jeff.shapiro@intlcodeconsultants.com)

2018 International Residential Code

Revise as follows:

R302.4.1 Through penetrations. Through penetrations of fire-resistance-rated wall or floor assemblies shall comply with Section R302.4.1.1 or R302.4.1.2.

Exception: Where the penetrating items are steel, ferrous or copper pipes, tubes or conduits, <u>or listed fire</u> <u>sprinkler piping</u>, the annular space shall be protected as follows:

- 1. In concrete or masonry wall or floor assemblies, concrete, grout or mortar shall be permitted where installed to the full thickness of the wall or floor assembly or the thickness required to maintain the fire-resistance rating, provided that both of the following are complied with:
 - 1.1. The nominal diameter of the penetrating item is not more than 6 inches (152 mm).
 - The area of the opening through the wall does not exceed 144 square inches (92 900 mm²).
- 2. The material used to fill the annular space shall prevent the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E119 or UL 263 time temperature fire conditions under a positive pressure differential of not less than 0.01 inch of water (3 Pa) at the location of the penetration for the time period equivalent to the fire-resistance rating of the construction penetrated.

Reason: Listed fire sprinkler piping is ignition resistant and will not sustain combustion. Allowing common fire sprinkler piping to protect multiple units in a townhouse can significantly reduce installation costs, and the IBC now allows penetration of townhouse separation walls in any townhouse that does not exceed the height and area limits. For reference IBC SEction 706.1.1, Exception 2 states:

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

It makes no sense for the IRC to be more restrictive than the IBC with respect to allowing penetration of sprinkler piping through townhouse separation walls.

Disclosure: although I am a consultant to the National Fire Sprinkler Association, this proposal is submitted on my own

behalf and was not reviewed or endorsed by NFSA prior to submittal.

Cost Impact: The code change proposal will decrease the cost of construction

The allowance for sprinkler piping to penetrate townhouse separation walls will reduce the infrastructure required to install a fire sprinkler system in some cases by allowing a shared feed for multiple units.

RB67-19

RB68-19

IRC®: SECTION R302, R302.5, R302.5.1, R302.5.2, TABLE R302.6

Proponent: Sharon Bonesteel, representing Salt River Project (sharon.bonesteel@srpnet.com)

2018 International Residential Code

SECTION R302 FIRE-RESISTANT CONSTRUCTION

Revise as follows:

R302.5 Dwelling-garage <u>and Dwelling-Energy Storage System Room</u> opening and penetration protection. Openings and penetrations through the walls or ceilings separating the *dwelling* from the garage <u>or</u> from rooms containing energy storage systems, shall be in accordance with Sections R302.5.1 through R302.5.3.

R302.5.1 Opening protection. Openings from a private garage <u>or a room containing an energy storage</u> <u>system(s),</u> directly into a room used for sleeping purposes shall not be permitted. Other openings between the garage <u>and residence</u>, and between an energy storage system room and residence, shall be equipped with solid wood doors not less than $1^{3}/_{8}$ inches (35 mm) in thickness, solid or honeycomb-core steel doors not less than $1^{3}/_{8}$ inches (35 mm) thick, or 20-minute fire-rated doors, equipped with a self-closing or automatic-closing device.

R302.5.2 Duct penetration. Ducts in the garage and ducts penetrating the walls or ceilings separating the *dwelling* from the garage shall be constructed of a minimum No. 26 gage (0.48 mm) sheet steel or other *approved* material and shall not have openings into the garage.

TABLE R302.6 DWELLING-GARAGE AND DWELLING-ENERGY STORAGE SYSTEM (ESS) ROOM, SEPARATION

SEPARATION	MATERIAL
From the residence and attics	Not less than $^{1}/_{2}$ -inch gypsum board or equivalent applied to the garage side <u>or energy storage system room side</u>
From habitable rooms above the garage <u>or an</u> energy storage system room	Not less than $\frac{5}{8}$ -inch Type X gypsum board or equivalent
Structure(s) supporting floor/ceiling assemblies used for separationrequired by this section	Not less than ¹ / ₂ -inch gypsum board or equivalent
Garages <u>or energy storage system buildings</u> located less than 3 feet from a dwelling unit on the same lot	Not less than $1/2$ -inch gypsum board or equivalent applied to the interiorside of exterior walls that are within this area

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

Reason: The evolution of battery technologies is moving faster than the building codes. This code change provides a reasonable amount of protection for energy storage in residential structures, by utilizing the existing seperation requirements already in the code in section R302.5.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code currently requires this seperation for garages; this code change just directs you to place energy

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storage systems within that space or a space equally protected.

Proposal # 5572

RB68-19

RB69-19

IRC®: R302.5.1

Proponent: Kevin Duerr-Clark, NYS Department of State, representing NYS Department of State (kevin.duerrclark@dos.ny.gov); Ronald Stark, NYS Department of State, representing NYS Department of State (ronald.stark@dos.ny.gov)

2018 International Residential Code

Revise as follows:

R302.5.1 Opening protection. Openings from a private garage directly into a room used for sleeping purposes shall not be permitted. Other openings between the garage and residence shall be equipped with solid wood doors not less than $1^{3}/_{8}$ inches (35 mm) in thickness, solid or honeycomb-core steel doors not less than $1^{3}/_{8}$ inches (35 mm) thick, or 20-minute fire-rated doors, equipped with a self-closing or automatic-closing <u>device</u> and self-latching device.

Reason: In order for the door between the garage and residence to properly prevent the passage of smoke, fire, and carbon monoxide, the door must be latched. Self-latching is just as important as self-closing. If the door does not latch in the closed position, it is not properly secured. Air pressures caused by a fire could cause doors without a self-latching device to open. Some door knobs and handles enable self-latching by design and proper installation, thus the provision is often taken for granted, but this is not necessarily true of all installations. The language of this proposal would prevent the installation of a push/pull knob without latching.

Cost Impact: The code change proposal will not increase or decrease the cost of construction If the intent of the code is for the garage door to be safely closed, then self-latching has already been part of the provision, though not clearly stated. Therefore, placing the language in the code will simply make it clearer and does not affect the cost of construction.

Proposal # 4169

RB69-19

RB70-19

IRC®: R302.8

Proponent: Marcelo M Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Revise as follows:

R302.8 Foam plastics. For requirements for foam plastics, see Foam plastics shall not be used as interior finish materials except as permitted by Section R316.

Reason: It is important to clarify that foam plastics shall not be used as interior finish materials unless they meet the requirements of section R316. The existing code language just sends the code user to R316 but does not specifically state that foam plastic products are not to be used as interior finish materials unless they meet the appropriate requirements, based on testing to NFPA 286 (which typical foam plastics do not meet) or are covered by a thermal barrier. Experience indicates that it is not safe to have exposed foam plastics that have been tested only to ASTM E84.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This is simple clarification.

Proposal # 4348

RB70-19

RB71-19

IRC®: R302.9.4 (New)

Proponent: Marcelo M Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Add new text as follows:

R302.9.4 High density polyethylene (HDPE) and polypropylene (PP). Where high density polyethylene or polypropylene is used as an interior finish material, it shall be tested in accordance with NFPA 286 and comply with the requirements in Section R302.9.4.

Reason: This proposal brings in a key fire safety requirement from the IBC and the IFC. The new section addresses the issue that it is not appropriate to allow testing of high density polyethylene (HDPE) and polypropylene (PP) materials used as interior finish in accordance with ASTM E84 or UL 723, because the test results are misleading. Such materials must be tested to NFPA 286, as shown in the existing section R302.9.4. A proposal that reorganizes the section on testing of interior finish places the requirements for NFPA 286 into section R302.9.1.1.

Cost Impact: The code change proposal will increase the cost of construction It is unsafe to test HDPE and PP materials for use as interior finish with ASTM E84 or UL 723.

Proposal # 4507

RB71-19

RB72-19

IRC®: R302.9, R302.9.1, R302.9.2, R302.9.3, R302.9.4, R302.9 (New), R302.9.1 (New), R302.9.1.1 (New), R302.9.2 (New), R302.9.3 (New), R302.9.4 (New), R302.9.5 (New), R302.9.6 (New), R302.9.7 (New), R302.9.8 (New), R302.9.8.1 (New), R302.9.8.2 (New), R302.9.8.3 (New), R302.9.9 (New), ASTM Chapter 44 (New), NFPA Chapter 44 (New)

Proponent: Marcelo M Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Delete without substitution:

R302.9 Flame spread index and smoke-developed index for wall and ceiling finishes. Flame spread and smoke-developed indices for wall and ceiling finishes shall be in accordance with Sections R302.9.1 through R302.9.4.

R302.9.1 Flame spread index. Wall and ceiling finishes shall have a flame spread index of not greater than 200.

Exception: Flame spread index requirements for finishes shall not apply to trim defined as picture molds, chair rails, baseboards and handrails; to doors and windows or their frames; or to materials that are less than $\frac{1}{28}$ inch (0.91 mm) in thickness cemented to the surface of walls or ceilings if these materials exhibit flame spread index values not greater than those of paper of this thickness cemented to a noncombustible backing.

R302.9.2 Smoke-developed index. Wall and ceiling finishes shall have a smoke-developed index of not greater than 450.

R302.9.3 Testing. Tests shall be made in accordance with ASTM E84 or UL 723.

R302.9.4 Alternative test method. As an alternative to having a flame spread index of not greater than 200 and a smoke-developed index of not greater than 450 where tested in accordance with ASTM E84 or UL 723, wall and ceiling finishes shall be permitted to be tested in accordance with NFPA 286. Materials tested in accordance with NFPA 286 shall meet the following criteria:

The interior finish shall comply with the following:

- 1. During the 40 kW exposure, flames shall not spread to the ceiling.
- 2. The flame shall not spread to the outer extremity of the sample on any wall or ceiling.
- 3. Flashover, as defined in NFPA 286, shall not occur.
- 4. The peak heat release rate throughout the test shall not exceed 800 kW.
- 5. The total smoke released throughout the test shall not exceed 1,000 m².

Add new text as follows:

R302.9 Interior wall and ceiling finishes. Interior wall and ceiling finish materials shall be classified for fire performance and smoke development in accordance with Section R302.9.1 or R302.9.2, unless otherwise shown in Sections R302.9.3 through R302.9.9. Materials tested in accordance with Section R302.9.1 shall not be required to be tested in accordance with Section R302.9.2.

R302.9.1 NFPA 286. Interior wall and ceiling finish materials shall be classified in accordance with NFPA 286 and comply with Section R302.9.1.1. Materials complying with Section R302.9.1.1 shall be considered to also comply with the requirements of Section R302.9.2.

R302.9.1.1 Acceptance criteria for NFPA 286. The interior finish shall comply with the following:

- 1. During the 40 kW exposure, flames shall not spread to the ceiling.
- 2. The flame shall not spread to the outer extremity of the sample on any wall or ceiling.
- 3. Flashover, as defined in NFPA 286, shall not occur.
- 4. The peak heat release rate throughout the test shall not exceed 800 kW.
- 5. The total smoke released throughout the test shall not exceed 1,000 m².

R302.9.2 ASTM E84 or UL 723. Wall and ceiling finishes shall exhibit a flame spread index not exceeding 200 and a smoke-developed index not exceeding 450 (Class C) where tested in accordance with ASTM E84 or UL 723, except as shown in Section R302.9.1 and in Sections R302.9.3 through R302.9.9.

R302.9.3 Interior trim. The requirements of Section R302.9.1 and those of Section R302.9.2, for interior wall and ceiling finishes, shall not apply to interior trim, defined as picture molds, chair rails, baseboards and handrails; or to doors and windows or their frames.

R302.9.4 Thickness exemption. The requirements of Section R302.9.1 and those of Section R302.9.2, for interior wall and ceiling finishes, shall not apply to materials having a thickness less than 0.036 inch (0.9 mm) and applied directly to the surface of walls or ceilings.

R302.9.5 High density polyethylene and polypropylene. Where high density polyethylene or polypropylene is used as an interior finish material, it shall be tested in accordance with NFPA 286 and comply with the requirements of Section R302.9.1.1.

R302.9.6 Facings or wood veneers intended to be applied on site over a wood substrate. Facings or veneers intended to be applied on site over a wood substrate shall comply with one of the following:

- 1. <u>The facing or veneer shall meet the criteria of Section R302.9.1.1 where tested in accordance with NFPA</u> 286 using the product mounting system, including adhesive, as described in Section 5.9 of NFPA 286.
- 2. <u>The facing or veneer shall exhibit a Class C flame spread index and smoke-developed index where</u> tested in accordance with ASTM E84 or UL 723. Test specimen preparation and mounting shall be in accordance with ASTM E2404.

R302.9.7 Laminated products factory-produced with a wood substrate. Laminated products factory-produced with a wood substrate shall comply with one of the following:

- 1. <u>The laminated product shall meet the criteria of Section R309.2.1.1 where tested in accordance</u> with NFPA 286 using the product-mounting system, including adhesive, as described in Section 5.8 of NFPA 286.
- 2. <u>The laminated product shall have a Class C flame spread index and smoke-developed index</u> where tested in accordance with ASTM E84 or UL 723. Test specimen preparation and mounting shall be in accordance with ASTM E2579.

R302.9.8 Textile or expanded vinyl wall covering materials. Where textile wall covering materials or expanded vinyl wall covering materials are used as interior finish materials they shall be tested for fire performance in accordance with Sections R302.9.8.1, R302.9.8.2 or R302.9.8.3.

R302.9.8.1 Testing of textile or expanded vinyl wall covering materials to NFPA 286. Textile wall covering materials or expanded vinyl wall covering materials shall be tested in the manner intended for use in accordance with NFPA 286 using the product-mounting system, including adhesive, and comply with the requirements of Section R302.9.1.1.

R302.9.8.2 Testing of textile or expanded vinyl wall covering materials to ASTM E84 or UL 723. Textile wall covering materials or expanded vinyl wall covering materials shall exhibit a flame spread index not exceeding 200 and a smoke-developed index not exceeding 450 (Class C) where tested in accordance with

ASTM E84 or UL 723. Test specimen preparation and mounting shall be in accordance with ASTM E2404.

R302.9.8.3 Testing of textile or expanded vinyl wall covering materials to NFPA 265. Textile wall covering materials and expanded vinyl wall covering materials shall be tested in the manner intended for use in accordance with the Method B protocol of NFPA 265 using the product-mounting system, including adhesive. The wall coverings shall comply with the following:

- 1. During the 40 kW exposure, flames shall not spread to the ceiling.
- 2. The flame shall not spread to the outer extremities of the samples on the 8-foot by 12-foot (203 by 305 mm) walls.
- 3. Flashover, as defined in NFPA 265, shall not occur.
- 4. The total smoke released throughout the test shall not exceed 1,000 m².

R302.9.9 Textile or expanded vinyl ceiling covering materials. Textile ceiling covering materials or expanded vinyl ceiling covering materials shall be fire tested in accordance with ASTM E84 or UL 723, with the acceptance criteria of Section R302.9.2, or in accordance with NFPA 286, with the acceptance criteria of Section R302.9.1.1. Where tested in accordance with ASTM E84 or UL 723, specimen preparation and mounting shall be in accordance with ASTM E2404.

Add new standard(s) as follows:

ASTM

ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

E2404: Standard Practice for Specimen Preparation and Mounting of Textile, Paper or Polymeric (Including Vinyl) and Wood Wall or Ceiling Coverings, Facings and Veneers, to Assess Surface Burning Characteristics (2017)

> ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

E2579-15: Standard Practice for Specimen Preparation and Mounting of Wood Products to Assess Surface Burning Characteristics

NFPA

ASTM

National Fire Protection Association 1 Batterymarch Park Quincy MA 02169-7471

265: Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls (2019)

Reason: This proposal reorganizes the section in the way that it is organized also in the IBC and IFC without changing requirements. Any material can be fire tested to NFPA 286 and those requirements are placed first, in R3029.1. With regard to the base requirement (testing for flame spread index and smoke-developed index by means of ASTM E84 or UL 723, with the corresponding criteria) it is still a Class C (flame spread index of 200 or less and smoke developed index of 450 or less) and it is all in a single section, namely R302.9.2. There is no change in the sense that, just like in the present code, materials can be tested to ASTM E84 or UL 723 (and get a Class C), or they can be tested to NFPA 286, with the requirements presently in the code.

The following sections address requirements for materials that require special consideration.

Sections R302.9.3 and R302.9.4 address the exceptions: for trim and for very thin materials, adhered directly to the wall or ceiling. The requirement that the very thin material be tested contradicts the point that it is an exception and that it does not need testing. This requirement for testing the very thin material has been eliminated from the IBC and IFC also.

Section R302.9.5 addresses a key fire safety issue: high density polyethylene (HDPE) and polypropylene (PP) materials used as interior finish should not be tested using ASTM E84 because the test results are misleading. Such materials must be tested to NFPA 286, as shown in R302.9.1. This is a fire safety requirement also contained in the IBC and the IFC. The new section addresses the issue that it is not appropriate to allow testing of high density polyethylene (HDPE) and polypropylene (PP) materials used as interior finish in accordance with ASTM E84 or UL 723, because the test results are misleading. Such materials must be tested to NFPA 286, as shown in the new section R302.9.1.

What is needed is some testing requirement for thin materials used as veneers but adhered to wood products, either as manufactured panels brought into the building or as veneers applied on site. They are being addressed in R302.9.6 and R302.9.7.It has been shown that applying veneers over a wood product will have a significant effect (typically negative) on the fire performance of the product. A specific mounting practice for this has been developed both for ASTM E84 (namely ASTM E2404) and a specific section of NFPA 286 was developed for the purpose also. When a veneer is installed on site over a wood substrate, details are needed for fire testing the veneer. It needs to be tested over a substrate that is consistent with the substrate to be used in the application. If the veneer is to be applied over wood it should be tested over that substrate. If the substrate is combustible testing over a wood substrate is an acceptable alternative. Section R302.9.7 addresses the case when manufacturers produce wood panels that have the veneer already applied before being introduced into the building. For that case, a specific mounting practice for ASTM E84 and a specific mounting method for NFPA 286 have been developed. In both cases the requirements involve testing the commercial panel and not the veneer. This language in both sections is consistent with language in the IBC and IRC, except that the requirements are for a Class C in ASTM E84, consistent with the charging paragraph.

Textile wall covering materials and expanded vinyl wall covering materials (Section R302.9.8) are permitted by the IBC and the IFC to be fire tested by three methods (they are the only type of product that have that option). They can be tested to ASTM E84 or UL 723, NFPA 286 and NFPA 265. If they are tested to ASTM E84 or UL 723 they need to use a special mounting method, namely ASTM E2404. Both the IBC and the IFC recognize a specific testing method that applies only to textile wall covering materials and expanded vinyl covering materials, namely NFPA 265. Therefore, commercial materials exist that have been tested to NFPA 265 and there is no reason that they should not be allowed into the IRC without further testing. The proposal contains the criteria from the IBC and IFC for testing to NFPA 265. This proposal does not require the materials to be tested to NFPA 265 or to NFPA 286 but allows materials already tested to NFPA 265 or to NFPA 286 to be used in the IRC. The NFPA 265 test is a room-corner test similar to NFPA 286, except for a few aspects: (a) the burner flame is less severe (150 kW instead of 160 kW), (b) the location of the burner is different (it is not placed flush against the corner) and (c) the material is not placed on the ceiling. Therefore the burner flame never reaches the ceiling, which makes the test unsuitable for ceiling materials.

Textile ceiling covering materials and expanded vinyl ceiling covering materials (Section R302.9.9) are permitted by the IBC and the IFC to be tested to NFPA 286 or to be tested to ASTM E84 or UL 723. However, when they are tested to ASTM E84 they need to use a special mounting method, namely ASTM E2404. They are not permitted to be tested to NFPA 265 because the flame in the test does not reach the ceiling.

Cost Impact: The code change proposal will increase the cost of construction

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This proposal provides more testing options for some materials and clarifies the testing requirements that apply to some materials that should not be tested to ASTM E84.

Staff Analysis: The referenced standards, ASTM E 2579, ASTM E 2404 and NFPA 265, are currently referenced in other 2018 I-codes.

Proposal # 4469

RB72-19

RB73-19

IRC®: R302.9.6 (New), ASTM Chapter 44 (New)

Proponent: Marcelo Hirschler, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Add new text as follows:

R302.9.6 Facings or wood veneers intended to be applied on site over a wood substrate. Facings or

veneers intended to be applied on site over a wood substrate shall comply with one of the following:

- 1. <u>The facing or veneer shall meet the criteria of Section R302.9.4 where tested in accordance with NFPA</u> 286 using the product mounting system, including adhesive, as described in Section 5.9 of NFPA 286.
- 2. <u>The facing or veneer shall exhibit a Class C flame spread index and smoke-developed index where</u> <u>tested in accordance with ASTM E84 or UL 723. Test specimen preparation and mounting shall be in</u> <u>accordance with ASTM E2404.</u>

Add new standard(s) as follows:

ASTM

ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

E2404-17: Standard Practice for Specimen Preparation and Mounting of Textile, Paper or Polymeric (Including Vinyl) and Wood Wall or Ceiling Coverings, Facings and Veneers, to Assess Surface Burning Characteristics

Reason: It has been shown that applying veneers over a wood product will have a significant effect (typically negative) on the fire performance of the product. A specific mounting practice for this has been developed both for ASTM E84 (namely ASTM E2404) and a specific section of NFPA 286 was developed for the purpose also. When a veneer is installed on site over a wood substrate, details are needed for fire testing the veneer. It needs to be tested over a substrate that is consistent with the substrate to be used in the application. If the veneer is to be applied over wood it should be tested over wood but if it is to be applied over gypsum board or a noncombustible substrate, it should be tested over that substrate. If the substrate is combustible testing over a wood substrate is an acceptable alternative.

An alternate proposal addresses the case when manufacturers produce wood panels that have the veneer already applied before being introduced into the building. For that case, a specific mounting practice for ASTM E84 and a specific mounting method for NFPA 286 have been developed. In both cases the requirements involve testing the commercial panel and not the veneer.

This language is consistent with language in the IBC and IRC, except that the requirements are for a Class C in ASTM E84, consistent with the charging paragraph.

This proposal refers to the existing section R302.9.4 but an alternate proposal reorganizes the section and makes that section into R302.9.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction ASTM E84 explains that this is the way that veneers to be applied on site are to be tested.

Staff Analysis: The referenced standard, ASTM E 2402, is currently referenced in other 2018 I-codes.

RB73-19

RB74-19

IRC®: R302.9.7 (New), ASTM Chapter 44 (New)

Proponent: Marcelo M Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Add new text as follows:

R302.9.7 Laminated products factory produced with a wood substrate.

- 1. Laminated products factory produced with a wood substrate shall comply with one of the following:The laminated product shall meet the criteria of Section R309.2.4 where tested in accordance with NFPA 286 using the product-mounting system, including adhesive, as described in Section 5.8 of NFPA 286.
- 2. The laminated product shall have a Class C flame spread index and smoke-developed index where tested in accordance with ASTM E84 or UL 723. Test specimen preparation and mounting shall be in accordance with ASTM E2579.

Add new standard(s) as follows:

ASTM

ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

E2579-15: Standard Practice for Specimen Preparation and Mounting of Wood Products to Assess Surface Burning Characteristics

Reason: It has been shown that applying veneers over a wood product will have a significant effect (typically negative) on the fire performance of the product. When manufacturers produce wood panels that have the veneer already applied before being introduced into the building, a specific mounting practice for ASTM E84 and a specific mounting method for NFPA 286 have been developed. In both cases the requirements involve testing the commercial panel and not the veneer. This language is consistent with language in the IBC and IRC, except that the requirements are for a Class C in ASTM E84, consistent with the charging paragraph. An alternate proposal addresses veneers that are installed on site and not as part of factory produced panels.

This proposal refers to the existing section R302.9.4 but an alternate proposal reorganizes the section and makes that section into R302.9.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposed mounting method is the required one contained in ASTM E84.

Staff Analysis: The referenced standard, ASTM E 2579, is currently referenced in other 2018 I-codes.

Proposal # 4473

RB74-19

RB75-19

IRC®: R302.9.8 (New), R302.9.8.1 (New), R302.9.8.2 (New), R302.9.8.3 (New), ASTM Chapter 44 (New), NFPA Chapter 44 (New)

Proponent: Marcelo M Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Add new text as follows:

R302.9.8 Textile and expanded vinyl wall covering materials. Where textile wall covering materials or expanded vinyl wall covering materials are used as interior finish materials they shall be tested for fire performance in accordance with Sections R302.9.8.1, R302.9.8.2 or R302.9.8.3.

R302.9.8.1 NFPA 286. Textile wall covering materials and expanded vinyl wall covering materials shall be tested in the manner intended for use in accordance with NFPA 286 using the product-mounting system, including adhesive, and comply with the requirements of Section R302.9.4.

R302.9.8.2 ASTM E84 or UL 723. Textile wall covering materials or expanded vinyl wall covering materials shall exhibit a flame spread index not exceeding 200 and a smoke-developed index not exceeding 450 (Class C) where tested in accordance with ASTM E84 or UL 723. Test specimen preparation and mounting shall be in accordance with ASTM E2404.

R302.9.8.3 NFPA 265. Textile wall covering materials and expanded vinyl wall covering materials shall be tested in the manner intended for use in accordance with the Method B protocol of NFPA 265 using the product-mounting system, including adhesive. The wall coverings shall comply with the following:

- 1. During the 40 kW exposure, flames shall not spread to the ceiling.
- 2. The flame shall not spread to the outer extremities of the samples on the 8-foot by 12-foot (203 by 305 mm) walls.
- 3. Flashover, as defined in NFPA 265, shall not occur.
- 4. The total smoke released throughout the test shall not exceed 1,000 m².

Add new standard(s) as follows:



ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

ASTM E2404: Standard Practice for Specimen Preparation and Mounting of Textile, Paper or Polymeric (Including Vinyl) and Wood Wall or Ceiling Coverings, Facings and Veneers, to Assess Surface Burning Characteristics (2017)



National Fire Protection Association 1 Batterymarch Park Quincy MA 02169-7471

<u>NFPA 265: Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile</u> <u>Wall Coverings on Full Height Panels and Walls (2019)</u>

Reason: Textile wall covering materials and expanded vinyl wall covering materials are permitted by the IBC

and the IFC to be fire tested by three methods (they are the only type of product that have that option). They can be tested to ASTM E84 or UL 723, NFPA 286 and NFPA 265. If they are tested to ASTM E84 or UL 723 they need to use a special mounting method, namely ASTM E2404.

Both the IBC and the IFC recognize a specific testing method that applies only to textile wall covering materials and expanded vinyl covering materials, namely NFPA 265. Therefore, commercial materials exist that have been tested to NFPA 265 and there is no reason that they should not be allowed into the IRC without further testing. The proposal contains the criteria from the IBC and IFC for testing to NFPA 265.

This proposal does not require the materials to be tested to NFPA 265 or to NFPA 286 but allows materials already tested to NFPA 265 or to NFPA 286 to be used in the IRC.

The NFPA 265 test is a room-corner test similar to NFPA 286, except for a few aspects: (a) the burner flame is less severe (150 kW instead of 160 kW), (b) the location of the burner is different (it is not placed flush against the corner) and (c) the material is not placed on the ceiling. Therefore the burner flame never reaches the ceiling, which makes the test unsuitable for ceiling materials.

An alternate proposal reorganizes the section and renumbers section R302.9.4 as R302.9.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The methods proposed here are alternate options but do not affect testing in accordance with the present code. The moutning method for ASTM E84 is contained in the standard.

Staff Analysis: The referenced standards, ASTM E 2404-2017 and NFPA 265-2019, are currently referenced in other 2018 I-codes.

Proposal # 4476

RB75-19

RB76-19

IRC®: R302.9.9 (New), ASTM Chapter 44 (New)

Proponent: Marcelo M Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Add new text as follows:

R302.9.9 Textile and expanded vinyl ceiling covering materials. Textile ceiling covering materials or expanded vinyl ceiling covering materials shall be fire tested in accordance with ASTM E84 or UL 723, with the acceptance criteria of Sections R302.9.1 and R302.9.2, or in accordance with NFPA 286, with the acceptance criteria of Section R302.9.4. Where tested in accordance with ASTM E84 or UL 723, specimen preparation and mounting shall be in accordance with ASTM E2404.

Add new standard(s) as follows:



ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

E2404: Practice for Specimen Preparation and Mounting of Textile, Paper or Polymeric (Including Vinyl) and Wood Wall or Ceiling Coverings, Facing and Veneers to Assess Surface Burning Characteristics (2017)

Reason: Textile ceiling covering materials and expanded vinyl ceiling covering materials are permitted by the IBC and the IFC to be tested to NFPA 286 or to be tested to ASTM E84 or UL 723. However, when they are tested to ASTM E84 they need to use a special mounting method, namely ASTM E2404. They are not permitted to be tested to NFPA 265 because the flame in the test does not reach the ceiling. Note that this does not require testing to NFPA 286 but it is simply an option, especially for materials that have already been approved by testing that way. This is just being more explicit with regard to what is in the code.

An alternate proposal combines existing sections R302.9.1, R302.9.2 and R302.9.3 into a section R302.9.2 and also converts existing section R302.9.4 into section R302.9.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The revision makes the code more explicit without adding any requirements.

Staff Analysis: The referenced standard, ASTM E 2404-2017, is currently referenced in other 2018 I-codes.

Proposal # 4508

RB76-19

RB77-19

IRC®: R302.15 (New), R302.15.1 (New), R302.15.2 (New), R302.15.3 (New), R802.1.5, R802.1.5.1, R802.1.5.2, R802.1.5.3, R802.1.5.4, R802.1.5.5, R802.1.5.6, R802.1.5.7, R802.1.5.8, R802.1.5.9, R802.1.5.10

Proponent: Marcelo Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Add new text as follows:

R302.15 Fire retardant treated wood Fire-retardant treated wood (FRTW) is any wood product that: is impregnated with chemicals by a pressure process or other means during manufacture; that has a listed flame spread index of 25 or less when tested in accordance with ASTM E84 or UL 723, and that does not show evidence of significant progressive combustion when the test is continued for an additional 20-minute period. In addition, the flame front shall not progress more than 10.5 feet (3200 mm) beyond the center line of the burners at any time during the test.

R302.15.1 Pressure process For wood products impregnated with chemicals by a pressure process, the process shall be performed in closed vessels under pressures not less than 50 pounds per square inch gauge (psig) (344.7 kPa).

R302.15.2 Other means during manufacture For wood products produced by other means during manufacture, the treatment shall be an integral part of the manufacturing process of the wood product. The treatment shall provide permanent protection to all surfaces of the wood product.

R302.15.3 Testing For wood products produced by means other than a pressure process during manufacture, all sides of the wood product shall be tested in accordance with and produce the results required in Section R302.15. For structural panels, only the front and back faces shall be required to be tested.

Revise as follows:

R802.1.5 Fire-retardant-treated wood. Fire-retardant-treated wood (FRTW) is any wood product that, when impregnated with chemicals by a pressure process or other means during manufacture, shall have, when tested in accordance with ASTM E84 or UL 723, a listed flame spread index of 25 or less and does not show evidence of significant progressive combustion where the test is continued for an additional 20-minute period. In addition, the flame front shall not progress more than 10.5 feet (3200 mm) beyond the center line of the burners at any time during the test. shall comply with Section R302.15.

Delete without substitution:

R802.1.5.1 Pressure process. For wood products impregnated with chemicals by a pressure process, the process shall be performed in closed vessels under pressures not less than 50 pounds per square inch gauge (psig) (344.7 kPa).

R802.1.5.2 Other means during manufacture. For wood products produced by other means during manufacture the treatment shall be an integral part of the manufacturing process of the wood product. The treatment shall provide permanent protection to all surfaces of the wood product.

R802.1.5.3 Testing. For wood products produced by other means during manufacture, other than a pressure process, all sides of the wood product shall be tested in accordance with and produce the results required in Section R802.1.5. Testing of only the front and back faces of wood structural panels shall be permitted.

Revise as follows:

R802.1.5.4 <u>R802.1.5.1</u> Labeling. In addition to the labels required by Section 802.1.1 for sawn lumber and Section 803.2.1 for wood structural panels, each piece of *fire-retardant-treated* lumber and wood structural panel shall be labeled. The label shall contain:

- 1. The identification *mark* of an *approved agency* in accordance with Section 1703.5 of the International Building Code.
- 2. Identification of the treating manufacturer.
- 3. The name of the fire-retardant treatment.
- 4. The species of wood treated.
- 5. Flame spread index and smoke-developed index.
- 6. Method of drying after treatment.
- 7. Conformance to applicable standards in accordance with Sections R802.1.5.5 <u>R802.1.5.2</u> through R802.1.5.10. <u>R802.1.5.7</u>.
- 8. For FRTW exposed to weather, or a damp or wet location, the words "No increase in the listed classification when subjected to the Standard Rain Test" (ASTM D2898).

R802.1.5.5 <u>R802.1.5.2</u> Strength adjustments. Design values for untreated lumber and wood structural panels as specified in Section R802.1 shall be adjusted for fire-retardant-treated wood. Adjustments to design values shall be based on an *approved* method of investigation that takes into consideration the effects of the anticipated temperature and humidity to which the fire-retardant-treated wood will be subjected, the type of treatment and redrying procedures.

R802.1.5.6 <u>R802.1.5.3</u> Wood structural panels. The effect of treatment and the method of redrying after treatment, and exposure to high temperatures and high humidities on the flexure properties of fire-retardant-treated softwood plywood shall be determined in accordance with ASTM D5516. The test data developed by ASTM D5516 shall be used to develop adjustment factors, maximum loads and spans, or both for untreated plywood design values in accordance with ASTM D6305. Each manufacturer shall publish the allowable maximum loads and spans for service as floor and roof sheathing for their treatment.

R802.1.5.7 <u>R802.1.5.4</u> Lumber. For each species of wood treated, the effect of the treatment and the method of redrying after treatment and exposure to high temperatures and high humidities on the allowable design properties of fire-retardant-treated lumber shall be determined in accordance with ASTM D5664. The test data developed by ASTM D5664 shall be used to develop modification factors for use at or near room temperature and at elevated temperatures and humidity in accordance with ASTM D6841. Each manufacturer shall publish the modification factors for service at temperatures of not less than 80°F (27°C) and for roof framing. The roof framing modification factors shall take into consideration the climatological location.

R802.1.5.8 <u>R802.1.5.5</u> Exposure to weather. Where fire-retardant-treated wood is exposed to weather or damp or wet locations, it shall be identified as "Exterior" to indicate there is not an increase in the listed flame spread index as defined required by the testing specified in Section R802.1.5 <u>R302.15</u> when subjected to ASTM D2898.

R802.1.5.9 <u>R802.1.5.6</u> Interior applications. Interior fire-retardant-treated wood shall have a moisture content of not over 28 percent when tested in accordance with ASTM D3201 procedures at 92-percent relative humidity. Interior fire-retardant-treated wood shall be tested in accordance with Section <u>R802.1.5.6</u> <u>R802.1.5.3</u> or <u>R802.1.5.7</u>. <u>R802.1.5.4</u>. Interior fire-retardant-treated wood designated as Type A shall be tested in accordance with the provisions of this section.

R802.1.5.10 <u>R802.1.5.7</u> Moisture content. Fire-retardant-treated wood shall be dried to a moisture content of 19 percent or less for lumber and 15 percent or less for wood structural panels before use. For wood kiln dried after treatment (KDAT) the kiln temperatures shall not exceed those used in kiln drying the lumber and plywood <u>the wood structural panels</u> submitted for the tests described in Section R802.1.5.6 <u>R802.1.5.3</u> for plywood <u>wood</u>

structural panels and R802.1.5.7 R802.1.5.4 for lumber.

Reason: This proposal simply moves fire retardant treated wood (much of which is used indoors or for applications that do not involve roofing) away from the roofing section (jn Chapter 8) and places it in chapter 3 (section 302) where all the products with improved fire performance are. It does not make any change to requirements and uses the same code language but in a more appropriate chapter of the code. A pointer sends the user from the section the information used to be (in chapter 8) to the new location.

Section R302 contains information on all the materials associated with "fire resistant construction", including wall and ceiling finishes, insulation and foam plastics. This is where the information on fire retardant treated wood belongs. Chapter 8 is on roof construction and, as staed above, many uses of fire retardant treated wood are for applications that are not roofs. The proposal keeps in chapter 8 the requirements for the wood products themselves, namely lumber and structural panels, to be consistent with cross-laminated timber and engineered rim wood board and so on. It just moves the requirements specific to fire retardant treated wood.

The changes in this proposal do not alter requirements but just move the sections for logical positioning. The only change in language is in relocated section R802.1.5.10 where the word plywood is replaced by wood structural panel, the title of relocated section R802.1.5.6, which is what is being referred to.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal simply relocates the FRTW sections from the roofing section to a new location, dealing with other fire safety issues, without changing requirements.

Proposal # 5084

RB78-19

IRC®: R303.3

Proponent: Kevin Gore, Borough of West Chester, representing Borough of West Chester (kgore@west-chester.com)

2018 International Residential Code

Revise as follows:

R303.3 Bathrooms. Bathrooms, water closet compartments and other similar rooms shall be provided with aggregate glazing area in windows of not less than 3 square feet (0.3 m^2), one-half of which shall be openable. **Exception:** The glazed areas shall not be required where artificial light and a local exhaust

system are provided.

<u>system.</u> The minimum local exhaust rates shall be determined in accordance with Section M1505. Exhaust air from the space shall be exhausted directly to the outdoors.

Reason: Typically, during winter and summer months or when inclement weather occurs, occupants fail to utilize windows in bathroom spaces to provide for proper ventiliation to control moisture and humidity levels. The failure to utilize natural ventilation and the lack of mechanical ventilation in these spaces leads to mold and/or mildew conditions which can ultimately create unsanitary conditions and cause health proplems for the occupants. According to the Centers for Disease Control and Prevention (2017), "In 2004 the Institute of Medicine (IOM) found there was sufficient evidence to link indoor exposure to mold with upper respiratory tract symptoms, cough, and wheeze in otherwise healthy people". Additionally, as we continue to improve the International Energy Conservation Code and enhance the energy efficiency of structures, we defeat the purpose of increased energy efficiency by requiring a window to be open in a space which is being heated or cooled.

Bibliography: Centers for Disease Control and Prevention. 2017. *Facts about mold and dampness.* Retrieved from https://www.cdc.gov/mold/dampness_facts.htm

Cost Impact: The code change proposal will increase the cost of construction The cost to supply and install a mechanical exhaust fan is approximately \$300.00.

Proposal # 3974

RB78-19

RB79-19

IRC®: R303.4

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com); Joseph Lstiburek, representing self (joe@buildingscience.com); Mike Moore, representing Broan-NuTone (mmoore@newportventures.net)

2018 International Residential Code

Revise as follows:

R303.4 Mechanical ventilation. Where the air infiltration rate of a *dwelling unit* is 5 air changes per hour or less where tested with a blower door at a pressure of 0.2 inch w.c (50 Pa) in accordance with Section N1102.4.1.2, the *dwelling unit* <u>Dwelling units</u> shall be provided with whole-house mechanical ventilation in accordance with Section M1505.4.

Exception: Dwelling units in the tropical climate zone complying with Section N1101.13.1.

Reason: To address this issue, two companion code changes have been submitted. RE90-19 addresses Section R403.6 of the IECC residential provisions. This change addresses the same issue in the IRC. Air changes per hour (ACH) is a volumetric metric that is useful for air quality measurements in buildings but is not the correct expression of air leakage from an energy or building durability perspective. This proposal introduces the ability to use an alternative cubic foot per minute (CFM) per square foot (ft²) of dwelling unit enclosure area metric for measuring air leakage in a building. In this way, the air leakage measured at 50 Pascals divided by the building surface area is used to assess the airtightness of the construction and building envelope. Unlike ACH, a CFM/ ft² of dwelling unit enclosure area metric normalizes the building air leakage per unit of building envelope surface area; the actual location where air is infiltrating or exfiltrating the building. To this end, the proposal also defines "Dwelling Unit Enclosure Area" as the sum of the area of ceiling, floors, and walls separating a dwelling unit's conditioned space from the exterior or from adjacent conditioned or unconditioned spaces. In addition, the definition offers guidance to further understand the measurement that must take place to calculate the dwelling unit enclosure area. This guidance states that the wall height shall be measured from the finished floor of the dwelling unit to the underside of the floor above. Lastly, the proposal ensures that the intent of the code, to ensure that the structure is built tight and ventilated correctly with mechanical ventilation, is maintained. If an additional option is adopted into the code, as proposed, then ventilation must also be ensured regardless of how air tightness of the structure is expressed.

Since 1980, The Energy Conservatory, has not only been a leader in air leakage science, but also one of the prominent manufacturers of the blower door air measurement tool. In their article, "Which Is A Better Metric For Measuring Airtightness: ACH @ 50 Pa Or CFM/ Ft² Of Surface Area @ 50 Pa?", which is adapted and added to in this reason statement, we get the basis of the argument for the introduction of a new metric into the International Energy Conservation Code for the measurement of air leakage.

To paraphrase, when measuring the airtightness of a building the objective is to learn how much leakage is occurring across the building's enclosure area. It is analogous to moisture permeability or the measurement of moisture across the building's enclosure area and thermal transmittance, the rate at which heat is transferred across the building enclosure area. The rate of air leakage or tightness does not depend on the volume of the structure as defined by the building's enclosure area but does depend on the holes associated with the surface area of the structure. Air permeability of a material is typically measured as the flow per area at a given pressure difference across the material. U value measurements are similar. If we want a metric to use to measure the airtightness quality of construction of the exterior enclosure of buildings it makes sense to use a metric that equates flow to the size and number of holes in the building's thermal enclosure.

The article continues with an example to help demonstrate how volume is not proportional to surface area:

Comparison between ACH50 and CFM50/ft² for a 2000 ft² home at 3 ACH50

House Is 50 X 40 X 8

Volume = $16,000 \text{ ft}^3$

Surface Area = 50 X 40 X 2 + 180 X 8 = 5440 ft²

CFM50 = (3 X 16000)/60 = 800 CFM

CFM50/ft2 = 800/5440 = 0.147 CFM50/ft²

Increase height to 2 story at 3 ACH50

House Is 50 X 40 X 16 Volume = 32,000 ft³

Surface area = 50 X 40 X 2 + 180 X 16 = 6880 ft²

CFM50 = (3 X 32000)/60 = 1600 cfm

CFM50/ft2 = 1600/6880 = 0.233 CFM50/ft²

In this example, when the volume is doubled, the surface area increased by 26%. And when the ACH50 stays the same, the CFM/ ft² of surface area increased by 58%. I have attached an Excel spreadsheet calculator that further defines the disconnect between ACH and CFM/ ft² of surface area to further elaborate the issue. In the attached calculator you can change the ratio of width and length of the building to see the effect on the resulting expressions of air leakage. An independent yet similar calculator can be found at this Residential Energy Dynamic link http://www.residentialenergydynamics.com/REDCalcFree/Tools/AirLeakageMetrics

The primary purpose of this code change proposal is to introduce the CFM/ft² of surface area metric into the code. Deciding on where to set the minimum allowable leakage rate is difficult largely due to the earlier volume and surface area discussion. Both tests are performed at a pressure differential of 0.2 inch water gauge (50 Pa), which is a the traditional residential testing pressure so an attempt was made to align the introduction of a CFM/ft² of surface area metric with the existing ACH50 matric of 3 and 5 air changes per hour. ACH being a volumetric measurement penalized small volume dwelling units so a decision was made to concentrate on a size range of dwellings between 2500 and 5500 square feet. By doing this and using the attached conditioned floor space to shell area calculator we were able to see that little variation occurred between ACH and CFM/ft² of surface area metric when changing the size ratio of the modeled house within this house size range. By rounding up, the proposal is using .17 CFM/ft² of surface area metric to align with 5 ACH. By using these numbers, small volume homes, while not having a volumetric penalty, are allowed to be a little more leaky and large volume homes must achieve just about the same level of tightness if not a slight bit more. As the average home size in the United States is approximately just less than 2500 square feet this code change proposals purpose of introducing a better measurement metric without removing the codes traditional measurement methodology, provid additional flexibility while maintaining

similar stringency.

The Energy Conservatory suggests that the use of Air Changes per Hour at 50 Pa (ACH50) started approximately 60 years ago by researchers who were interested in ways to predict the natural infiltration rate of buildings, which at the time was most commonly measured in Air Changes per Hour. At the time air quality in buildings was being studied and the metric made sense. If a pollutant is released in a building, the time for the concentration to decay by a certain percentage depends on the infiltration measured in air changes per hour. The analysis of a tracer gas decay test gives a result in air changes per hour. So, when they started measuring airtightness, for use in estimating natural infiltration in air changes per hour, it made sense to use ACH50 as the metric.

However, as discussed earlier, two homes with the same volume can have very different surface areas and holes associated with the building enclosure area.

Value is gained by including a surface area-based metric in that air-sealing varies directly with the amount of surface area not the amount of volume in the dwelling. Two buildings can have surface areas that differs by 15%, but have the same volume and the current metric offers the same leakage allowance. Therefore, if the purpose of measuring air leakage is to determine something about the construction quality, air leakage rate, energy efficiency and building durability the metric should be associated with the flow of air through holes in the enclosure. To quantify these things ACH is the wrong metric. It does not tell you anything about the quantity and air leakage through holes in the building. Conversely, the CFM/ ft² of surface area metric concretely expresses the quantity of air leakage through the building's exterior enclosure. When an enclosure is tight more energy is conserved as well as allowing better control and predictability of air flow, thermal flow, and moisture flow.

Many standards are now using square foot of enclosure area instead of ACH. Examples include EnergyStar, US Army Corp of Engineers, LEED, US Passive House and ASHRAE 62.2. This proposal is the first step to bring this better expression of air leakage into the code. It has been created in such a way that options are maintained allowing jurisdictions and building professionals flexibility in defining air leakage requirements.

Link to Energy Conservatory article from which portions of this reason statement have been added:

https://support.energyconservatory.com/hc/en-us/articles/204176240-Which-is-a-better-metric-for-measuringairtightness-ACH-50-Pa-or-CFM-ft-of-surface-area-50-Pa-

Why the change to R403.6?

It was pointed out in the last code cycle, that this metric could have an unintended loophole since it is not used in the IRC. To avoid that, the section was edited to to ensure whole house mechanical ventilation continues to be required and installed

Why The change to IRC 303.4?

It was pointed out in the last code cycle, that this metric could have an unintended loophole since it is not used in the IRC. To avoid that, the section was edited to ensure whole house mechanical ventilation continues to be required and installed

Cost Impact: The code change proposal will not increase or decrease the cost of construction There should be no cost implication associated with the adoption of this proposed language. Dwellings will continue to need to be tested and testing prices will not change due to an additional option for how to express
the results of the test.

Proposal # 5697

RB79-19

RB80-19

IRC®: R305.1

Proponent: Felix Zemel, representing ICC Region 6 -- North East Regional Coalition (felix@pracademicsolutions.com); Peter Zvingilas, Representing ICC Region 6- North East Regional Coalition, Town of Groton and Voluntown, CT, representing Representing ICC Region 6- North East Regional Coalition (pzvingilas@voluntown.gov)

2018 International Residential Code

Revise as follows:

R305.1 Minimum height. *Habitable space*, hallways and portions of *basements* containing these spaces shall have a ceiling height of not less than 7 feet (2134 mm).

Bathrooms, toilet rooms and laundry rooms shall have a ceiling height of not less than 6 feet 8 inches (2032 mm).

Exceptions:

- 1. For rooms with sloped ceilings, the required floor area of the room shall have a ceiling height of not less than 5 feet (1524 mm) and not less than 50 percent of the required floor area shall have a ceiling height of not less than 7 feet (2134 mm).
- 2. The ceiling height above bathroom and toilet room fixtures shall be such that the fixture is capable of being used for its intended purpose. A shower or tub equipped with a showerhead shall have a ceiling height of not less than 6 feet 8 inches (2032 mm) above an area of not less than 30 inches (762 mm) by 30 inches (762 mm) at the showerhead.
- 3. Beams, girders, ducts or other obstructions in *basements* containing *habitable space* shall be permitted to project to within 6 feet 4 inches (1931 mm) of the finished floor.
- 4. <u>Beams and girders spaced not less than 4 feet (1219 mm) on-center shall project not more</u> than 6 inches (152 mm) below the required ceiling height.

Reason: The proposed language was remived in the 2009 IRC because the argument was made that a 4-foot space between beams could not be regulated due to no definitive beam size. We are suggesting 5-1/2" width for a beam to allow a 2x6 wall to be utilized for beam support. The original intent of this section was to allow supportive exposed beams between rooms to be lower than 7 feet. With the engineered lumber and spans larger than normal in homes, beams are larger than traditional nominal lumber.

The removal of this language has left the ceiling height unattainable in many situations. If the current code is to be followed, no beams are alowed to fall below 7 feet in any home, except for basements, which we have defined in Section 305.1 exception 3.

By adding relief to the current code will allow the use of engineered lumber for many situations that are not legal under current code. In practice, this section is either ignored by the code official, or they may need to issue a lot of variances. In section R311.2, we allow a minimum of 78 inches (1981 mm) in height for an egress door. By that logic, we should allow 78 inches (1981 mm) for any transitional opening between rooms. By defining this, we can minimize the confusion of what is allowable height on a beam on any floor other than basements.

Cost Impact: The code change proposal will not increase or decrease the cost of construction Adding relief to the current code will allow the use of engineered lumber for many situations that are not legal under current code.

RB80-19

RB81-19

IRC®: SECTION R307, R307.1, R307.2, R301.3 (New), R307.3.1 (New), R307.3.2 (New), R307.3.3 (New), R307.3.4. (New), R307.3.5. (New)

Proponent: Jake Pauls, representing self (bldguse@aol.com)

2018 International Residential Code

Revise as follows:

SECTION R307 TOILET, BATH AND SHOWER SPACES<u>, INCLUDING GRAB BAR</u> <u>PROVISION</u>

R307.1 Space required. Fixtures shall be spaced in accordance with Figure R307.1, and in accordance with the requirements of Section P2705.1.

R307.2 Bathtub and shower spaces. Bathtub and shower floors and walls above bathtubs with installed shower heads and in shower compartments shall be finished with a nonabsorbent surface. Such wall surfaces shall extend to a height of not less than 6 feet (1829 mm) above the floor.

Add new text as follows:

R301.3 Grab bars. Grab bars shall be in accordance with Sections R303.3.1 trough R303.3.7.

R307.3.1 Grab Bar Provision. New bathtubs and showers shall be provided with grab bars complying with Section R307.3. Positioning of the grab bars, including stanchion type grab bars in addition to conventional wall mounted grab bars, shall be such that they are within reach of bathtub and shower users where such users are standing within the bathtub or shower and standing within the clearance spaces required by R307.2 as illustrated in Figure R307.1.

R307.3.2 Shower grab bar. A vertical grab bar shall be provided with a length of at least 24 inches (610 mm) positioned with its lower end not higher than 39 inches (990 mm) above the finished floor, its upper end not lower than 60 inches (1525 mm) above the finished floor, and located either inside or outside the shower enclosure and usable by a person entering and exiting the shower enclosure to occupy the clear floor area required by R307.2.

R307.3.3 Vertical bar for bathtub. A vertical grab bar with a minimum length of 36 inches (915 mm) shall be provided at the unobstructed entrance for the end wall of the bathtub, adjacent to the clear floor area required by R307.2 and positioned with its lower end not higher than 27 inches (685 mm) above the finished floor and its upper end not less than 60 inches (1525 mm) above the finished floor. If wall-mounted, the grab bar shall be between 9 inches (230 mm) and 12 inches (305 mm), measured horizontally, from the exterior plane of the bathtub. If provided as a stanchion extending from the ceiling to the floor or bathtub rim, the vertical bar shall be not more than 6 inches (150 mm) horizontally of the outer edge of the bathtub and not more than 30 inches (760 mm), measured horizontally, from the control end wall or from the water delivery spout in the absence of a control end wall.

R307.3.4. Horizontal or diagonal grab bar for bathtub. At the non-access side of the bathtub there shall be a diagonal or horizontal grab bar with a length of at least 24 inches (610 mm) placed not higher than 10 inches (255 mm) above the rim of the bathtub. If horizontally oriented the bar shall be positioned not higher than 10 inches above the rim of the bathtub and one end no more than 12 inches (305 mm), measured horizontally, from the control end or the water spout location if there is no control wall end. If diagonally oriented, the higher

end shall be not more then 12 inches (305 mm) measured horizontally from the control end wall and between 25 inches and 27 inches (685 mm) above the rim of the bathtub.

R307.3.5. Grab bar details. Grab bars shall be circular in cross section with a minimum diameter of 1.25 inches (30mm) and a maximum diameter of 2 inches (50 mm). There shall be a clearance, for hand grasp, of not less than 1.5 inches (40 mm) between the bar and any surface. Grab bars shall be designed and constructed to withstand a load, in any direction, of 250 pounds minimum. Grab bars shall be designed and constructed with their fixings resistant to corrosion from water and to deterioration, from water, of surfaces and structure to which they are attached.

Reason: Reason Statement for IRC R307, new grab bar requirements in the IRC **General Introduction**

Grab bars are what are, more generally, called "points of control" which help us maintain our posture and facilitate movement via our bodily contacts with surfaces underfoot and graspable fixed objects for our hands. For example, stair use requires—for minimum safety—one foot taking our body weight on a step (while the other foot moves between steps) and one hand on a handrail if we need lateral support of our upright bodies and/or some pulling assistance for the stair climb.

Thus, from a code point of view, it is widely accepted that stairs require at least one handrail to assure that at almost all times we have two points of control available when using stairs. The same ergonomic or biomechanical standard has not been generally applied to another dangerous act in buildings, entering and exiting a bathing or showering facility. In a home these facilities will typically require stepping over a bathtub wall or a low dam preventing water from draining onto the floor from a shower pan. This step-over behavior is complicated by the quality of the underfoot surfaces, some wet with water and others insecure due to other conditions (such as a dry towel or mat on a dry but very smooth tile surface) that are precursors to a slip. With this brief, fundamental consideration of the problem and its solution in mind, see Figure 1, a matrix which relates points of control to simplified regulatory strategies, namely how many points of control are enough.

Right now, for bathing/showering on wet, slippery surfaces the point of control at our feet is very dubious and unreliable. And, currently, home bathrooms very, very seldom have any grab bars. The effective level of points of control in most home bathrooms is less than one. As already noted, stairs even in homes provide about two points of control (although, with undersized tread depths and dysfunctional decorative railings instead of function handrails, that figure of two might be closer to one). See Figure 1 for a hierarchy of points of control and situations where bathtubs/showers exist currently with very substandard availability of points of control combined with dangerous, hard surfaces to fall against and, thus, exacerbate injuries.

Grab Bar Equity with Stair Handrails

Number of Points of Control Via Hands or Feet	≤1	1	2	3	3-4
Standard walker for older adult with altered gait.					~
Occupational settings with risk of worker falls from heights. Also, stairs where users can use two handrails simultaneously, one on each side.				~	
Stairs where users have only a single handrail.			~		
Grab bar(s) usable for bathtub/shower entry/egress.			*		I
Bathtubs/showers with slip resistant underfoot surfaces when wet.		~			
Bathtubs/showers without slip resistant underfoot surfaces when wet, the common condition currently.	~				

Figure 1. Hierarchy of Points of Control

and Proposed Grab Bar Equity with Stair Handrails

Therefore, in recent years, there has been an international move to providing one or more new points of control for bathtubs and showers, largely to aid in two types of transfer for bathtubs—transfers in a standing position over the tub wall (for all tub uses) and transferring from a standing position to sitting or lying and later transferring from a lying or sitting position to standing. These bathtub transfers require two different points of control in relation to where the hand(s) are needed for the two types of transfers. Thus for all bathtub transfers two upper body points of control are needed either sequentially or simultaneously—the latter being increasingly important as one ages and loses lower body strength and has greater issues with balance generally. Especially as we get older, we rely more and more on bilateral support on stairs with handrails on both sides and bathtubs where there are points of control on both sides of the tub if we have a bath as opposed to showering.

The most basic package of grab bar requirements for transfers by ambulatory means is a single vertical grab bar reachable from the entrance area of a bathtub or a dedicated shower. If a bath is desired in a tub, then a diagonally oriented or horizontal bar on the non-access side of the tub is needed where there is often a wall on which to attach a conventional grab bar. An option is to use a horiaontal stanchion (a bar or tube that is attached between surfaces rather than cantilevered from a surface) attached *between* end walls of a tub enclosure. See the installation photograph at the end of this Reason Statement; the horizontal stanchion is held in place by two large tiles through which the stanchion tube is passed with the tube ends butted against the wall tile with no hole made in the wall tile so there is no chance of water entry behind the wall tile due to this installation. High-grade adhesive is used to hold the assembly in place meeting the 250-pound load crtierion easily.

The foregoing was the rationale used to develop the first set of mainstreamed grab bar requirements in a model building code as well as in a companion, safety standard—specifically NFPA 5000 and NFPA 101 in their 2018

editions and retained in the upcoming 2021 editions. The basic set of criteria that were adopted with very little fuss within the NFPA process has now been used to develop a proposal for the IRC, specifically Section R307 which deals with toilet, bath and shower spaces. This was where some people in ICC, during 2018 hearings for Group A code requirements, recommended a new mainstreamed grab bar requirement should be situated. Their advice has been followed in the proposal now submitted for Group B code requirements. (When the proponent started down this road of trying to get grab bar requirements into the I-codes, he was unaware there were various options on where such requirements might best fit. The consensus on this in last year's Group hearings was "*not here*" and, for dwelling units, the logical place to be addressed in Group B was the Planning chapter of the IRC, specifically Section R307 on spaces in bathrooms. Hence, proposed here is the basic, minimum or entry level proposal to mainstreamed grab bars for dwelling units, the most likely context for injuries related to bathtubs and showers.

The Problem of Injuries Associated with Bathtubs and Showers

How Bathtub and Shower-related Injuries Compare to Other Injury Sources. Figure 1 provides a quickly appreciated comparison of the relative size of three problems in buildings: fires, stairs and baths/showers.



Figure 1. Chart of Approximate Relative Occurrence of Serious Injuries

Associated with Three Common Dangers in Homes and Other Buildings

One can quickly see that injuries related to baths/showers greatly outnumber those from fire and that baths/showers are in the same league as stairs in terms of injuries. However, note that when exposure is taken into account, baths/showers are more dangerous. (Exposure will also be addressed in the following section where the other major safety culprit in home bathrooms is briefly noted.)

The central and most important point of this code change proposal is to respond to the relatively high risk of injurious falls when entering and exiting a bathing/showering facility. An organization, PIRE (Pacific Institute for Research and Evaluation), in Maryland is the best available source of some very insightful data collections that have been prepared by likely the finest minds on injury data in the world. PIRE has provided the proponent with data sets that have their origins in the US CPSC National Electronic Injury Surveillance System (NEISS) but have been subjected to intelligent analysis and presentation which are shared here, where they can do a lot of good.

First let us examine data on where (occupancy or building context) bathtub and shower injuries occur in the USA in the years 2010-2014. Table 1(a) provides this data set from PIRE along with a related data set, in 1(b) Table for toilets, the third relatively dangerous facility in home bathrooms.

	Locale of accident	Frequency	Percent
0	Not recorded	209,935.6	21.02
1	Home	754,831.6	75.57
2	Farm/ranch	25.3	0.00
4	Street/highway	756.9	0.08
5	Other public property	29,838.6	2.99
6	Mobile/manuf home	75.2	0.01
8	School	1,092.9	0.11
9	Place of rec/sports	2,293.3	0.23
	Total	998,849.3	100.00

Toilets

	Locale of accident	Frequency	Percent
0	Not recorded	56,454.2	19.09
1	Home	203,471.0	68.79
4	Street/highway	165.6	0.06
5	Other public property	33,400.8	11.29
8	School	1,541.3	0.52
9	Place of rec/sports	760.4	0.26
	Total	295,793.3	100.00

Tables 1(a) Bathtubs & Showers plus 1(b) Toilets:

Injuries by Locale in the US

Some important preliminary lessons from these tables: first homes are, by far, the most common locale for bathroom-related injuries. People can avoid using showers anywhere, but they need to use toilets everywhere.

Next, let us examine data on rates of injuries by age group and the context of professional treatment for those injuries. Again we compare two tables addressing (a) bathing/showering and (b) toileting.

Bathrutes & showing		1	Hospital ad		
Age	Dec/Dute	60	via ED	Direct	Total
00-09	0.56	107.1	5.3	1.6	204.0
10-19	84.6	54.7	2.3	0.5	311.1
85-25	159.5	81.7	3.1	1.3	245.4
20-39	223.7	90.4	1.7	1.3	3522.9
40-49	301.5	88.6	\$5	2.7	397.2
50-55	285.8	87.6	8.8	3.3	383.2
60-65	222.2	77A	35.G	5.2	320.1
20-79	284.3	105-9	33.3	30.4	433.8
	429.0	201.0	50.4	24.7	745.1
Total	215.2	89.0	20.3	3.2	31.0.3

Toriets			Hospital admitted			
Ape	Dec/Dutp	60	viaED	Direct:	Total	
00-09	20.2	5.61	0.6	92	43.1	
10-19	7.5	6.0	6.8	6.3	52.4	
20.25	37.5	12.2	0.6	0.3	30.0	
30-19	37.2	14.2	1.2	0.3	53.5	
40-49	46.0	14.1	3.6	1.0	65.8	
50-59	61.7	21.6	5.1	1.6	90.0	
60.69	23.3	32.6	22.8	4.6	213.2	
70-75	154.7	59.7	\$2.6	30.4	257.0	
>:80	375.0	179.2	112.0	80.1	495.9	
fotal	37.6	17.2	8.7	2.6	24.3	

Tables 2(a) Bathtubs & Showers plus 2(b) Toilets:

Injury Rates by Age & Treatment Context

Some important preliminary lessons from these tables: First, note the heightened vulnerability of older adults to injuries—at rates ten to a hundred times higher than for younger and middle-age adults. Second, note for the very oldest people, toilets are especially dangerous because their use—or avoidance of use—is not by choice as is the case for showers and baths. Third, note for the oldest people, injuries tend to be very serious as the rate for minor treatment is close to the rate for hospital admission.

Next, let us examine data on incidence (estimated number) of injuries by age group and the context of professional treatment for those injuries. Again we compare two tables addressing (a) bathing/showering and (b) toileting.

Bathtubs & showers		1	Hospital-admitted		
Age	Doc/Outp	ED	via ED	Direct	Total
00-09	37,209.4	43,339.8	1,331.7	666.4	82,547.3
10-19	35,633.2	23,065.4	550.0	193.0	59,441.6
20-29	69,977.6	35,853.2	1,362.6	482.8	107,676.2
30-39	111,103.0	36,699.4	1,497.8	444.1	149,744.3
40-49	128,478.0	37,743.3	2,339.7	706.7	169,267.6
50-59	122,562.0	37,817.5	3,806.7	1,332.2	165,518.4
60-69	70,334.1	24,507.2	4,954.2	1,648.5	101,444.0
70-79	50,248.3	18,727.5	5,880.1	1,832.0	76,687.9
>=80	49,813.7	23,342.6	10,501.9	2,864.2	86,522.4
Total	675,359.0	281,096.0	32,224.6	10,169.9	998,849.5

Toilets			Hospital-ad		
Age	Doc/Outp	ED	via ED	Direct	Total
00-09	8,162.7	7,752.4	235.8	90.6	16,241.5
10.19	2,997.7	2,507.3	109.4	31.9	5,646.3
20-29	7,660.3	5,348.3	275.1	139.9	13,423.6
30-39	15,285.7	5,965.9	481.2	132.8	21,865.5
40-49	19,586.3	6,929.6	1,121.8	414.5	28,052.1
50-59	26,660.4	9,330.3	2,190.4	707.6	38,888.7
60-69	29,557.7	10,315.4	4,054.4	1,383.1	45,310.7
70-79	27,339.4	10,463.1	5,791.4	1,838.0	45,431.9
>=80	43,548.8	20,879.0	13,006.3	3,498.9	80,933.0
Total	180,799.0	79,491.3	27,265.8	8,237.2	295,793.3

Tables 3(a) Bathtubs & Showers plus 3(b) Toilets:

Injury Incidence by Age & Treatment Context

Some important preliminary lessons from these tables: Note that there are many injuries occurring to younger people so their greater preference for frequent bathing/showering is not reduced by the dangers; they still fall due to factors that go beyond frailty and/or balance issues that increase with older people. Their injuries might be less severe but they are still highly vulnerable to incidents with balance or footing, for example, from which they are less likely to be hurt very badly. In other words, there are problems to be addressed across the life span with bathing/showering.

The societal cost of these injuries was (for 2010) about 20 billion dollars for US bathtubs plus showers and about 93 billion dollars for US stairs with the greatest risk for both being in homes, where bathing/showering is a near daily activity for most people in the US (Data source: Lawrence, B., Spicer, R., Miller, T. A fresh look at the costs of non-fatal consumer product injuries. *Injury Prevention,* digital publication, August 2014, paper journal publication, 2015:**21**:23-29.)

Source of the Text of the Proposed New Requirements for IRC Section R307.3

The source of the proposed new requirements is a few sources, first the proponent's proposals of last year for Group A changes to the IBC (first Means of Egress, Ch. 10 and later Interior Environment, Ch. 12) and the IRC (plumbing). A Comment was submitted only for the IBC knowing already that there were numerous suggestions

that the best place in the IRC was not for a section in Group A; it was the Planning Chapter in Group B.

Other sources include activity in Canada on two separately submitted proposals, from 2007 and 2015, for mainstreamed grab bars, first only in homes and later in all occupancy contexts.

The best source was the proposals that have actually been incorporated in a major set of documents, NFPA 5000 and NFPA 101. The latter, in addition to adopting a package of requirements for mainstreamed grab bars in virtually every non-healthcare occupancy, adopted a new scoping provision (1.1.6): "Injuries from Falls. The Code also addresses reducing injury to occupants from falls." (NFPA 5000 already had such an expanded scope from its inception.) The proponent for both the successful mainstreamed grab requirements and the new scope statement was the current proponent of the two proposals to the I-Codes in Group A in 2018 and is the proponent of this proposal in Group B during 2019.

To be specific, for a few reasons the proponent elected to pattern the now-proposed requirements, for an expansion of IRC R307.3, on what NFPA has adopted and will soon include in its next code editions, the 2021 editions of NFPA 5000 and NFPA 101. This is not done out of loyalty to NFPA but, more fundamentally, because with all the discussions that have been going on internationally over the last two decades on improved bathroom safety, there is a consensus emerging on what a package of mainstreamed grab bar proposals should contain. So, bottom line, the ICC has a widely considered proposal in Group B for the IRC during 2019. They have had much discussion and, as noted in last year's proposals, the proponent is a devoted documenter of bathrooms in hotels in many countries due to, first, his attention to detail and, second, the need to document bathroom facilities to near-forensic standards for his 130 nights of travel using a variety of hotels, wth rooms in a wide range of price categories, each year.

Finally, the proponent practices what he preaches; see Figure 2 for the bathroom in his dwelling unit; it would readily comply with the proposed IRC requirements.



Figure 2. Bathroom Retrofitted (in a rental apartment)

with Mainstreamed Grab Bar Set That Would Comply

with the Proposed IRC Requirements for R307.3

Bibliography: An extensive bibliography of about 50 items was provided with all the Group A proposals on grab bars. That can be obtained from cdpAccess archives as well as from the proponent. There was only one citation to the Itierature in this Group B proposal and all the usual bibliographic information was included in the Reason Statement text.

Cost Impact: The code change proposal will increase the cost of construction

From careful analysis on related code change proposals in Canada (where an Impact Analysis is being required for many proposed changes to the National Building Code of Canada. The bottom line is that the payback period for the few hundred dollars of materials and labour to install two grab bars per shower-bathtub combination in a dwelling, even for two bathrooms in such a dwelling, is on the order of several years. After that, the grab bars just keep preventing and mitigating falls for decades, given the large cost of bathing/showering-related injuries as discussed in the Reason Statement.

Proposal # 5619

RB82-19

IRC®: R308.4.5 (New)

Proponent: Lucas Pump, representing Self (I.pump@cedar-rapids.org)

2018 International Residential Code

Revise as follows:

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

Exception: Glazing that is more than 60 inches (1524 mm), measured horizontally and in a straight line, from the water's edge of a bathtub, hot tub, spa, whirlpool or swimming pool or from the edge of a shower, sauna or steam room.

Reason: This code change proposal provides clarification on where safety glazing is required when adjacent to wet surfaces. This section has come up a number of times in our jurisdiction and there is always confusion on whether the adjacent wall next to a tub/shower needs safety glazing, or just the wall "facing" the tub/shower as specifically stated in the code. We believe the intent is similar to that of a landing at the bottom of the stairs, which requires any glazing within a 60 inch arc to be safety glazing. If you step out of a tub/shower, you are just as likely to slip and fall to the side as you are to fall forward. For this reason we believe simply adding the words "adjacent to" will make this more clear. This proposal adds language that would support safety glazing in a window next to a bathtub on the wall adjacent to a bathtub/shower.

Wet Surfaces



Cost Impact: The code change proposal will not increase or decrease the cost of construction I believe that this wouldn't increase the cost of construction, because most inspectors and contractors are interpreting this area as being required to be safety glazing already.

RB83-19

IRC®: R308.6.3, R308.6.4, R308.6.5, R308.6.7

Proponent: Jennifer Hatfield, representing American Architectural Manufacturers Association (jen@jhatfieldandassociates.com)

2018 International Residential Code

Revise as follows:

R308.6.3 Screens, general. For fully tempered or heat-strengthened glass, a retaining broken glass retention screen meeting the requirements of Section R308.6.7 shall be installed below the full area of the glass, except for fully tempered glass that meets either condition <u>1 or 2</u> listed in Section R308.6.5.

R308.6.4 Screens with multiple glazing. Where the inboard pane is fully tempered, heat-strengthened or wired glass, a retaining broken glass retention screen meeting the requirements of Section R308.6.7 shall be installed below the full area of the glass, except for either condition <u>1 or 2</u> listed in Section R308.6.5. Other panes in the multiple glazing shall be of any type listed in Section R308.6.2.

R308.6.5 Screens not required. Screens shall not be required where <u>laminated glass complying with item 1 of</u> <u>Section R308.6.2 is used as single glazing or the inboard pane in multiple glazing.</u> <u>Screens shall not be required where fully tempered glass is used as single glazing or the inboard pane in</u> multiple glazing and either of the following conditions are met:

- The glass area is 16 square feet (1.49 m²) or less; the highest point of glass is not more than 12 feet (3658 mm) above a walking surface; the nominal glass thickness is not more than ³/₁₆ inch (4.8 mm); and -(, for multiple glazing only)-, the other pane or panes are fully tempered, laminated or wired glass.
- 2. The glass area is greater than 16 square feet (1.49 m²); the glass is sloped 30 degrees (0.52 rad) or less from vertical; and the highest point of glass is not more than 10 feet (3048 mm) above a walking surface.

R308.6.7 Screen characteristics. The screen and its fastenings shall: be capable of supporting twice the weight of the glazing, be firmly and substantially fastened to the framing members, be installed within 4 inches (102mm) of the glass; and have a mesh opening of not more greater than 1 inch by 1 inch (25 mm by 25 mm).

Reason: The current language that states when screens are required below unit skylights glazing has frequently been difficult to interpret by jurisdictions, causing consumers and others concern when they are incorrectly told they need to install a glass retention screen below conforming laminated glass. Skylight manufacturers are asked to intervene far too frequently to ensure that unsightly, unnecessary screens are not installed in these instances. Furthermore, it is believed that many times an optional skylight installation is removed from submitted plans due to misinterpretation at the plan check stage, where the supplier may never know that the issue was raised because the permit applicant chooses to surrender rather than appeal. The current code language addresses qualifying laminated glass by simple omission from the sections dealing with screens. It is this omission that seems to create the confusion within the industry. The proposed additional sentence in Section R308.6.5 states <u>directly</u> that permitted laminated glass does not require screens. This should reduce the frequency of misinterpretations that have been experienced.

Adding the modifier, "broken glass retention" fully describes the screen's purpose. This is to ensure readers do not confuse them with insect screens or fall protection screens, which are physically different and will not serve

as effective retention screens.

Section R308.6.7 is further clarified to be consistent with the language in IBC Section 2405.3.

None of the proposed changes affect the long-standing requirements; rather, the only expected outcomes are simply better clarity that will then provide more consistent enforcement.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposal should have a nominal effect of the cost of construction as the changes presented are not meant to alter the current requirements but simply meant to provide better clarity and more consistent enforcement.

Proposal # 5259

RB84-19

IRC®: R310.1

Proponent: Matt Archer, representing City of Lone Tree (Matt.archer@cityoflonetree.com)

2018 International Residential Code

Revise as follows:

R310.1 Emergency escape and rescue opening required. *Basements, habitable attics* and every sleeping room shall have not less than one operable emergency escape and rescue opening. Where *basements* contain one or more sleeping rooms, an emergency escape and rescue opening shall be required in each sleeping room. Emergency escape and rescue openings shall open directly into a public way, or to a *yard* or court that opens to a public way.

Exceptions Exception:

- 1. Storm shelters and *basements* used only to house mechanical *equipment* not exceeding a total floor area of 200 square feet (18.58 m²).
- 2. Where the *dwelling* or *townhouse* is equipped with an automatic sprinkler system installed in accordance with Section P2904, sleeping rooms in basements shall not be required to have emergency escape and rescue openings provided that the basement has one of the following:
 - 2.1. One means of egress complying with Section R311 and one emergency escape and rescue opening.
 - 3.2. Two means of egress complying with Section R311.

Reason: This exception was introduced to the 2018 IRC to encourage the installation of fire suppression systems. Egress windows should not be removed from a sleeping area or room. Bedrooms in a basement are unique in the fact they are in a concrete bunker essentially. Should a fire event happen at or near the door you will have no option to self-evacuate if you do not have an egress window. I have heard basements described by fire crews as a large oven as they contain and radiate the heat in a confined space. Putting all the egress expectations on a system with an effective design time of possibly 6 minutes versus an opening which will always be available is a no brainer. Egress windows are also used for rescue and ingress for fire crews to attack the event. Last, unlike the IBC and IFC, IRC systems are not required to be inspected annually and maintenance is dependent on the owner who could remove the head, modify the head or paint over the head effectively hampering or removing this system as an egress option. And, now they have no window either...

Cost Impact: The code change proposal will increase the cost of construction This change could increase the cost of construction if you were to install a suppression system.

Proposal # 5607

RB84-19

RB85-19

IRC®: R310.1

Proponent: Jeffrey Shapiro, P.E., representing Self (jeff.shapiro@intlcodeconsultants.com)

2018 International Residential Code

Revise as follows:

R310.1 Emergency escape and rescue opening required. *Basements, habitable attics* and every sleeping room shall have not less than one operable emergency escape and rescue opening. Where *basements* contain one or more sleeping rooms, an emergency escape and rescue opening shall be required in each sleeping room. Emergency escape and rescue openings shall open directly into a public way, or to a *yard* or court that opens to a public way.

Exceptions:

- 1. Storm shelters and *basements* used only to house mechanical *equipment* not exceeding a total floor area of 200 square feet (18.58 m²).
- 2. Where the *dwelling* or *townhouse* is equipped with an automatic sprinkler system installed in accordance with Section P2904, sleeping rooms in basements shall not be required to have emergency escape and rescue openings provided that the *basement*, *story*, *habitable attic* or *mezzanine* in which the sleeping room is located has one of the following:
 - 2.1. One means of egress complying with Section R311 and one emergency escape and rescue opening.
 - 2.2. Two means of egress complying with Section R311.

Reason: This proposal suggests an extension of the means of escape window allowance, added last cycle by RB89-16 (which duplicates an IBC exception added by E145-15). The current application, which is limited to basements of sprinklered dwelling units, would be applicable to all levels, provided that each level using the exception has at least one escape window or door in addition to a code-compliant means of egress, such as an interior stair or a door to the outside. It is important to remember that means of escape openings are in the code due to fire concerns and are sized based on a firefighter in full turnout gear going through the opening. Where sprinklers and hard-wired interconnected smoke alarms are present there is minimal prospect of a firefighter having to make entry through or an occupant having to escape via a window opening.

Precedent for extending this exception is well established by the NFPA 101 - Life Safety Code, which allows eliminating ALL required means of escape openings from sprinklered one- and two-family dwellings [24.2.2.1.2(2)], hotels, motels, apartments and similar uses. In addition, the states of New Hampshire and Virginia have both amended R310.1 of their statewide code adoptions by eliminating ALL requirement for means of escape openings when sprinklers are provided. This proposal is more conservative by retaining a requirement for at least one means of escape plus the means of egress from each level.

This proposal offers significant value to builders, architects, homeowners and firefighters. For builders, architects and homeowners, the proposal offers significant <u>design flexibility and choice</u> of where and how to locate windows when a dwelling unit is equipped with a fire sprinkler system. There is particularly beneficial for cases where it is difficult, or perhaps impossible, to provide a complete path from a sleeping room means of escape to a public way due to pathway obstructions created by fences isolating townhouse yards, rooftop solar arrays or other obstacles. For firefighters, it is far safer to respond to a sprinklers home than a non-sprinklered home, and reasonable and appropriate incentives, such as this one, encourage and recognize the value of residential sprinkler installations.

Disclosure: although I am a consultant to the National Fire Sprinkler Association, this proposal is submitted on my own behalf and was not reviewed or endorsed by NFSA prior to submittal.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposal adds an option to the code. There is no requirement to utilize this option; however, if it is used, the cost of construction may decrease.

Proposal # 4703

RB85-19

RB86-19

IRC®: R310.1

Proponent: Thomas Barrs, City of Scottsdale, representing Self (tbarrs@scottsdaleaz.gov)

2018 International Residential Code

Revise as follows:

R310.1 Emergency escape and rescue opening required. *Basements, habitable attics* and every sleeping room shall have not less than one operable emergency escape and rescue opening. Where *basements* contain one or more sleeping rooms, an emergency escape and rescue opening shall be required in each sleeping room. Emergency escape and rescue openings shall open directly into a public way, or to a <u>minimum 36" wide</u> *yard* or court that opens to a public way.

Exceptions:

- 1. Storm shelters and *basements* used only to house mechanical *equipment* not exceeding a total floor area of 200 square feet (18.58 m²).
- 2. Where the *dwelling* or *townhouse* is equipped with an automatic sprinkler system installed in accordance with Section P2904, sleeping rooms in basements shall not be required to have emergency escape and rescue openings provided that the basement has one of the following:
 - 2.1. One means of egress complying with Section R311 and one emergency escape and rescue opening.
 - 2.2. Two means of egress complying with Section R311.

Reason: 1. The current requirement for yards and courts to "open directly into a public way" or "opens to a public way" does not specify a minimum width.

2. Both the IRC and IBC use the defined terms 'yards' and 'courts', however only the IBC in Section 1028 for Exit Discharge provides specific language for minimum width of a court as "Egress courts serving Group R-3 and U occupancies shall be not less than 36 inches." This code change provides uniformity with the IBC, and a minimum level of safety by including a width for both emergency egress and fire department access.

3. Without this code change, developers, designers, and code officials are provided with no width criteria for yards or courts that must be provided as links to the public way from emergency escape and rescue openings.

Note: The graphic is intended to depict a general example of townhouse and a single family dwelling where the 36" width portion of the yard or court may link from a rear yard or court, to a side yard, then link to a public way. Emergency Escape and Rescue Openings may be from various locations, on various stories, from sleeping rooms, basements, etc., which are not depicted here, but are presently required to "open to a public way", or from "yards" or "courts" to a public way.

Public Way



Cost Impact: The code change proposal will not increase or decrease the cost of construction By providing a uniform width requirement, jurisdictions which allowed lesser widths may see an increase in costs, however other jurisdictions that required a larger width due to lack of a specified width, may see a reduction in costs.

Proposal # 5559

RB86-19

RB87-19

IRC®: R310.1

Proponent: Cesar Lujan, representing National Association of Home Builders (clujan@nahb.org); Gary Ehrlich (gehrlich@nahb.org)

2018 International Residential Code

Revise as follows:

R310.1 Emergency escape and rescue opening required. *Basements, habitable attics* and every sleeping room shall have not less than one operable emergency escape and rescue opening. Where *basements* contain one or more sleeping rooms, an emergency escape and rescue opening shall be required in each sleeping room. Emergency escape and rescue openings shall open directly into a public way, or to a *yard* or court that opens to a public way.

Exceptions:

- 1. Storm shelters and *basements* used only to house mechanical *equipment* not exceeding a total floor area of 200 square feet (18.58 m²).
- 2. Where the *dwelling* or *townhouse* is equipped with an automatic sprinkler system installed in accordance with Section P2904, sleeping rooms in basements shall not be required to have emergency escape and rescue openings provided that the basement has one of the following:
 - 2.1. One means of egress complying with Section R311 and one emergency escape and rescue opening.
 - 2.2. Two means of egress complying with Section R311.*approved* detection devices.
- 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 in. (914 mm).

Reason: The purpose of this code change is to allow an EERO to discharge into a fenced yard that does not directly open onto a public way if a minimum 36" wide path can be provided from the fenced yard to the public way. In many cities, new townhouses are being constructed on infill lots with tight space limitations. Locating an EERO while also wanting to provide fenced yards is becoming tricky. In some cases, a builder may want to construct two rows of townhouses that are tight up to the street but that have fenced backyards for each unit. Under the current code, the builder would either have to construct a window well in the sidewalk to access a basement EERO or in the backyard and forgo the private fenced yards as there will likely not be enough space to provide a 10 foot wide "public way". The problems with placing an EERO in the front to allow a fenced yard in the back include coordinating the location with entry doors and front steps, coordinating the location with utilities, and providing a cover over the window well that prevents passers-by from dropping trash into the window well or getting high heels stuck in the openings of a grate. The problem with forgoing fenced yards is obviously the loss of privacy.

While a 10-foot wide path between back-to-back fenced yards is almost certainly not feasible, a 3-foot path may be in many cases. The new exception would allow such a path, that occupants could use to get out of their yard after escaping through an EERO or that firefighters could use to access the fenced yard for firefighting and rescue operations without having to bash through or climb over a series of fences. The assumption is that the yard opens via a gate with access to the public way.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code change does not change the requirement to provide an EERO for sleeping rooms and for basements (including each sleeping room in a basement). Thus, there should be no increase in cost as a result of this proposal. There may be a modest savings from the added ability to locate a basement EERO in the rear of the home, where covers may not be required and coordination with utilities is easier.

Proposal # 4734

RB87-19

RB88-19

IRC®: R310.1

Proponent: Cesar Lujan, representing National Association of Home Builders (clujan@nahb.org); Gary Ehrlich, representing National Association of Home Builders (gehrlich@nahb.org)

2018 International Residential Code

Revise as follows:

R310.1 Emergency escape and rescue opening required. *Basements, habitable attics* and every sleeping room shall have not less than one operable emergency escape and rescue opening. Where *basements* contain one or more sleeping rooms, an emergency escape and rescue opening shall be required in each sleeping room. Emergency escape and rescue openings shall open directly into a public way, or to a *yard* or court that opens to a public way.

Exceptions:

- 1. Storm shelters and *basements* used only to house mechanical *equipment* not exceeding a total floor area of 200 square feet (18.58 m²).
- 2. Where the *dwelling* or *townhouse* is equipped with an automatic sprinkler system installed in accordance with Section P2904, sleeping rooms in basements shall not be required to have emergency escape and rescue openings provided that the basement has one of the following:
 - 2.1. One means of egress complying with Section R311 and one emergency escape and rescue opening.
 - 2.2. Two means of egress complying with Section R311.
- 3. <u>A yard shall not be required to open directly into a public way where an infill property is</u> located next to adjoining neighboring properties without rescue openings that do not open directly into a public way.

Reason: The purpose of this code change is to address the condition where infill lots, and single lot new residential construction (i.e. townhomes/rowhouses), do not have the capacity for rescue openings to open directly into a public way. An infill project may not have the ability to comply with the rescue opening requirements by having access to a public way because the front yard may be non-existent, utility lines, steps and other constraints prevent placing an area well in the sidewalk, the side yards are non-existent due to party walls, and the rear yard may already be delineated without access to a public way due to the neighboring conditions, existing historic design of the neighborhood, or landlocked properties. This occurs in particular where fenced-in yards already exist for the neighboring properties.

The problem is that since an infill project is considered new construction, compliance with zoning laws and ordinances, and for some projects historic design criteria, has led to denials of building permits. The code provisions have created a conflict between trying to maintain the architectural character of the neighborhood and meeting what the building code requires for new construction.

If a rear yard is required to open to a public way, and is next to adjoining existing neighboring properties with yards not opening to a public way, the code will affect the viability of the new infill project and where bedrooms can be located within the residence. With no public access in the rear yard or side yards, due to party walls or existing fences, all bedrooms will have to be located at the front of residence as that may be the only unobstructed path to a public way since sleeping areas require an emergency escape rescue opening. Basements may have to be left unfinished or used only for storage and utilities. This potentially reduces the market value of the new infill property relative to its neighbors since the adjoining properties do not have to

follow the EERO requirements for new construction.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code change will not increase or decrease the cost of construction since the new infill construction design intent is to match the neighboring existing properties also without rescue openings not opening directly into a public way.

Proposal # 5075

RB88-19

RB89-19

IRC: R301.1 (New), R310.1

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

SECTION R310 EMERGENCY ESCAPE AND RESCUE OPENINGS

Add new text as follows:

R310.1 General. Emergency escape and rescue openings shall comply with the requirements of this section.

Revise as follows:

R310.1 <u>**R310.2**</u> <u>**Emergency escape and rescue opening** <u>**Where required.**</u> Basements, habitable attics and every sleeping room shall have not less <u>not fewer</u> than one operable emergency escape and rescue opening. Where basements contain <u>opening in accordance with this section.</u> Where basements contain one or more sleeping rooms, an emergency escape and rescue opening shall be required in each sleeping room <u>, but shall</u> not be required in adjoining areas of the basement. Emergency escape and rescue <u>Such</u> openings shall open directly into a public way, or to a *yard* or court that opens to a public way.</u>

Exceptions:

- <u>1.</u> Basements with a ceiling height of less than 80 inches (2032 mm) shall not be required to have emergency escape and rescue openings.
- <u>2.</u> Emergency escape and rescue openings are not required from basements or sleeping rooms that have an exit door or exit access door that opens directly into a public way or to a yard, court or exterior egress balcony that opens to a public way.
- **1.3.** Storm shelters and *basements* Basements used only to house mechanical equipment and not exceeding a total floor area of 200 square feet (18.58 m²) shall not be required to have emergency escape and rescue openings.
- 4. Storm shelters are not required to comply with this section where the shelter is constructed in accordance with ICC 500.
- 2.5. Where the dwelling or townhouse is equipped with an automatic sprinkler system installed in accordance with Section P2904, sleeping rooms in basements shall not be required to have emergency escape and rescue openings provided that the basement has one of the following:
 - 2.1.5.1 One means of egress complying with Section R311 and one emergency escape and rescue opening.
 - 2.2.5.2 Two means of egress complying with Section R311.

Reason: The intent of this proposal is to coordinate with the approved changes to INC (E107-18 AMPC1) and clarify the exceptions.

Adding Section R310.1 is to coordinate with the format modification made by the public comment to E107-18.

There are revisions to the exceptions for where emergency escape and rescue openings are required.

Exceptions 1 and 2 are current exceptions for EEROs in the IBC. New exception 1 is for basements with ceiling so low that they would not typically include normally occupied spaces. New exception 2 is to allow for the option of a door. The current exception 1 has been divided into new exceptions 3 and 4. New exception 3 clarifies that the 200 sq.ft. limit was for basements that only house mechanical equipment. The new exception 4 separates out storm shelters and adds a specific reference for ICC 500 (currently referenced in ICC R323). The current exception 2 is renumbered only.

This is one of a series of proposal to coordinate the requirements for emergency escape and rescue openings in the IBC and IRC. While independent issues, if all the proposals are approved, the IRC section would appear as indicated in the reason for the proposal to revise the definition – emergency escape and rescue openings.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as w ell as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This is a coordination item for exceptions for EEROs already permitted between the codes.

Proposal # 4143

RB89-19

RB90-19

IRC®: R310.1.1

Proponent: Samuel Steele, representing Seattle Department of Construction and Inspection (SDCI) (samuel.steele@seattle.gov)

2018 International Residential Code

Revise as follows:

R310.1.1 Operational constraints and opening control devices. Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys, tools or special knowledge. Window opening control devices on windows serving as a required emergency escape and rescue opening shall <u>be not</u> more than 70" (177.8 cm) above the finished floor and shall comply with ASTM F2090.

Reason: The 70" (177.8 cm) is the sum of the dimensions in the attached example of a single hung egress window having a maximum 44" sill height with a 24" operable leaf. Added to this is 2" to reach the latch to unlock the window which is set at 70". Similarly on a casement window, the lock should also be no higher than 70" (177.8 cm).

Unlike the dimensions for clear area, sill height, and minimum openings, a height has never been determined for the location of window contols for emergency and escape openings. This would make it very clear for all users of the code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This merely indicates the height of where the control should be. It would not add any cost to to the manufacturing and installation.

Proposal # 5526

RB90-19

RB91-19

IRC®: R310.1.1

Proponent: Jeff Inks, representing Window and Door Manufacturers Association (jinks@wdma.com); Jennifer Hatfield, representing American Architectural Manufacturers Association (jen@jhatfieldandassociates.com)

2018 International Residential Code

Revise as follows:

R310.1.1 Operational constraints and opening control devices. Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys, tools or special knowledge. Window opening control devices <u>complying with ASTM F2090</u> shall be permitted for use on windows serving as a required emergency escape and rescue opening shall comply with ASTM F2090.

Reason: This revision makes the operational and opening control devices provisions in the IRC consistent with the same provisions in the IBC. The proposed language above was approved for the IBC during the last cycle because further clarity regarding the permitted installation of window opening control devices (wocd's) compliant with ASTM F2090 on EERO windows was determined to be helpful. While allowing the use of F2090 WOCD's on EERO windows is implied and intended by this section and Section R312.2, and in addition, the purpose of F2090 is specifically for WOCD's with emergency release mechanisms for use on EERO windows, providing more express language under Section 310.1 will provide further clarification that the installation of F2090 compliant devices is permitted on EERO windows, and again will make this provision consistent with the same in the IBC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction However, it will avoid potential misinterpretation in the field that could be problematic.

Proposal # 5397

RB91-19

RB92-19

IRC®: R310.1.1

Proponent: Jeff Inks, representing Window and Door Manufacturers Association (jinks@wdma.com); Jennifer Hatfield, representing American Architectural Manufacturers Association (jen@jhatfieldandassociates.com)

2018 International Residential Code

Revise as follows:

R310.1.1 Operational constraints and opening control devices. Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys <u>, or tools or special knowledge.</u> Window opening control devices on windows serving as a required emergency escape and rescue opening shall comply with ASTM F2090.

Reason: This proposal removes the term "special knowledge" to be consistent with the same operational constraint provision in the IBC. The term is undefined and ambiguous and is not necessary.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposal is intended to make the IRC consistent with the IBC.

Proposal # 5251

RB92-19

RB93-19

IRC: R310.1.1

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

R310.1.1 R310.2.1 Operational constraints and opening control devices. Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys <u>or</u>, tools or special knowledge. Window opening control devices and fall prevention devices complying with ASTM F2090 shall be permitted for use on windows serving as a required emergency escape and rescue opening shall comply with ASTM F2090.

Reason: The term "special knowledge" was removed from IBC because the phrase "special knowledge' is too open for interpretations.

The revision to the last sentence could not require opening control devices or fall prevention devices. This section would just allow for them to be on windows that were also serving as emergency escape and rescue openings. ASTM F2090, *Specification for Window Fall Prevention Devices with Emergency Escape (Egress Release Mechanisms),* includes criteria for window fall prevention devices and window opening control devices (see Section R312.2). This standard is specifically written for window openings within 75 feet (22 860 mm) of grade and specifically allows for windows to be used for emergency escape and rescue. This standard was updated in 2008 to address window opening control devices. This control device can be released from the inside to allow the window to be fully opened in order to comply with the emergency escape provisions in IRC.

This is one of a series of proposal to coordinate the requirements for emergency escape and rescue openings in the IBC and IRC. While independent issues, if all the proposals are approved, the IRC section would appear as indicated in the reason for the proposal to revise the definition – emergency escape and rescue openings.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as w ell as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This is a coordination item for emergency escape and rescue openings.

Proposal # 4144

RB93-19

RB94-19

IRC: R310.2, R310.2.1, R310.2.2 (New), R310.2.2, R312.2.2

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

R310.2 Emergency escape and rescue openings. Emergency escape and rescue openings shall have minimum dimensions as specified in this section. in accordance with Sections 310.2.1 through 310.2.3.

R310.2.1 Minimum opening area. <u>size.</u> Emergency and escape rescue openings shall have a net clear opening of not less than 5.7 square feet (0.530 m²). *The net clear opening* dimensions required by this section shall be obtained by the normal operation of the *emergency escape and rescue* opening from the inside. The net clear height of the opening shall be not less than 24 inches (610 mm) and the net clear width shall be not less than 20 inches (508 mm).

Exception: Grade floor openings or below-grade openings shall have a net clear opening area of not less than The minimum net clear opening for grade-floor emergency escape and rescue openings shall be 5 square feet (0.465 m²).

Add new text as follows:

R310.2.2 Minimum dimensions. The minimum net clear opening height dimension shall be 24 inches (610 mm). The minimum net clear opening width dimension shall be 20 inches (508 mm). The net clear opening dimensions shall be the result of normal operation of the opening.

Revise as follows:

R310.2.2 R310.2.3 Window sill height. Maximum height from floor. Where a window is provided as the emergency Emergency escape and rescue opening openings, it shall have a sill height of not more than the bottom of the clear opening not greater than 44 inches (1118 mm) above the floor; where the sill height is below grade, it shall be provided with a window well in accordance with Section R310.2.3.

R312.2.2 Window opening control devices. Window opening control devices shall comply with ASTM F2090. The window opening control device, after operation to release the control device allowing the window to fully open, shall not reduce the net clear opening area of the window unit to less than the area required by Section R310.2.1 and R310.2.2.

Reason: The intent of this proposal is to clarify minimum size, dimensions and height for emergency escape and rescue openings.

R310.2.1 and R310.2.2 - The requirements for size and dimensions have been split into two sections. The exception does not need to say 'below grade' as this could be considered a conflict with the definition (i.e., 44" above or below finished grade).

R310.2.3 - The revision clarifies that the 44" is to the bottom of the opening. The sill can be interpreted a lot of different ways. Window well requirements are in a new section - a reference from here is redundant and not needed.

The change to R312.2.2 is correlation only.

This is one of a series of proposal to coordinate the requirements for emergency escape and rescue openings in the IBC and IRC. While independent issues, if all the proposals are approved, the IRC section would appear as indicated in the reason for the proposal to revise the definition – emergency escape and rescue openings.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as w ell as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This is a coordination item for requirements for EEROs already permitted between the codes.

Proposal # 4147

RB94-19

RB95-19

IRC®: R310.2.2

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Residential Code

Revise as follows:

R310.2.2 Window <u>sill clear opening height</u>. Where a window is provided as the emergency escape and rescue opening, <u>it the bottom of the clear opening</u> shall have a <u>sill</u> height of not more than 44 inches (1118 mm) above the floor; where <u>the sill height the bottom of the clear opening</u> is below grade, it shall be provided with a window well in accordance with Section R310.2.3.

Reason: Remove the word "sill" with respect to windows and rather use the terminology "clear opening" as this is the critical portion of the window from which to measure, to ensure access to, or when requiring fall protection. This change will provide greater consistency within the text since R310 and R312 reference "clear opening" to describe the requirements of the allowable size of a window.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This Code Change will not affect the cost of construction

Proposal # 5053

RB95-19

RB96-19

IRC®: R310.2.2

Proponent: Timothy Pate, Colorado Chapter Code Change Committee, representing City and County of Broomfield (tpate@broomfield.org)

2018 International Residential Code

Revise as follows:

R310.2.2 Window <u>sill opening</u> height. Where a window is provided as the emergency escape and rescue opening, it shall have a sill height of the bottom of the clear opening shall be not more than 44 inches (1118 mm) above the floor; where the sill height the bottom of the clear opening is below *grade*, it shall be provided with a window well in accordance with Section R310.2.3.

Reason: This proposal is to change the existing language back to what was changed in 2012. It was changed to the current language in 2015 (and stayed the same in 2018) with no apparent reason since it was a part of a larger change. This same language was changed for the 2012 (RB41-09/10) to measure to bottom of opening since it is confusing to what a sill is (no definition) and sills can be much lower than the bottom of opening especially with the heights of the window tracks on a lot of current vinyl windows. I am proposing to change this language back to what was in the 2012. This would also match the current language in IBC section 1030.3.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal will not increase or decrease the cost of construction. It will only clarify what the intent of the code is.

Proposal # 4519

RB96-19

RB97-19

IRC®: R310.2.3, R310.2.3.1, R310.2.3.2 (New)

Proponent: Donald Masters, Master Home and Building Inspections, LLC, representing Self (mhbinspections@gmail.com)

2018 International Residential Code

Revise as follows:

R310.2.3 Window wells. The horizontal area of the window well shall be not less than 9 square feet (0.9 m²), with a horizontal projection and width of not less than 36 inches (914 mm). The area of the window well shall allow the emergency escape and rescue opening to be fully opened. <u>opened</u>, and installed safety grates or covers to be fully opened, and remain open without physical assistance to keep them open. The height of the well shall not exceed one (1) foot above the surrounding soil level except as <u>approved</u>.

Exception: The ladder or steps required by Section R310.2.3.1 shall be permitted to encroach not more than 6 inches (152 mm) into the required dimensions of the window well.

R310.2.3.1 Ladder and steps. Window wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with a permanently affixed ladder or steps usable with the window in the fully open position. Ladders or steps required by this section shall not be required to comply with Section R311.7. Ladders or rungs shall have an inside width of not less than 12 inches (305 mm), shall project not less than 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the window well.

Add new text as follows:

R310.2.3.2 Window Well Coverings. Window well covers, grates, and similar structures shall meet the following requirements:

- 1. Safety or security grates or structures and protective covers shall not exceed 25 lbs in total;
- 2. Grates or structures shall be hinged or otherwise attached such that they will remain open without human support while exiting the well;
- 3. Locks or other deterrent mechanisms shall not be installed without the ability to release them from inside the well.

Reason: Purpose for Requested Change:

As a home inspector, I see many creative design installations for items required by locally approved ICC new construction building codes. Tying the reason for a code to the design and implementation of the requirement, and then to the effective design functionality of the product created, in this instance leaves me with much concern for the safety of children or adults of limited physical means needing to use the installed escape route through a below grade window or below grade door and up through a well and grate covering.

Assumptions:

1) The minimum age for which the egress opening shall be intuitively functional is age four (4). In other words individuals of age four or greater shall be able to exit the window or door, structure, and well without any training or prior experience;

2) Any occupant in the structure who meets three components of physical capability (agility, balance, and muscular strength) shall be able to exit the window or door, and climb the well, open any grate and cover and escape to safety.

3) Occupants with physical limitations that limit the following abilities - agility, balance, and muscular strength -
may not be able to exit these emergency egress windows and wells, and are cause for further discussion.

Changes Requested to current installations:

1) Limit the height of the well above the surrounding grade

2) Limit the combined weight of any installed safety grate and other covering components (i.e. rain protective coverings)

3) Require that if a safety grate is installed, the grate shall be mounted such that it cannot be removed without tools (hinges or other mechanical balance system)

4) Require that any grate or covering material shall not be locked or secured such that it cannot be opened from the interior of the well by an average person

5) Require that any grate or covering shall be able to be pushed to and remain in a safe open position

6) Require that stairs be secured such that they remain secure while initially grabbing and while climbing, and cannot be removed from the well (already in the code but not being implemented)

7) Safety railings can be used in place of a horizontal grate to protect against injury from falling into a well.

Reasons and Examples for the Changes:

1) Weight - Current typical weight of the steel grates are upwards of 40 lbs.

2) Height - Some installed wells are built such that reaching the top of the well would requires steps on the exterior of the well to fully escape for some people.

3) Windows & locks - Can the windows be successfully unlocked and opened by a child? Many installed sash or slider windows are installed tight, bind, and are difficult for a fully functional adult to open and climb the 44 inches over the interior ledge.

4) Grates - In areas that are prevalent to break-ins, the grates may have a locking mechanism installed, which would require a key or other way to unlock or unlatch the grate cover.

5) Stairs - Although in the current code, many stairs are found to be hanging loose, are removable, or are dangerously unstable when climbing.

Cost Impact: The code change proposal will increase the cost of construction

The requested code changes may impact construction costs for companies that are not following the current code or are minimally designing and constructing egress wells, but may be negligible for companies currently dedicated to constructing safe egress wells. So costs would vary based on design implementations.

Proposal # 4666

RB97-19

RB98-19

IRC®: R310.2.4

Proponent: Timothy Swanson, representing Colorado Chapter of the ICC (tim.swanson@greeleygov.com)

2018 International Residential Code

Revise as follows:

R310.2.4 Emergency escape and rescue openings under decks, porches and porches. cantilevers.

Emergency escape and rescue openings installed under decks, porches and porches cantilevers shall be fully openable and provide a path not less than 36 inches (914 mm) in height to a *yard* or court.

Reason: As with decks and porches, the potential also exists for cantilevers to be located directly over EERO's.

Bibliography: None

Cost Impact: The code change proposal will not increase or decrease the cost of construction When openings for potential EERO's are detailed for a basement in the planning/design stage, they can be located anywhere at that time. There would be no additional cost at that stage to properly locate the opening away from a cantilever.

Proposal # 4534

RB98-19

RB99-19

IRC®: R310.2.4

Proponent: Matt Archer, City of Lone Tree, representing City of Lone Tree (matt.archer@cityoflonetree.com)

2018 International Residential Code

Revise as follows:

R310.2.4 Emergency escape and rescue openings under decks and porches. Access to a yard or court. Emergency escape and rescue openings installed under decks and porches shall be fully openable and provide a <u>an unobstructed</u> path not less than 36 inches (914 mm) in height <u>and 36 inches (914 mm) in width to a yard</u> or court.

Reason: This proposal simplifies the existing code language by eliminating a potential list of items and provides a performance parameter for a clear path to a court or yard to meet egress and ingress requirements. I maintained the minimum height requirement of 36 in and added a minimum width requirement of 36 inches. The code was previously silent on width. I have no technical justification for a 36" minimum width. It just made sense to have a consistent width if you had to crawl any distance with full fire gear and hose or while trying to extract someone who may not be conscious.

I know Titles are not code but felt necessary to change the title to give the reader a brief detail of what this section is about

Cost Impact: The code change proposal will not increase or decrease the cost of construction This code chage will not increase or decrease the cost of construction.

Proposal # 5592

RB99-19

RB100-19

IRC®: R310.4 (New), R310.2.3 (New), R310.2.3.1 (New), R310.4.2.1 (New), R310.2.3.2 (New), R310.3 (New), R310.3.1 (New), R310.3.2 (New), R310.3.2.1 (New), R310.3.2.2 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Add new text as follows:

R310.4 Area wells. An emergency escape and rescue opening where the bottom of the clear opening is below the adjacent grade shall be provided with an area well in accordance with Sections R310.4.1 through R310.4.4.

Revise as follows:

R310.2.3 R310.4.1 Window wells. Minimum size. The horizontal area of the window area well shall be not less than 9 square feet (0.9 m²), with a horizontal projection and width of not less than 36 inches (914 mm). The area size of the window area well shall allow the emergency escape and rescue opening to be fully opened.

Exception: The ladder or steps required by Section R310.2.3.1 shall be permitted to encroach not more than 6 inches (152 mm) into the required dimensions of the <u>window area</u> well.

R310.2.3.1 R310.2.4.2 Ladder and steps. Window Area wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with a <u>an approved permanently affixed ladder or steps. The ladder or steps</u> usable with shall not be obstructed by the emergency escape and rescue opening where the window or door is in the fully open position. Ladders or steps required by this section shall not be required to comply with Section R311.7. Ladders or rungs shall have an inside width of not less than 12 inches (305 mm), shall project not less than 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the window well.

Add new text as follows:

R310.4.2.1 Ladders. Ladders and rungs shall have an inside width of not less than 12 inches (305 mm), shall project not less than 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the area well.

Revise as follows:

R310.2.3.2 R310.2.4.3 Drainage. Window Area wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1 or by an approved alternative method. R405.1.

Exception: A drainage system for <u>window area</u> wells is not required where the foundation is on welldrained soil or sand-gravel mixture soils in accordance with the United Soil Classification System, Group I Soils, as detailed in Table <u>R405.1. R405.1</u>.

R310.4 R310.4.4 Bars, grilles, covers and screens. Where bars, grilles, covers, screens or similar devices are placed over emergency escape and rescue openings, area wells <u>bulkhead enclosures</u>, or window area wells that serve such openings, the minimum net clear opening size shall comply with Sections R310.2.1 R310.2 through R310.2.3, R310.2.2 and such R310.4.1. Such devices shall be releasable or removable from the inside without the use of a key <u>, or tool</u> , special knowledge or force greater than that required for the normal operation of the escape and rescue opening.

R310.3 Emergency escape and rescue doors. Where a door is provided as the required emergency escape and rescue opening, it shall be a side-hinged door or a slider. Where the opening is below the adjacent grade, it shall be provided with an area well. sliding door.

Delete without substitution:

R310.3.1 Minimum door opening size. The minimum net clear height opening for any door that serves as an emergency and escape rescue opening shall be in accordance with Section R310.2.1.

R310.3.2 Area wells. Area wells shall have a width of not less than 36 inches (914 mm). The area well shall be sized to allow the emergency escape and rescue door to be fully opened.

R310.3.2.1 Ladder and steps. Area wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with a permanently affixed ladder or steps usable with the door in the fully open position. Ladders or steps required by this section shall not be required to comply with Section R311.7. Ladders or rungs shall have an inside width of not less than 12 inches (305 mm), shall project not less than 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the exterior stairwell.

R310.3.2.2 Drainage. Area wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1 or by an *approved* alternative method.

Exception: A drainage system for area wells is not required where the foundation is on well-drained soil or sand-gravel mixture soils in accordance with the United Soil Classification System, Group I Soils, as detailed in Table R405.1.

Reason: This is one of a series of proposal to coordinate the requirements for emergency escape and rescue openings in the IBC and IRC. While independent issues, if all the proposals are approved, the IRC section would appear as indicated in the reason for the proposal to revise the definition – emergency escape and rescue openings.

The intent of this proposal to clarify and coordinate the requirements for area wells at emergency escape and rescue openings (EERO) that are below grade (current R310.2.3 and R310.3.2). This does NOT delete doors as an option. This recognizes that windows and doors are both types of emergency escape and rescue openings. The term 'area well' will apply for both windows or doors. The IBC correlating change was E111-18(AS)

- IRC R310.4 This general paragraph clarifies that the bottom of the EERO sets the requirements for the area well.
- IRC R310.4.1 Revisions for consistent terminology.
- IRC 1030.4.2 The sentence about the window not obstruction the steps or ladder is a safety feature. The requirements for ladders has moved into a separate section-R310.4.2.1. Requirements for steps are addressed in another proposal since they are new.
- IRC R1030.4.3 Since the code always allows alternative means, the last phrase is not needed.
- IRC R310.4.4 Revisions for coordination. The reference to emergency and escape opening size and minimum area well size. The term "special knowledge is removed to be consistent with IBC and IRC R310.1.1 – the term allows for too broad of an interpretation.
- IRC R310.3 The last sentence in R310.3 is deleted as redundant since the criteria for area wells is specifically addressed later in Section 310.4.
- IRC Section R310.3.2, R310.3.2.1 and R310.3.2.2 delete the separate area well requirements for doors.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the

ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as w ell as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This is a coordination item for requirements for EEROs already permitted between the codes.

Proposal # 4153

RB101-19

IRC®: R310.4.2.2 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Add new text as follows:

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

Reason:

The overall plan is to have area wells address in a comprehensive manner. Following the graphics for this proposal is how this option of steps will fit in with this group of changes. Area wells less than less than a 44" depth will NOT have to comply with the step provisions. Area wells with a depth of 44" or greater will continue to have the option of a ladder. If a designer chooses to use steps, it is important safety feature to make sure that the occupants would be able to use those steps to evacuate from the window well.

The current provisions says ladders and steps don't have to comply with the standard stairway provisions, however, while specific provisions are provided for ladders, no limits are provided for steps. The option here it the same width and distance between steps are permitted for ladders. The tread depth is the minimum width from alternating tread devices and ships ladders.

Following are examples of stepped configurations that are used today.

The Figure 1 and 2 are examples of stepped area wells that would comply with the proposed language.



Figure 1





Figure 3 and 4 are examples of stepped area wells that would **<u>NOT</u>** comply with the proposed language. The large changes in elevation would be difficult for a child or elderly person to negotiate on their own.







The following is the proposed language for areas wells associated with emergency escape and rescue openings.

R310.5 Area wells. An emergency escape and rescue opening with the bottom of the clear opening below the adjacent grade shall be provided with an area well in accordance with Sections R310.5.1 through R310.5.4.

R310.5.1 Minimum size. The horizontal area of the area well shall be not less than 9 square feet (0.9 m), with a horizontal projection and width of not less than 36 inches (914 mm). The area well shall allow the emergency escape and rescue opening to be fully opened.

Exception: The ladder or steps required by Section R310.5.2.1 shall be permitted to encroach not more than 6 inches (152 mm) into the required dimensions of the area well.

R310.5.2 Ladder and steps. Area wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with a an approved permanently affixed ladder or steps. The ladder or steps shall not be obstructed by the emergency escape and rescue opening when the window or door is in the open position. Ladders or steps required by this section shall not be required to comply with Section R311.7.

R310.5.2.1 Ladders. Ladders or rungs shall have an inside width of at least 12 inches (305 mm), shall project at least 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center (o.c.) vertically for the full height of the area well.

R310.5.2.2 Steps. Steps shall have an inside width of at least 12 inches (305 mm), shall have minimum treads depth of 5 inches (127 mm) and a maximum riser height of 18 inches (457 mm) for the full height of the area well.

R310.5.3 Drainage. Area wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1.

Exception: A drainage system for area wells is not required where the foundation is on well-drained soil or sand gravel mixture soils in accordance with the United Soil Classification System, Group I Soils, as detailed in Table R405.1.

R310.5.4 Bars, grilles, covers and screens. Where bars, grilles, covers, screens or similar devices are placed over emergency escape and rescue openings, bulkhead enclosures, or area wells that serve such openings, the minimum net clear opening size shall comply with Sections R310.2 through R310.2.2 and R310.4.1. Such devices shall be releasable or removable from the inside without the use of a key or tool or force greater than that required for the normal operation of the escape and rescue opening.

This is one of a series of proposal to coordinate the requirements for emergency escape and rescue openings in the IBC and IRC. While independent issues, if all the proposals are approved, the IRC section would appear as indicated in the reason for the proposal to revise the definition – emergency escape and rescue openings. The IBC portion was E112-18(AS).

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as w ell as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This is a design option for window wells that want to use steps instead of ladders.

Proposal # 4156

RB102-19

IRC®: R310.6

Proponent: Jeffrey Hinderliter, New York State Department of State, representing New York State Department of State (Jeffrey.Hinderliter@dos.ny.gov); Gerard Hathaway, New York State Department of State, representing New York State Department of State (gerard.hathaway@dos.ny.gov)

2018 International Residential Code

Revise as follows:

R310.6 Alterations or repairs of existing basements. An emergency escape and rescue opening is not required where existing *basements* undergo alterations or repairs.

Exception: New sleeping rooms habitable spaces created in an existing *basement* shall be provided with emergency escape and rescue openings in accordance with Section R310.1.

Reason: This exception emphasizes the importance of providing an emergency escape and rescue opening (EERO) when sleeping rooms are added to existing basements. However, when a basement is altered to create habitable space, such as a living room or recreational room, many of the same risks will be encountered in an emergency. In addition, when a basement is reconfigured to create multiple rooms, those rooms may not remain for non-sleeping purposes. For example, if a basement office is later converted to a bedroom, owners will rarely seek a permit.

The intention of this code change is to increase the safety of basements when they are converted to habitable space and not just sleeping rooms. This code change would cause an owner to install an EERO when the alteration of a basement causes a basement to become habitable, which would include spaces used for living, sleeping, eating or cooking.

Cost Impact: The code change proposal will increase the cost of construction

This code change could increase the cost of construction due to EEROs being installed in habitable spaces rather than just sleeping rooms. If a basement was undergoing an alteration to create a habitable space other than a sleeping room, an EERO would now be required.

Proposal # 5298

RB102-19

RB103-19

IRC®: SECTION R311, R311.1

Proponent: Jon Sutherland, representing Self (Jon.Sutherland@minneapolismn.gov)

2018 International Residential Code

SECTION R311 MEANS OF EGRESS

Revise as follows:

R311.1 Means of egress. *Dwellings* shall be provided with a means of egress in accordance with this section. The means of egress shall provide a continuous and unobstructed path of vertical and horizontal egress travel from all portions of the *dwelling* to the required egress door <u>public way</u> without requiring travel through a garage. The required egress door shall open directly into a public way or to a *yard* or court that opens to a public way.

Reason: It is important to provide code compliance to the public way. This change provides consistency with the IBC and previous code editions which required compliance to the public way for residential uses.

Cost Impact: The code change proposal will not increase or decrease the cost of construction Any fixture required to be constructed to the public way for example a stairway down a hill would already be needed.

Proposal # 5686

RB103-19

RB104-19

IRC®: R311.3.2

Proponent: Michael Eutsey, King & Queen County, representing VBCOA (meutsey@kingandqueenco.net); Jason Laws, representing VBCOA (lawsj@chesterfield.gov)

2018 International Residential Code

Revise as follows:

R311.3.2 Floor elevations at other exterior doors. Doors, other than the required egress door, including doors required in Section R302.5.1, shall be provided with landings or floors not more than $7^{3}/_{4}$ inches (196 mm) below the top of the threshold.

Exception: A top landing is not required where a stairway of not more than two risers is located on the exterior side of the door, provided that the door does not swing over the stairway.

Reason: Doors that are required to be installed per Section R302.5.1 often times have a threshold. Some builders feel that they are not required to measure their floor or landing to the top of the threshold because Section R311.3.2 is used for "other exterior doors". Since the doors are part of the building thermal envelope they would be considered exterior doors. This change would eliminate the confusion of this door meeting the requirements of Section R311.3.2.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code requires a floor, landing, or stairs on each side of a door. This change addresses a location where doors that are used have a threshold the majority of the time. This section is addresses how the rise of a floor, landing or stair is to be measured when the door has a threshold. By adding this in the code it would cut down on the cost of rebuilding any landings or stairs that were constructed and the top of the threshold was not figured into the rise of the landing or stair.

Proposal # 4686

RB104-19

RB105-19

IRC®: [RB] 202, R311.4

Proponent: Shaunna Mozingo, City of Westminster, representing Self (smozingo@cityofwestminster.us)

2018 International Residential Code

Revise as follows:

[RB] STAIRWAY. One or more flights of stairs, either interior or exterior, with the necessary landings and connecting platforms to form a continuous and uninterrupted passage from one level to another within or attached to a building, porch or deck.

R311.4 Vertical egress. Egress from habitable levels including habitable attics and *basements, and from one* level to another within or attached to a *building,* porch or deck, that are not provided with an egress door in accordance with Section R311.2 shall be by a ramp in accordance with Section R311.8 or a stairway in accordance with Section R311.7.

Reason: Does a stair from a deck have to comply with any code requirements? that depends on who you talk to.

R311 talks about residential means of egress and requires one means of egress from a dwelling unit. With stairsway provisions included under MOE in 311, does that mean that only stairs for the requiired egress have to comply and all others do not? 1/3 of those questioned believe this.

The definition of a stairway was changed to include some scoping to show that it includes levels attached to or within the building or porch or deck. Since the definition includes that wording, 1/3 of the people polled believe that all stairs that attach to the building or are within the building must comply.

R311.4 Vertical egress specifically mentions vertical egress being required from habitable spaces and doesnt mention decks and porches so the last third believe that the requirement is only for stairs of habitable spaces that must comply.

This proposal takes the scoping language out of the IRC definition so that the definition now matches the IBC definition and we added the scoping into ther vertical egress section so that the intent of the definition is actually realized in code language.

We would also ask that the word "stairway" be italicized throughout R311 to clear up some of this. we were initially going to just suggest this as the fix but many agreed that the scoping wording in the IRC definition needed to come out and be placed in the body of the code.

Cost Impact: The code change proposal will increase the cost of construction

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Some people will say it increases cost because stairs that were not from habitable space never had to comply. some will say that it will not increase cost because all stairs within or attached to the building had to always comply.

Proposal # 5583

RB105-19

RB106-19

IRC®: R311.5, R311.5.1 (New), R311.5.2 (New), R311.5.3 (New), TABLE R311.5.3 (New), R311.5.4 (New), TABLE R311.5.4 (New)

Proponent: John Davis, Miami County, Kansas, representing Self (mdavis@miamicountyks.org)

2018 International Residential Code

Revise as follows:

R311.5 Landing, deck, balcony and stair construction and attachment. construction. Exterior landings Landing, decks deck, balconies, stairs and similar facilities shall be positively anchored to the primary structure to resist both vertical and lateral forces or shall be designed to be self-supporting. Attachment shall not be accomplished by use of toenails or nails subject to withdrawal. balcony and stair construction shall be in accordance with Sections R311.5.1, R311.5.2 and R311.5.3.

Add new text as follows:

R311.5.1 Attachment. Landings, decks, balconies, stairs and similar facilities shall be positively anchored to the primary structure to resist both vertical and lateral forces or shall be designed to be self-supporting. Attachment shall not be accomplished by use of toenails or nails subject to withdrawal.

R311.5.2 Stair stringer support. Stair stringers shall be provided with bearing at the upper level for the full cut depth of the stringer against a header or the floor framing and shall be supported with a minimum 2X8 ledger nailed to each stud with 3-8d nails or an approved hanger installed in accordance with the manufacturer's installation instructions.

Stair stringers shall be provided with support of the full cut depth of the stringer on the lower floor platform or other solid surface at the lower level of the stringer. The toe of the stringer shall be notched and a minimum 2X4 toe board shall be installed at the toe of the stringer in accordance with Figure R311.5.2. The stringer toe board shall be attached to the floor framing or solid blocking with a minimum of eight 16d nails or to a concrete surface with three ½ inch X 3 inch long anchor bolts.

R311.5.3 Stair stringer cutting and notching. A stringer that is cut or notched to form the stair treads and risers shall have a remaining uncut or notched throat depth not less than shown in Table R311.5.3.

TABLE R311.5.3 MINIMUM STAIR STRINGER THROAT DEPTH

Stringer Dimensions	Minimum Throat Depth
<u>2 X 10</u>	<u>3 3/8 inches</u>
<u>2 x 12</u>	<u>5 3/4 inches</u>

R311.5.4 Stringer span. Maximum span and rise for stair stringers shall be in accordance with Table R311.5.4.

TABLE R311.5.4 ALLOWABLE STAIR STRINGER SPAN

Stringer Depth	Stairway Width									
36 Inches	;			42 Inches		44 Inches		46 Inches		
2 Stringers 3 S		3 Stringer	3 Stringers		3 Stringers		3 Stringers		3 Stringers	
Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	
			NGS ::: April,	2019					RB230	

PstPinger Depth	Rise	Run	Rise	Run	Rise Stairway W	Run idth	Rise	Run	Rise	
(feet- inches)	(feet- inches)	(feet- inches)	(feet- inches)	(feet- inches)	(feet- inches)	(feet- inches)	(feet- inches)	(feet- inches)	(feet- inches)	
2X10	3-9	4-0	4-3	4-6	4-1	4-4	4-0	4-3	3-11	4- 2
2X12	6-5	6-4	7-3	7-1	6-11	6-10	6-10	6-9	6-8	6- 7

Reason: The International Residential Code has lack any minimum specifications for stairway construction. The proposed new code subsections removes the application of R311.5 from exterior locations only and adds some very basic construction guidelines to establish minimum requirements for attachment, support, cutting and notching and maximum spans of stairway stringers.



Cost Impact: The code change proposal will not increase or decrease the cost of construction There should be little impact to the cost of construction as the proposed subsections only codify what are basic construction methodology.

Proposal # 5553

RB106-19

RB107-19

IRC®: [RB] 202, R311.7, R311.8

Proponent: Shaunna Mozingo, City of Westminster, representing Self (smozingo@cityofwestminster.us)

2018 International Residential Code

Revise as follows:

[RB] STAIRWAY. One or more flights of stairs, either interior or exterior, with the necessary landings and connecting platforms to form a continuous and uninterrupted passage from one level to another within or attached to a building, porch or deck.

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

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

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

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

Reason: Does a stair from a deck have to comply with any code requirements? That depends on who you talk to.

R311 talks about residential means of egress and requires one means of egress from a dwelling unit. With stairsway provisions included under MOE in 311, does that mean that only stairs for the requiired egress have to comply and all others do not? 1/3 of those questioned believe this.

The definition of a stairway was changed to include some scoping to show that it includes levels attached to or within the building or porch or deck. Since the definition includes that wording, 1/3 of the people polled believe that all stairs that attach to the building or are within the building must comply.

R311.4 Vertical egress specifically mentions vertical egress being required from habitable spaces and doesnt mention decks and porches so the last third believe that the requirement is only for stairs of habitable spaces that must comply.

This proposal takes the scoping language out of the IRC definition so that the definition now matches the IBC definition and has added the scoping into the stairway and ramp sections so that the intent of the definition is actually realized in code language.

In CDP Access, R311.7 and8 are putin as sections instead of subsections so it wouldnt let us edit as you can a subsection so we hope you get the idea that the intent is to read as follows:

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

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

All remaining subsections of 311.7 unchanged. the same would work for ramps under r311.8.

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We would also ask that the word "stairway" be italicized throughout R311 to clear up some of this. we were initially going to just suggest this as the fix but many agreed that the scoping wording in the IRC definition needed to come out and be placed in the body of the code.

Cost Impact: The code change proposal will increase the cost of construction

Some people will say it increases cost because stairs that were not from habitable space never had to comply. some will say that it will not increase cost because all stairs within or attached to the building had to always comply.

Proposal # 5597

RB108-19

IRC®: R311.7.1

Proponent: David Cooper, Stair Manufacturing and Design Consultants, representing Stairbuilders and Manufacturers Association (coderep@stairways.org)

2018 International Residential Code

Revise as follows:

R311.7.1 Width. Stairways shall be not less than 36 inches (914 mm) in clear width at all points above the permitted handrail height and below the required headroom height. The clear width of stairways at and below the handrail height, including treads and landings, shall be not less than $31^{1}/_{2}$ inches (787 mm) where a handrail is installed on one side and 27 inches (698 mm) where handrails are installed on both sides. Baseboards and skirtboards shall not project into the clear width of the stairway, as measured above the handrails, more than $4^{1}/_{2}$ inches (114 mm) on either side of the stairway. At the sides of stairs with guards that are open above the handrail height the projection shall be measured horizontally from the inside edge of the top of the guard.

Exception: The width of spiral stairways shall be in accordance with Section R311.7.10.1.

Reason: The allowed projection of trim into the width of a stairway is not clearly addressed in the code. Although discussed in the commentary, certain accepted practices that are prevalent in residential stairways are not clarified and often inconsistently interpreted. Further issues arise from the fact that the *maximum* projection of trim components is not defined in the code.

- 1. This code change specifically addresses only baseboard at landings and skirtboards at the side of flights.
- 2. The proposal defines a maximum projection of 4.5 inches that matchs that allowed for handrails in **R311.7.8.2 Handrail projection**
- 3. This code change does not change any of the current minimum stairway widths.
- 4. The projection of baseboard and skirtboards is measured related to the stairway width as determined at the location "above the handrails". This prevents reduction of the minimum widths currently stated "at and below the handrails" by the baseboards and skirtboards.
- 5. Where the open side of a stairway has a guard and there is no surface to establish a width above the handrails, the projection of the baseboard and skirtboard are measured from the inside edge of the top of the guard. This is important to allow consistent enforcement of what is the most common, cost-effective style of guards used in one and two family homes. Please see Photos 1 3 illustrating this style of guard and the necessary projection of the skirtboard. Note how the balusters terminate in the top of the wall and the skirtboard projects into the stairway. This type of guard system is highly utilized because it is easily adapted to low cost carpeted stairways.
- 6. Please see photo 4 illustrating the measurement of the projection at a guard.









Cost Impact: The code change proposal will not increase or decrease the cost of construction Although more pervasive use of carpeted stairs with "curb" or "wall cap" guard systems would reduce costs over finished hardwood stairs and guards it is not possible to estimate.

Proposal # 5216

RB108-19

RB109-19

IRC®: R311.4

Proponent: Mike Fischer, Kellen Company, representing Self (mfischer@kellencompany.com)

2018 International Residential Code

R311.4 Vertical egress. Egress from habitable levels including habitable attics and *basements* that are not provided with an egress door in accordance with Section R311.2 shall be by a ramp in accordance with Section R311.8 or a stairway in accordance with Section R311.7. <u>Stairways serving attics that do not contain habitable space are not required to meet the requirements of Section R311.7.</u>

Reason: The IRC Contains some Means of Egress requirements, but does not address some constructions that fall outside of exit and egress. The code requires stairways to comply with a series of requirements for landings, stair tread and rise, handrailes, headroom etc. Attics that are not habitable spaces and are thus unoccupiable should be exempt from stairway requirements.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposal is consistent with current practice.

Proposal # 5684

RB109-19

RB110-19

IRC®: R311.7.3

Proponent: Jenifer Gilliland, representing Department of Construction and Inspections (jenifer.gilliland@seattle.gov)

2018 International Residential Code

Revise as follows:

R311.7.3 Vertical rise. A flight of stairs shall not have a vertical rise larger greater than 151 12 feet 7 inches (3835 mm) between floor levels or landings.

Reason: The notation in the code change uses feet and inches to describe the vertical rise of a flight of stairs rather than just inches. This change aligns the format of this section of code with other portions of the code (see section 305 requirements) and is easier for readers to apply.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This is just a change in the formatting of feet and inches in this section of the code.

Proposal # 4419

RB110-19

RB111-19

IRC®: R311.7.5.1

Proponent: David Cooper, representing Stairbuilders and Manufacturers Association (coderep@stairways.org)

2018 International Residential Code

Revise as follows:

R311.7.5.1 Risers. The riser height shall be not more than $7^{3}/_{4}$ inches (196 mm). The riser <u>height</u> shall be measured vertically between leading edges of the adjacent treads. The greatest riser height within any flight of stairs shall not exceed the smallest by more than $^{3}/_{8}$ inch (9.5 mm). Risers shall be vertical or sloped from the underside of the nosing of the tread above at an angle not more than 30 degrees (0.51 rad) from the vertical. <u>above.</u> At open risers, openings located more than 30 inches (762 mm), as measured vertically, to the floor or grade below shall not permit the passage of a 4-inch-diameter (102 mm) sphere.

Exceptions:

- 1. The opening between adjacent treads is not limited on spiral stairways.
- 2. The riser height of spiral stairways shall be in accordance with Section R311.7.10.1.

Reason: -Riser or Riser Height:

It is necessary to insert the word height in the second sentence to more clearly state what is being measured. In most cases the riser or more accurately the face of the riser terminates under the tread above and is not the subject of the measurement described. The dimension of the "riser" would be less than the "riser height". There are also instances where there is "no riser" but there is still a riser height, referred to in this section as "open risers". This change would add help to explain that *riser* a defined term in the IRC is different than "riser height" and aid in the correct application of the code.

Deletion of the Maximum Angle Reference:

The entire phrase - "at an angle not more than 30 degrees (0.51 rad) from the vertical" has been deleted. It is simply unnecessary and only creates confusion.

It is unnecessary to have a maximum angle limit because the maximum nosing projection of 1.25 inches as stated in R311.7.5.3 limits the maximum angle of the riser. See figures 1 and 2 illustrating the angle of the riser slope of typical "slant riser" stairs with the maximum nosing projection.

- 1. Figure 1 illustrates that the maximum angle of 17 degrees can be obtained in one plane with a 4 inch riser height
- 2. Figure 2 illustrates that the maximum angle of 10 degrees can be obtained in one plane with a 7 inch riser height

From these two illustrations it is easy to see both the taller riser heights and shorter nosing projections allowed will produce even lower angles. The illustrations prove that the angle of the riser is controlled by the projection of the tread nosing. I have not illustrated shorter riser heights but the angle would not exceed 30 degrees until you approached the implausible riser height of 2 inches.

A similar change was introduced to the IBC in this cycle. There was great confusion over what is a riser and what is a tread nosing. There was concern that eliminating the maximum angle reference would restrict the use of curves or multiple slopes as shown in the**A117.1-2017 NOSING Figures, Fig. 504.5B** and **Fig. 504.5C.** That is not the case in the IRC. In the IRC, riser is defined as, **Riser.** 1. The vertical component of a step or stair., and tread and landing nosings are regulated in **R311.7.5.3 Nosings.**

Neither the A117.1 nosing profiles shown here nor those commonly used nosing details as regulated by **R311.7.5.3 Nosings** will be affected by this change. Only a clarity of the regulation, and a better understanding of the design options currently allowed in the code will result.





FIGURE 504.5(C) STAIR NOSINGS - VERTICAL RISER BEVELED NOSING

Cost Impact: The code change proposal will not increase or decrease the cost of construction This change does not effect the methods or materials and only offers clarification of the code.

Proposal # 5261

RB111-19

RB112-19

IRC®: R311.7.5.1, R311.7.5.2, R311.7.5.2.1

Proponent: Jake Pauls, representing self (bldguse@aol.com)

2018 International Residential Code

Revise as follows:

R311.7.5.1 Risers. The riser height shall be not more than 7 $\frac{3}{4}$ -inches ($\frac{196}{180}$ mm). The riser shall be measured vertically between leading edges of the adjacent treads. The greatest riser height within any flight of stairs shall not exceed the smallest by more than $\frac{3}{8}$ inch (9.5 mm). Risers shall be vertical or sloped from the underside of the nosing of the tread above at an angle not more than 30 degrees (0.51 rad) from the vertical. At open risers, openings located more than 30 inches (762 mm), as measured vertically, to the floor or grade below shall not permit the passage of a 4-inch-diameter (102 mm) sphere.

Exceptions:

- 1. The opening between adjacent treads is not limited on spiral stairways.
- 2. The riser height of spiral stairways shall be in accordance with Section R311.7.10.1.

R311.7.5.2 Treads. The tread depth shall be not less than 10 inches <u>11inches</u> (<u>254 <u>280</u> mm</u>). The tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge. The greatest tread depth within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm).

R311.7.5.2.1 Winder treads. Winder treads shall have a tread depth of not less than <u>10-11</u> inches (<u>254-280</u> mm) measured between the vertical planes of the foremost projection of adjacent treads at the intersections with the walkline. Winder treads shall have a tread depth of not less than 6 inches (152 mm) at any point within the clear width of the stair. Within any flight of stairs, the largest winder tread depth at the walkline shall not exceed the smallest winder tread by more than 3/8 inch (9.5 mm). Consistently shaped winders at the walkline shall be allowed within the same flight of stairs as rectangular treads and shall not be required to be within 3/8 inch (9.5 mm) of the rectangular tread depth.

Exception: The tread depth at spiral stairways shall be in accordance with Section R311.7.10.1.

Reason: This proposal shares the Reason Statement for Proposal 5467, which includes the changes proposed on the step rise and tread depth — changing 7.75 inches for the maximum rise to 7 inches and changing the minimum tread depth from 10 inches to 11 inches in Sections R311.7.5.1, R311.7.5.2 and R311.7.5.2.1. Proposal 5467 accomplishes the same change indirectly by deleting almost all the requirements of R311.7 and requiring that stairs comply with NFPA 101-2018 which has the "7-11" requirement applying to dwelling unit stairs (with an exception for certain spiral stairs for which more options are provided in NFPA 101 than in the IRC). Those interested in this proposal should refer to the Reason Statement for Proposal 5467 dealing with all of R311.7. The bottom line is that if the "7-11" rule is applied (as it has for two decades for all other stairs in the IBC) and the dangers of injuries on stairways are mostly in homes, that is where the "7-11" should also be required. The Reason Statement provides very extensive technical and other information that directly confirms the much better performance of the "7-11" geometry relative to the several times more dangerous step dimensions — including the 7.75 - 10 geometry — that have been used in homes where about 90 percent of the stair-related falls occur in the US at a huge cost to everybody — currently on the order of \$100 billion dollars annually in societal injury costs in the USA.

Bibliography: A few publication are cited in the Reason Statement for my Proposal # 5467 and nothing beyond

those is needed for this more-limited proposal.

Cost Impact: The code change proposal will increase the cost of construction

While cost of construction will increase, that increase (as shown also in the first proposal on this same topic in a 2003

proposal on stairways in the IRC) pales in comparison to the benefits of the "7-11" step geometry for dwelling unit stairs.

From the Reason Statement (which is the Reason Statement for Proposal 5467) covering all of R311, not just rise and tread depth changes, comes the following updated detail on cost impact in relation to step dimensions.

"If we assume, as an approximation, there were about 120 million US households in 2012 (the midpoint in the periods discussed above) and further assume an average of one flight of stairs for each household (with some homes having several flights of stairs and many having none), the average cost of home stairway-related injuries is

roughly \$700 per stair flight (or household) per year. This average injury cost greatly exceeds the annual cost (e.g.,

over a 50-year service life) of a stair flight in a home. As currently allowed by the IRC and built into new homes, stairways with such high annual injury costs are an extremely poor investment in terms of costs to society, families

and individuals."

Proposal # 5412

RB112-19

RB113-19

IRC®: R311.7.7

Proponent: Dan Buuck, National Association of Home Builders, representing National Association of Home Builders (dbuuck@nahb.org)

2018 International Residential Code

Revise as follows:

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

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

Reason: Landings have been required in more places since the 2009 IRC defined a single riser as a "stair." This causes difficulties where the MAXIMUM landing slope requirements of R311.7.7 conflict with the MINIMUM drainage slope requirements in the exception of R401.3 (reprinted below).

The picture below shows an example of such a landing. If one or more risers lead from the raised walkway to the paved driveway the landing provision would require a MAX slope of 2 percent in either direction. But the drainage provision in R401.3 would require a MIN slope of 2 percent away from the building. These dueling requrements create a condition that is not exactly a conflict, but it is just as impossible to satisfy them both. The 5-percent slope in the exception was chosen to correlate with the maximum running slope allowed for an accessible route.

Additionally, the word "inches" was changed to "units" for consistency. (See definition of *ramp*, Section R311.3, R311.8, etc.)



R401.3 Drainage. Surface drainage shall be diverted to a storm sewer conveyance or other *approved* point of collection that does not create a hazard. *Lots* shall be graded to drain surface water away from foundation walls. The *grade* shall fall not fewer than 6 inches (152 mm) within the first 10 feet (3048 mm). **Exception:** Where *lot lines*, walls, slopes or other physical barriers prohibit 6 inches (152 mm) of fall within 10 feet (3048 mm), drains or swales shall be constructed to ensure drainage away from the structure. Impervious surfaces within 10 feet (3048 mm) of the building foundation shall be sloped not less than 2 percent away from the building.

R309.1 Floor surface. Garage floor surfaces shall be of *approved* noncombustible material. The area of floor used for parking of automobiles or other vehicles shall be sloped to facilitate the movement of liquids to a drain or toward the main vehicle entry doorway.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposed change removes the impossible-to-meet requirements for drainage and slope when they both apply to a landing. If anything it would decrease the cost of construction due to failed inspections.

Proposal # 4392

RB113-19

RB114-19

IRC®: R311.7.8.4 (New)

Proponent: Lucas Pump, City of Cedar Rapids, representing Self (I.pump@cedar-rapids.org)

2018 International Residential Code

Revise as follows:

R311.7.8.4 Continuity. Handrails shall be continuous for the full length of the flight, from a point directly above the top riser of the flight to a point directly above the lowest riser of the flight. Handrail ends shall be returned or shall terminate in newel posts or safety terminals.

Exceptions:

- 1. Handrail continuity shall be permitted to be interrupted by a newel post at a turn in a flight with winders, at a landing, or over the lowest tread.
- 2. A volute, turnout or starting easing shall be allowed to terminate over the lowest tread.
- 3. Offsets or interruptions of six inches or less in total length shall be considered to be continuous.

Reason: This proposal would allow a handrail to terminate at a newel post or a wall section, then start back up. Also, this would allow for more aesthetically pleasing handrail designs, in a residential stairway were wall sections are off-set and would allow for a newel post within the handrail.





Cost Impact: The code change proposal will decrease the cost of construction This proposal would decrease the cost of construction because the contractor could eliminate the need for some of the handrail offset fittings and elbows.

Proposal # 3881

RB114-19

RB115-19

IRC®: R311.7.8.4

Proponent: Stephen Thomas, Colorado Code Consulting, LLC, representing Himself (sthomas@coloradocode.net)

2018 International Residential Code

Revise as follows:

R311.7.8.4 Continuity. Handrails shall be continuous for the full length of the flight, from a point directly above the top riser of the flight to a point directly above the lowest riser of the flight. Handrail ends shall be returned or shall terminate in newel posts or safety terminals.

Exceptions:

- 1. Handrail continuity shall be permitted to be interrupted by a newel post at a turn in a flight with winders, at a landing, or over the lowest tread.
- 2. A volute, turnout or starting easing shall be allowed to terminate over the lowest tread.

Reason: Ther term saftety terminal is for commercial handrails that need to comply with the projecting elements requirements for the means of egress and accessibility. It is also not a defined term in the IRC. Many people don't know what a safety terminal is. Therefore, the language is not needed in the IRC and should be deleted.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal will have not an impact on the construction. It is deleting language that is not needed in the IRC.

Proposal # 5497

RB115-19

RB116-19

IRC®: R311.7, R311.7.1, R311.7.2, R311.7.3, R311.7.4, R311.7.5, R311.7.5.1, R311.7.5.2, R311.7.5.2.1, R311.7.5.3, R311.7.5.4, R311.7.6, R311.7.7, R311.7.8, R311.7.8.1, R311.7.8.2, R311.7.8.3, R311.7.8.4, R311.7.8.5, R311.7.8.6, R311.7.9, R311.7.10, R311.7.10.1, R311.7.10.2, R311.7.11, R311.7.11, R311.7.11.2, R311.7.12, R311.7.12.1, R311.7.12.2

Proponent: Jake Pauls, Jake Pauls Consulting Services, representing self (bldguse@aol.com)

2018 International Residential Code

R311.7 Stairways.

Revise as follows:

R311.7.1 Width.<u>Stairways.</u> Stairways shall be not less than 36 inches (914 mm) in clear width at all points above the permitted handrail height and below the required headroom height. The clear width of stairways at and below the handrail height, including treads and landings, shall be not less than 31[†]/₂ inches (787 mm) where a handrail is installed on one side and 27 inches (698 mm) where handrails are installed on both sides. **Exception:** The width of spiral stairways shall be in accordance with Section R311.7.10.1. comply with NEPA 101-2018 Section 24.2.5.

Delete without substitution:

R311.7.2 Headroom. The headroom in stairways shall be not less than 6 feet 8 inches (2032 mm) measured vertically from the sloped line adjoining the tread nosing or from the floor surface of the landing or platform on that portion of the stairway.

Exceptions:

- 1. Where the nosings of treads at the side of a flight extend under the edge of a floor opening through which the stair passes, the floor opening shall not project horizontally into the required headroom more than $4^{3}/_{4}$ inches (121 mm).
- 2. The headroom for spiral stairways shall be in accordance with Section R311.7.10.1.

R311.7.3 Vertical rise. A flight of stairs shall not have a vertical rise larger than 151 inches (3835 mm) between floor levels or landings.

R311.7.4 Walkline. The walkline across winder treads and landings shall be concentric to the turn and parallel to the direction of travel entering and exiting the turn. The walkline shall be located 12 inches (305 mm) from the inside of the turn. The 12-inch (305 mm) dimension shall be measured from the widest point of the clear stair width at the walking surface. Where winders are adjacent within a flight, the point of the widest clear stair width of the adjacent winders shall be used.

R311.7.5 Stair treads and risers. Stair treads and risers shall meet the requirements of this section. For the purposes of this section, dimensions and dimensioned surfaces shall be exclusive of carpets, rugs or runners.

R311.7.5.1 Risers. The riser height shall be not more than $7^{3}/_{4}$ inches (196 mm). The riser shall be measured vertically between leading edges of the adjacent treads. The greatest riser height within any flight of stairs shall not exceed the smallest by more than $3^{\prime}/_{8}$ inch (9.5 mm). Risers shall be vertical or sloped from the underside of the nosing of the tread above at an angle not more than 30 degrees (0.51 rad) from the vertical. At open risers,
openings located more than 30 inches (762 mm), as measured vertically, to the floor or grade below shall not permit the passage of a 4-inch-diameter (102 mm) sphere.

Exceptions:

- 1. The opening between adjacent treads is not limited on spiral stairways.
- 2. The riser height of spiral stairways shall be in accordance with Section R311.7.10.1.

R311.7.5.2 Treads. The tread depth shall be not less than 10 inches (254 mm). The tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge. The greatest tread depth within any flight of stairs shall not exceed the smallest by more than $\frac{3}{8}$ inch (9.5 mm).

R311.7.5.2.1 Winder treads. Winder treads shall have a tread depth of not less than 10 inches (254 mm) measured between the vertical planes of the foremost projection of adjacent treads at the intersections with the walkline. Winder treads shall have a tread depth of not less than 6 inches (152 mm) at any point within the clear width of the stair. Within any flight of stairs, the largest winder tread depth at the walkline shall not exceed the smallest winder tread by more than $\frac{3}{8}$ inch (9.5 mm). Consistently shaped winders at the walkline shall be allowed within the same flight of stairs as rectangular treads and shall not be required to be within $\frac{3}{8}$ inch (9.5 mm) of the rectangular tread depth.

Exception: The tread depth at spiral stairways shall be in accordance with Section R311.7.10.1.

R311.7.5.3 Nosings. Nosings at treads, landings and floors of stairways shall have a radius of curvature at the nosing not greater than $\frac{9}{16}$ inch (14 mm) or a bevel not greater than $\frac{1}{2}$ inch (12.7 mm). A nosing projection not less than $\frac{3}{4}$ inch (19 mm) and not more than $\frac{1}{4}$ inches (32 mm) shall be provided on stairways. The greatest nosing projection shall not exceed the smallest nosing projection by more than $\frac{3}{8}$ inch (9.5 mm) within a stairway.

Exception: A nosing projection is not required where the tread depth is not less than 11 inches (279 mm).

Revise as follows:

R311.7.5.4 R311.7.2 Exterior plastic composite stair treads. Plastic composite exterior stair treads shall comply with the provisions of this section and Section R507.2.2.

Delete without substitution:

R311.7.6 Landings for stairways. There shall be a floor or landing at the top and bottom of each stairway. The width perpendicular to the direction of travel shall be not less than the width of the flight served. For landings of shapes other than square or rectangular, the depth at the walk line and the total area shall be not less than that of a quarter circle with a radius equal to the required landing width. Where the stairway has a straight run, the depth in the direction of travel shall be not less than 36 inches (914 mm).

Exception: A floor or landing is not required at the top of an interior flight of stairs, including stairs in an enclosed garage, provided that a door does not swing over the stairs.

R311.7.7 Stairway walking surface. The walking surface of treads and landings of stairways shall be sloped not steeper than one unit vertical in 48 inches horizontal (2-percent slope).

R311.7.8 Handrails. Handrails shall be provided on not less than one side of each flight of stairs with four or more risers.

R311.7.8.1 Height. Handrail height, measured vertically from the sloped plane adjoining the tread nosing, or

finish surface of ramp slope, shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm).

Exceptions:

- 1. The use of a volute, turnout or starting easing shall be allowed over the lowest tread.
- 2. Where handrail fittings or bendings are used to provide continuous transition between flights, transitions at winder treads, the transition from handrail to *guard*, or used at the start of a flight, the handrail height at the fittings or bendings shall be permitted to exceed 38 inches (956 mm).

R311.7.8.2 Handrail projection. Handrails shall not project more than 4¹/₂ inches (114 mm) on either side of the stairway.

Exception: Where nosings of landings, floors or passing flights project into the stairway reducing the clearance at passing handrails, handrails shall project not more than $6^{1}/_{2}$ inches (165 mm) into the stairway, provided that the stair width and handrail clearance are not reduced to less than that required.

R311.7.8.3 Handrail clearance. Handrails adjacent to a wall shall have a space of not less than 1[†]/₂ inches (38 mm) between the wall and the handrails.

R311.7.8.4 Continuity. Handrails shall be continuous for the full length of the flight, from a point directly above the top riser of the flight to a point directly above the lowest riser of the flight. Handrail ends shall be returned or shall terminate in newel posts or safety terminals.

Exceptions:

- 1. Handrail continuity shall be permitted to be interrupted by a newel post at a turn in a flight with winders, at a landing, or over the lowest tread.
- 2. A volute, turnout or starting easing shall be allowed to terminate over the lowest tread.

R311.7.8.5 Grip size. Required handrails shall be of one of the following types or provide equivalent graspability.

- Type I. Handrails with a circular cross section shall have an outside diameter of not less than 1[†]/₄ inches (32 mm) and not greater than 2 inches (51 mm). If the handrail is not circular, it shall have a perimeter of not less than 4 inches (102 mm) and not greater than 6[†]/₄ inches (160 mm) and a cross section of not more than 2[†]/₄ inches (57 mm). Edges shall have a radius of not less than 0.01 inch (0.25 mm).
- 2. Type II. Handrails with a perimeter greater than 6¹/₄ inches (160 mm) shall have a graspable finger recess area on both sides of the profile. The finger recess shall begin within ³/₄ inch (19 mm) measured vertically from the tallest portion of the profile and have a depth of not less than ⁵/₁₆ inch (8 mm) within ⁷/₈ inch (22 mm) below the widest portion of the profile. This required depth shall continue for not less than ³/₈ inch (10 mm) to a level that is not less than 1³/₄ inches (45 mm) below the tallest portion of the profile. The width of the handrail above the recess shall be not less than 1⁴/₄ inches (32 mm) and not more than 2³/₄ inches (70 mm). Edges shall have a radius of not less than 0.01 inch (0.25 mm).

Revise as follows:

R311.7.8.6 R311.7.3 Exterior plastic composite handrails. Plastic composite exterior handrails shall comply with the requirements of Section R507.2.2.

R311.7.9 R311.7.4 Illumination. Stairways shall be provided with illumination in accordance with Sections R303.7 and R303.8. The illumination system shall be capable of providing a minimum of 10 foot-candles (110 lux), measured at the center of stairway landings and treads, when the stairway is in use.

R311.7.10 R311.7.5 Special stairways. Spiral stairways and bulkhead Bulkhead enclosure stairways shall comply with the requirements of Section R311.7 except as specified in Sections R311.7.10.1 and R311.7.10.2. NFPA 101-2018 Section 24.2.2.3.

Delete without substitution:

R311.7.10.1 Spiral stairways. The clear width at and below the handrails at spiral stairways shall be not less than 26 inches (660 mm) and the walkline radius shall be not greater than $24^{+}/_{2}$ inches (622 mm). Each tread shall have a depth of not less than $6^{3}/_{4}$ inches (171 mm) at the walkline. Treads shall be identical, and the rise shall be not more than $9^{+}/_{2}$ inches (241 mm). Headroom shall be not less than 6 feet 6 inches (1982 mm).

R311.7.10.2 Bulkhead enclosure stairways. Stairways serving bulkhead enclosures, not part of the required building egress, providing access from the outside *grade* level to the *basement* shall be exempt from the requirements of Sections R311.3 and R311.7 where the height from the *basement* finished floor level to *grade* adjacent to the stairway is not more than 8 feet (2438 mm) and the *grade* level opening to the stairway is covered by a bulkhead enclosure with hinged doors or other *approved* means.

Revise as follows:

R311.7.11 R311.7.6 Alternating tread devices. Alternating tread devices shall not be used as an element of a means of egress. Alternating tread devices shall be permitted provided that a required means of egress stairway or ramp serves the same space at each adjoining level or where a means of egress is not required. The clear width at and below the handrails shall be not less than 20 inches (508 mm).

Exception: Alternating tread devices are allowed to be used as an element of a means of egress for lofts, mezzanines and similar areas of 200 gross square feet (18.6 m²) or less where such devices do not provide exclusive access to a kitchen or bathroom.

R311.7.11.1 <u>R311.7.6.1</u> Treads of alternating tread devices. Alternating tread devices shall have a tread depth of not less than 5 inches (127 mm), a projected tread depth of not less than $8^{1}/_{2}$ inches (216 mm), a tread width of not less than 7 inches (178 mm) and a riser height of not more than $9^{1}/_{2}$ inches (241 mm). The tread depth shall be measured horizontally between the vertical planes of the foremost projections of adjacent treads. The riser height and tread depth provided shall result in an angle of ascent from the horizontal of between 50 and 70 degrees (0.87 and 1.22 rad). The initial tread of the device shall begin at the same elevation as the platform, landing or floor surface.

R311.7.11.2 R311.7.6.2 Handrails of alternating tread devices. Handrails shall be provided on both sides of alternating tread devices and shall comply with Sections R311.7.8.2 to R311.7.8.6. Handrail height shall be uniform, not less than 30 inches (762 mm) and not more than 34 inches (864 mm).

R311.7.12 R311.7.7 Ships ladders. Ships ladders shall not be used as an element of a means of egress. Ships ladders shall be permitted provided that a required means of egress stairway or ramp serves the same space at each adjoining level or where a means of egress is not required. The clear width at and below the handrails shall be not less than 20 inches.

Exception: Ships ladders are allowed to be used as an element of a means of egress for lofts, mezzanines and similar areas of 200 gross square feet (18.6 m²) or less that do not provide exclusive access to a kitchen or bathroom.

R311.7.12.1 R311.7.7.1 Treads of ships ladders. Treads shall have a depth of not less than 5 inches (127 mm). The tread shall be projected such that the total of the tread depth plus the nosing projection is not less than $8^{1}/_{2}$ inches (216 mm). The riser height shall be not more than $9^{1}/_{2}$ inches (241 mm).

R311.7.12.2 R311.7.7.2 Handrails of ships ladders. Handrails shall be provided on both sides of ships ladders and shall comply with Sections R311.7.8.2 to R311.7.8.6. Handrail height shall be uniform, not less than 30 inches (762 mm) and not more than 34 inches (864 mm). Section R311.7.1.

Reason: Introduction. Over the last two decades, covering the entire history of the *International Residential Code*, subsection R311.7 on stairways—*which started with some serious defects*—has not improved as much as warranted by the home stair-related injury toll, especially the toll's growth over the last two decades. This proponent sees little value in addressing, *in detail*, all of the IRC's deficits with regards to stairways unless there are major changes in how ICC members and committees understand and address the overarching topic of home step dimensions, handrail requirements, etc., with step dimensions being the most potent set of factors impacting both home stairway usability and safety. Thus the best strategy is to propose a substitution of most of the IRC's stairway requirements with a reference to NFPA 101's Chapter on One and Two-Family Dwellings. The justification for this drastic proposal is technical as well as procedural, with emphasis below on the technical issues. Addressing the procedural issues would mean going into detail on the overarching role of two organizations in the development, to date, of the IRC's stairway requirements, namely the National Association of Home Builders (NAHB) and the Stairway Manufacturers Association (SMA).

Neither of these organizations have been participating actively in all the research conducted over the last five decades in several countries, most notable of which are the USA, the UK, Japan and Canada. Such participation clearly sets the proponent of this substitution apart from the NAHB and SMA, both organizationally and in terms of any individual in these organizations (now and in the past three decades).

The proponent's participation entails formal research (for 20 years at the National Research Council of Canada), international consulting (for four decades), ergonomics certification (since 1993, with re-certifications in 2010 and 2015), and public health involvement (as the lead, formal/voting representative for the American Public Health Association, APHA, on eight ICC and NFPA committees dating back two decades). His publications record includes about 100 publications on stairway use, safety and design. His record of formal presentations worldwide includes over 100 on stairways beginning in 1974. His record production of educational and documentary videos include over 30 videos and one documentary film, "The Stair Event" (the only such film on stairways, produced 40 years ago).

No individual, organization or any collection of these, can match the proponent's record of scientific and technical accomplishments since 1967 which has resulted in several awards and an Honorary Doctor of Science degree. These reflect international recognition focused most intensively in three countries, the USA (his longest base of activity), Canada and the UK.

Moreover, the proponent is relatively well known by premises liability attorneys in the US and Canada who represent persons injured on stairways or, in a minority of cases, attorneys representing premises owners and operators. Some of the latter, rather than being defendants, are corporate counsel for very large organizations with multiple facilities where stairway safety has been a major concern and the organization wishes to take a pro-active approach to injury prevention. In Canada, due to the premises liability laws there, the proponent's litigation-related work focuses much more on one- and two-family dwellings than is the case in the USA where the home stairway dangers are almost as bad as in Canada—especially in relation to stair step dimensions, but there has been less litigation focused on the comparable dangers to stairway users.

Bottom line: much has been learned over the last four decades especially that draws on multiple sources of insight on the real dangers of stairways and the need for model code organizations, adopting authorities and

enforcing officials to recognize just how devastating the home stairway-related injury *endemic* has become. Only NFPA has responded realistically to the home stairway-related endemic. ICC has had the opportunity to do so over the last 20 years but it has failed, very badly, to respond to the public health and safety situation. *This has to change!*

Analogy connecting stairways and automobiles. For readers who are put off by technical and other details, please read the following sentences about an apt comparison. Imagine the outcry that would have occurred if, starting decades ago, the automobile industry adopted, and implemented, a policy of only providing brakes for vehicles that were only used by relatively fit, working-age adults. For everyone else—e.g., children and older adults—vehicles would not be provided with functional brakes or steering that worked reliably for people with widely varying strength abilities. Of course the automobile industry—internationally (partly following developments in the USA)—took a different path, a path to cars that were not only safer, for example with brakes and steering systems, but were much more functional. These and other systems served a wide range of drivers and occupants in ALL use conditions, not only crashes, emergency stopping and control but for normal operational usability.

Through the decades, while the automobile industry adopted more progressive policies—*partly dictated by laws and regulations*—the building industry has steadfastly avoided clear evidence that home stairway-related falls were growing faster than population growth and costs of stair-related injuries vastly exceeded the initial costs of stairway construction. Indeed the building industry operated oblivious of scientific knowledge and other evidence.

APHA Policies on Building Codes. Since the turn of the century, ICC has diverged from NFPA's far more evidence-based approach to ALL stairways, notably those in homes, as well as repeated public policies adopted by the American Public Health Association (APHA).

APHA Policy Statement 99-16, Public Health Role of Codes Regulating the Design, Construction and Use of Buildings

APHA Policy Statement 2000-19, Public Health Role of the National Fire Protection Association in Setting Codes and Standards for the Built Environment

APHA Policy Statement 200913, Building Code Development, Adoption, and Enforcement Problems Affecting Injury Prevention in, and Usability of, Homes and Other Buildings.

Here is what the last in this series, the currently active APHA policy 200913, stated:

"From ICC's beginnings, there were indications that public health was not as high of a priority for the ICC, as was a dominating business presence in the US building regulatory field. This concern regarding the relationship between the ICC and the National Association of Home Builders (NAHB) was first addressed in APHA Policy 99-16 and reiterated in APHA Policy 2000-19. When the longer-established National Fire Protection Association (NFPA), with its very large set of widely used safety standards, decided to develop a competing model building code, APHA adopted policy statement 2000-19 to help influence NFPA in a more public health–oriented approach to model building code development. . . .

Much of what was recommended to NFPA in APHA's policy 2000-19 was implemented in NFPA codes and standards during the next several years, including, in 2003, mainstreamed safety and usability requirements for the most dangerous element in homes, the stairways....

The model code development process, especially within ICC's system of public hearings, is based on a model encouraging adversarial testimony and other formal input to the process. Certain issues typically pit advocates for public health goals (such as safety and accessibility or usability of the built environment) against certain industry representatives whose goals are to have little or no change in established, traditional practices; to experience minimal regulatory interference; and to claim often that housing affordability will be harmed....

As a general rule, there is no epidemiological or etiological basis for the traditional double, lower standard for home stair step geometry or for inferior handrail provision or functional quality; this was a point made explicitly in APHA's Policy 2000-19. NFPA has taken this issue to heart in its post-2000 revisions to its leading codes; ICC has gone in the opposite direction, increasing the gulf of safety and usability levels between home stairways and those in other settings. . . .

Therefore the APHA recommends: 5. ICC and NFPA should develop and maintain model codes and standards requiring home stairways to be designed and constructed so that stairs and railings provide at least the same level of usability and safety from falls as do stairs and railings in other buildings."

Now, almost two decades after ICC published first editions of the IBC and IRC, ICC continues to ignore the evidence of stairway safety issues as well as the formally adopted policies of the American Public Health Association, APHA. Here follow highlights of that evidence, including Injury Epidemiology and Etiology.

Injury Epidemiology

Stairways. Since 2002, approximately the time that the IRC began to influence home stairway construction, medically-treated injuries in all settings—sufficient to lead to hospital emergency room visits—*increased by about 39 percent as of 2017 in the USA.* (This equates to a growth rate of about 2 percent a year over the 15-year period.) During this 15-year period, US population only increased by about 13 percent, that is with a demographic growth only about one-third that of stair-related injuries.

Also during this period there appears to have been an increase in the proportion of stairway related injuries occurring in home settings for which the location data are not as complete. For known locations, the home-based proportion has increased from about 85 percent to about 90 percent or higher over the 15-year period.

Stairs Compared to Fires. During this same 15-year period, *fire-related fatalities* in all US settings—with homes again being the most common site of fatalities—*decreased* with the approximate rate, per 100,000 population dropping from about 1.3 to about 0.98 injuries annually per 100,000 US population.

Comparison of stair-related *injuries* with fire-related *injuries* is complicated by the lack of detail about the nature of treatment needed for the fire-related injuries. For stair-related injuries, that are professionally treated, the treatment rates per 100,000 US population are displayed in Table 1 for the annual averages over the years 2010 to 2014: the average injury rate was about 1,400 per 100,000 population. At about the same time, fire-related injuries (based on 2016 figures from the US Fire Administration) had a rate of about 45 injuries per 100,000 and they were declining. (The resulting ratio of stairways to fire is about 31, a factor depicted in Figure 1.) There were some age differences for fires with rates of 55 for middle-age adults, 25 for children and 45 for older adults, all per 100,000 population. By contrast, during the period 2010-2014, *annual rates* for stair-related injuries, per 100,000 population, that resulted in professional medical care, are described in more detail in Table 1, right to left: for Doctors Offices or Outpatient Clinics, for Emergency Departments, and for Hospital Admission.

Stairs			Hospital-admitted		
Age	Doc/Outp	ED	via ED	Direct	Total
00-09	369.2	327.1	10.7	3.7	710.8
10-19	569.9	290.6	5.4	2.0	867.8
20-29	962.0	453.2	10.6	3.5	1,429.2
30-39	1,381.9	454.3	13.9	4.7	1,854.8
40-49	1,489.6	406.3	21.7	7.2	1,924.8
50-59	1,164.3	342.9	34.6	11.9	1,553.6
60-69	905.9	298.2	52.3	17.8	1,274.2
70-79	981.6	374.4	101.2	34.1	1,491.3
>=80	917.0	478.0	200.4	54.7	1,650.1
Total	980.5	374.5	31.5	10.2	1,396.7

Table 1. Annual US Injury Rates for Stairs

(per 100,000 population), by treatment and age, during 2010-2014

(Source: Pacific Institute for Research and Evaluation, Maryland)



Figure 1. Chart of Approximate Relative Occurrence of Serious Injuries

Associated with Three Common Dangers in Homes and Other Buildings

Comparing these stairway-related rates, with their enhanced specificity, in Table 1, with those noted earlier for fires, we should note the much larger public safety problem posed by stairways, compared to fires. From Figure 1 we should recognize that there is great disparity of code response to injury occurrence for stairways, along

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with another badly neglected topic in the IRC, fall prevention for bathtubs and showers (the subject of another set of proposed changes to the IRC).

To fully appreciate the size of the stairway safety problem in the USA, Table 2 provides estimates of incidence, annually, of injuries by treatment type and victim age.

Stairs		1	Hospital-admitted		
Age	Doc/Outp	ED	via ED	Direct	Total
00-09	149,389.0	132,344.0	4,313.0	1,515.8	287,561.8
10-19	240,132.0	122,449.0	2,288.5	824.6	365,694.1
20-29	422,114.0	198,838.0	4,634.7	1,533.7	627,120.4
30-39	560,978.0	184,438.0	5,628.9	1,910.3	752,955.2
40-49	634,787.0	173,156.0	9,241.0	3,050.3	820,234.3
50-59	502,896.0	148,100.0	14,928.3	5,133.4	671,057.7
60-69	286,908.0	94,429.1	16,556.9	5,644.9	403,538.9
70-79	173,515.0	66,176.8	17,891.0	6,021.7	263,604.5
>=80	106,489.0	55,507.0	23,272.4	6,356.7	191,625.1
Total	3,077,207.0	1,175,439.0	98,754.8	31,991.4	4,383,392.2

Table 2. Annual US Injury Incidence for Stairs

by treatment and age, during 2010-2014

(Source: Pacific Institute for Research and Evaluation, Maryland)

The overall total, of over 4 million professionally treated injuries annually in the USA (within the period, 2010-2014), related to stairways, is mind blowing as is the huge societal cost of such injuries. During 2010-2014, the average *annual* societal cost of stairway-related injuries in the USA was estimated as over \$92 billion (2009 US dollars) and the vast majority of those injuries were in homes. (Source: Lawrence, B., Spicer, R., Miller, T. A fresh look at the costs of non-fatal consumer product injuries. *Injury Prevention,* digital publication, August 2014, paper journal publication, 2015:**21**:23-29.0)

Some Preliminary Cost-Benefit Insights. If we assume, as an approximation, there were about 120 million US households in 2012 (the midpoint in the periods discussed above) and further assume an average of one flight of stairs for each household (with some homes having several flights of stairs and many having none), the average cost of home stairway-related injuries is roughly \$700 per stair flight (or household) *per year*. This average injury cost greatly exceeds the annual cost (e.g., over a 50-year service life) of a stair flight in a home. As currently allowed by the IRC and built into new homes, stairways with such high annual injury costs are an extremely poor investment in terms of costs to society, families and individuals. Why this is the case is discussed in the next section, on etiology, the study of causes (of bad events such as disease, injuries, etc.).

Injury Etiology for Stairways

There is widespread agreement—*about the very prominent, indeed central role of stair step dimensions (among several stairway design and construction factors)*—among all the experts on stairway safety who have researched the topic and have been lead authors of papers, book chapters, a book or producer of widely viewed, edited video programs. Many have worked at, or for, the leading building science and technology centers in Japan, Britain, Australia, Sweden, Canada and the USA during the last six decades. All of the following individuals, listed alphabetically, have addressed various aspects of stairway use, safety and design; all have published authoritatively on one or more of these topics. Most have had long-term contact with the proponent. *All favor improvements in stairway design to reduce the toll of injuries seen internationally over the last several decades*.

- Dr. John Archea (deceased), USA
- Dr. Susan Baker (retired)
- Dr. Ben Barkow, USA and Canada
- Dr. Peter Barss, MD, Canada
- Dr. Michael Brill (deceased), USA
- Dr. Daniel Carson (deceased), USA
- Dr. Harvey Cohen, (retired) USA
- Dr. Nancy Edwards, Canada
- Dr. Nigel Ellis, USA
- Dr. Geoff Fernie, USA
- Dr. John Fruin, (retired) USA
- Dr. Tom Hay, Canada
- Dr. Charles Irvine (deceased), USA
- Dr. Daniel Johnson, USA
- Dr. Satoshi Kose, (retired) Japan
- Dr. Lennart Kvanstrom (deceased), Sweden
- Dr. Hamish MacLennan, Australia & New Zealand
- Dr. Hisao Nagata, (retired) Japan
- Dr. Alison Novak, Canada
- Dr. Marcus Ormerod, UK
- Dr. Joan Ozanne-Smith, Australia
- Dr. Jake Pauls, Canada & USA
- Mr. Mike Roys, UK
- Dr. Gary Sloan, (retired) USA
- Dr. Edward Steinfeld, USA
- Dr. Leif Svanström, Sweden
- Dr. John Templer, (retired) USA
- Dr. Keith Vidal, USA
- Dr. Michael Wright, UK

Both Sides of the "7-11" Proposal for Home Stairs Debated. There are relatively few people who have argued on the reactionary, industry side of the long-running debate about improving the design of stairways. One published example of an extended debate on the topic of improved home step dimensions dates back to 1985 (Dacquisto, D.J. and Pauls, J., 1985, The "7-11" stair: Should it be required for residential construction? *The Building Official and Code Administrator,* May-June, pp. 16-35.) David Dacquisto represented the National Association of Home Builders in this published debate. Jake Pauls represented scientific plus technical perspectives, e.g., based on research and public health evidence. The "Yes" side of published, 12-page account of the debate, in the BOCA magazine, was based on an 8,000-word position paper by Pauls.

Here follow concluding remarks in both sides' lengthy arguments, with Pauls' remarks selected for roughly comparable length and subject focus:

Dacquisto, for the NAHB. "What should be the standard for deciding whether to adopt a code proposal which faces opposition? Both cost and benefit estimates will always be uncertain. A suggested minimum standard is that no regulatory proposal should be finally approved over opposition unless the regulatory body finds it more likely than not that benefits of the proposal will exceed the costs, and believes there is probably no less costly way to achieve the anticipated benefits. The burden of proof should be on the proponent. By this standard, for the reasons presented in this article, the residential 7/11 stair proposal appears unwarranted at the present time."

Pauls, for many experts and consumers "... Clearly, judging from the technical literature, the disagreement among apparently, "reasonable people" is certainly not great enough to give any real comfort to those trying to justify continuation of very poor step geometry standards for residential stairs. Also, despite Mr. Dacquisto's apparent attempts to conceal the fact, literature produced by "reasonable people" generally calls for residential stair geometry that is similar to and sometimes better than, what is expected elsewhere...."

Today, over three decades after the above debate, the evidence has grown significantly, *both from epidemiology and etiology*, for improving home step dimensions, specifically to the "7-11" standard—with maximum 7-inch rise and minimum 11-inch tread depth or run. Mr. Daquisto's criterion (for "7-11" adoption) about evidence, "that benefits of the proposal will exceed the costs," has been repeatedly provided, including being the lead subject in Pauls' IRC proposal, *in 2003,* for the "7-11" rule—*submitted sixteen years and five editions of the IRC ago—16 years including over 40 million US stair related injuries and about \$900 billion in US stair-related, societal injury costs!*

During the 16 years, specifically 2010, Jake Pauls attempted a second set of proposals to update both the IBC and the IRC with respect to home stairway safety, specifically the step dimension rules. That led to a formal appeal to ICC after which the ICC Board refused to deliberate on the matter with the appellant and his counsel. ICC's refusal to properly address the home stairway safety issue extends right to the top of the organization.

This era of three major attempts to change the ICC codes requirements will end with the current proposal in 2019 after which the effort will be moved—painfully for ICC, the building regulatory field, the building industry, and others—increasingly into the litigation arena as has already gained some momentum in Canada where a significant portion of forensic assignments (of the proponent's, especially in Ontario) are now in home settings in relation to injuries due to defective stairs.

History within ICC — **2003.** The first major public proposal in March 2003, by Jake Pauls, to ICC to change the IRC home stair step dimension requirements to the "7-11" standard was over 18,000 words in length. In addition to epidemiology and etiology aspects of the issue, the proposal dealt extensively with benefit-cost and other issues.

Here is the outline of the entire proposal.

- ICC Public Proposal Form identifying proponent, etc.
- Legislative Text of Proposed Changes (to sections similar to those now addressed).
 - R311.5.3 Stair treads and risers.
 - R311.5.3.1 Riser height.
 - R311.5.3.2 Tread depth.
 - R311.5.3.3 Profile.
- Benefit-Cost Analysis for Improved Stairs in the USA

- Injury Epidemiology
- History of Debate on Improved Step Geometry Requirements in Codes & Standards
- Benefits and Costs
- Industry's and Regulators' Reviews of Research
- Latest Research on Step Geometry from Britain

Politically-driven Local and State Adoption Process

- Building and Marketing Improved Stairs
- The Problem of the Double Standard
- Intimidation of Building Officials
- Roles of NFPA and APHA
- Summary

Some of these topics are still as relevant today as they were in 2003 and a brief update on these is provided below. Nearly an identical proposal was submitted to NFPA in parallel with the ICC proposal during 2003. An NFPA task group was set up to advise on the issue; it strongly recommended adoption. A rule about 7-11 stairs across the board—especially in homes—was adopted. NAHB appealed and lost. Since then NAHB has given up trying to get the NFPA dwelling unit requirements to revert to what the IRC has. Rather, NAHB turned its efforts to stopping NFPA and others from improving home safety through model code adoption at state and local levels in the USA. ICC appeared to be a willing partner in this effort. Ethics apparently took a back seat as ICC continued to give NAHB a guaranteed one-third of the relevant IRC committee's 12 positions and thus needed only two votes to stop any proposal it did not like. Proponents require 7 votes. The math is clear, as is the need for legal intervention where evidence is treated in much higher regard and nobody with a pre-determined position is allowed to serve as a trier of fact, such as a judge or jury member.

NAHB's Political Opposition Spanning Over Two Decades. The 2003 proposal was not accepted by ICC, largely for what will be termed "political considerations" namely that ICC was not prepared to go against NAHB's bullying (and other forms of power-based influence) against ICC and building officials generally. Indeed, the political power of the NAHB continues, with ICC's apparent *and effective blessing*, two decades after NAHB adopted, in 1996, a policy that stated:

"NOW THEREFORE BE IT RESOLVED that the National Association of Home Builders recommends that all state and local governments who adopt the National Building Code (BOCA) and the Council of American Building Officials (CABO) model building codes, postpone the adoption of any new stair geometry,

BE IT FURTHER RESOLVED that the National Association of Home Builders recommends that all state and local governments who automatically adopt BOCA and CABO model building codes, amend the 1996 and 1995 editions respectively to continue the use of the 1993 BOCA and CABO model codes as they relate to stair geometry provisions,

BE IT FURTHER RESOLVED that the National Association of Home Builders urges all state and local affiliated Home Builders' Associations to contact state and local code authorities and persuade them to postpone the adoption of the new CABO and BOCA stair geometry standard, and

BE IT FURTHER RESOLVED that the National Association of Home Builders continue to vigorously pursue the adoption of a stair geometry standard consistent with the 1993 BOCA Code."

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The 1993 *BOCA National Building Code* still permitted stairs in dwelling units to have a maximum riser height of 8.25 inches (210 mm) and a minimum tread depth of 9 inches (229 mm); this contrasted with the same Code's requirements for the "7-11"-based standard for other buildings and occupancies.

Role of Stair Step Dimensions. This topic is the most researched aspect of stairway safety and it has a history dating back centuries, indeed, a few millennia (as set out in detail in the proponents 2003 proposal to ICC. This history was described in detail in the proponents proposal in 2003 and will not be repeated here (although, if necessary, it will be part of a comment submitted during 2019 for consideration at the Public Comment Hearing this autumn). Staff can provide the appropriate code change committee with that 2003 proposal if there is a demand from committee members. (It can also be provided to ICC by the proponent if necessary as a PDF file.)

UK Research Findings. Since the turn of the century, about two decades ago, there was extensive stairway safety research in the UK at the Building Research Establishment (BRE), a UK version of US NIST or NRC Canada's former Division of Building Research (up to about 1982). It was briefly noted in the proponent's 2003 and 2010 proposals on the step dimension issue in the IRC. The charts below are based on many charts and other results produced for the BRE's sponsor the national agency in the UK responsible for its building regulations. BRE's research included (1) laboratory studies of ten different stair step run (going or tread depth) dimensions and several different rise dimensions and (2) a mail-back survey of home owners home stair dimensions combined with a survey of falls on their stairs in the preceding two years.



Figure 2 shows one of many results based on both objective measures and test subjects' responses to a multi-item questionnaire used for each combination of experimental stair rise and run.



and Run/Going, Here Assessed by the Best Subjective Measure

Figure 2 is the chart for the most valuable question or assertion for which the study team wanted to know extent of agreement by individual subjects using a scale for which the lower score is associated with a more-preferred step geometry combination. The results, shown in Figure 2, are for the statement, "I felt safe walking down the stair." There is a streaming video of a discussion between the proponent and one of the two co-investigators, Mike Roys, posted at www.bldguse.com. The discussion, in 2017, focused on the relative importance of the two variables—rise and run—influencing the actual and perceived safety of a stair. While step run (tread depth in the IRC) is very important, there is also some notable effect of the rise. Further research, with larger samples of test subject are needed to pin this down (i.e., statistical significance which was established for the run).

The results of the laboratory studies and the field survey were very similar to what is presented in Figure 3. It shows—for run dimension only—the combined results of the BRE mail-back survey and the laboratory testing; this shows the close correspondence of both subjective and objective measures of the increasing danger of falls when the run dimension is smaller. The vertical scale of the graph in Figure 3 was the basis for estimates, below, on relative risk of falls sufficient to warrant a visit to a hospital Emergency Department in the US.



Figure 3. Combined Results of BRE Laboratory Testing

of Combinations of Step Rise plus Run/Going and the Results of

a Mail-back Survey about Home Stair Dimensions

The proponent, working with original reports of the UK studies as well as numerous meetings with the UK researchers, at BRE and elsewhere, prepared a table which is partly reproduced below, as Table 3, based on a 2013 publication, that described how step run or tread depth ("going" in UK terminology) affected the risk of an injurious fall sufficiently serious to warrant a visit to a hospital Emergency Department. The range of run (tread depth) dimensions in the table ranged from 190 mm (7.5 inches) to 280 mm (11 inches).

(These results and the full table partly reproduced as Table 3 are found in: Pauls, J. and Barkow, B., 2013. Combining risks from two leading factors in stair-related falls. *Proceedings of the International Conference on Fall Prevention and Protection*, Tokyo, pp. 87-92, Table 2.)

Uniformity condition:	Annual injurious fall risk rates with various nominal tread runs Risk rates shown are per 100,0000 population					
Percentage of stairs with TOFF	190 mm Effective run with carpet	210 mm	230 mm Favoured by US home builders	250 mm Minimum in ICC codes	280 mm Minimum in NFPA codes	
0	230	140	110	50	20	
		2.2.2.3		1. Sec. 1		

Table 3. Small Portion of Published Table: Estimated relative annual risks

per 100,000 population, of US hospital emergency department visits

for home stair-related falls with various nominal run (going) dimensions

and with various occurrences of Top of Flight Flaw (TOFF) non-uniformity

Injury Consequences of Inferior Stairs Resulting from NAHB's Policy and ICC's Refusal to Improve Home Stair Step Dimensions. What these and many other research findings mean today is that, across much of the USA, there is mix of inferior—*indeed dangerously inferior*—stairs in homes in their second decade (or more) of a several-decade life. Such homes with stair step tread depths or runs of only 9 inches (even an inch or more smaller effectively, with carpet coverings) are injuring home occupants at rates exceeding those achievable with "7-11" step dimensions by a factor of as much as six to eight. In standard epidemiological terms such NAHB-demanded, home stairs are associated with—*per 100,000 population*— at least 110 stair-related injuries—*annually*—leading to hospital emergency room (ER) treatment compared with 20 stair-related injuries for stairs meeting the "7-11" standard. (This relationship and the role of dimensions both nominal and with nonuniformities are discussed in detail in the Pauls-Barkow paper, from 2013, cited above in relation to Table 3.)

Injury Costs. As seen in Table 2 (near the front of this substantiation), for the entire US, in 2018, the ERtreated injury toll alone for such NAHB-demanded stairs is estimated to be on the order of 600,000 injuries. Adding other treatment consequences, i.e., doctors offices and clinics along with hospital admissions brings the annual injury toll into the millions in the US with a societal cost on the order of 100 billion dollars or approaching \$1,000 per average US household annually. Note that, societal injury costs for such injuries are composed of three components: medical care, work loss and other direct economic losses, plus pain and suffering (quality of life generally) which are, roughly, in the ratio: one : two : seven, respectively. In other words, medical care cost is the smallest of three components responsible for only about 11 percent of total, societal costs. See figure 4.



Figure 4. Components of Societal Injury Cost

Benefits of Normal Stairway Use. Moreover, during a year period, there are on the order of one-trillion stair flight uses in the USA, everyone of which has a value to the stair users. Such normal uses have a significant value that must be taken into account in any benefit-cost analysis. This will increasingly be the case as stairs become safer to use—due to design improvements—and thus such uses can be confidently recommended as a good source of exercise our increasingly sedentary populations need for better fitness. Currently, this proponent cannot endorse use of typical US (or Canadian) home stairs for exercise purposes. Exposure to predictable and preventable dangers has to be minimized and this means that a valuable, readily available place to exercise has less value over its lifetime, simply because its design and construction have been dictated largely by two organizations in the USA: NAHB and SMA, using a flawed code-development process maintained (in an otherwise laudable process for example for its openness and use of communication media) by the ICC.

Concluding Remarks

There are two tactics currently being utilized to change the IRC requirements, one uses 'micro-surgery' to change the smallest amount of text in IRC Section on Stairways, focused only on the step dimension issue in relation to specifying minimum tread depth (run) and maximum rise. This would change minimum tread depth from 10 inches to 11 inches and would change maximum rise from 7.75 inches to 7 inches. The other tactic takes a more-comprehensive approach, substituting almost all IRC's requirements for stairways through a mandatory reference to NFPA 101's requirements on home stairways, specifically for one- and two-family dwellings—the same scope as the IRC has.

In the proponent's professional opinion, the first tactic addresses a problem largely created and maintained by the NAHB; the other adds issues for which the SMA is largely responsible due to its largely poorly justified tinkering with a wider range of stairway design issues which owe more to tradition than to technology. SMA's approach has been marked by the attempt to keep building what has been built in the past, without adequate scientific and technical justification. It appears that SMA has faired very poorly in attempting to do this in the NFPA process where scientific and technical justification carries more weight.

In the proponent's professional opinion, both the NAHB and SMA bear much responsibility for the sorry state of home stairway safety in facilities built to the IRC. Ultimately it is ICC that has failed, and—unless drastic actions are taken—will continue to fail us with huge injury ramifications that will last for many decades. This raises questions about the Preface to the IRC which states: (ICC) "provides an international forum for discussion and deliberation about building design, construction methods, safety, performance requirements, technological advances and innovative products." If this were completely true, why do the requirements of the IRC differ so significantly from those adopted by NFPA?

With the "7-11" being, now, a long-established standard for stairway safety—including in the *International Building Code* for all settings except one- and two-family dwellings, why is the "7-11" not applied to the setting where it is most needed and where it would produce the largest benefit for the cost of implementation—*in homes?*

Bibliography: All citations to the published literaure are embedded in the Reason Statement

Cost Impact: The code change proposal will increase the cost of construction While cost of construction will increase, that increase (as shown also in the first proposal on this same topic in a 2003 proposal on stairways in teh IRC) pales in comparison to the benefits of the "7-11" step geometry for dwelling unit stairs. (From the Reason Statement comes the following updated detail on cost impact.

"If we assume, as an approximation, there were about 120 million US households in 2012 (the midpoint in the periods discussed above) and further assume an average of one flight of stairs for each household (with some homes having several flights of stairs and many having none), the average cost of home stairway-related injuries is roughly \$700 per stair flight (or household) *per year*. This average injury cost greatly exceeds the annual cost (e.g., over a 50-year service life) of a stair flight in a home. As currently allowed by the IRC and built into new homes, stairways with such high annual injury costs are an extremely poor investment in terms of costs to society, families and individuals."

Moreover, for all the other changes proposed for Section 311.7, there is actually a reduction of cost for handrails for example as the more functional handrails are also less costly than the ones typically provided for new home stairways. Changes such as lighting of stairways also have a minor impact on costs as, with modern lighting control systems and energy-saving sources, lighting with increased illumination levels that operates as needed, automatically, means this is not costly as in the past.

Staff Analysis: The referenced standard, NFPA 101-18, is currently referenced in other 2018 I-codes.

Proposal # 5467

RB117-19

IRC®: SECTION R310, R311.1, R311.2, R311.3, R311.3.1, R311.3.2, R311.3.3, R311.4, R311.6, R310.1, R310.1.1, R310.2, R310.2.1, R310.2.2, R310.2.3, R310.2.3.1, R310.2.3.2, R310.2.4, R310.2.5, R310.3, R310.3.1, R310.3.2, R310.3.2.1, R310.3.2.2, R310.4, R310.5, R310.6, SECTION R311, R311.7, R311.7, R311.7.2, R311.7.3, R311.7.4, R311.7.5, R311.7.5.1, R311.7.5.2, R311.7.5.2.1, R311.7.5.3, R311.7.5.4, R311.7.6, R311.7.7, R311.7.8, R311.7.8.1, R311.7.8.2, R311.7.8.3, R311.7.8.4, R311.7.8.5, R311.7.8.6, R311.7.9, R311.7.10, R311.7.10.1, R311.7.10.2, R311.7.11, R311.7.11.1, R311.7.11.2, R311.7.12, R311.7.12.1, R311.7.12.2, R311.8, R311.8.1, R311.8.2, R311.8.3, R311.8.3.1, R311.8.3.2, R311.8.3.3

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2018 International Residential Code

Revise as follows:

SECTION R310 EMERGENCY ESCAPE AND RESCUE OPENINGS MEANS OF EGRESS

R311.1 R310.1 Means of egress. *Dwellings* shall be provided with a means of egress in accordance with this section. The means of egress shall provide a continuous and unobstructed path of vertical and horizontal egress travel from all portions of the *dwelling* to the required egress door without requiring travel through a garage. The required <u>means of egress door shall open directly into a public way or to a *yard* or court that opens to a public way.</u>

R311.2 R310.2 Egress door. Not less than one egress door shall be provided for each *dwelling* unit. The egress door shall be side-hinged, and shall provide a clear width of not less than 32 inches (813 mm) where measured between the face of the door and the stop, with the door open 90 degrees (1.57 rad). The clear height of the door opening shall be not less than 78 inches (1981 mm) in height measured from the top of the threshold to the bottom of the stop. Other doors shall not be required to comply with these minimum dimensions. Egress doors shall be readily openable from inside the *dwelling* without the use of a key or special knowledge or effort.

R311.3 R310.3 Floors and landings at exterior doors. There shall be a landing or floor on each side of each exterior door. The width of each landing shall be not less than the door served. Landings shall have a dimension of not less than 36 inches (914 mm) measured in the direction of travel. The slope at exterior landings shall not exceed 1/4 unit vertical in 12 units horizontal (2 percent).

Exception: Exterior balconies less than 60 square feet (5.6 m²) and only *accessed* from a door are permitted to have a landing that is less than 36 inches (914 mm) measured in the direction of travel.

R311.3.1 R310.3.1 Floor elevations at the required egress doors. Landings or finished floors at the required egress door shall be not more than $1^{1}/_{2}$ inches (38 mm) lower than the top of the threshold.

Exception: The landing or floor on the exterior side shall be not more than $7^{3}/_{4}$ inches (196 mm) below the top of the threshold provided that the door does not swing over the landing or floor.

Where exterior landings or floors serving the required egress door are not at *grade*, they shall be provided with access to *grade* by means of a ramp in accordance with Section R311.8 or a stairway in accordance with Section R311.7.

R311.3.2 R310.3.2 Floor elevations at other exterior doors. Doors other than the required egress door shall be provided with landings or floors not more than $7^{3}/_{4}$ inches (196 mm) below the top of the threshold.

Exception: A top landing is not required where a stairway of not more than two risers is located on the exterior side of the door, provided that the door does not swing over the stairway.

R311.3.3 R310.3.3 Storm and screen doors. Storm and screen doors shall be permitted to swing over exterior stairs and landings.

R311.4 R310.4 Vertical egress. Egress from habitable levels including habitable attics and *basements* that are not provided with an egress door in accordance with Section R311.2 shall be by a ramp in accordance with Section R311.8 or a stairway in accordance with Section R311.7.

R311.6 R310.5 Hallways. The width of a hallway shall be not less than 3 feet (914 mm).

R310.1 R310.6 Emergency escape and rescue opening required. Basements, habitable attics and every sleeping room shall have not less than one operable emergency escape and rescue opening. Where basements contain one or more sleeping rooms, an emergency escape and rescue opening shall be required in each sleeping room. Emergency escape and rescue openings shall open directly into a public way, or to a yard or court that opens to a public way.

Exceptions:

- 1. Storm shelters and *basements* used only to house mechanical *equipment* not exceeding a total floor area of 200 square feet (18.58 m²).
- 2. Where the *dwelling* or *townhouse* is equipped with an automatic sprinkler system installed in accordance with Section P2904, sleeping rooms in basements shall not be required to have emergency escape and rescue openings provided that the basement has one of the following:
 - 2.1. One means of egress complying with Section R311 Sections R310.2 through R310.6 and one emergency escape and rescue opening.
 - 2.2. Two means of egress complying with Section R311. Sections R310.2 through R310.6.

R310.1.1 <u>R310.6.1</u> **Operational constraints and opening control devices.** Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys, tools or special knowledge. Window opening control devices on windows serving as a required emergency escape and rescue opening shall comply with ASTM F2090.

R310.2 R310.7 Emergency escape and rescue openings. Emergency escape and rescue openings shall have minimum dimensions as specified in this section.

R310.2.1 <u>R310.7.1</u> Minimum opening area. Emergency and escape rescue openings shall have a net clear opening of not less than 5.7 square feet (0.530 m²). The net clear opening dimensions required by this section shall be obtained by the normal operation of the emergency escape and rescue opening from the inside. The net clear height of the opening shall be not less than 24 inches (610 mm) and the net clear width shall be not less than 20 inches (508 mm).

Exception: Grade floor openings or below-grade openings shall have a net clear opening area of not less than 5 square feet (0.465 m²).

R310.2.2 R310.7.2 Window sill height. Where a window is provided as the emergency escape and rescue opening, it shall have a sill height of not more than 44 inches (1118 mm) above the floor; where the sill height is below *grade*, it shall be provided with a window well in accordance with Section R310.2.3. R310.7.3.

R310.2.3 R310.7.3 Window wells. The horizontal area of the window well shall be not less than 9 square feet

(0.9 m²), with a horizontal projection and width of not less than 36 inches (914 mm). The area of the window well shall allow the emergency escape and rescue opening to be fully opened.

Exception: The ladder or steps required by Section R310.2.3.1 R310.7.3.1 shall be permitted to encroach not more than 6 inches (152 mm) into the required dimensions of the window well.

R310.2.3.1 R310.7.3.1 Ladder and steps. Window wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with a permanently affixed ladder or steps usable with the window in the fully open position. Ladders or steps required by this section shall not be required to comply with Section R311.7. Ladders or rungs shall have an inside width of not less than 12 inches (305 mm), shall project not less than 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the window well.

R310.2.3.2 R310.7.3.2 Drainage. Window wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1 or by an approved alternative method.

Exception: A drainage system for window wells is not required where the foundation is on well-drained soil or sand-gravel mixture soils in accordance with the United Soil Classification System, Group I Soils, as detailed in Table R405.1.

R310.2.4 R310.7.4 Emergency escape and rescue openings under decks and porches. Emergency escape and rescue openings installed under decks and porches shall be fully openable and provide a path not less than 36 inches (914 mm) in height to a *yard* or court.

R310.2.5 R310.7.5 Replacement windows. Replacement windows installed in buildings meeting the scope of this code shall be exempt from the maximum sill height requirements of Section R310.2.2 <u>R310.7.2</u> and the requirements of Section R310.2.1 <u>R310.7.1</u>, provided that the replacement window meets the following conditions:

- 1. The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening. The replacement window is of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window.
- 2. The replacement window is not part of a change of occupancy.

R310.3 R310.8 Emergency escape and rescue doors. Where a door is provided as the required emergency escape and rescue opening, it shall be a side-hinged door or a slider. Where the opening is below the adjacent grade, it shall be provided with an area well.

R310.3.1 R310.8.1 Minimum door opening size. The minimum net clear height opening for any door that serves as an emergency and escape rescue opening shall be in accordance with Section R310.2.1. <u>R310.7.1.</u>

R310.3.2 R310.8.2 Area wells. Area wells shall have a width of not less than 36 inches (914 mm). The area well shall be sized to allow the emergency escape and rescue door to be fully opened.

R310.3.2.1 R310.8.2.1 Ladder and steps. Area wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with a permanently affixed ladder or steps usable with the door in the fully open position. Ladders or steps required by this section shall not be required to comply with Section R311.7. Ladders or rungs shall have an inside width of not less than 12 inches (305 mm), shall project not less than 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the exterior stairwell.

R310.3.2.2 R310.8.2.2 Drainage. Area wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1 or by an *approved* alternative method.

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Exception: A drainage system for area wells is not required where the foundation is on well-drained soil or sand-gravel mixture soils in accordance with the United Soil Classification System, Group I Soils, as detailed in Table R405.1.

R310.4 R310.9 Bars, grilles, covers and screens. Where bars, grilles, covers, screens or similar devices are placed over emergency escape and rescue openings, area wells, or window wells, the minimum net clear opening size shall comply with Sections R310.2.1 <u>R310.7.1</u> through R310.2.3 <u>R310.7.3</u>, and such devices shall be releasable or removable from the inside without the use of a key, tool, special knowledge or force greater than that required for the normal operation of the escape and rescue opening.

R310.5 R310.10 Dwelling additions. Where *dwelling additions* contain sleeping rooms, an emergency escape and rescue opening shall be provided in each new sleeping room. Where *dwelling additions* have *basements*, an emergency escape and rescue opening shall be provided in the new *basement*.

Exceptions:

- 1. An emergency escape and rescue opening is not required in a new *basement* that contains a sleeping room with an emergency escape and rescue opening.
- 2. An emergency escape and rescue opening is not required in a new *basement* where there is an emergency escape and rescue opening in an existing *basement* that is *accessed* from the new *basement*.

R310.6 R310.11 Alterations or repairs of existing basements. An emergency escape and rescue opening is not required where existing *basements* undergo alterations or repairs.

Exception: New sleeping rooms created in an existing *basement* shall be provided with emergency escape and rescue openings in accordance with Section R310.1. R310.6.

SECTION R311 MEANS OF EGRESS STAIRWAYS AND RAMPS

Add new text as follows:

R311.1 Stairways. Stairways shall comply with Sections R311.1.1 through R311.12.2

Revise as follows:

R311.7.1 R311.1.1 Width. Stairways shall be not less than 36 inches (914 mm) in clear width at all points above the permitted handrail height and below the required headroom height. The clear width of stairways at and below the handrail height, including treads and landings, shall be not less than $31^{1}/_{2}$ inches (787 mm) where a handrail is installed on one side and 27 inches (698 mm) where handrails are installed on both sides.

Exception: The width of spiral stairways shall be in accordance with Section R311.7.10.1. R311.1.10.1.

R311.7.2 R311.1.2 Headroom. The headroom in stairways shall be not less than 6 feet 8 inches (2032 mm) measured vertically from the sloped line adjoining the tread nosing or from the floor surface of the landing or platform on that portion of the stairway.

Exceptions:

1. Where the nosings of treads at the side of a flight extend under the edge of a floor opening through which the stair passes, the floor opening shall not project horizontally into the

required headroom more than $4^{3}/_{4}$ inches (121 mm).

2. The headroom for spiral stairways shall be in accordance with Section R311.7.10.1. <u>R311.1.10.1.</u>

R311.7.3 R311.1.3 Vertical rise. A flight of stairs shall not have a vertical rise larger than 151 inches (3835 mm) between floor levels or landings.

R311.7.4 R311.1.4 Walkline. The walkline across winder treads and landings shall be concentric to the turn and parallel to the direction of travel entering and exiting the turn. The walkline shall be located 12 inches (305 mm) from the inside of the turn. The 12-inch (305 mm) dimension shall be measured from the widest point of the clear stair width at the walking surface. Where winders are adjacent within a flight, the point of the widest clear stair width of the adjacent winders shall be used.

R311.7.5 R311.1.5 Stair treads and risers. Stair treads and risers shall meet the requirements of this section. For the purposes of this section, dimensions and dimensioned surfaces shall be exclusive of carpets, rugs or runners.

R311.7.5.1 R311.1.5.1 Risers. The riser height shall be not more than $7^{3}/_{4}$ inches (196 mm). The riser shall be measured vertically between leading edges of the adjacent treads. The greatest riser height within any flight of stairs shall not exceed the smallest by more than $^{3}/_{8}$ inch (9.5 mm). Risers shall be vertical or sloped from the underside of the nosing of the tread above at an angle not more than 30 degrees (0.51 rad) from the vertical. At open risers, openings located more than 30 inches (762 mm), as measured vertically, to the floor or grade below shall not permit the passage of a 4-inch-diameter (102 mm) sphere.

Exceptions:

- 1. The opening between adjacent treads is not limited on spiral stairways.
- 2. The riser height of spiral stairways shall be in accordance with Section R311.7.10.1. <u>R311.1.10.1.</u>

R311.7.5.2 R311.1.5.2 Treads. The tread depth shall be not less than 10 inches (254 mm). The tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge. The greatest tread depth within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm).

R311.7.5.2.1 R311.1.5.2.1 Winder treads. Winder treads shall have a tread depth of not less than 10 inches (254 mm) measured between the vertical planes of the foremost projection of adjacent treads at the intersections with the walkline. Winder treads shall have a tread depth of not less than 6 inches (152 mm) at any point within the clear width of the stair. Within any flight of stairs, the largest winder tread depth at the walkline shall not exceed the smallest winder tread by more than 3/8 inch (9.5 mm). Consistently shaped winders at the walkline shall be allowed within the same flight of stairs as rectangular treads and shall not be required to be within 3/8 inch (9.5 mm) of the rectangular tread depth.

Exception: The tread depth at spiral stairways shall be in accordance with Section R311.7.10.1. <u>R311.1.10.1.</u>

R311.7.5.3 R311.1.5.3 Nosings. Nosings at treads, landings and floors of stairways shall have a radius of curvature at the nosing not greater than $^{9}/_{16}$ inch (14 mm) or a bevel not greater than $^{1}/_{2}$ inch (12.7 mm). A nosing projection not less than $^{3}/_{4}$ inch (19 mm) and not more than $1^{1}/_{4}$ inches (32 mm) shall be provided on stairways. The greatest nosing projection shall not exceed the smallest nosing projection by more than $^{3}/_{8}$ inch (9.5 mm) within a stairway.

Exception: A nosing projection is not required where the tread depth is not less than 11 inches (279 mm).

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R311.7.5.4 R311.1.5.4 Exterior plastic composite stair treads. Plastic composite exterior stair treads shall comply with the provisions of this section and Section R507.2.2.

R311.7.6 R311.1.6 Landings for stairways. There shall be a floor or landing at the top and bottom of each stairway. The width perpendicular to the direction of travel shall be not less than the width of the flight served. For landings of shapes other than square or rectangular, the depth at the walk line and the total area shall be not less than that of a quarter circle with a radius equal to the required landing width. Where the stairway has a straight run, the depth in the direction of travel shall be not less than 36 inches (914 mm).

Exception: A floor or landing is not required at the top of an interior flight of stairs, including stairs in an enclosed garage, provided that a door does not swing over the stairs.

R311.7.7 R311.1.7 Stairway walking surface. The walking surface of treads and landings of stairways shall be sloped not steeper than one unit vertical in 48 inches horizontal (2-percent slope).

R311.7.8 R311.1.8 Handrails. Handrails shall be provided on not less than one side of each flight of stairs with four or more risers.

R311.7.8.1 R311.1.8.1 Height. Handrail height, measured vertically from the sloped plane adjoining the tread nosing, or finish surface of ramp slope, shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm).

Exceptions:

- 1. The use of a volute, turnout or starting easing shall be allowed over the lowest tread.
- 2. Where handrail fittings or bendings are used to provide continuous transition between flights, transitions at winder treads, the transition from handrail to *guard*, or used at the start of a flight, the handrail height at the fittings or bendings shall be permitted to exceed 38 inches (956 mm).

R311.7.8.2 R311.1.8.2 Handrail projection. Handrails shall not project more than $4^{1/2}$ inches (114 mm) on either side of the stairway.

Exception: Where nosings of landings, floors or passing flights project into the stairway reducing the clearance at passing handrails, handrails shall project not more than $6^{1}/_{2}$ inches (165 mm) into the stairway, provided that the stair width and handrail clearance are not reduced to less than that required.

R311.7.8.3 R311.1.8.3 Handrail clearance. Handrails adjacent to a wall shall have a space of not less than $1^{1}/_{2}$ inches (38 mm) between the wall and the handrails.

R311.7.8.4 R311.1.8.4 Continuity. Handrails shall be continuous for the full length of the flight, from a point directly above the top riser of the flight to a point directly above the lowest riser of the flight. Handrail ends shall be returned or shall terminate in newel posts or safety terminals.

Exceptions:

- 1. Handrail continuity shall be permitted to be interrupted by a newel post at a turn in a flight with winders, at a landing, or over the lowest tread.
- 2. A volute, turnout or starting easing shall be allowed to terminate over the lowest tread.

R311.7.8.5 R311.1.8.5 Grip size. Required handrails shall be of one of the following types or provide equivalent graspability.

- 1. Type I. Handrails with a circular cross section shall have an outside diameter of not less than $1^{1}/_{4}$ inches (32 mm) and not greater than 2 inches (51 mm). If the handrail is not circular, it shall have a perimeter of not less than 4 inches (102 mm) and not greater than $6^{1}/_{4}$ inches (160 mm) and a cross section of not more than $2^{1}/_{4}$ inches (57 mm). Edges shall have a radius of not less than 0.01 inch (0.25 mm).
- 2. Type II. Handrails with a perimeter greater than $6^{1}/_{4}$ inches (160 mm) shall have a graspable finger recess area on both sides of the profile. The finger recess shall begin within $3/_{4}$ inch (19 mm) measured vertically from the tallest portion of the profile and have a depth of not less than $5/_{16}$ inch (8 mm) within $7/_{8}$ inch (22 mm) below the widest portion of the profile. This required depth shall continue for not less than $3/_{8}$ inch (10 mm) to a level that is not less than $1^{3}/_{4}$ inches (45 mm) below the tallest portion of the profile. The width of the handrail above the recess shall be not less than $1^{1}/_{4}$ inches (32 mm) and not more than $2^{3}/_{4}$ inches (70 mm). Edges shall have a radius of not less than 0.01 inch (0.25 mm).

R311.7.8.6 R311.1.8.6 Exterior plastic composite handrails. Plastic composite exterior handrails shall comply with the requirements of Section R507.2.2.

R311.7.9 R311.1.9 Illumination. Stairways shall be provided with illumination in accordance with Sections R303.7 and R303.8.

R311.7.10 R311.1.10 Special stairways. Spiral stairways and bulkhead enclosure stairways shall comply with the requirements of Section R311.7 R311.1 except as specified in Sections R311.7.10.1 R311.1.10.1 and R311.7.10.2. R311.1.10.2.

R311.7.10.1 Spiral stairways. The clear width at and below the handrails at spiral stairways shall be not less than 26 inches (660 mm) and the walkline radius shall be not greater than $24^{1}/_{2}$ inches (622 mm). Each tread shall have a depth of not less than $6^{3}/_{4}$ inches (171 mm) at the walkline. Treads shall be identical, and the rise shall be not more than $9^{1}/_{2}$ inches (241 mm). Headroom shall be not less than 6 feet 6 inches (1982 mm).

R311.7.10.2 Bulkhead enclosure stairways. Stairways serving bulkhead enclosures, not part of the required building egress, providing access from the outside *grade* level to the *basement* shall be exempt from the requirements of Sections R311.3 <u>R310.3</u> and R311.7 <u>R311.1</u> where the height from the *basement* finished floor level to *grade* adjacent to the stairway is not more than 8 feet (2438 mm) and the *grade* level opening to the stairway is covered by a bulkhead enclosure with hinged doors or other *approved* means.

R311.7.11 Alternating tread devices. Alternating tread devices shall not be used as an element of a means of egress. Alternating tread devices shall be permitted provided that a required means of egress stairway or ramp serves the same space at each adjoining level or where a means of egress is not required. The clear width at and below the handrails shall be not less than 20 inches (508 mm).

Exception: Alternating tread devices are allowed to be used as an element of a means of egress for lofts, mezzanines and similar areas of 200 gross square feet (18.6 m²) or less where such devices do not provide exclusive access to a kitchen or bathroom.

R311.7.11.1 R311.1.11.1 Treads of alternating tread devices. Alternating tread devices shall have a tread depth of not less than 5 inches (127 mm), a projected tread depth of not less than $8^{1}/_{2}$ inches (216 mm), a tread width of not less than 7 inches (178 mm) and a riser height of not more than $9^{1}/_{2}$ inches (241 mm). The tread depth shall be measured horizontally between the vertical planes of the foremost projections of adjacent treads. The riser height shall be measured vertically between the leading edges of adjacent treads. The riser height and tread depth provided shall result in an angle of ascent from the horizontal of between 50 and 70 degrees (0.87 and 1.22 rad). The initial tread of the device shall begin at the same elevation as the platform, landing or floor surface.

R311.7.11.2 R311.1.11.2 Handrails of alternating tread devices. Handrails shall be provided on both sides of alternating tread devices and shall comply with Sections R311.7.8.2 R311.1.8.2 to R311.7.8.6. R311.1.8.6. Handrail height shall be uniform, not less than 30 inches (762 mm) and not more than 34 inches (864 mm).

R311.7.12 R311.1.12 Ships ladders. Ships ladders shall not be used as an element of a means of egress. Ships ladders shall be permitted provided that a required means of egress stairway or ramp serves the same space at each adjoining level or where a means of egress is not required. The clear width at and below the handrails shall be not less than 20 inches.

Exception: Ships ladders are allowed to be used as an element of a means of egress for lofts, mezzanines and similar areas of 200 gross square feet (18.6 m²) or less that do not provide exclusive access to a kitchen or bathroom.

R311.7.12.1 R311.1.12.1 Treads of ships ladders. Treads shall have a depth of not less than 5 inches (127 mm). The tread shall be projected such that the total of the tread depth plus the nosing projection is not less than $8^{1}/_{2}$ inches (216 mm). The riser height shall be not more than $9^{1}/_{2}$ inches (241 mm).

R311.7.12.2 R311.1.12.2 Handrails of ships ladders. Handrails shall be provided on both sides of ships ladders and shall comply with Sections R311.7.8.2 R311.1.8.2 to R311.7.8.6. R311.1.8.6. Handrail height shall be uniform, not less than 30 inches (762 mm) and not more than 34 inches (864 mm).

Add new text as follows:

R311.2 Ramps. Ramps shall comply with Sections R311.2.1 through R311.2.3.3.

Revise as follows:

R311.8.1 R311.2.1 Maximum slope. Ramps serving the egress door required by Section R311.2 shall have a slope of not more than 1 unit vertical in 12 units horizontal (8.3-percent slope). Other ramps shall have a maximum slope of 1 unit vertical in 8 units horizontal (12.5 percent).

Exception: Where it is technically infeasible to comply because of site constraints, ramps shall have a slope of not more than 1 unit vertical in 8 units horizontal (12.5 percent).

R311.8.2 R311.2.2 Landings required. There shall be a floor or landing at the top and bottom of each ramp, where doors open onto ramps, and where ramps change directions. The width of the landing perpendicular to the ramp slope shall be not less than 36 inches (914 mm).

R311.8.3 R311.2.3 Handrails required. Handrails shall be provided on not less than one side of ramps exceeding a slope of one unit vertical in 12 units horizontal (8.33-percent slope).

R311.8.3.1 R311.2.3.1 Height. Handrail height, measured above the finished surface of the ramp slope, shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm).

R311.8.3.2 R311.2.3.2 Grip size. Handrails on ramps shall comply with Section R311.7.8.5. R311.1.8.5.

R311.8.3. R311.2.3.3 Continuity. Handrails where required on ramps shall be continuous for the full length of the ramp. Handrail ends shall be returned or shall terminate in newel posts or safety terminals. Handrails adjacent to a wall shall have a space of not less than $1^{1}/_{2}$ inches (38 mm) between the wall and the handrails.

Reason: This proposal reorganizes two sections R310 and R311. The intent is to consolidate the different types of egress (Egress Doors, Emergency Escape Windows and Emergency Escape Doors) under one section, Means of Egress and separate Stairways and Ramps into their own section. The deletion of section "R311.5 Landing, deck, balcony and stair construction and attachment" removes a section that is addressed better and

in more detail in other sections of the code.

Separating Stairs and Ramps into their own section clears up the hierarchy and when to apply the codes. Having to look for stair and ramp requirements under means of egress can imply these requirements do not apply to garage or deck stairs as they are not part of the means of egress.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal reorganizes the code.

Proposal # 5641

RB117-19

RB118-19

IRC®: R312.1.1

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Residential Code

Revise as follows:

R312.1.1 Where required. *Guards* shall be provided for those portions of open-sided walking surfaces, including <u>floors</u>, stairs, ramps and landings , that are located more than 30 inches (762 mm) measured vertically to the floor or *grade* below at any point within 36 inches (914 mm) horizontally to the edge of the open side. Insect screening shall not be considered as a *guard*.

Reason: The first sentence of the IRC, section R312.1.1, is revised by deleting the phrase "walking surfaces, including" and replacing it with the word "floors." As amended, guards are required along open- sided floors, stairs, ramps, and landings when they are located more than 30 inches vertically to the floor or grade below. This change is necessary because the term "walking surfaces" is too broad and can be misinterpreted to apply to almost any surface on or in a building or a lot. This requirement could be interpreted to mean that guards are required to be installed around window wells, on the top of retaining walls, along driveways and sidewalks, on landings near window wells, at the edge of swimming pools, and even at the edge of flat roofs. It is reasonable to use terms that are currently defined and that will best convey the intent of the requirement.

Cost Impact: The code change proposal will not increase or decrease the cost of construction Depending on interpretatioon this code clarification may even save costs

Proposal # 5057

RB118-19

RB119-19

IRC®: R312.1.2, R312.1.3

Proponent: Kevin Duerr-Clark, representing NYS Department of State (kevin.duerr-clark@dos.ny.gov); Gary Traver, representing NYS Department of State (gary.traver@dos.ny.gov)

2018 International Residential Code

Revise as follows:

R312.1.2 Height. Required Where installed, guards at open-sided walking surfaces, including stairs, porches, balconies or landings, shall be not less than 36 inches (914 mm) in height as measured vertically above the adjacent walking surface or the line connecting the *nosings*.

Exceptions:

- 1. *Guards* on the open sides of stairs shall have a height of not less than 34 inches (864 mm) measured vertically from a line connecting the *nosings*.
- 2. Where the top of the *guard* serves as a handrail on the open sides of stairs, the top of the *guard* shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm) as measured vertically from a line connecting the *nosings*.

R312.1.3 Opening limitations. Required Where installed, guards shall not have openings from the walking surface to the required guard height that allow passage of a sphere 4 inches (102 mm) in diameter.

Exceptions:

- 1. The triangular openings at the open side of stair, formed by the riser, tread and bottom rail of a *guard*, shall not allow passage of a sphere 6 inches (153 mm) in diameter.
- 2. *Guards* on the open side of stairs shall not have openings that allow passage of a sphere $4^{3}/_{8}$ inches (111 mm) in diameter.

Reason: The way the language is currently written, only required guards need to meet the height and opening limitations. Meaning guards on a low (30 inches or less above grade) deck, installed voluntarily as a design choice, are permitted to be lower than 36-inches and with openings which would allow small children to get caught in. Just like many other code provisions, if a component is installed, whether it is required or not, it should meet the safety requirements of the code instead of providing a false sense of security.

Cost Impact: The code change proposal will increase the cost of construction

This change will likely marginally increase the cost of construction for those elevated walking surfaces that are 30 inches or less that voluntarily choose to install guards.

Proposal # 4168

RB119-19

RB120-19

IRC®: R312.2.1

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Residential Code

Revise as follows:

R312.2.1 Window sills. Lowest part of window openings. In dwelling units, where the top lowest part of the sill opening of an operable window opening is located less than 24 inches (610 mm) above the finished floor and greater than more than 72 inches (1829 mm) above the finished grade or other walking surface below on the exterior of the building, the operable window shall comply with one of the following below, the lowest part of the window opening shall be not less than 36 inches (914 mm) above the finished floor of the room in which the window is located.

Exceptions:

- 1. Operable window openings windows that will not allow a 4-inch- diameter (102 mm) sphere to pass through where the openings are in their largest opened position.
- 2. Operable windows with openings that are provided with window fall prevention devices that comply with ASTM F2090.
- 3. Operable windows <u>with openings that are provided with window opening control devices that comply</u> with Section R312.2.
- 4. <u>Replacement windows where the lowest part of the opening is not lower than that of the existing</u> window and the maximum width of the opening of the replacement window does not exceed that of the existing window.

Reason: The first sentence of IRC, section R312.2.1, deletes the IRC language "the lowest part of the clear opening of the window" and replaces it with the phrase "the lowest part of the window opening." The IRC Technical Advisory Group (TAG) determined that "the lowest part of the window opening" meant the same thing as "lowest part of the clear opening." The proposed text "lowest part of the window opening" is also consistent with the proposed definition for "sill height" in Code Section 202 (definitions), which clarifies the meaning of sill height pertaining to emergency escape and rescue openings. The first sentence also replaces the phrase "24 inch above finished floor" with "36 inches above the floor." The 24- and 36-inch dimensions are heights that establish a threshold at which the window fall protection requirements are required. The threshold dimension in the current code is set at 24 inches. The IRC sets this dimension at 24 inches, while the IBC sets this dimension at 36 inches. This threshold dimension must be coordinated between the two codes to provide consistent application and enforcement in residential construction. Windows installed having the lowest part of the window opening below this threshold will require window fall protection compliance. The TAG determined that the 36inch dimension is reasonable because it will provide increased life safety for occupants since raising the threshold dimension from 24 to 36 inches will require more windows to be fall protection compliant. Requiring more windows to have fall protection devices installed will provide increased life safety to more occupants, especially children. Additionally, these more restrictive requirements are consistent with the intent of codes which require compliance with the standards for window fall protection devices established in the Codes. The proposed exception #4 is added to exempt replacement windows from the window fall protection requirements. The TAG determined that requiring window fall protection devices in replacement windows would mandate retroactive code compliance for existing structures. Typically, the code is not retroactive for existing structures, with the exception of smoke alarms and safety glazing. If homeowners of existing homes are required to add safety devices that must comply with ASTM F 2090, they may not be as likely to replace

windows that trigger this requirement. It is not reasonable to require window fall protection safety devices that may discourage homeowners from replacing old windows that are broken or painted shut.

There will be an increase to the overall cost of windows in a comparable residential unit. Double-hung windows are currently dominant in the market in sizes that would be most likely be affected by adding a window fall protection device would cost about \$30.00 per window. On casement windows, which currently have a smaller share of the market, adding a window fall protection device would increase the cost by approximately \$100.00 per window.

Cost Impact: The code change proposal will increase the cost of construction

Yes there will be a cost increase for some windows depending on the locations where they are installed, however, these more restrictive requirements are being incorporated into the proposed code to provide for increased life safety for the occupants, to coordinate the provisions of the IBC and IRC, and to provide a more consistent application and enforcement between the Codes in Residential construction in both the IBC and the IRC.

Proposal # 5062

RB120-19

RB121-19

IRC®: R312.2.1

Proponent: Timothy Pate, Colorado Chapter Code Change Committee, representing City and County of Broomfield (tpate@broomfield.org)

2018 International Residential Code

Revise as follows:

R312.2.1 Window sills. opening height. In dwelling units, where the top bottom of the sill clear opening of an operable window opening is located less than 24 inches (610 mm) above the finished floor and greater than 72 inches (1829 mm) above the finished *grade* or other surface below on the exterior of the building, the operable window shall comply with one of the following:

- 1. Operable window openings will not allow a 4-inch-diameter (102 mm) sphere to pass through where the openings are in their largest opened position.
- 2. Operable windows are provided with window fall prevention devices that comply with ASTM F2090.
- 3. Operable windows are provided with window opening control devices that comply with Section R312.2.2.

Reason: This proposal is to change the language on how to measure when you need to protect for child fall protection. Since there is not a definition of sill and typically a window sill is lower than the actual bottom of window opening the language should reflect measuring to the bottom of the actual window opening. This language was changed in the 2015 as a part of a larger change with no apparent reason for this language. I have written a companion change to IRC Section R310.2.2 for egress window heights. This language will now match the revised language that was approved by membership for section IBC 1015.8 as per code change E80-2021

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal is to help clarify the intent of the code

Proposal # 4520

RB121-19

RB122-19

IRC®: R312.2.1

Proponent: Norman Clark, representing Self

2018 International Residential Code

Revise as follows:

R312.2.1 Window sills. In dwelling units, where the top of the sill of an operable window opening is located less than 24 inches (610 mm) above the finished floor <u>or any other horizontal surface below that is within the framed opening of the window, and greater than 72 inches (1829 mm) above the finished *grade* or other surface below on the exterior of the building, the operable window shall comply with one of the following:</u>

- 1. Operable window openings will not allow a 4-inch-diameter (102 mm) sphere to pass through where the openings are in their largest opened position.
- Operable windows are provided with window fall prevention devices that comply with ASTM F2090.
- 3. Operable windows are provided with window opening control devices that comply with Section R312.2.2.

Reason: The National SAFE KIDS campaign indicate that 4,700 children annually in the United States require treatment following a fall from a window. About 18 of these children die from such falls. ASTM F2090 is referenced as a required step in the prevention side with fall protection devices and their installation requirements, but now we need to go a step further. The U.S. Consumer Product Safety Commission studies reported that the majority of child falls occurred from the first and second floors. When the requirement for fall protection came in with the 72 inch above grade or exterior surface below requirement, and the 24 inch interior height above finish floor, there was one thing missing.....Built in Furnishings, such as window seats. We have seen many plans submitted for permits with window seats that are 18 inches maximum above the finished floor. This is a height that a child can climb up onto, and now we have a walking surface with the window sill height only inches above. It is understood that anyone can move a piece of furniture such as a hope chest or table under the window sill, but we are not here to monitor what people will do after the fact, we are hear to educate, along with establishing codes that help protect and save lives. We are here to make places where we live, work, educate, assemble, etc. safer. Having this requirement in the body of the code is a step closer to bringing that 4,700 statistic down.

This entire issue hit close to home when an employees child fell from the second floor of a dwelling. My Plumbing Inspectors child had pushed the screen of an opened window toppling out the window and landing in an empty hot tub that was up against the house. This was due to a bed being pushed up against the window. This child was hospitalized for approximately a month with severe head and liver injuries. If the hot tub hadn't been there, a concrete patio is where he would have landed. The outcome could have been much more grim than it was. Children are curious and they do not recognize danger. They like to climb and explore, and they are top heavy with their center of gravity up near their chest. By inserting this text into section R312.2.1, we are establishing fall protection when window seats or furnishings are constructed below the window. If a window sill happens to be 27 inches above the finish floor and a window seat is constructed at 18 inches above the finish floor, we now have a walking surface with the window sill 9 inches above (see Exhibit A), well below their center of gravity. This is a prime opportunity for a child to get in trouble. By inserting this text in to R312.2.1 for any horizontal surface constructed beneath the window, we are reducing the opportunity for a child to fall. To keep the a child's center of gravity below the windows edge, we have to require the 24 inch requirement from ANY horizontal surface that they can climb upon. I personally know toddlers who can climb up on a 24 inch window seat with no effort at all.

It is very important that we educate the occupants of these dwellings on moving furniture in front of a window. But in addition to that, we can reduce the statistics by not permitting <u>built in</u> raised walking surfaces within 24 inches of the bottom of the window. Every study from the National Safety Council to Consumer Reports lists one of the main problems is furniture in front of a window. A report from WebMD and the American Academy of Pediatrics in 2011 (attached) mentions several times that a major preventer is keeping furniture away from windows. If this is the case, why would we allow these homes to be built with permanent furniture in front of a window without protection? If permanent furniture is to be built in front of a window, then the windows bottom edge needs to be 24 inches or greater above the permanent furnishings, or fall under the requirements of R312.2.1. We have a hard time enforcing R312.2.1 when window seats are constructed because code states only above the finish floor. Some will say that beings how a toddler can climb up on the seat and walk on it that is a walking surface. This doesn't work because there is no definition for a walking surface in the code. This is easily remedied by adding the text to R312.2.1.



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Falls from Windows Injure Nearly 100,000 U.S. Children in 19-Year Period

10/22/2011

During a 19-year period, an estimated 98,145 children were treated in U.S. emergency departments for injuries sustained in falls from windows.

The study, "Pediatric Injuries Attributable to Falls from Windows in the United States in 1990-2008" is the first study to use a nationally representative sample to identify risk factors and trends for pediatric window fall-related injuries treated in US hospital emergency departments. The authors found that windows falls occur more frequently during spring and summer months. The rate of injury is higher for children younger than 5 years of age, and those children were more likely to sustain serious injuries. In addition to young age, a fall height of three stories or higher and a hard landing surface (such as concrete) increased the risk for serious injuries.

Window fall prevention measures for young children should include the use of window guards or window locks and <mark>moving furniture away from windows</mark> to decrease a young child's access. Another way to reduce injuries is to consider the surface below windows. Simply planting bushes or plant beds under windows can soften the landing surface, reducing impact and the resulting injuries.

5,000 kids a year hurt in falls from windows

The number of children treated in U.S. emergency departments for falls from windows approached 100,000 between 1990 and 2008, says a <u>study</u> in the journal Pediatrics. The research shows that the number of injuries declined during the first decade of the study period, but has since plateaued.

"We still are seeing over 5,000 children a year treated in hospital emergency departments across the country for injuries related to window falls, said Dr. Gary A. Smith, study author and director of the Center for Injury Research and Policy at Nationwide Children's Hospital in Columbus, Ohio. "That's 14 children a day. This continues to be a very common, important problem."

Researchers studied data from the <u>National Electronic Injury Surveillance System</u>, maintained by the U.S. Consumer Product Safety Commission. The group monitors injuries involving consumer products, treated in emergency departments nationwide. Researchers divided data from almost 4,000 patients into two groups: 0-4 years and 5-17 years.

Boys were involved in more falls from windows than girls were. In addition, the younger children made up two-thirds of the injuries. The injury rate was highest at age 2.

"These are kids who don't recognize danger - they're curious, they want to explore and when they see an open window, they are going to investigate," Smith said. "Kids at that age tend to be top heavy. Their center of gravity is up near their chest and so as they lean out of the window to see what's going on, they'll topple."

Many of the young children experienced injuries to their head or face, and, often times, these led to hospitalization or death. On the other hand, children in the older group were more likely to have fractures to their arms or legs.

While a few children did fall from a third story or higher, many more fell from a first- or secondstory window.

"What we're finding is that most of these aren't these really high-rise buildings," Smith added. "These are just often homes or apartments that aren't high-rise, where children live. This is a problem that extends to small towns and even rural areas across the country."

He reinforces the message that a screen does not offer protection and should give parents no feeling of comfort.

Smith, who is a pediatric emergency medicine physician, offers the following advice for parents.

Parents of children younger than 5:

-Use window guards or locks -Do not allow any window to be open more than four inches -Move furniture away from windows so children cannot climb on it

Parents of children older than 5:

-Educate children and teens of the risk of climbing out of a window or jumping from it

The authors also note that the landing surface made a difference. The patients who ended up on a cushioned surface often fared better than those who ended up on a hard surface.

"Our focus should be on preventing the child from falling in the first place, but cushioning the fall can help," Smith noted.

"If a child falls from a window and they land on bushes or a planted flower bed, that often is enough to cushion the fall so that they'll end up with bruises or scrapes instead of a severe injury," he said.

The study points out that great reductions were seen in <u>New York</u> and <u>Boston</u> after programs were implemented there to combat the problem. The programs involved education in the community and among parents. Window guards were also made available. In New York City, window guards became mandatory in apartments where young children lived.

"We know what works," Smith said. "We need to now go out and implement that."

Smith said there were limitations with the set of data, especially with fatality numbers, and therefore these numbers under represent the problem.

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PreventingWindow Falls

Laela's Law, the first statewide window fall prevention legislation, reference two ASTM standards

by Richard Wilhelm

On June 16, 2006, Laela Shaugobay, then not quite 2 years old, climbed on a piece of furnitur pushed on an insect screen and fell from a fourth-floor apartment window in Franklin, Minn.

Laela was critically injured but survived the fall and has since fully recovered. However, statistics compiled by the National SAFE KIDS campaign indicate that Laela is one of approximately 4,700 children annually in the United States who require treatment following a fall from a window. According to these same statistics, about 18 children per year die from su falls.

Laela's case inspired action, which resulted in the 2007 passage of a Minnesota state law setti standards for stronger child fall prevention screens and other window fall prevention devices. Laela's Law, as it is now known, took effect in Minnesota on July 1 of this year.

Laela's Law is the first statewide window fall prevention law in the United States, and it coulbecome a model for other state and municipal legislation. The Minnesota law references two ASTM International standards, <u>F2006</u>, Safety Specification for Window Fall Prevention Devi for Non-Emergency Escape (Egress) and Rescue (Ingress) Windows, and <u>F2090</u>, Specificatio for Window Fall Prevention Devices With Emergency Escape (Egress) Release Mechanisms.

Both standards were developed by Subcommittee F15.38 on Window Fall Prevention, part of ASTM International Committee F15 on Consumer Products.
Kathryn Coen, product safety engineer, product safety and liability prevention group, Anderse Corp., and current chair of Subcommittee F15.38, says that F2006 and F2090 can be used in legislation and in building codes, as well as by individual parents who can purchase devices th comply to the standards for their own homes. "F15.38 wants to educate adults on the importat of window safety, and our standards play an important role in this," says Coen.

History of Subcommittee F15.38

Subcommittee F15.38 was formed in 1995 following a roundtable meeting and a report issued the U.S. Consumer Product Safety Commission that found that children age 5 and younger account for a high percentage of window fall fatalities and injuries.

The first standard approved by the subcommittee, F2006, applies strictly to fall prevention devices that protect against potential falls by children age 5 and under through open windows designated for emergency escape or rescue in installations more than 75 ft. (23 m) above grou level in multiple family dwellings. Windows at these heights are beyond the reach of rescue ladders currently in use.

With its second approved standard, F2090, Subcommittee F15.38 covers window fall prevent devices for windows situated up to 75 ft. (23 m) above ground. At this height level, windows have emergency escape release mechanisms, which needed to be taken into account in the standard.

According to its introduction, F2090 addresses window fall prevention devices that protect against potential falls by children age 5 years and under through open windows. The standard covers a variety of currently available window fall prevention devices, including window opening control devices, window fall prevention screens and some types of window guards, a of which use different strategies to prevent children from falling through open windows.

ASTM F2090 covers the general requirements, installation instructions and performance tests window fall prevention devices, which are defined in the standard as "any device intended to prevent a young child from passing or falling through an open window." The definition goes (to note that such devices may be an integral part of a window or may be attached to the windo its frame or the area around the window after the window has been installed. F2090 also inclu examples of safety information panels to be used within assembly/installation instructions.

Window Fall Prevention Devices

Three types of window fall prevention devices described in the F15.38 standards are:

 Fall prevention window guard — Device designed to fit into or onto a window to prevent a cl from passing or falling through an open window. Typically mounted on the interior frame of window and includes side frames fastened to the sides of a window frame and a plurality of spaced-apart, transverse, tubular, width-adjustable crosspiece elements to form a grid pattern between the side supports to prevent passage of a child.

- Window fall prevention screen Screen device designed to fit into or onto a window to prevent
 a child from passing or falling through an open window. Typically mounted on the exterior
 surface/frame of a sliding style window and on the interior of a cranking style window and
 includes screening mesh or material and attachment mechanism(s) of sufficient strength to
 meet the performance requirements of this standard while preventing passage of a child.
- Window opening control device Device that limits a window sash to be opened with normal
 operation of the sash such as to prohibit the free passage of a 4-in. (102-mm) diameter rigid
 sphere at the lowest opening portion of the window opening, with a release mechanism that
 shall allow the sash to be opened to a large opening area such as that required for emergency
 escape and rescue, and that automatically resets when a window is fully closed.

According to Coen, the subcommittee is currently in the process of updating F2090 and invites all interested parties to contribute to future revisions. "We are having ongoing virtual meetings to get everyone on the same page regarding potential updates to the standard," says Coen.

"There is a wide range of subcommittee members, including parents whose children have been in window fall accidents, injury prevention and fire safety experts, building code officials, homebuilders, window manufacturers, makers of fall prevention devices and CPSC representatives," says Coen, who notes that the subcommittee is particularly interested in having input from fire safety experts at this time.

Coen is hopeful that the use of F15.38 standards in building codes and in legislation such as Laela's Law, along with continuing education and information dissemination, will help to lower the incidence of window falls in the future.

WebMD

About 5,000 Kids Fall From Windows Each Year

Simple Prevention Measures Include Installing Locks, Keeping Furniture Away From Windows

By Jennifer Warner

Aug. 22, 2011 -- Falls from windows injure about 5,100 children on average each year in the U.S., and most could be prevented with simple window safety measures.

A new study shows an estimated 98,415 children were treated in hospital emergency rooms from 1990 to 2008 for injuries caused by falls from windows. Injuries ranged from cuts and bruises to fatal head injuries, and young children were most at risk for serious injuries.

Researchers say it's the first study to look at the risk factors and injuries associated with children's falls from windows. The results suggest that many of these injuries could be prevented with simple steps, such as moving furniture away from windows, installing locks, and placing plant beds or bushes under windows.

Window Fall Risks

In the study, researchers analyzed information from a nationwide database of children treated in hospital emergency rooms over a 19-year period from 1990 to 2008.

Continue Reading Below

The results showed that an estimated 98,415 children were treated for injuries caused by a fall from a window during this period, an average of 5,180 per year.

Researchers found the following factors were associated with window falls:

- Boys were more likely than girls to fall out of windows and accounted for 58% of window fall injuries.
- · Falls from windows were more common in spring and summer months.
- One-fourth of the window fall-related injuries required hospitalization.
- Children under 5 years were more likely to suffer serious injuries from a window fall and three times more likely to suffer a head injury.

The study also showed that the type of landing surface plays a major role in the severity of head injuries caused by window falls. Children who landed on a hard surface, such as concrete, were twice as likely to suffer head injuries, be hospitalized, or die from their injuries compared with those who landed on cushioned surfaces.

How to Improve Window Safety

Researchers say placing bushes or plant beds underneath windows can create a cushioned landing surface and reduce the impact of falls from windows for children of all ages.

WebMD Health News Reviewed by Laura J. Martin, MD on August 22, 2011 Sources

SOURCES:

Harris, V. Pediatrics, Aug. 22, 2011.

News release, American Academy of Pediatrics.

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Other steps to increase window safety include reducing access to windows by moving furniture away from windows and installing window guards or locks that prevent the window from opening more than 4 inches.

Although information about whether furniture was placed near the window was not available for 95% of the falls, researchers found 4% of window falls involved children rolling off beds or climbing on furniture before falling out a window.

Similarly, there was little information about whether a screen was in place at the time of the fall. But when this information was available, 83% reported that a screen was in place.

"Findings from other studies demonstrate that screens often are in place (up to 76% of the time) but do not provide adequate protection against window falls involving children," researcher Vaughn A. Harris, of the Center For Injury Research and Policy, The Research Institute at Nationwide Children's Hospital, in Columbus, Ohio, and colleagues write in *Pediatrics.* "Parents and other child caregivers should be counseled not to depend on screens to prevent children from falling out windows."

WebMD Health News Reviewed by Laura J. Martin, MD on August 22, 2011 Sources

SOURCES:

Harris, V. Pediatrics, Aug. 22, 2011.

News release, American Academy of Pediatrics.

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Bibliography: American Academy of Pediatrics, WebMD, National Safe Kids, U.S. Consumer Product Safety Commission, National Safety Council NSC, Consumer Reports

Cost Impact: The code change proposal will not increase or decrease the cost of construction There would be minimal to no cost impact on this change.

Proposal # 3973

RB122-19

RB123-19

IRC®: SECTION R312 (New), R312.2 (New), R312.2.1 (New), R312.2.2 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

SECTION R312 GUARDS AND WINDOW FALL PROTECTION

R312.2 Window fall protection. Window fall protection shall be provided in accordance with Sections R312.2.1 and R312.2.2.

R312.2.1 Window sills. In dwelling units, where the top bottom of the sill clear opening of an operable window opening is located less than 24 inches (610 mm) above the finished floor and greater than 72 inches (1829 mm) above the finished *grade* or other surface below on the exterior of the building, the operable window shall comply with one of the following:

- 1. Operable window openings will not allow a 4-inch-diameter (102 mm) sphere to pass through where the openings are in their largest opened position.
- 2. Operable windows are provided with window <u>opening control devices or fall prevention devices</u> that comply with ASTM F2090.
- 3. Operable windows are provided with window opening control devices that comply with Section R312.2.2.

R312.2.2 Window opening control devices. <u>Emergency escape and rescue openings</u>. Window opening control devices shall comply with ASTM F2090. The <u>Where an operable window serves as an emergency</u> escape and rescue opening, the window opening control device <u>or fall prevention devices</u>, after operation to release the control device allowing the window to fully open, shall not reduce the net clear opening area of the window unit to less than the area required by Section R310.2.1.

Reason: ASTM F2090, *Specification for Window Fall Prevention Devices with Emergency Escape (Egress Release Mechanisms)*, includes criteria for window fall prevention devices and window opening control devices (see Section R312.2). This standard is specifically written for window openings within 75 feet (22 860 mm) of grade and specifically allows for windows to be used for emergency escape and rescue. This standard was updated in 2008 to address window opening control devices. This control device can be released from the inside to allow the window to be fully opened in order to comply with the emergency escape provisions in IRC. Section 312.2.2.1 - The change to the first sentence is to clarify where the measurement for the bottom of the window should be taken. Exception 2 and 3 are combined since ASTM F2090 includes information on both opening control devices and fall prevention devices.

Section 312.2.2 - The revision does not require opening control devices or fall prevention devices. This section would just allow for them to be on windows that were also serving as emergency escape and rescue openings. This is coordinated with the proposals for emergency escape and rescue openings.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included

members of the committee as w ell as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: https://www.iccsafe.org/codes-techsupport/codes/codedevelopment-process/building-code-actioncommittee-bcac.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This is a clarification with no technical changes.

Proposal # 4145

RB123-19

RB124-19

IRC®: 312.3 (New)

Proponent: Thomas Olson, Kirkland Dynamics, LLC., representing Kirkland Dynamics, LLC. (tom@kirklanddynamics.com)

2018 International Residential Code

Add new text as follows:

312.3 Roof guards. Guards shall be provided where various components that require service are located within 10 feet (3048 mm) of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches (762 mm) above the floor, roof or grade below. The guards shall extend not less than 30 inches (762 mm) beyond each end of such components. The guard shall be constructed so as to prevent the passage of a sphere 21 inches (533 mm) in diameter.

<u>Guards shall be provided where the roof hatch opening is located within 10 feet (3048 mm) of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches (762 mm) above the floor, roof or grade below. The guard shall be constructed so as to prevent the passage of a sphere 21 inches (533 mm) in diameter.</u>

Exception: Guards are not required where permanent fall arrest/restraint anchorage connector devices that comply with ANSI/ASSE Z 359.1 are affixed for use during the entire roof covering lifetime. The devices shall be reevaluated for possible replacement when the entire roof covering is replaced. The devices shall be placed not more than 10 feet (3048 mm) on center along hip and ridge lines and placed not less than 10 feet (3048 mm) from the roof edge or open side of the walking surface

Reason: To create parity with the IRC and the IBC, IMC, IFC, and the SRCC requirements for guards. This exception to the requirement for guards is currently in these codes. We are looking to create parity with the requirements and have the same requirement in the IRC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction No cost impact. The installation of the ANSI/ ASSE Z 359.1 devices offset any increase in construction costs.

Proposal # 5275

RB124-19

RB125-19

IRC®: SECTION R314, R314.1, R314.1.1, R314.2, R314.2.1, R314.2.2, R314.2.3 (New), R314.3, R314.3.1, R314.4, R314.4.1 (New), R314.5, R314.6, R314.7, R314.7, R314.7.1, R314.7.2, R314.7.3, R314.7.4

Proponent: Francis McAndrew, NYS Department of State, representing NYS Department of State (francis.mcandrew@dos.ny.gov); Ronald Stark, NYS Department of State, representing NYS Department of State (ronald.stark@dos.ny.gov)

2018 International Residential Code

Revise as follows:

SECTION R314 SMOKE ALARMS AND HEAT DETECTION

R314.1 General. Smoke alarms, heat detectors, and heat alarms shall comply with NFPA 72 and Section R314.

R314.1.1 Listings. Smoke alarms shall be *listed* in accordance with UL 217. <u>Heat detectors and heat alarms</u> shall be listed for the intended application. Combination smoke and carbon monoxide alarms shall be *listed* in accordance with UL 217 and UL 2034.

R314.2 Where required. Smoke alarms, heat detectors, and heat alarms shall be provided in accordance with this section.

R314.2.1 New construction. Smoke alarms shall be provided in *dwelling units*. <u>A heat detector or heat alarm</u> shall be provided in new attached garages.

R314.2.2 Alterations, repairs and additions. Where *alterations, repairs* or *additions* requiring a permit occur, the individual *dwelling unit* shall be equipped with smoke alarms located as required for new *dwellings*.

Exceptions:

- 1. Work involving the exterior surfaces of *dwellings*, such as the replacement of roofing or siding, the *addition* or replacement of windows or doors, or the addition of a porch or deck.
- 2. Installation, alteration or repairs of plumbing or mechanical systems.

Add new text as follows:

R314.2.3 New attached garages. A heat detector or heat alarm rated for the ambient outdoor temperatures and humidity shall be installed in new garages that are attached to or located under new and existing dwellings. Heat detectors and heat alarms shall be installed in a central location and in accordance with the manufacturer's instructions.

Exception: Heat detectors and heat alarms shall not be required in dwellings without commercial power.

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

- 1. In each sleeping room.
- 2. Outside each separate sleeping area in the immediate vicinity of the bedrooms.
- 3. On each additional *story* of the *dwelling*, including *basements* and *habitable attics* and not including crawl spaces and uninhabitable *attics*. In *dwellings* or *dwelling units* with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full

story below the upper level.

4. Smoke alarms shall be installed not less than 3 feet (914 mm) horizontally from the door or opening of a bathroom that contains a bathtub or shower unless this would prevent placement of a smoke alarm required by this section.

R314.3.1 Installation near cooking appliances. Smoke alarms shall not be installed in the following locations unless this would prevent placement of a smoke alarm in a location required by Section R314.3.

- 1. Ionization smoke alarms shall not be installed less than 20 feet (6096 mm) horizontally from a permanently installed cooking *appliance*.
- 2. Ionization smoke alarms with an alarm-silencing switch shall not be installed less than 10 feet (3048 mm) horizontally from a permanently installed cooking *appliance*.
- 3. Photoelectric smoke alarms shall not be installed less than 6 feet (1828 mm) horizontally from a permanently installed cooking *appliance*.

Revise as follows:

R314.4 Interconnection. Where more than one smoke alarm is required to be installed within an individual dwelling unit in accordance with Section R314.3, the alarm devices shall be interconnected in such a manner that the actuation of one alarm will activate all of the alarms in the individual *dwelling unit*. Physical interconnection of smoke alarms shall not be required where listed wireless alarms are installed and all alarms sound upon activation of one alarm.

Exception: Smoke alarms and alarms installed to satisfy Section R314.4.1 shall not be required to be interconnected to existing smoke alarms where such existing smoke alarms are not interconnected or where such new smoke alarm or alarm is not capable of being interconnected to the existing smoke alarms.

Add new text as follows:

R314.4.1 Heat detection interconnection. Heat detectors and heat alarms shall be connected to an alarm or a smoke alarm that is installed in the dwelling. Alarms and smoke alarms that are installed for this purpose shall be located in a hallway, room, or other location that will provide occupant notification.

R314.5 Combination alarms. Combination smoke and carbon monoxide alarms shall be permitted to be used in lieu of smoke alarms.

Revise as follows:

R314.6 Power source. Smoke alarms, <u>alarms</u>, <u>and heat detectors</u> shall receive their primary power from the building wiring where such wiring is served from a commercial source and, where primary power is interrupted, shall receive power from a battery. Wiring shall be permanent and without a disconnecting switch other than those required for overcurrent protection.

Exceptions:

- 1. Smoke alarms shall be permitted to be battery operated where installed in buildings without commercial power.
- 2. Smoke alarms installed in accordance with Section R314.2.2 shall be permitted to be battery powered.

R314.7 Fire alarm systems. Fire alarm systems shall be permitted to be used in lieu of smoke alarms and shall comply with Sections R314.7.1 through R314.7.4.

R314.7.1 General. Fire alarm systems shall comply with the provisions of this code and the household fire warning *equipment* provisions of NFPA 72. Smoke detectors shall be *listed* in accordance with UL 268.

R314.7.2 Location. Smoke detectors shall be installed in the locations specified in Section R314.3.

R314.7.3 Permanent fixture. Where a household fire alarm system is installed, it shall become a permanent fixture of the occupancy, owned by the homeowner.

R314.7.4 Combination detectors. Combination smoke and carbon monoxide detectors shall be permitted to be installed in fire alarm systems in lieu of smoke detectors, provided that they are *listed* in accordance with UL 268 and UL 2075.

Reason: An estimated 9,000 residential garage fires are reported to United States fire departments each year and cause an estimated 50 deaths, 400 injuries, and \$557 million in property loss (NFPA Research Report: Home Structure Fires, September 2017).

Fires that originate in residential garages are normally larger, spread farther, and cause more damage than fires that start in other areas of a home. This is largely due to garages not having any means of smoke or heat detection. By the time a smoke detector in the dwelling detects the fire, or the home owner or a neighbor notices the fire, it is often too late, and the fire has begun to burn through the fire separation between the garage and the dwelling. At this point, the fire rapidly spreads through wall cavities and begins to attack the structural parts of the home. Unfortunately, smoke alarms installed in garages may lead to nuisance alarms due to vehicle exhause fumes.

Installing a heat detector or heat alarm in these unprotected areas of a home will significantly reduce fire related deaths, injuries, and property loss.



Bibliography:

- 1. NFPA Research Report: Home Structure Fires, September 2017. https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics-and-reports/Building-and-life-safety/osHomes.pdf
- FEMA Topical Fire Report Series: Residential Building Garage Fires (2009-2011). https://www.usfa.fema.gov/downloads/pdf/statistics/v14i12.pdf

ICC COMMITTEE ACTION HEARINGS ::: April, 2019

3. USFA Prevent Home Garage Fires. https://www.usfa.fema.gov/downloads/pdf/publications/prevent_home_garage_fires_flyer.pdf

Cost Impact: The code change proposal will increase the cost of construction

- An interconnected heat detector or heat alarm will increase the cost of construction by about \$100, which includes installation.
- If a new garage is attached to an existing dwelling that has only battery powered smoke alarms installed, the heat detector or heat alarm will require the installation of an interconnected alarm or smoke alarm to be installed in the dwelling for the purposes of providing occupant notification. Under this scenario, the total cost will increase to about \$200.

Proposal # 4850

RB125-19

RB126-19

IRC®: R314.2 (New), R314.3, R315.3

Proponent: Gregory Wickline, Snohomish county, representing self (gwickline@comcast.net)

2018 International Residential Code

Revise as follows:

R314.2 Where required. Smoke alarms shall be provided in accordance with this section.

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

- 1. In each sleeping room.
- 2. Outside each separate sleeping area in the immediate vicinity of the bedrooms.
- 3. On each additional *story* of the *dwelling*, including *basements* and *habitable attics* and not including crawl spaces and uninhabitable *attics*. In *dwellings* or *dwelling units* with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full *story* below the upper level.
- 4. Smoke alarms shall be installed not less than 3 feet (914 mm) horizontally from the door or opening of a bathroom that contains a bathtub or shower unless this would prevent placement of a smoke alarm required by this section.
- 5. <u>In attics where fuel-fired appliances are installed.</u>

R315.3 Location. Carbon monoxide alarms in *dwelling units* shall be installed outside of each separate sleeping area in the immediate vicinity of the bedrooms. Where a fuel-burning *appliance* is located within a bedroom or its attached bathroom, a carbon monoxide alarm shall be installed within the bedroom. <u>Where a fuel fired appliance is located in and attic, a carbon monoxide alarm shall be installed within the attic.</u>

Reason: More and more I see furnaces being installed in attics and if it was to catch fire, no one would ever know

Cost Impact: The code change proposal will increase the cost of construction 20 bucks

Proposal # 3549

RB126-19

RB127-19

IRC®: R314.3

Proponent: Timothy Pate, Colorado Chapter Code Change Committee, representing City and County of Broomfield (tpate@broomfield.org)

2018 International Residential Code

Revise as follows:

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

- 1. In each sleeping room.
- 2. Outside each separate sleeping area in the immediate vicinity of the bedrooms.
- 3. On each additional *story* of the *dwelling*, including *basements* and *habitable attics* and not including crawl spaces and uninhabitable *attics*. In *dwellings* or *dwelling units* with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full *story* below the upper level.
- 4. Smoke alarms shall be installed not less than 3 feet (914 mm) horizontally from the door or opening of a bathroom that contains a bathtub or shower unless this would prevent placement of a smoke alarm required by this section.
- 5. <u>In dwelling units where the ceiling height of a room open to a hallway serving bedrooms</u> exceeds that of the hallway by 24 inches (610 mm) or more smoke alarms shall be installed in the hallway and in the room open to the hallway.

Reason: The proposed added language existing on one of the legacy codes and did not make it into the IRC or the IBC. It is not clear why it did not. In the case of a floor plan that has a taller ceiling immediately outside the hallway that leads to the bedrooms smoke from a fire would move to the upper level of the taller ceiling first and then have to build up to get down to the level of the hallway that leads to the bedrooms and where the required smoke alarm is placed. It makes sense to put a smoke alarm at the taller ceiling so as to signal smoke from a fire quicker in order to notify the occupants of a problem. This would not be a significant cost addition since it would be a small amount or wiring along with one more smoke alarm. It is proven that smoke alarms do save lives. This would be even more important for the many jurisdictions that have amended out the residential fire sprinkler requirements.

Cost Impact: The code change proposal will increase the cost of construction There will be additional cost for wiring and smoke alarms

Proposal # 4521

RB127-19

RB128-19

IRC®: R314.3 (New), R315.3

Proponent: Lisa Simmons, Dorchester County, representing Dorchester County (lsimmons2@dorchestercountysc.gov)

2018 International Residential Code

Revise as follows:

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

- 1. In each sleeping room.
- 2. Outside each separate sleeping area in the immediate vicinity of the bedrooms.
- 3. On each additional *story* of the *dwelling*, including *basements* and *habitable attics* and not including crawl spaces and uninhabitable *attics*. In *dwellings* or *dwelling units* with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full *story* below the upper level.
- 4. Smoke alarms shall be installed not less than 3 feet (914 mm) horizontally from the door or opening of a bathroom that contains a bathtub or shower unless this would prevent placement of a smoke alarm required by this section.
- 5. <u>Inside each room located on the second floor of a detached garage or accessory structure</u> where supplied with power.

R315.3 Location. Carbon monoxide alarms in *dwelling units* shall be installed outside of each separate sleeping area in the immediate vicinity of the bedrooms. Where a fuel-burning *appliance* is located within a bedroom or its attached bathroom, a carbon monoxide alarm shall be installed within the bedroom. <u>Carbon monoxide alarms sahll be installed inside each room located on the second floor of a detached garage or accessory structure where supplied with power.</u>

Reason: This area could be occupied as habitable space or used for sleeping purposes.

Cost Impact: The code change proposal will increase the cost of construction The cost impact would be one additional smoke/carbon monoxide alarm combo.

Proposal # 419

RB128-19

RB129-19

IRC®: R314.3.1 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Revise as follows:

R314.3.1 Installation near cooking appliances. Smoke alarms shall not be installed in the following locations unless this would prevent placement of a smoke alarm in a location required by Section R314.3.

- 1. Ionization smoke alarms shall not be installed less than 20 feet (6096 mm) horizontally from a permanently installed cooking *appliance*.
- 2. Ionization smoke alarms with an alarm-silencing switch shall not be installed less than 10 feet (3048 mm) horizontally from a permanently installed cooking *appliance*.
- 3. Photoelectric smoke alarms shall not be installed less than 6 feet (1828 mm) horizontally from a permanently installed cooking *appliance*.
- 4. Smoke alarms listed and marked "helps reduce cooking nuisance alarms" shall not be installed less than 6 feet (1828 mm) horizontally from a permanently installed cooking appliance.

Reason: This proposal recognizes that smoke alarms listed to the new edition of UL 217 (with an effective date of May 29, 2020) are required to pass tests designed to reduce nuisance alarms caused by residential cooking. The proposal provides an additional option for the types of smoke alarms that can be used near cooking appliances, without changing additional options.

The wording is based on the following 2019 NFPA 72 language:

29.11.3.4 (6) Effective January 1, 2022, smoke alarms and smoke detectors installed between 6 ft (1.8 m) and 20 ft (6.1 m) along a horizontal flow path from a stationary or fixed cooking appliance shall be listed for resistance to common nuisance sources from cooking.

There is no need to reference the 2022 effective date in NFPA 72 because if smoke alarms are listed to the new requirements prior to that date they should be allowed to be used as an option to the other technologies provided in Items 1 to 3.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as w ell as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac.

Cost Impact: The code change proposal will increase the cost of construction The increased cost will be for providing carbon monoxide detection when classrooms in Group E occupancies are covered by these code sections.

Proposal # 4309

RB130-19

IRC®: R315.2.2

Proponent: Terry Kozlowski, representing Southern Nevada Chapter; Amanda Moss, representing SN-ICC Member; Cassidy Wilson, representing SN-ICC Member; Valarie Evans, representing Southern Nevada Chapter

2018 International Residential Code

Revise as follows:

R315.2.2 Alterations, repairs and additions. Where *alterations, repairs* or *additions* requiring a permit occur, the individual *dwelling unit* shall be equipped with carbon monoxide alarms located as required for new *dwellings.*

Exceptions:

- 1. Work involving the exterior surfaces of *dwellings*, such as the replacement of roofing or siding, or the addition or replacement of windows or doors, or the addition of a porch or deck.
- 2. Installation, alteration or repairs of plumbing or <u>non-fuel fired</u> mechanical systems.

Reason: Mechanical systems, including forced air units, dryers, water heaters, stoves, etc., are often fuel burning and therefore subject to leakage, should not be exempt from the requirement for carbon monoxide alarms.

Cost Impact: The code change proposal will increase the cost of construction

Will increase the cost of construction by modifying the current exemption to mechanical systems to include mechanical systems that are fuel-fired to have carbon monoxide detection and only exempt non fuel-fired mechanical systems.

Proposal # 4340

RB130-19

RB131-19

IRC®: R316.2.1 (New), R316.3

Proponent: David Rich, Reax Engineering, representing Reax Engineering Inc. (rich@reaxengineering.com); Joe Charbonnet, representing Green Science Policy Institute (joe@greensciencepolicy.org); Martin Hammer, representing Martin Hammer, Architect (mfhammer@pacbell.net); David Eisenberg, DCAT, representing DCAT (strawnet@gmail.com); Arlene Blum, representing Green Science Policy Institute (arleneb@lmi.net); Donald Lucas, representing Self (dlucas0929@gmail.com); Suzanne Drake, representing PERKINS+WILL (suzanne.drake@perkinswill.com); Marjorie Smith, representing Siegel & Strain Architects (msmith@siegelstrain.com); Paul Wermer, representing self (paul@pw-sc.com); Michael Lipsett, representing Self (mlipsett@astound.net); Alicia Daniels Uhlig, representing International Living Future Institute (alicia.uhlig@living-future.org); William Kelley, County of Marin, representing County of Marin and County Building Officials Association of California (CBOAC); Tony Stefani, representing San Francisco Firefighters Cancer Prevention Foundation (stefanit@sbcglobal.net); Clark Rendall, representing Troon Pacific (cpr@troonpacific.com); Vytenis Babrauskas, representing Fire Science and Technology Inc. (vytob@doctorfire.com); Joseph Fleming, Boston Fire Dept., representing Boston Fire Dept.; Teresa McGrath, representing Healthy Building Network (tmcgrath@healthybuilding.net); Alison Mears, Parsons The New School, representing Healthy Materials Lab (mearsa@newschool.edu); David Collins, representing The American Institute of Architects (dcollins@preview-group.com)

2018 International Residential Code

Add new text as follows:

R316.2.1 Mark on polystyrene foam insulation without flame retardants. Polystyrene foam insulation boards manufactured without flame retardants shall be marked in accordance with this section. 1. Each board shall be marked on both faces every 8 square feet in red 1/2" text with the following information:

- WARNING FIRE HAZARD
- This product must only be installed below a minimum 3.5-inch thick concrete slab on grade.
- NOT FOR VERTICAL OR ABOVE GRADE APPLICATIONS
- This product contains NO flame retardants
- Not tested for flame spread or smoke development requirements of the model building codes

2. Each package shall be marked on at least two sides in red 1/2" text with the following information:

- WARNING COMBUSTIBLE MATERIAL
- Keep away from ignition sources
- <u>Maintain code required separation between product storage and structures under construction (minimum</u> <u>30 feet).</u>

Revise as follows:

R316.3 Surface burning characteristics. Unless otherwise allowed in Section R316.5, foam plastic, or foam plastic cores used as a component in manufactured assemblies, used in building construction shall have a flame spread index of not more than 75 and shall have a smoke-developed index of not more than 450 when tested in the maximum thickness and density intended for use in accordance with ASTM E84 or UL 723. Loose-fill-type foam plastic insulation shall be tested as board stock for the flame spread index and smoke-developed index.

Exception Exceptions:

<u>1.</u> Foam plastic insulation more than 4 inches (102 mm) thick shall have a flame spread index of not more than 75 and a smoke-developed index of not more than 450 where tested at a thickness of not more than 4 inches (102 mm), provided that the end use is *approved* in accordance with Section R316.6 using the thickness and density intended for use.

2. Polystyrene foam insulation boards with a maximum thickness of 2 inches (51 mm) where installed below a minimum 3.5-inch (89 mm) thick concrete slab-on-grade.

Reason: Purpose of Proposal

Polystyrene insulation (EPS and XPS) iis commonly used in buildings to improve energy efficiency. To meet fire test building code requirements in the US and Canada all such insulation currently must contain flame retardant chemicals. In many cases, the tests do not accurately assess the fire safety of insulation.¹ Research has shown that flame retardants used in polystyrene insulation below a slab-on-grade do not provide a significant fire-safety benefit. However, across their lifecycle these chemicals can harm human and ecosystem health.²

This code change proposal would allow, but not require, the use of polystyrene insulation without flame retardants when installed below a concrete slab-on-grade at least 3-1/2 inches thick. The proposal was developed in response to the demand for healthier building materials from designers, developers and builders.

This proposed code change is nearly identical to the code change developed and advanced by the California Office of the State Fire Marshal for both the California Residential and the California Building Codes.



Justification for Proposal

Academic research and expert opinion that flame retardants are unnecessary for insulation below a slab- on-

grade.^{1,3} Neither an ignition source nor sufficient oxygen are present below a concrete slab-on-grade to support combustion. This proposal stipulates that flame retardant-free insulation and packaging be labeled with red 1/2" text lettering to ensure safe transport, storage, and proper installation.

Flammable liquids and gases, engineered wood products, and ABS pipe are all commonplace on construction sites. Other flame retardant-free polystyrene products such as cups and plates, packaging, and ice chests are stored and transported safely. Existing fire safety requirements in the fire and building codes, and in transportation regulations, adequately address necessary design and safety precautions for flame retardant-free polystyrene insulation.

Through the process described below, the California Office of the State Fire Marshal determined that chemical flame retardants provide no fire safety benefit for polystyrene insulation below a concrete slab-on-grade.

On the other hand, considerable peer-reviewed research has found that flame retardants used in building insulation are harmful to human and ecosystem health.^{4,5} Flame retardants have been linked to neurological impairment, hormone disruption, and aquatic toxicity.^{6–8} The flame retardant currently used in polystyrene insulation, PolyFR, is a brominated chemical that has not been well-studied nor proven safe.^{4,9} The manufacture, installation, demolition, landfilling, incineration, and recycling of flame-retarded polystyrene insulation can lead to environmental release of flame retardants and their toxic combustion by-products including brominated dioxins and furans. These chemicals can harm the health of construction workers and others exposed throughout the product life-cycle.

Human and ecosystem health and safety are within the ICC's scope of concern. The language of intent of the 2018 IRC in Section R102.3 states: "The purpose of this code is...to safeguard the public safety, health and general welfare...from...hazards attributed to the built environment."¹⁰ Action has been taken in ICC codes to limit exposure to lead, carbon monoxide, ozone depleting substances, volatile organic compounds, toxic compounds, and formaldehyde based on scientific evidence demonstrating that these materials present human health and environmental hazards.^{10–13}

History of Proposal Development

The California Office of the State Fire Marshal developed the language in this IRC proposal in collaboration with a large, multi-stakeholder Working Group on flammability standards for building insulation materials from 2014-2016. The Working Group recommended testing to determine the fire safety benefit of adding flame retardants to polystyrene insulation below a slab-on-grade.¹⁴

The Office of the State Fire Marshal commissioned Oklahoma State University (OSU) to compare the flammability of polystyrene insulation in a subgrade installation with and without flame retardants. The CAL Fire/OSU Phase II Working Group reviewed and provided input on the testing criteria and results. Members of the Working Group representing multiple stakeholder perspectives were present for the testing. This group included scientists, NGOs, and representatives of flame-retardant manufacturers. Standard testing protocols had not been previously developed for combustible materials below a concrete slab-on-grade due to a lack of fire hazard in this application. Therefore, the Working Group, in collaboration with the OSU researchers, developed the specific tests and testing configurations.

The OSU researchers found:15

- When installed below-slab, insulation without flame retardants presents no risk of fire spread to the building and will not endanger occupants or first responders.
- Adding flame retardants to polystyrene insulation does not significantly reduce peak heat release rates.

• The time to ignition of flame-retardant free polystyrene was comparable to other combustible materials commonly found at construction sites.

The Phase II report can be found at: http://osfm.fire.ca.gov/codedevelopment/pdf/CalFire-OSU_Phase_II_Working_Group_Final_Report.pdf

Based on the result of the independent testing and following review by the California Building Standards Commission's Code Advisory Committee and public comment, the Office of the State Fire Marshal proposed code changes to the California Building Standards Commission which are technically identical to this proposal for the IRC.

In summary, the California Office of the State Fire Marshal concluded, based on extensive stakeholder input, prior research, and transparent and independent testing by OSU, that flame retardant-free polystyrene foam insulation below slab-on-grade presents no fire risk, and the addition of flame retardants provides no fire-safety benefit. Flame retardant-free polystyrene insulation boards would create no more of a fire hazard than other combustible materials commonly found on construction sites, existing codes and standards that cover fire safety during construction.

Precedent in Scandinavian countries

Code updates in Norway have allowed polystyrene insulation board without flame retardants in buildings. A report by the Norwegian government in 2011 stated insulation placed underneath the concrete slab is considered to be the most fire safe solution. In the finished foundation, the insulation material is well protected from fire exposure. There is no advantage of using fire resistant materials or materials with flame retardants in this construction."

Similarly, a Risk Management Evaluation for EPS and XPS foam insulation stated: "By using thermal barriers it is possible to fulfill fire safety requirements in most uses in construction and buildings with EPS and XPS without a fire retardant do not represent a higher cost to the manufacturer. Our research of available data from these countries found no evidence of increased fire risk, insulation fires, or rollbacks of these code changes.^{18,19} Thus, this proposed code change has a significant precedent without increased fire risk.

Summary Statement

The proponents urge you to support this common-sense proposal. Human and ecosystem health will be improved. Fire fighters, building officials, and architects agree that builders should be able to choose flame retardant-free polystyrene insulation below a slab-on-grade.

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Cost Impact: The code change proposal will not increase or decrease the cost of construction Because this code change is not mandatory, there would be no required increased or decreased costs.

Proposal # 4622

RB131-19

RB132-19

IRC®: R316.3, R316.3.1 (New), R316.3.2 (New)

Proponent: John Woestman, representing Extruded Polystyrene Foam Association (jwoestman@kellencompany.com)

2018 International Residential Code

Revise as follows:

R316.3 Surface burning characteristics. Unless otherwise allowed in Section R316.5, foam plastic, or foam plastic cores used as a component in manufactured assemblies, used in building construction shall comply with Section R316.3.1 or Section R316.3.2. Loose-fill-type foam plastic insulation shall be tested as board stock for the flame spread index and smoke developed index.

Add new text as follows:

R316.3.1 Foam plastic insulation 4" thick or less. Foam plastic insulation installed at 4" thickness or less shall have a flame spread index of not more than 75 and shall have a smoke-developed index of not more than 450 where tested in the maximum thickness and density intended for use in accordance with ASTM E84 or UL 723.

R316.3.2 Foam plastic insulation more than 4" thick. Foam plastic insulation installed at more than 4 inches (102 mm) thickness shall have a flame spread index of not more than 75 and a smoke-developed index of not more than 450 where tested at a thickness of not more than 4 inches (102 mm) in accordance with ASTM E84 or UL723, provided that the end use is approved in accordance with Section R316.6 using the thickness and density intended for use..

Reason: Proposed Section R316.3.2 is currently written as an exception. This exception allows foam plastic insulation intended to be installed in thickness greater than 4" to be tested in the Steiner Tunnel (ASTM E84) at a 4" thickness. This addresses the concern that Steiner Tunnels are generally physically limited to fire testing materials of not more than about 4" thickness. Rearranging and revising this section clarifies what fire testing is required.

Cost Impact: The code change proposal will not increase or decrease the cost of construction No technical changes are proposed.

Proposal # 5221

RB132-19

RB133-19

IRC®: R316.3

Proponent: Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council (mfischer@kellencompany.com)

2018 International Residential Code

Revise as follows:

R316.3 Surface burning characteristics. Unless otherwise allowed in Section R316.5, foam plastic, or foam plastic cores used as a component in manufactured assemblies, used in building construction shall have a flame spread index of not more than 75 and shall have a smoke-developed index of not more than 450 when tested in the maximum thickness and density intended for use in accordance with ASTM E84 or UL 723. Loose-fill-type foam plastic insulation shall be tested as board stock for the flame spread index and smoke-developed index.

Exception Exceptions:

<u>1.</u> Foam plastic insulation more than 4 inches (102 mm) thick shall have a flame spread index of not more than 75 and a smoke-developed index of not more than 450 where tested at a thickness of not more less than 4 inches (102 mm), provided that the end use is *approved* in accordance with Section R316.6 using the thickness and density intended for use.

2. Spray foam plastic insulation more than 4 inches (102 mm) in thickness shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450 where tested at a thickness of not less than 4 inches (102 mm), and at the density intended for use, provided that the spray foam plastic is separated from the interior of a building by an *approved* thermal barrier in accordance with Section R316.4.

Reason: Multiple successful NFPA 286 tests with a variety of spray foam plastic insulations with a 25 or less Flame Spread and thicknesses far exceeding 4 inches have demonstrated that any thickness will pass when covered with a prescriptive thermal barrier. Test have been burned with as much as 16 inches of spray foam in the NFPA 286 assembly (approx R-value over 100) and passed. The assembly construction is needlessly complicated to accommodate these excess thickness of foam, and only adds unnecessary expense to the test procedure. With the extensive available data, ICC Evaluation Services recognized there was no usefulness in full-scale testing of foam plastics with FS ±25 when covered with a prescriptive thermal barrier. ICC-ES began issuing code compliance evaluation reports using AC377 that permit these foam plastic insulations to be installed at any thickness when covered with a prescriptive thermal barrier. This provision is in the draft ICC 1100 Standard for Spray-applied Polyurethane Foam Plastic Insulation, which is in the final stages of approval for publication and has been approved for reference in the 2021 IBC (Code Proposal FS 155-18).

Cost Impact: The code change proposal will decrease the cost of construction The proposal adds options to the code.

Proposal # 5617

RB133-19

RB134-19

IRC®: R316.4

Proponent: Marcelo M Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Revise as follows:

R316.4 Thermal barrier. Unless otherwise allowed in Section R316.5, foam plastic shall be separated from the interior of a building by an *approved* thermal barrier of not less than 1/2-inch (12.7 mm) gypsum wallboard , 23/32-inch (18.2 mm) wood structural panel or a material that is tested in accordance with and meets the acceptance criteria of both the Temperature Transmission Fire Test and the Integrity Fire Test of NFPA 275.

Reason: Thermal barriers are intended to protect foam plastics in case of fire from two hazards: (1) the foam plastic should not catch fire and reach flashover in 15 minutes when exposed to a fire similar to what can be expected in a room and (2) the foam plastic should not breach the thermal barrier for a period of 15 minutes so as to transmit high temperatures, fire and smoke from the concealed space (where the foam plastic is located) to the room (or viceversa). The NFPA 275 contains two tests that thermal barriers need to pass to demonstrate that they provide that protection: the temperature transmission fire test (which is a small scale ASTM E119 test conducted for 15 minutes) and the integrity fire test (that can be conducted using NFPA 286, FM 4880, UL 1715 or UL 1040). One of the key criteria of the integrity fire test is that the thermal barrier not reach flashover and not burn completely. If the integrity fire test is conducted as NFPA 286, the same criteria are used as shown in section 302 of the IRC for NFPA 286 (and equivalent criteria are used for the other tests). It has been shown that a 0.5 inch gypsum wallboard is equivalent to a material that meets the test requirements of NFPA 275 and provides the appropriate fire protection from both fire penetration and fire integrity. On the

of NFPA 275 and provides the appropriate fire protection from both fire penetration and fire integrity. On the other hand, tests conducted to NFPA 286 show clearly that a 23/32 inch wood structural panel burns and is not equivalent: it clearly reaches flashover and will lead to the foam plastic insulation burning. Therefore, it does not provide equivalent protection to a thermal barrier or to a 0.5 inch gypsum board.

Note that the language in the code states that the thermal barrier must be an approved material but gives two exceptions to a material that passes NFPA 275, clearly suggesting that they are equivalent: a 0.5 inch gypsum board (which are equivalent) and a thin wood product, which is easily combustible and clearly not equivalent to gypsum board.

Thermal barriers are required in the IRC to protect building occupants from fires associated with foam plastics (as separated from the building interior, R302.8 and R316) and structural insulated panels (SIPs) in walls (R610.5.6). The IBC (section 2603.4) describes a thermal barrier and also allows a wood product as an untested alternate, but the exception in IBC is heavy timber and not a thin wood panel.

Cost Impact: The code change proposal will increase the cost of construction This will prohibit the use of thin wood as a thermal barrier.

Proposal # 4349

RB134-19

RB135-19

IRC®: R316.5.13

Proponent: Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council (mfischer@kellencompany.com)

2018 International Residential Code

Revise as follows:

R316.5.13 Floors. The thermal barrier specified in Section R316.4 is not required to be installed on the walking surface of a structural floor system that contains foam plastic insulation where the foam plastic is covered by not more less than a nominal 1/2-inch-thick (12.7 mm) wood structural panel or equivalent. The thermal barrier specified in Section R316.4 is required on the underside of the structural floor system that contains foam plastic insulation where the underside of the structural floor system that contains foam plastic insulation where the underside of the structural floor system that contains foam plastic insulation where the underside of the structural floor system that contains foam plastic insulation where the underside of the structural floor system is exposed to the interior of the building.

Reason: The current code contains an error by specifying a maximum thickness for wood structural panel used to cover foam plastic insulation in floor systems. The code should establish a minimum thickness for protection.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposal fixes an editorial flaw in the current text.

Proposal # 5611

RB135-19

RB136-19

IRC®: R317.1, R317.1.3, R317.1.5

Proponent: Paul Coats, representing American Wood Council (pcoats@awc.org)

2018 International Residential Code

Revise as follows:

R317.1 Location required. Protection of wood and wood-based products from decay shall be provided in the following locations by the use of naturally durable wood or wood that is preservative-treated in accordance with AWPA U1.

- 1. Wood joists or the bottom of a wood structural floor where closer than 18 inches (457 mm) or wood girders where closer than 12 inches (305 mm) to the exposed ground in crawl spaces or unexcavated area located within the periphery of the building foundation.
- 2. Wood framing members that rest on concrete or masonry exterior foundation walls and are less than 8 inches (203 mm) from the exposed ground.
- 3. Sills and sleepers on a concrete or masonry slab that is in direct contact with the ground unless separated from such slab by an impervious moisture barrier.
- 4. The ends of wood girders entering exterior masonry or concrete walls having clearances of less than 1/2 inch (12.7 mm) on tops, sides and ends.
- 5. Wood siding, sheathing and wall framing on the exterior of a building having a clearance of less than 6 inches (152 mm) from the ground or less than 2 inches (51 mm) measured vertically from concrete steps, porch slabs, patio slabs and similar horizontal surfaces exposed to the weather.
- 6. Wood structural members supporting moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, unless separated from such floors or roofs by an impervious moisture barrier.
- 7. Wood furring strips or other wood framing members attached directly to the interior of exterior masonry walls or concrete walls below *grade* except where an *approved* vapor retarder is applied between the wall and the furring strips or framing members.
- 8. Portions of wood structural members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances where those members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering that would prevent moisture or water accumulation on the surface or at joints between members.

Exception: Sawn lumber used in buildings located in a geographical region where experience has demonstrated that climatic conditions preclude the need to use naturally durable or perservative-treated wood where the structure is exposed to the weather.

Delete without substitution:

R317.1.3 Geographical areas. In geographical areas where experience has demonstrated a specific need, *approved* naturally durable or pressure-preservative-treated wood shall be used for those portions of wood members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances where those members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering that would prevent moisture or water accumulation on the surface or at joints between members. Depending on local experience, such members typically include:

- 1. Horizontal members such as girders, joists and decking.
- 2. Vertical members such as posts, poles and columns.
- 3. Both horizontal and vertical members.

R317.1.5 Exposed glued-laminated timbers. The portions of glued-laminated timbers that form the structural supports of a building or other structure and are exposed to weather and not properly protected by a roof, eave or similar covering shall be pressure treated with preservative, or be manufactured from naturally durable or preservative-treated wood.

Reason: The proposed change does several things:

First, the existing section R317.1.3 (Geographical areas) seems to require wood members exposed to the weather to be treated or naturally durable only if a need is demonstrated. It makes more sense to require them to be protected outright and have an exception for arid geographical regions where it has been demonstrated that the protection is not needed. Relocating it to the list of locations in R317.1 and providing an exception to the item will be clearer. The text of R317.1.3 was moved to the new item 8, except for the descriptors about horizontal and vertical members in the three items at the end of the current section, which seem more appropriate for the commentary to the code.

The wording of the proposed exception to new item 8 is the same as the wording of the parallel exception in Section 2304.12.2.3 of the IBC, with the addition of the words "Sawn lumber used in" at the beginning and replacing the words "durable materials" with "naturally durable or preservative-treated wood" for better language without changing the meaning. The proposal limits the "geographic areas" exception to sawn lumber and excludes engineered wood products such as glued-laminated timber. Under the current code structure, glued-laminated timbers are covered under their own section R317.1.5 and it is commonly understood that the provisions of current Section R317.1.3 are not applicable to them anyway. Presumably all engineered wood products using adhesives should be protected when exposed to the weather regardless of climate or geographic locations, and manufacturers' recommendations would require it.

It is intended to be a new item 8 with the same hierarchy as the current seven items preceding it, and the Exception is intended to be indented under new item 8 so that it only applies to item 8.

Finally, since the proposed item 8 is broad enough to include the current requirement in R317.1.5 for gluedlaminated timber, R317.1.5 can also be deleted.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The application of the current code section may vary depending on interpretation. It is not intended to change the requirements from the most common interpretations, therefore there will be no difference in cost of construction.

Proposal # 4687

RB136-19

RB137-19

IRC®: R317.1, R317.1.4

Proponent: Paul Coats, representing American Wood Council (pcoats@awc.org)

2018 International Residential Code

Revise as follows:

R317.1 Location required. Protection of wood and wood-based products from decay shall be provided in the following locations by the use of naturally durable wood or wood that is preservative-treated in accordance with AWPA U1.

- 1. Wood joists or the bottom of a wood structural floor where closer than 18 inches (457 mm) or, wood girders where closer than 12 inches (305 mm) to the exposed ground, in In crawl spaces or unexcavated area located within the periphery of the building foundation, wood joists or the bottom of a wood structural floor where closer than 18 inches (457 mm) to exposed ground, wood girders where closer than 12 inches (305 mm) to exposed ground, and wood columns where closer than 8 inches (204 mm) to exposed ground.
- 2. Wood framing members <u>, including columns</u>, that rest on concrete or masonry exterior foundation walls and are less than 8 inches (203 mm) from the exposed ground.
- 3. Sills and sleepers on a concrete or masonry slab that is in direct contact with the ground unless separated from such slab by an impervious moisture barrier.
- 4. The ends of wood girders entering exterior masonry or concrete walls having clearances of less than 1/2 inch (12.7 mm) on tops, sides and ends.
- 5. Wood siding, sheathing and wall framing on the exterior of a building having a clearance of less than 6 inches (152 mm) from the ground or less than 2 inches (51 mm) measured vertically from concrete steps, porch slabs, patio slabs and similar horizontal surfaces exposed to the weather.
- 6. Wood structural members supporting moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, unless separated from such floors or roofs by an impervious moisture barrier.
- 7. Wood furring strips or other wood framing members attached directly to the interior of exterior masonry walls or concrete walls below *grade* except where an *approved* vapor retarder is applied between the wall and the furring strips or framing members.
- 8. <u>Wood columns in contact with basement floor slabs unless supported by concrete piers or metal</u> pedestals projecting at least 1 inch (25 mm) above the concrete floor and separated from the concrete pier by an impervious moisture barrier.

Delete without substitution:

R317.1.4 Wood columns. Wood columns shall be *approved* wood of natural decay resistance or *approved* pressure-preservative-treated wood.

Exceptions:

- Columns exposed to the weather or in *basements* where supported by concrete piers or metal pedestals projecting 1 inch (25 mm) above a concrete floor or 6 inches (152 mm) above exposed earth and the earth is covered by an *approved* impervious moisture barrier.
- 2. Columns in enclosed crawl spaces or unexcavated areas located within the periphery of the building where supported by a concrete pier or metal pedestal at a height more than 8 inches (203 mm) from exposed earth and the earth is covered by an impervious moisture barrier.

3. Deck posts supported by concrete piers or metal pedestals projecting not less than 1 inch (25 mm) above a concrete floor or 6 inches (152 mm) above exposed earth.

Reason: Current Section R317.1.4 on wood column protection is unnecessarily confusing and contains errors in syntax, making it difficult to apply.

Current Exceptions 1 and 2: Current Exception 1 seems to exempt all columns exposed to the weather, which is not the intent. The rest of Exception 1 has criteria which conflicts with the current IBC and also seems to conflict with Exception 2—does the elevation of concrete piers and metal pedestals need to be 6 inches or 8 inches? It may be confusing when comparing the exceptions. In addition, the parallel section in the IBC, Section 2304.12.2.2, says nothing about covering the exposed ground in the crawl space with an impervious moisture barrier as a criterium for column protection, and sets the clearance for the bottom of the column at 8 inches above exposed earth, the same as is required for framing on exterior walls.

Current Exception 3: Current Exception 3 seems to exempt any deck posts that are supported by piers or pedestals extending 1 inch above concrete or 6 inches above exposed earth. But it would seem good policy that any deck post exposed to the weather should be treated regardless of clearance to a slab or ground.

Current charging language: The charging language in R317.1.4 requires all columns, regardless of location, to be treated unless they fit into an exception. Interior columns completely protected from the weather, such as heavy timber columns in the interior of the building or built-up columns in walls, are technically required to be treated since they don't fit into any exception. This is not the intent of the code.

This proposal attempts to incorporate wood columns in the general "location" items of R317.1 and eliminate the separate confusing columns section altogether:

Revisions to R317.1 item 1: Similar to floor framing and girders, columns are given a required clearance from exposed earth in crawl spaces, a clearance which is generally consistent with current Exception 2 except the requirement to cover the exposed ground with an impervious moisture barrier is dropped. The reason this requirement was dropped is because there is no such requirement in the parallel sections of the IBC (2304.12.2.2), and it seems that as long as a conservative clearance is required, provisions for moisture barriers over exposed earth in a crawl space should be governed by the crawl space section of the code (R408 Under-Floor Spaces, which has provisions for moisture barriers). The wording of item 1 is rearranged to retain readability with the addition of the new provision for columns.

Revision to R317.1 item 2: Including columns here specifically with other "wood framing members" seems prudent since the columns section is proposed for deletion. However, it may not be necessary since wood columns would normally be considered a wood framing member.

New item 8 to R317.1: This new item is necessary to preserve the reduced clearance for columns above basement floor slabs. It provides for as little as 1 inch of clearance if on a metal pedestal (consistent with current Exception 1 to R317.1.4), and 1 inch of clearance on a concrete pier if it is separated from the pier by an impervious moisture barrier, since concrete is porous and will allow wicking of moisture more readily (this consistent with current Exception 1 of R317.1.4 and also with IBC Section 2304.12.2.2 Exception 2).

Cost Impact: The code change proposal will not increase or decrease the cost of construction These proposed revisions correct errors to match how the code is currently applied. Therefore, no cost increase is anticipated.

Proposal # 5511

RB138-19

IRC®: R317.1.4

Proponent: Matthew Hunter, American Wood Council, representing American Wood Council (mhunter@awc.org)

2018 International Residential Code

Delete and substitute as follows:

R317.1.4 Wood columns. Wood columns shall be *approved* wood of natural decay resistance or *approved* pressure-preservative-treated wood.

Exceptions:

- 1. Columns exposed to the weather or in *basements* where supported by concrete piers or metal pedestals projecting 1 inch (25 mm) above a concrete floor or 6 inches (152 mm) above exposed earth and the earth is covered by an *approved* impervious moisture barrier.
- 2. Columns in enclosed crawl spaces or unexcavated areas located within the periphery of the building where supported by a concrete pier or metal pedestal at a height more than 8 inches (203 mm) from exposed earth and the earth is covered by an impervious moisture barrier.
- 3. Deck posts supported by concrete piers or metal pedestals projecting not less than 1 inch (25 mm) above a concrete floor or 6 inches (152 mm) above exposed earth.

R317.1.4 Posts or columns Posts and columns supporting permanent structures and supported by a concrete or masonry slab or footing that is in direct contact with the earth shall be of naturally durable or preservative-treated wood.

Exceptions:

- 1. <u>Are not exposed to the weather, or are protected by a roof, eave, overhang, or other</u> <u>covering where exposed to the weather.</u>
- 2. <u>Are supported by concrete piers or metal pedestals projected not less than 1 inch (25 mm)</u> above the slab or deck and the posts and columns are separated from the concrete pier by an impervious moisture barrier.
- 3. <u>Are located not less than 8 inches (203 mm) above exposed earth.</u>

Reason: This proposal completely replaces the current text of R317.1.4 with the current provisions of Section 2304.12.2.2 from the IBC. The proposed text is exactly what appears in the current section 2304.12.2.2 of the IBC. The current IRC Section R317.1.4 on wood column protection is unnecessarily confusing and contains errors in syntax, making it difficult to apply. Current charging language requires all wood columns to be preservative treated and the exceptions are inadequate. Current Exception #1 erroneously references "*columns exposed to the weather*", which is not the intent. Rather it should read "Columns NOT exposed to weather...". The rest of Exception 1 has criteria which conflicts with the current IBC and also may conflict with Exception 2. The parallel section in the IBC says nothing about impervious moisture barriers on exposed ground. In addition, Exception 3 would seem to permit deck posts exposed to the weather to be untreated, as long as they are elevated off of the ground. Also, the current section does not contain an adequate exception for interior columns.

This proposal is one alternative to correcting the errors in this section.

Bibliography: None.

Cost Impact: The code change proposal will not increase or decrease the cost of construction These proposed revisions correct errors to match how the code is currently applied. Therefore, no cost increase is anticipated.

Proposal # 5141

RB138-19

RB139-19

IRC: 202 (New), R320.1, R320.1.1

Proponent: Steven Mickley, representing American Institute of Building Design (steve.mickley@aibd.org)

2018 International Residential Code

SECTION R320 ACCESSIBILITY

Revise as follows:

R320.1 Scope. Where there are four or more *dwelling units* or sleeping units in a single structure, the provisions of Chapter 11 of the *International Building Code* for Group R-3 shall apply. For the purpose of applying the requirements of Chapter 11 of the *International Building Code*, guestrooms shall be considered to be sleeping units.

Exceptions:

- 1. <u>A multistory dwelling unit that is not provided with elevator service is not required to comply with this section.</u>
- 2. Owner-occupied lodging houses with five or fewer guestrooms constructed in accordance with the *International Residential Code* are not required to comply with this section.

Delete without substitution:

R320.1.1 Guestrooms. A *dwelling* with guestrooms shall comply with the provisions of Chapter 11 of the International Building Code for Group R-3. For the purpose of applying the requirements of Chapter 11 of the International Building Code, guestrooms shall be considered to be sleeping units.

Exception: Owner-occupied lodging houses with five or fewer guestrooms constructed in accordance with the International Residential Code are not required to be accessible.

Add new definition as follows:

MULTISTORY UNIT. A dwelling unit or sleeping unit with habitable space located on more than one story.

Reason: Chapter 11 of the IBC exempts owner-occupied lodging houses with no more than five sleeping units and multistory dwelling units not provided with elevator service. IRC, Section 320 currently only mentions lodging houses being exempt. Therefore, this proposed amendment is intended to clarify, without the designer having to refer to both Section 320 of the IRC and Chapter 11 of the IBC, multistory dwelling units not provided with elevator service are not required to comply.

The following illustration from the Fair Housing Act Design Manual visually depicts which units are "covered" by the act, and which are "not covered." It also depicts the scope of Chapter 11 of the IBC and the intent of this amendment.



= covered unit

Bibliography: International Building Code, International Code Council, published in September 2018 Fair Housing Act Design Manual, U.S. Department of Housing and Urban Development, published in August 1996, revised in April 1998.

Cost Impact: The code change proposal will decrease the cost of construction This proposal will decrease the cost of design and construction by eliminating potential misinterpretation and unnecessary regulation.

Proposal # 5528

RB139-19

RB140-19

IRC: R202, R320.1, R320.1.1, R320.2 (New)

Proponent: Ed Kulik, representing ICC Building Code Action Committee (bcac@iccsafe.org)

2018 International Residential Code

Add new text as follows:

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.

Add new definition as follows:

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.

Revise as follows:

SECTION R320 ACCESSIBILITY

R320.1 Scope. Where there are four or more *dwelling units* or sleeping units in a single structure, the provisions of Chapter 11 of the International Building Code for Group R-3 shall apply.

Exception: Owner-occupied lodging houses with five or fewer guestrooms are not required to be accessible.

Delete without substitution:

R320.1.1 Guestrooms. A *dwelling* with guestrooms shall comply with the provisions of Chapter 11 of the International Building Code for Group R-3. For the purpose of applying the requirements of Chapter 11 of the International Building Code, guestrooms shall be considered to be sleeping units.

Exception: Owner-occupied lodging houses with five or fewer guestrooms constructed in accordance with the International Residential Code are not required to be accessible.

Add new text as follows:

R320.2 Live/work units. In live/work units, the nonresidential portion shall be accessible in accordance with Sections 419.7 and 419.9 of the International Building Code. In a structure where there are four or more live/work units, the dwelling portion of the live/work unit shall comply with Section 1107.6.2.1 of the International Building Code.

Reason: The accessibility provisions have not kept up with the revised scope of the IRC. This is the scope -**R101.2 Scope.** The provisions of this code shall apply to the construction, *alteration*, movement, enlargement, replacement, repair, *equipment*, use and occupancy, location, removal and demolition of detached one- and two-family dwellings and *townhouses* not more than three stories above *grade plane* in height with a separate means of egress and their *accessory structures* not more than three stories above *grade plane* in height.

Exception: The following shall be permitted to be constructed in accordance with this code where provided with a residential fire sprinkler system complying with Section P2904:

1. Live/work units located in *townhouses* and complying with the requirements of Section 419 of the *International Building Code*.

2. Owner-occupied lodging houses with five or fewer guestrooms.

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.

The scope in the IRC of the transient lodging is limited to owner occupied with 5 or fewer guestrooms, so there will be no larger facilities. Guestrooms are sleeping units which is covered in R320.1, so a separate section that start by applying to something that is not permitted just to get the exception is not needed. You can just apply the exception to R310.1. This does coordinate with IBC Section 1103.2.11.

1103.2.11 Residential Group R-1. Buildings of Group R-1 containing not more than five sleeping units for rent or hire that are also occupied as the residence of the proprietor are not required to comply with this chapter.

For Live work units, the IBC has

419.7 Accessibility. Accessibility shall be designed in accordance with Chapter 11 for the function served.

419.9 Plumbing facilities. The nonresidential area of the *live/work unit* shall be provided with minimum plumbing facilities as specified by Chapter 29, based on the function of the nonresidential area. Where the nonresidential area of the *live/work unit* is required to be *accessible* by Section 1107.6.2.1, the plumbing fixtures specified by Chapter 29 shall be *accessible*.

1107.6.2.1 Live/work units. In *live/work units* constructed in accordance with Section 419, the nonresidential portion is required to be *accessible*. In a structure where there are four or more *live/work units intended to be occupied as a residence*, the residential portion of the *live/work unit* shall be a *Type B unit*.

Exception: The number of *Type B units* is permitted to be reduced in accordance with Section 1107.7.

It is proposed to add a reference to this language to the IRC for consistency for accessibility requirements for Live/work units.

Since the terms 'sleeping units' and 'live/work units' are used in the IRC, in this section and others. It is proposed to add the definitions currently found in the IBC.

This proposal is submitted by the ICC Building Code Action Committee (BCAC). BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. Since 2017 the BCAC has held 6 open meetings. In addition, there were numerous Working Group meetings and conference calls for the current code development cycle, which included members of the committee as w ell as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: https://www.iccsafe.org/codes-tech-support/codes/codedevelopment-process/building-code-actioncommittee-bcac.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This will make the IRC requirements consistent with the IBC for owner-occupied lodging houses and live/work
units.

Proposal # 4235

RB140-19

RB141-19

IRC®: R309.3, R322.1.6, R322.2.1, R322.2.2, R322.2.2.1, R322.3.2, R322.3.5, R322.3.6, R322.3.7

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn, RCQuinn Consulting, on behalf of Federal Emergency Management Agency, representing Federal Emergency Management Agency (rcquinn@earthlink.net)

2018 International Residential Code

Revise as follows:

R309.3 Flood hazard areas. For buildings located in flood hazard areas as established by Table R301.2(1), garage floors shall be one of the following:

- 1. Elevated to or above the design flood required lowest floor elevation as determined in accordance with Section R322.
- 2. Located below the design flood required lowest floor elevation provided that the floors are at or above grade on not less than one side, are used solely for parking, building access or storage, meet the requirements of Section R322 and are otherwise constructed in accordance with this code.

R322.1.6 Protection of mechanical, plumbing and electrical systems. Electrical systems, *equipment* and components; heating, ventilating, air-conditioning; plumbing *appliances* and plumbing fixtures; *duct systems*; and other service *equipment* shall be located at or above the elevation required in Section R322.2 or R322.3. If replaced as part of a substantial improvement, electrical systems, *equipment* and components; heating, ventilating, air-conditioning *appliances* and plumbing fixtures; *duct systems*; and other service *equipment* and plumbing *appliances* and plumbing fixtures; *duct systems*; and other service *equipment* shall meet the requirements of this section. Systems, fixtures, and *equipment* and components shall not be mounted on or penetrate through walls intended to break away under flood loads.

Exception: Locating electrical systems, *equipment* and components; heating, ventilating, air-conditioning; plumbing *appliances* and plumbing fixtures; *duct systems*; and other service *equipment* is permitted below the elevation required in Section R322.2 or R322.3 provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood required elevation in accordance with ASCE 24. Electrical wiring systems are permitted to be located below the required elevation provided that they conform to the provisions of the electrical part of this code for wet locations.

R322.2.1 Elevation requirements.

- Buildings and structures in flood hazard areas, including flood hazard areas designated as Coastal A Zones, shall have the lowest floors elevated to or above the base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher.
- 2. In areas of shallow flooding (AO Zones), buildings and structures shall have the lowest floor (including *basement*) elevated to a height above the highest adjacent *grade* of not less than the depth number specified in feet (mm) on the FIRM plus 1 foot (305 mm), or not less than 3 feet (915 mm) if a depth number is not specified.
- 3. Basement floors that are below *grade* on all sides shall be elevated to or above base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher.

Exception: Enclosed areas below the design flood elevation required in this section, including basements with floors that are not below grade on all sides, shall meet the requirements of Section R322.2.2.

R322.2.2 Enclosed area below design flood required elevation. Enclosed areas, including crawl spaces, that are below the design flood elevation required in Section R322.2.1 shall:

- 1. Be used solely for parking of vehicles, building access or storage.
- 2. Be provided with flood openings that meet the following criteria and are installed in accordance with Section R322.2.2.1:

2.1.The total net area of nonengineered openings shall be not less than 1 square inch (645 mm^2) for each square foot (0.093 m^2) of enclosed area where the enclosed area is measured on the exterior of the enclosure walls, or the openings shall be designed as engineered openings and the *construction documents* shall include a statement by a registered *design professional* that the design of the openings will provide for equalization of hydrostatic flood forces on *exterior walls* by allowing for the automatic entry and exit of floodwaters as specified in Section 2.7.2.2 of ASCE 24.

- 2.2. Openings shall be not less than 3 inches (76 mm) in any direction in the plane of the wall.
- 2.3. The presence of louvers, blades, screens and faceplates or other covers and devices shall allow the automatic flow of floodwater into and out of the enclosed areas and shall be accounted for in the determination of the net open area.

R322.2.2.1 Installation of openings. The walls of enclosed areas shall have openings installed such that:

- 1. There shall be not less than two openings on different sides of each enclosed area; if a building has more than one enclosed area below the design flood elevation, each area shall have openings.
- 2. The bottom of each opening shall be not more than 1 foot (305 mm) above the higher of the final interior grade or floor and the finished exterior grade immediately under each opening.
- 3. Openings shall be permitted to be installed in doors and windows; doors and windows without installed openings do not meet the requirements of this section.

R322.3.2 Elevation requirements.

- 1. Buildings and structures erected within coastal high-hazard areas and Coastal A Zones, shall be elevated so that the bottom of the lowest horizontal structural members supporting the lowest floor, with the exception of piling, pile caps, columns, grade beams and bracing, is elevated to or above the base flood elevation plus 1 foot (305 mm) or the design flood elevation, whichever is higher.
- 2. Basement floors that are below *grade* on all sides are prohibited.
- 3. The use of fill for structural support is prohibited.
- 4. Minor grading, and the placement of minor quantities of fill, shall be permitted for landscaping and for drainage purposes under and around buildings and for support of parking slabs, pool decks, patios and walkways.
- 5. Walls and partitions enclosing areas below the design flood elevation required in this section shall meet the requirements of Sections R322.3.5 and R322.3.6.

R322.3.5 Walls below design flood required elevation. Walls and partitions are permitted below the elevated floor elevation required in Section R322.3.2, provided that such walls and partitions are not part of the structural support of the building or structure and:

- 1. Electrical, mechanical and plumbing system components are not to be mounted on or penetrate through walls that are designed to break away under flood loads; and
- 2. Are constructed with insect screening or open lattice; or
- 3. Are designed to break away or collapse without causing collapse, displacement or other structural damage to the elevated portion of the building or supporting foundation system. Such

walls, framing and connections shall have a resistance of not less than 10 (479 Pa) and not more than 20 pounds per square foot (958 Pa) as determined using allowable stress design; or

- 4. Where wind loading values of this code exceed 20 pounds per square foot (958 Pa), as determined using allowable stress design, the *construction documents* shall include documentation prepared and sealed by a registered *design professional* that:
 - 4.1. The walls and partitions below the design flood required elevation have been designed to collapse from a water load less than that which would occur during the base flood.
 - 4.2. The elevated portion of the building and supporting foundation system have been designed to withstand the effects of wind and flood loads acting simultaneously on structural and nonstructural building components. Water-loading values used shall be those associated with the design flood. Wind-loading values shall be those required by this code.
- 5. Walls intended to break away under flood loads as specified in Item 3 or 4 have flood openings that meet the criteria in Section R322.2.2, Item 2.

R322.3.6 Enclosed areas below design flood required elevation. Enclosed areas below the design flood elevation required in Section R322.3.2 shall be used solely for parking of vehicles, building access or storage.

R322.3.7 Stairways and ramps. Stairways and ramps that are located below the lowest floor elevations specified in Section R322.3.2 shall comply with one or more of the following:

- 1. Be designed and constructed with open or partially open risers and guards.
- 2. Stairways and ramps not part of the required means of egress shall be designed and constructed to break away during design flood conditions without causing damage to the building or structure, including foundation.
- 3. Be retractable, or able to be raised to or above the lowest floor elevation, provided that the ability to be retracted or raised prior to the onset of flooding is not contrary to the means of egress requirements of the code.
- 4. Be designed and constructed to resist flood loads and minimize transfer of flood loads to the building or structure, including foundation.

Areas below stairways and ramps shall not be enclosed with walls below the design flood elevation required in <u>Section R322.3.2</u> unless such walls are constructed in accordance with Section R322.3.5.

Reason: The primary aspect of elevated homes in flood hazard areas that contributes to reducing damage is the elevation of the lowest floor (R322.2.1) or lowest horizontal structural member of the lowest floor in Zone V and Coastal A Zones (R322.3.2) relative to the base flood elevation. The higher the floor, the lower the risk (and the lower are NFIP flood insurance premiums). To ensure the same level of protection is applied to all aspects of dwellings, Section R322.1.6 requires mechanical, plumbing and electrical equipment to be located at or above the required elevations, and R322.1.8 requires use of flood damage-resistant materials below the required elevations. This same level of protection should apply to enclosures and walls below the required elevation, which may be lower than the lowest floor elevations required in R322.2.1 and R322.3.2.

This proposal is consistent with ASCE 24, in which each table specifying elevations refers not to the elevation of the flood, but the required elevation of the lowest floor (ow lowest horizontal structural member of the lowest floor). This proposal is consistent with the NFIP regulations which, in Section 60.3(c)(5) specifies.... "fully enclosed areas below the lowest floor..." and Section 60.3(e)(5) which specifies...." space below the lowest floor either free of obstruction or constructed with non-supporting breakaway walls ...".

Cost Impact: The code change proposal will not increase or decrease the cost of construction Most enclosures below elevated buildings in flood hazard areas are constructed with all elements required for enclosures applied below the elevated lowest floor, thus no change in cost of construction. There may be a slight increase in cost in those rare situations where someone determines the DFE/BFE and "precisely" applies the regulations up to that elevation rather than up to the actual elevation of the lowest floor.

Proposal # 4437

RB142-19

IRC®: R322.2.1

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn, RCQuinn Consulting, on behalf of Federal Emergency Management Agency, representing Federal Emergency Management Agency (rcquinn@earthlink.net)

2018 International Residential Code

Revise as follows:

R322.2.1 Elevation requirements.

- Buildings and structures in flood hazard areas, <u>not</u> including flood hazard areas designated as Coastal A Zones, shall have the lowest floors elevated to or above the base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher.
- 2. In areas of shallow flooding (AO Zones), buildings and structures shall have the lowest floor (including *basement*) elevated to a height above the highest adjacent *grade* of not less than the depth number specified in feet (mm) on the FIRM plus 1 foot (305 mm), or not less than 3 feet (915 mm) if a depth number is not specified.
- 3. Basement floors that are below *grade* on all sides shall be elevated to or above base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher.

Exception: Enclosed areas below the design flood elevation, including *basements* with floors that are not below *grade* on all sides, shall meet the requirements of Section R322.2.2.

Reason: Two successful changes were approved in the 2015 code development cycle. One change modified the elevation requirement by adding 1 foot (freeboard) uniformly into R322, and one change made buildings in designated Coastal A Zones subject to the requirements of R322.3. The clear intent of the second change is to require buildings in Coastal A Zones to comply with R322.3. This is also clear in both R322.2 and R322.3. However, the combination of the two changes approved for R322.2.1 resulted in misleading phrasing. As written, buildings in flood hazard areas designated as Coastal A Zones are subject to the elevation requirements of both R322.2.1 (item #1) and R322.3.2. This proposal adds the word "not" in the first item, removing confusion by explicitly stating buildings in flood hazard areas designated areas designated as Coastal A Zones are subject to a Coastal A Zones are not addressed by R322.2.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction No additional cost. This proposal does not change any requirements for buildings in flood hazard areas designated as Coastal A Zones, which must comply with R322.3.

Proposal # 4436

RB142-19

RB143-19

IRC®: R322.2.3

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn,RCQuinn Consulting, on behalf of Federal Emergency Management Agency, representing Federal Emergency Management Agency (rcquinn@earthlink.net)

2018 International Residential Code

Revise as follows:

R322.2.3 Foundation design and construction. Foundation walls Foundations for buildings and structures erected in flood hazard areas shall meet the requirements of Chapter 4. Plain masonry walls are not permitted unless designed to account for flood loads.

Exception: Unless designed in accordance with Section R404:

1. The unsupported height of 6-inch (152 mm) plain masonry walls shall be not more than 3 feet (914 mm).

2. The unsupported height of 8-inch (203 mm) plain masonry walls shall be not more than 4 feet (1219 mm).

3. The unsupported height of 8-inch (203 mm) reinforced masonry walls shall be not more than 8 feet (2438 mm).

For the purpose of this exception, unsupported height is the distance from the finished *grade* of the under-floor space to the top of the wall.

Reason: Section R322.2 applies in flood hazard areas other than coastal high hazard areas (Zone V) and coastal A zones. These are flood hazard areas along waterways, around lakes, and inland of the Zone V or Limit of Moderate Wave Action (if delineated). This proposal removes the exception to allow prescriptive heights for unsupported masonry walls and therefore requires all foundations in flood hazard areas to meet the requirements of Chapter 4. The proposal also would not allow plain masonry walls. The proposal also clarifies that all foundations, not just foundation walls, must meet Chapter 4 requirements.

The wall height limitations in R322.2.3 are based on analyses performed in 1998 for a range of flood depths and flood velocities. FEMA re-examined those limitations in 2013 after observing foundation damage documented in FEMA's post-disaster Mitigation Assessment Team reports which identified failure of unreinforced masonry (URM) walls under flood loads (see FEMA P-765, Midwest Floods of 2008 in Iowa and Wisconsin) and design wind loads (see FEMA P-908, Spring 2011 Tornadoes). MAT teams deployed after Hurricane Sandy documented numerous examples of failed unreinforced and lightly reinforced walls sections in areas shown on Flood Insurance Rate Maps as Zone A, both with and without evidence of moderate waves. Analyses performed in 2013 for a range of wall types and heights, and a range of flood conditions, demonstrated the importance of reinforcement. If this proposal passes, FEMA will provide commentary with guidance for foundations in special flood hazard areas where velocities may exceed 5 fps.

When wind and flood loads are applied under Allowable Stress Design (ASD) Load Combination 7 per ASCE 7-10 Section 2.4.2 (2), net tension results at the top of the foundation wall from the minimum ASCE 7-10 basic wind speed of 115 mph (Exposure Category B). Higher design wind speeds result in greater uplift. The design criteria of ACI-530 Section 2.2.4 specifies that the tensile strength of unreinforced masonry shall be neglected when subjected to axial tension forces. Accordingly, unreinforced wall sections analyzed with net axial tension at the top of wall from the combined effects of wind and flood loading have been disallowed. ACI-530 commentary to Section 2.2.4 further stipulates, "Net axial tension in unreinforced masonry walls due to axially applied load are not permitted. If axial tension develops in walls due to uplift of connected roofs or floors, the walls must be reinforced to resist the tension. Compressive stress from dead load can be used to offset axial tension."

Cost Impact: The code change proposal will increase the cost of construction

The code change proposal will increase the cost of construction for a limited set of buildings that might have perimeter wall foundations that would fall within the height and wall thickness limits in the exception. However, the likelihood of failure of those foundations under anticipated flood loads will be reduced, and thus decreases future costs associated with rebuilding after flood and flood/high wind events.

Proposal # 4440

RB144-19

IRC®: R322.3.2

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn, RCQuinn Consulting, on behalf of Federal Emergency Management Agency, representing Federal Emergency Management Agency (rcquinn@earthlink.net)

2018 International Residential Code

Revise as follows:

R322.3.2 Elevation requirements.

- 1. Buildings and structures erected within coastal high-hazard areas and Coastal A Zones , shall be elevated so that the bottom of the lowest horizontal structural members supporting the lowest floor, with the exception of piling, pile caps, columns, grade beams and bracing, is elevated to or above the base flood elevation plus 1 foot (305 mm) or the design flood elevation, whichever is higher. Where stem wall foundations in Coastal A Zones meet the requirements of R322.3.3, the bottom of the lowest horizontal structural member supporting the lowest floor is the bottom of the capping slab.
- 2. Basement floors that are below *grade* on all sides are prohibited.
- 3. The use of fill for structural support is prohibited.
- 4. Minor grading, and the placement of minor quantities of fill, shall be permitted for landscaping and for drainage purposes under and around buildings and for support of parking slabs, pool decks, patios and walkways.
- 5. Walls and partitions enclosing areas below the design flood elevation shall meet the requirements of Sections R322.3.5 and R322.3.6.

Reason: Section R322.3.2 requires the bottom of the lowest horizontal structural member supporting the lowest floor to be at or above a specific elevation. The basic foundation requirement, in Section R322.3.3, specifies pilings or columns, which minimize obstructions and allow floodwater to pass under elevated buildings. When Coastal A Zones, where designated, were added to Section R322.3 in recognition of the damage even moderate waves can cause, along with scour, the exception to permit backfilled stem wall foundations was added to Section R322.3.3. Unlike open piling and column foundations, it is not clear where the lowest horizontal structural member is to be measured on a stem wall foundation. This proposal clarifies the bottom of the lowest horizontal structural member is the bottom of the capping slab.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposal provides clarification to an existing requirement.

Proposal # 4446

RB144-19

RB145-19

IRC®: R322.3.3

Proponent: Gregory Wilson, representing Federal Emergency Management Agency (gregory.wilson2@fema.dhs.gov); Rebecca Quinn, RCQuinn Consulting, on behalf of Federal Emergency Management Agency, representing Federal Emergency Management Agency (rcquinn@earthlink.net)

2018 International Residential Code

Revise as follows:

R322.3.3 Foundations. Buildings and structures erected in coastal high-hazard areas and Coastal A Zones shall be supported on pilings or columns and shall be adequately anchored to such pilings or <u>columns and shall</u> <u>comply with the following:</u>

- 1. columns. The space below the elevated building shall be either free of obstruction or, if enclosed with walls, the walls shall meet the requirements of Section R322.3.5.
- Pilings shall have adequate soil penetrations to resist the combined wave and wind loads (lateral and uplift) - Water-loading values used shall be those associated with the design flood. Wind-loading values shall be those required by this code. Pile and pile embedment shall include consideration of decreased resistance capacity caused by scour of soil strata surrounding the piling.
- 3. <u>Columns and their supporting foundations shall be designed to resist combined wave and wind loads</u>, lateral and uplift, and shall include consideration of decreased resistance capacity caused by scour of soil strata surrounding the columns. Pile systems design and installation shall be certified in accordance with Section R322.3.9. Spread footing, mat, raft or other foundations that support columns shall not be permitted where soil investigations that are required in accordance with Section R401.4 indicate that soil material under the spread footing, mat, raft or other foundation is subject to scour or erosion from wave-velocity flow conditions. If permitted, spread footing, mat, raft or other foundations that support columns shall be designed in accordance with ASCE 24.
- 4. Flood and wave loads shall be those associated with the design flood. Wind loads shall be those required by this code.
- 5. <u>Foundation designs and construction documents shall be prepared and sealed in accordance with</u> <u>Section R322.3.9.</u>

Exception: In Coastal A Zones, stem wall foundations supporting a floor system above and backfilled with soil or gravel to the underside of the floor system shall be permitted provided that the foundations are designed to account for wave action, debris impact, erosion and local scour. Where soils are susceptible to erosion and local scour, stem wall foundations shall have deep footings to account for the loss of soil.

Reason: Section R322.3.3 allows the use of pilings or columns, but the way the requirements are phrased makes it appear they apply only to pilings, without equivalent specificity for columns. Columns must also be designed to account for wave and wind loads and the effects of scour. The primary object of this proposal is to provide that specificity. Second, the current text is long, so the proposal breaks it into distinct numbered items which makes it easier to read.

Cost Impact: The code change proposal will not increase or decrease the cost of construction No cost impact associated with the added text for columns because the text is clarifying only and column foundations already are required to be designed by registered design professionals who should always evaluate whether sites have erodible soils subject to scour as part of the design process.

Proposal # 4443

RB146-19

IRC®: 202 (New), R106.1.5 (New), SECTION R323, R323.1, R323.1.1 (New)

Proponent: Marc Levitan, representing the ICC 500 Storm Shelter Development Committee; Benchmark Harris representing the National Storm Shelter Association (NSSA) (bharris@huckabee-inc.com)

2018 International Residential Code

Add new definition as follows:

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

Add new text as follows:

R106.1.5 Information on storm shelters. Construction documents for storm shelters shall include the information required in ICC 500.

SECTION R323 STORM SHELTERS

Revise as follows:

R323.1 General. This section applies to storm shelters where constructed as separate detached buildings or where constructed as safe rooms within buildings for the purpose of providing refuge from storms that produce high winds, such as tornados and hurricanes. In addition to other applicable requirements in this code, storm shelters shall be constructed in accordance with ICC /NSSA-500.

Add new text as follows:

R323.1.1 Sealed documentation. The construction documents for all structural components and impactprotective 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.

Reason: This proposal is submitted by the National Storm Shelter Association (NSSA) and the ICC 500 Storm Shelter Standard Development committee.

The ICC 500 Standards Development committee is responsible for the development of the ICC/NSSA Standard for the Design and Construction of Storm Shelters. The committee is currently working on the development of the 2020 edition. In 2017 the ICC 500 committee held 7 open conference calls. In addition, there were numerous Working Group meetings and conference calls, which included members of the committee as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at: <u>https://www.iccsafe.org/codes-tech-support/codes/code-development-process/standards-development/is-stm</u>.

NSSA was responsible for the development of the original standard for storm shelters in 2001, which ICC 500 replaced through an agreement between ICC and NSSA. Representing General, User and Producer interest categories, NSSA is a technical organization that is committed to promoting consistent quality in both residential and community storm shelters.

The term "storm shelter" is used throughout ICC-500 and is defined in the IBC but is not defined in the IRC. The definition proposed in this code change matches the definition in the IBC.

This proposed modification removes the words "as safe rooms" because that language is not necessary and is not defined.

The standard is ICC-500, not ICC/NSSA-500.

Currently, IRC R323.1 requires designs of storm shelters comply with ICC/NSSA-500. However, the National Storm Shelter Association (NSSA) has received reports of failures around the country and even a death in Mayflower, Arkansas associated with residential storm shelters that are not designed in accordance with ICC/NSSA-500. Impact-protective systems of non-engineered systems that builders call residential storm shelters have failed prematurely when they did not meet the testing requirements of ICC/NSSA-500. Additionally, non-engineered systems that builders call residential storm shelters have floated above ground (**Figure 2**) when they aren't designed for the required load and resistance factors defined by ASCE 7, which is referenced by ICC/NSSA-500. It is important to note that the NSSA indicates that none of these failures have occurred in residential shelters manufactured by NSSA producer members, which have their shelters engineered before NSSA will provide them with a seal for their residential storm shelter. The provisions of ICC/NSSA-500 cannot be met by any prescriptive methods in the IRC and therefore require the expertise of a registered design professional.



Figure 1: Photograph of the residential shelter after a tornado caused a death in Mayflower, Arkansas



Figure 2: Failure of an underground residential "storm shelter" not designed per ICC/NSSA-500

As an example of where the IRC has a similar requirement that a registered design professional provide documentation indicating compliance with a standard in a similar circumstance: The current language in the IRC requires that "the construction documents shall include documentation that is prepared and sealed by a registered design professional" indicating that the design complies with certain criteria in R322.3.9 for coastal high-hazard areas.

The proposed exception allows building officials to waive the requirement for a design professional to provide documentation indicating compliance with the design requirements of ICC/NSSA-500 where an approved agency has listed a product such as an entire storm shelter (e.g. an underground shelter with stated conditions for where it can be used) or portions of a storm shelter (e.g. a prefabricated shelter that is to be bolted onto a garage floor with a foundation to be designed by a design professional).

Cost Impact: The code change proposal will not increase or decrease the cost of construction This does not change construction requirements.

Proposal # 4846

RB146-19

RB147-19

IRC®: R324.3, R324.6

Proponent: Joseph H. Cain, Solar Energy Industries Association (SEIA), representing Solar Energy Industries Association (SEIA) (JoeCainPE@gmail.com); Kevin Reinertson, Riverside County Fire Department, representing California Fire Chiefs Association (kevin.reinertson@fire.ca.gov)

2018 International Residential Code

Revise as follows:

R324.3 Photovoltaic systems. Photovoltaic systems shall be designed and installed in accordance with Sections R324.3.1 through R324.7.1 , NFPA 70 and the manufacturer's installation instructions. <u>The electrical portion of solar PV systems shall be designed and installed in accordance with NFPA 70.</u>

R324.6 Roof access and pathways. 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:

- 1. Detached, nonhabitable structures, including but not limited to detached garages, parking shade structures, carports, solar trellises and similar structures, shall not be required to provide roof access.
- 2. Roof access, pathways and setbacks need not be provided where the code official has determined that rooftop operations will not be employed.
- 3. These requirements shall not apply to roofs with slopes of two units vertical in 12 units horizontal (17-percent slope) or less.
- 4. <u>Building integrated photovoltaic (BIPV) systems listed in accordance with Section 690.12(B)</u> (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 hazards.

Reason: This proposal correlates sections of the IRC with proposals that were approved by the IFC Committee for the 2021 International Fire Code under Group A.

The change to Section R324.3 is editorial only, and correlates the reference to NFPA 70 with the language from IFC Section 1204.1.

New Exception 4 in IRC Section R324.6 is based on new Exception 3 for 2021 IFC Section 1204.2, as created under Proposal F197-18 approved uanimously by the IFC Committee in Group A.

The technology of solar roofs has been advancing with new materials and methods, particularly in the area of BIPV. Unlike conventional PV panel systems mounted above the roof surface, BIPV systems are integrated into the finished rood surface, and do not present significant trip hazards or physical obstacles to equipment such as ladders that typically exist with other systems. Portions of these systems, and soon the entire roof system, may be listed to meet the NEC safety thresholds for firefighters upon rapid shutdown activation. There are BIPV systems available today that have been shown through testing to not present electrical hazards to firefighters even when cutting into them during ventilation operations. In order to build confidence in the safety features and performance of these systems an evaluation by a NRTL should be required.

These systems eliminate the hazard to firefighters for large portions of the roof, or in some cases the entire roof where BIPV is installed, eliminating the need to provide for access and pathways.

This proposal is intended to provide recognition of those safety levels by adding exceptions to the access and pathways portion of the IFC PV requirements.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal correlates with Group A language changes and will not increase or decrease cost of construction.

Proposal # 5056

RB147-19

RB148-19

IRC®: R324.3.1

Proponent: Jonathan Roberts, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Revise as follows:

R324.3.1 Equipment listings. Photovoltaic panels and modules shall be listed and labeled in accordance with UL 1703. Inverters shall be *listed* and *labeled* in accordance with UL 1741. Systems connected to the utility grid shall use inverters *listed* for utility interaction. <u>Mounting systems *listed* and *labeled* in accordance with UL 2703 shall be installed in accordance with the manufacturer's installation instructions and their listings.</u>

Reason: This proposal provides direction on the use of mounting systems listed and labeled in accordance with UL 2703. These specially designed systems provide an alternative method for mounting.

Cost Impact: The code change proposal will not increase or decrease the cost of construction There are numerous listed mounting systems available, and provides an alternative method for mounting the PV panels.

Proposal # 4884

RB148-19

RB149-19

IRC®: R324.5, R324.5.1, R324.5.2, R324.5.3 (New)

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Revise as follows:

R324.5 Building-integrated photovoltaic systems. Building-integrated photovoltaic (BIPV) systems that serve as roof coverings shall be designed and installed in accordance with Section R905.

R324.5.1 Photovoltaic shingles. Photovoltaic shingles shall comply with Section R905.16.

R324.5.2 Fire classification. *Building-integrated photovoltaic systems* shall have a fire classification in accordance with Section R902.3.

Add new text as follows:

R324.5.3 BIPV roof panels. BIPV roof panels shall comply with Section R905.17.

Reason: Section R905.17 was added to the IRC in the last code cycle for BIPV roof panels, but a specific pointer to that section was not included in Section R324. This proposal provides that pointer and this is similar to what is being done for photovoltaic shingles in Section 324.5.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction There is no cost impact as this is only adding a specific pointer to a section within the code.

Proposal # 4268

RB149-19

RB150-19

IRC®: R324.5.3 (New)

Proponent: Joseph H. Cain, Solar Energy Industries Association (SEIA), representing Solar Energy Industries Association (SEIA) (JoeCainPE@gmail.com); Kevin Reinertson, Riverside County Fire Department, representing California Fire Chiefs Association (kevin.reinertson@fire.ca.gov)

2018 International Residential Code

Add new text as follows:

R324.5.3 Markings at BIPV roof coverings. Where Building Integrated Photovoltaic (BIPV) roof coverings are installed in a manner that creates areas with electrical hazards to be hidden from view, markings shall be provided to identify the hazardous areas to avoid. The markings shall be reflective and shall be visible from grade.

Exception: 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 hazards.

Reason: This proposal intends to correlate provisions in the IRC with the successful proposal F200-18 in the IFC.

When Building Integrated Photovoltaic (BIPV) Systems are installed as the roof covering, the areas containing electrical hazards can be hidden from view of firefighters and other responders seeking to access the roof for emergency operations With at least one manufacturer the entire roof surface has the same appearance -- photovoltaic and non-photovoltaic tiles have the same finish, preventing any awareness of where the system is located.

The purpose of this proposal is to require markings warning firefighters and others that access the roof of where theh areas are they must avoid for safety purposes. The marking must be readily visible day and night and visible from grade to avoid ground ladder placement at an area with an electrical hazard.

The exception for this requirement is consistent with the language approved by the IFC Committee in proposal F200-18.

Cost Impact: The code change proposal will increase the cost of construction The increase of cost of construction is specific to BIPV systems and only includes additional marking or labeling.

Proposal # 5091

RB150-19

RB151-19

IRC®: R324.6.2.2

Proponent: Joseph H. Cain, Solar Energy Industries Association (SEIA), representing Solar Energy Industries Association (SEIA) (JoeCainPE@gmail.com); Kevin Reinertson, Riverside County Fire Department, representing California Fire Chiefs Association (kevin.reinertson@fire.ca.gov)

2018 International Residential Code

Revise as follows:

R324.6.2.2 <u>R324.6.3</u> Emergency escape and rescue opening. openings. Panels and modules installed on dwellings shall not be placed on the portion of a roof that is below an emergency escape and rescue opening. A pathway not less than 36 inches (914 mm) wide shall be provided to the emergency escape and rescue opening.

Exception: 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 hazards.

Reason: The technology of solar roofs has been advancing with new materials and methods, particularly in the area of BIPV. Unlike conventional PV panel systems mounted above the roof surface, BIPV systems are integrated into the finished rood surface, and do not present significant trip hazards or physical obstacles to equipment such as ladders that typically exist with other systems. Portions of these systems, and soon the entire roof system, may be listed to meet the NEC safety thresholds for firefighters upon rapid shutdown activation. There are BIPV systems available today that have been shown through testing to not present electrical hazards to firefighters even when cutting into them during ventilation operations. In order to build confidence in the safety features and performance of these systems an evaluation by a NRTL should be required.

These systems eliminate the hazard to firefighters for large portions of the roof, or in some cases the entire roof where BIPV is installed, eliminating the need to provide for access and pathways.

This proposal is intended to provide recognition of those safety levels by adding exceptions to the access and pathways portion of the IFC PV requirements.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal only provides a BIPV exception to access pathways to emergency escape & rescue openings, and will not increase or decrease the cost of construction.

Proposal # 5088

RB151-19

RB152-19

IRC®: R325.6

Proponent: Jeffrey Hinderliter, New York State Department of State, representing New York State Department of State (Jeffrey.Hinderliter@dos.ny.gov); Gerard Hathaway, New York State Department of State, representing New York State Department of State (gerard.hathaway@dos.ny.gov)

2018 International Residential Code

Revise as follows:

R325.6 Habitable attic. A habitable attic shall not be considered <u>to be a story above grade plane</u>. a story where complying with all of the following requirements:

- 1. The occupiable floor area is not less than 70 square feet (17 m²), in accordance with Section R304.
- 2. The occupiable floor area has a ceiling height in accordance with Section R305.
- 3. The occupiable space is enclosed by the roof assembly above, knee walls (if applicable) on the sides and the floor-ceiling assembly below.
- 4. The floor of the occupiable space shall not extend beyond the exterior walls of the floor below.

Reason: The topic of habitable attics in the International Residential Code was discussed at length in previous hearings. During our code development process in New York State (which is based on the I-Codes), we have realized that allowing a habitable level above the third story above grade plane that is not considered a "story", creates both an inconsistency between the IRC and the IBC and a potential threat to the life and safety of occupants living in dwellings regulated under this code. This same change has been proposed to the New York State Uniform Building Code Council for consideration.

1. The current allowance for a "habitable attic" in the IRC creates an inconsistency within the I-Codes.

In its introduction, the IRC states the IRC is "fully compatible with all the International Codes® (I-Codes®) published by the International Code Council® (ICC)®, including the International Building Code®." The IRC also states in the section entitled "Effective Use of the International Residential Code" the following:

"All buildings within the scope of the IRC are limited to three stories above grade plane. For example, a fourstory single-family house would fall within the scope of the International Building Code® (IBC®), not the IRC."

Traditionally, the scope of the Residential Code has been limited to three-stories. The IRC currently allows additional habitable spaces within one- and two-family dwellings and townhouses that enlarge the size of a dwelling while still considering it a "three-story": a habitable attic and story below grade plane (a basement). With a habitable attic not considered a story, a dwelling can now have 5 habitable levels, which we believe conflicts with the scope and intent of the Residential Code. It should be noted that there is no limit to the area of a habitable attic. The occupiable floor area and ceiling height requirements in Items 1 and 2 of Section R325.6 are just minimums required for habitable space. For example, a modest footprint three story dwelling with a cape cod style roof, could easily accommodate two bedrooms and a bathroom on the fourth habitable level above grade plane. A larger estate size dwelling could have as much space on that fourth habitable attic level as a small ranch style house.

As justification for this position, consider that the 2015 International Building Code® Illustrated Handbooks contains the following definition of an attic:

ATTIC. Several provisions apply to the attic area of a building, such as those relating to ventilation of the attic space. In order to fully clarify that portion of a building defined as an attic, Chapter 2 identifies an attic as that space between the ceiling beams at the top story and the roof rafters. An attic designation is appropriate only if

the area is not considered occupiable. Where this area has a floor, it would be defined as a story. A common misuse of IBC terminology is the designation of a space as a habitable or occupiable attic. Such a designation is inappropriate insofar as once such a space is utilized for some degree of occupancy; it is no longer deemed an attic.

(Source: "2015 International Building Code® Illustrated Handbook" by The International Code Council® (ICC®), Douglas W. Thornburg, AIA, C.B.O., John R. Henry, P.E. Published by McGraw-Hill Education. Accessed through Access Engineering, a service of McGraw-Hill Education)

While this handbook is not enforceable, it acts as a commentary on the IBC and provides guidance as to how the IBC views individual provisions and definitions. As stated above, the IBC considers a space an attic when it "is not considered occupiable". When a space becomes "habitable or occupiable" it is considered a story in the IBC. Hence, a three story one-family dwelling with a habitable attic would be considered a four-story building in the IBC.

There appears to be a conflict between how the IBC and the IRC views the same space. This conflict is allowing the creation of a space under the IRC which would require additional safety measures if built under the IBC. The IBC currently does not have a definition for a "habitable attic" nor any provisions that would allow this space to not be considered a story. Historically, the I-Codes have treated an attic that is habitable as a story.

2. Allowing the creation of a habitable attic, but not considering it an additional story, is allowing a structure that potentially creates unmitigated life-safety hazards.

The IRC currently restricts one- and two-family dwellings and townhouses to be three-stories above grade plane with an unlimited area. For comparison purposes, this is consistent with the R-3 occupancy classification of the IBC. The Tables 504.3 and 504.4 of the 2018 IBC limit the building heights on R-3 occupancies to 40 feet or three stories for buildings equipped with a NFPA 13D automatic sprinkler system and 60 feet or four-stories for buildings equipped with a NFPA 13D automatic sprinkler system. It is noted that these tables were updated in the 2018 version of the IBC by a Code Action Committee of the ICC to address the consistency of the IBC (Refer to Code Change Proposal G133-15).

For a three-story, one-family dwelling with habitable space in the attic, the maximum story height is limited to 11'-7" in both the IRC and the IBC. Using both a typical story height (8'-0" ceiling height with a 1'-0" structural space) and the maximum story height, the following figures illustrate some possible building heights that can be achieved. Along with this comparison, Table 1 highlights some life-safety features that would result when these structures are constructed under either the IRC or the IBC. It should also be noted that the code currently does not bring into consideration habitable attics that include dormers or various roof styles (such as a mansard roof) that could easily blur the lines of the current definitions and create spaces that appear to miss the intentions of the original code change proposal.



Figure 1



Figure 2

<u>Table 1</u>

Comparison of IRC Requirements to IBC Requirements for Figure 1 and Figure 2

IRC Requirements	IBC Requirements
One-Family Dwelling	Occupancy Group R-3
 2018 IRC considers this a 3-Story Dwelling with a Habitable Attic 2018 IRC Section R313.2 requires a Section P2904 or NFPA 13D sprinkler system, which results in a 10-minute sprinkler duration (P2904.5.2) 	 4-story Dwelling IBC Table 504.4 would require a NFPA 13R sprinkler system, with a minimum 30-minute sprinkler duration for 4-stories (NFPA 13R Section 9.2)
• EERO required in the Habitable Attic (R310.1)	o Alternative: Type IV or higher rated construction with
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 35' ladder reaches 3rd story EERO, but may fail to reach the Habitable Attic (4th Level) EERO in Fig. 1, and fails to reach the Habitable Attic (4th Level) EERO in Fig. 2 	 an NFPA 13D system EERO not required above the 3rd story due to their ineffectiveness at that height (IBC Section 1030.1) 35' ladder reaches 3rd story EERO, but may fail to reach the Habitable Attic (4th Level) EERO in Fig. 1, and fails to reach the Habitable Attic (4th Level) EERO in Fig. 2
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As is shown in Table 1, the result of applying either the IRC or the IBC would result in different safety levels for the same structure.



Figure 3: Walkout basement (not considered a stroy above grade plane) with typical story height, floor-to-floor, of 9'-0"



Figure 4: Walkout basement (not considered a stroy above grade plane) with maximum prescriptive story height, floor-to-floor, of 11'-7"

To correct this inconsistency, we recommend altering the IRC to consider a habitable attic a story above grade plane, as has been the historical interpretation of the IRC, and is the current practice of the IBC. The change would require new dwellings that exceed the three-story limit permitted under the IRC to be constructed to meet the structural and life-safety standards of the IBC. This will increase the safety of these tall dwellings and bring greater consistency across the I-Codes. We also recommend deleting the qualifying Items 1 through 4 because, once the habitable attic level is considered a story above grade plane, the qualifiers are not necessary.

We recommend the definition of, "Attic, Habitable" should remain unchanged because it differentiates that area of a building which contains "habitable space" from a typical "attic" as defined. The definition stating that a habitable attic can be finished or unfinished takes away the arguments made by those who would seek to disqualify the area in question because it is unfinished in some way. If the area is being used as habitable

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space, all other requirements necessary for a space to be considered habitable must be provided.

On the other hand, if the area is being used for non-habitable space such as for equipment or storage, then the owner should not be required to provide EEROs, egress stairs and other items required for habitable space, just because it has the minimum area and ceiling height requirements of a habitable space. Code enforcement officers could condition the Certificate of Occupancy for such a dwelling as a three-story structure with attic storage not approved for use as habitable space.

Bibliography: "2018 International Residential Code for one- and two-family dwellings" by The International Code Council® (ICC®). (2017). Country Club Hills, IL: International Code Council. "2015 International Building Code® Illustrated Handbook" by The International Code Council® (ICC®), Douglas W. Thornburg, AIA, C.B.O., John R. Henry, P.E. Published by McGraw-Hill Education. Accessed through Access Engineering, a service of McGraw-Hill Education

Cost Impact: The code change proposal will increase the cost of construction

This code change, by returning to the historical interpretation and application of the IRC, would increase the cost of construction only when a habitable attic is above a third story, creating a fourth-story above grade plane. This change would potentially force some dwellings to be constructed under the IBC rather than the IRC, which would trigger height limitations and the need for higher types of construction and additional life-safety measures, including the potential to install a NFPA 13R system rather than a NFPA 13D system. This cost increase reflects the need to offset the increased risk of these structures.

Proposal # 5299

RB152-19

RB153-19

IRC®: SECTION R202, [RB] 202, 202 (New), SECTION R327, R327.1, R327.2, R327.3, R327.4, R327.5, R327.6 (New), R327.6.1 (New), R327.6

Proponent: Robert Davidson, Davidson Code Concepts, LLC, representing Tesla, USA (rjd@davidsoncodeconcepts.com); Kevin Reinertson, representing Riverside County Fire Department (kevin.reinertson@fire.ca.gov); Jack Applegate, Northwest Code Professionals, representing City of Clatskanie, Oregon (jacka@nwcodepros.com)

2018 International Residential Code

SECTION R202 DEFINITIONS

Delete without substitution:

[RB] BATTERY SYSTEM, STATIONARY STORAGE. A rechargeable energy storage system consisting of electrochemical storage batteries, battery chargers, controls and associated electrical *equipment* designed to provide electrical power to a building. The system is typically used to provide standby or emergency power, an uninterruptable power supply, load shedding, load sharing or similar capabilities.

Add new definition as follows:

[RB] Energy Storage Systems (ESS). One or more devices, assembled together, capable of storing energy in order to supply electrical energy at a future time.

Revise as follows:

SECTION R327 STATIONARY ENERGY STORAGE BATTERY SYSTEMS

R327.1 General. Stationary storage battery system ESS shall comply with the provisions of this section.

R327.2 Equipment listings. *Stationary storage battery systems <u>ESS</u> shall be listed and labeled for residential use in accordance with UL 9540.*

Exceptions:

- 1. Where *approved*, repurposed unlisted battery systems from electric vehicles are allowed to be installed outdoors or in detached sheds located not less than 5 feet (1524 mm) from exterior walls, property lines and public ways.
- 2. *Battery systems* that are an integral part of an electric vehicle are allowed provided that the installation complies with Section 625.48 of NFPA 70.
- 3. Battery systems less than 1 kWh (3.6 megajoules).

R327.3 Installation. *Stationary storage battery systems <u>ESS</u> shall be installed in accordance with the manufacturer's instructions and their <i>listing*, if applicable, and shall not be installed within the habitable space of a dwelling unit.

R327.4 Electrical installation. Stationary storage battery systems ESS shall be installed in accordance with

NFPA 70. Inverters shall be *listed* and *labeled* in accordance with UL 1741 or provided as part of the UL 9540 listing. Systems connected to the utility grid shall use inverters listed for utility interaction.

R327.5 Ventilation. Indoor installations of *stationary storage battery systems <u>ESS</u>* that include batteries that produce hydrogen or other flammable gases during charging shall be provided with ventilation in accordance with Section M1307.4.

Add new text as follows:

R327.6 Commissioning. ESS shall be commissioned as follows:

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

R327.6.1 Installation prior to closing. Where the system is installed in a one- or two-family dwelling or townhouse that is owned by the builder and has yet to be sold, commissioning shall be conducted as outlined in Section R327.6, and the builder shall then transfer the required information in Section R327.6 to the home owner when the property is transfered to the owner at the closing.

Revise as follows:

R327.6 R327.7 Protection from impact. *Stationary storage battery systems* <u>ESS</u> installed in a location subject to vehicle damage shall be protected by approved barriers.

Reason: The purpose of this proposal is two fold. First it replaces the term Stationary Battery Storage System with Energy Storage Systems (ESS) throughout the document. The existing term is from older editions of the IFC and legacy codes and based on older concepts. The new term suggested is the industry recognized term and is what both the IFC and NFPA 855 Energy Storage Systems use to identify these systems. The second item is the addition of R327.6 for commissioning requirements as part of the installation of ESS. These systems are new technology and intricate. Commissioning is necessary to ensure a proper installation and proper operation of the systems once installed. This requirement is consistent with requirements added to the IFC for R-3 and R-4 Group occupancies and NFPA 855 requirements for one- and two-family homes and townhouses.

Usually these systems are added to an existing dwelling by the current owner. In the rare case a system is installed as part of construction of a custom home, new Section R327.6.1 provides for the nadoff of the commissioning paperwork to the new owner after closing. This is consistent with what is done for the manufacturer's paperwork for other applicances and for fire alarms systems.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposed change does not impact the cost of construction of one- or two-family dwellings and townhouses. ESS are

specialty systems typically installed in an existing dwelling by the current owner. In the rare case that a new custom

home owner desires installation of ESS as part of the construction of the custom home, these requirements impact the

cost of the ESS portion of the installation not the home iteself. These requirments will increase the cost of installation of ESS.

RB153-19

RB154-19

IRC®: SECTION R202, [RB] 202, 202 (New), SECTION R327, R327.1, R327.2, R327.3, R327.3.1 (New), 327.3.2 (New), R327.3.3 (New), R327.4, R327.5, R327.6, R327.3.7 (New), Table R327.3.7 (New), R327.3.7.1 (New), R327.3.7.2 (New), R327.3.8 (New), R327.4 (New), R327.5 (New), R327.5.1 (New)

Proponent: Robert Davidson, Davidson Code Concepts, LLC, representing Tesla, USA (rjd@davidsoncodeconcepts.com); Kevin Reinertson, representing Riverside County Fire Department (kevin.reinertson@fire.ca.gov); Jack Applegate, representing City of Clatskanie, Oregon (jacka@nwcodepros.com)

2018 International Residential Code

SECTION R202 DEFINITIONS

Delete without substitution:

[RB] BATTERY SYSTEM, STATIONARY STORAGE. A rechargeable energy storage system consisting of electrochemical storage batteries, battery chargers, controls and associated electrical *equipment* designed to provide electrical power to a building. The system is typically used to provide standby or emergency power, an uninterruptable power supply, load shedding, load sharing or similar capabilities.

Add new definition as follows:

[RB] ENERGY STORAGE SYSTEM (ESS). One or more devices, assembled together, capable of storing energy in order to supply electrical energy at a future time.

Revise as follows:

SECTION R327 STATIONARY ENERGY STORAGE BATTERY SYSTEMS

R327.1 General. *Stationary storage battery system* shall comply with the provisions of this section. *ESS* shall be installed and maintained in accordance with Sections R327.2 through R327.4. The temporary use of an owner or occupant's electric powered vehicle as an ESS shall be in accordance with Section R327.5.

R327.2 Equipment listings. *Stationary storage battery systems* <u>ESS 1 kWh or greater in maximum stored</u> <u>energy</u> shall be *listed* and *labeled* for residential use in accordance with UL 9540.

Exceptions:

- 1. Where *approved*, repurposed unlisted battery systems from electric vehicles are allowed to be installed outdoors or in detached sheds located not less than 5 feet (1524 mm) from exterior walls, property lines and public ways.
- 2. Battery systems that are an integral part of an electric vehicle are allowed provided that the installation complies with Section 625.48 of NFPA 70. ESS listed and labeled in accordance with UL 9540 solely for utility or commercial use installed in accordance with Section 1206 of the International Fire Code.
- 3. Battery systems less than 1 kWh (3.6 megajoules).

R327.3 Installation. Stationary storage battery systems ESS shall be installed in accordance with the

manufacturer's instructions and their *listing*, if applicable, and shall not be installed within the <u>living space or</u> habitable space of a dwelling unit.

Add new text as follows:

R327.3.1 Spacing. Individual units shall be separated from each other by at least three feet of spacing unless smaller separation distances are documented to be adequate as approved by the code official based on large scale fire testing complying with Section 1206.1.5 of the International Fire Code.

327.3.2 Location. ESS shall only be installed in the locations listed in items 1 through 4.

- 1. Detached garages and detached accessory structures.
- 2. <u>Attached garages separated from the dwelling unit living space and sleeping units in accordance with</u> <u>Section R302.6.</u>
- 3. Outdoors on exterior walls or on the ground located a minimum 3 ft. from doors and windows.
- 4. Enclosed utility closets or spaces, or enclosed storage closets within dwelling units.

R327.3.3 Energy ratings. Individual *ESS* units shall have a maximum stored energy of 20 kWh. The aggregate rating within or outside the structure shall not exceed:

- 1. <u>40 kWh within utility closets and storage or utility spaces.</u>
- 2. <u>80 kWh in attached or detached garages and detached accessory structures.</u>
- 3. 80 kWh on exterior walls.
- 4. 80 kWh outdoors on the ground.

ESS installations exceeding the permitted individual or aggregate ratings shall be installed in accordance with Section 1206 of the International Fire Code

Revise as follows:

R327.4 <u>R327.3.4</u> <u>Electrical installation</u>. <u>Stationary storage battery systems ESS</u> shall be installed in accordance with NFPA 70. Inverters shall be *listed* and *labeled* in accordance with UL 1741 or provided as part of the UL 9540 listing. Systems connected to the utility grid shall use inverters listed for utility interaction.

R327.5 R327.3.5 Ventilation. Indoor installations of *stationary storage battery systems* <u>ESS</u> that include batteries that produce hydrogen or other flammable gases during <u>charging normal operation</u> shall be provided with ventilation in accordance with Section <u>M1307.4. M1307.4.2</u>.

R327.6 R327.3.6 Protection from impact. *Stationary storage battery systems <u>ESS</u>* installed in a location subject to vehicle damage shall be protected by approved barriers.

Add new text as follows:

R327.3.7 Fire separation When located within a garage, utility closet or space, or storage closet, the garage, room or space shall be separated as required by Table R327.3.7. Attachment of gypsum board shall comply with Table R702.3.5. The wall separation provisions of Table R327.3.7 shall not apply to garage walls that are perpendicular to the adjacent dwelling unit wall.

SEPARATION	MATERIAL
From the residence and attics	Not less than 1/2-inch gypsum board or equivalent applied to the garage, room or space side

Table R327.3.7 ESS Fire Separation

From habitable rooms above the garage, room or space	Not less than 5/8-inch Type X gypsum board or equivalent
Structure(s) supporting floor/ceiling assemblies used for separation required by this section	Not less than 1/2-inch gypsum board or equivalent
Garages located less than 3 feet from a dwelling unit on the same lot	Not less than 1/2-inch gypsum board or equivalent applied to the interior side of exterior walls that are within this area

R327.3.7.1 Openings. Openings from a garage, room or space directly into a room used for sleeping purposes shall be prohobited.

R327.3.7.2 Penetrations. Penetration protection shall be provided at openings in walls, ceilings and floors around vents, pipes, ducts, cables and wires, with an approved material to resist the free passage of flame and products of combustion. The material filling this annular space shall not be required to meet the ASTM E136 requirements.

R327.3.8 Fire detection. Interconnected smoke alarms shall be installed throughout the dwelling in accordance with Section R314, including in the room or area within the dwelling or attached garage in which the *ESS* are installed. A heat detector listed and interconnected to the smoke alarms shall be installed in the room or area within the dwelling or attached garage in which the *ESS* is installed where smoke alarms cannot be installed based on their listing.

R327.4 Toxic and highly toxic gas. *ESS* that have the potential to release toxic or highly toxic gas during charging, discharging and normal use conditions shall be installed outdoors.

R327.5 Electric vehicle use. The temporary use of an owner or occupant's electric powered vehicle to power a dwelling unit while parked in an attached or detached garage or outside shall comply with the vehicle manufacturer's instructions and NFPA 70. The batteries on electric vehicles shall not contribute to the aggregate energy limitations in Section R327.4.3.

R327.5.1 Temporary. The temporary use of the dwelling unit owner's or occupant's electric-powered vehicle to power the dwelling while parked in an attached or detached garage or outside shall not exceed 30 days.

Reason: Last cycle the portion of the International Fire Code dealing with Stationary Battery Storage Systems was heavily rewritten by the Energy Storage Work Group of the ICC Fire Code Action Committee to address changes in technology and application of battery storage systems. When that work was accepted by the IFC Committee and the voting membership, new Section R327 was added to the International Residential Code to provide for some core requirements when the systems are installed in one- and two-family dwellings and townhouses.

Simultaneous to that work, NFPA created a new NFPA 855 Energy Storage Systems Standard for a comprehensive document addressing the hazards of energy storage systems. The ICC FCAC Energy Storage Work Group continued to work on the topic in coordination with the work being done by the NFPA 855 committee to keep the technical details of the documents as coordinated as possible. As a result, the new requirements in the 2018 edition of the IFC have been heavily updated as to structure and the topics covered.

This proposal is an outgrowth of work done by the NFPA 855 Committee specific to one- and two-family dwellings and townhouses as well as new language added to the IFC for the 2021 edition addressing R-3 and R-4 Group Occupancies.

The concerns identified for one and two-family dwellings and townhouses dealt with:

• Where the ESS units could be located.

- Energy rating maximum of individual units.
- Aggregate energy ratings when more than one unit is installed.
- Linkage to the fire code when energy limitations are exceeded.
- Fire separation.
- Fire detection.
- ESS that may produce toxic or highly toxic gases during operation.
- Temporary use of electric vehicle as ESS for the dwelling.

The breakdown of the suggested changes are as follows:

New definition: The definition for Energy Storage Systems (ESS) from the IFC has been brought over to the IRC for consistency of terminology between the IFC and NFPA 855.

R327 generally: The term Energy Storage Systems has replaced the term Stationary Storage Battery Systems.

R327.1: Has been modified to identify the sections ESS shall comply with and to add a separate pointer for the section applicable to the temporary use of an electric vehicle as an ESS.

R327.2: Has been modified to pull the exception for the systems with less than 1 kWh and provide it as the energy rating level trigger for cleaner application of the requirements. Exception 2 has been deleted since the use of electric vehicles is covered by the new section R327.5. In its place language has been added providing for the installation of utility or commercial listed systems (not listed for residential use) to be outside the dwelling and to be in accordance with the IFC. Exception 3 is deleted since that topic is now covered by the initial language at the start of R327.2.

R327.3: Has been modified to replace the current terminology with ESS, and a restriction against installation in "living space" has been added to address concerns that there are other locations such as hallways that are not covered by the existing restriction for habitable spaces. That addition provides consistency with language added o NFPA 855.

New R327.3.1: Adds a separation requirement of 3 feet between ESS units unless large scale testing has documented that an event in one unit will not propagate to the next unit.

New R327.3.2: Adds a listing of specific installation locations consistent with the IFC R-3 and R-4 locations and NFPA 855.

New R327.3.3: Provides a limitation on the maximum energy rating of an individual unit as well as an aggregate energy rating for specific installation locations. The size of an event is directly correlated to the amount of energy stored. It then provides that if increased energy above these limits is desired the installation shall be done in accordance with the IFC.

R327.3.4 (Prior R327.4): Has been modified to replace the current terminology with ESS.

R327.3.5 (Prior R327.5): Has been modified to replace the current terminology with ESS. The term "charging" has been replaced with the phrase "normal operation". It doesn't matter at what point the gases are produced, they need to be exhausted. Section M1307.4 was changed to Section 1307.4.2 to clarify this is a mechanical exhaust system that is required.

R327.3.6 (Prior R327.6): Has been modified to replace the current terminology with ESS.

New R327.3.7: This section has been added to address the need for fire separation. When an event occurs, it cannot always be extinguished with water. Exposures would be wetted while the unit burns itself out. For that reason, separation is needed to assist in preventing fire spread. The language from existing Section 302.6 was taken for consistency and editorially modified slightly to fit this area of the code.

New R327.3.7.1: Adds the first sentence of existing Section R302.5.1 to keep rooms or spaces with ESS from opening into areas for sleeping purposes. (The remainder of R302.5.1 concerning doors and closures is part of a separate proposal).

New R327.3.7.2: Adds language from existing Section R302.11, Item 4, (as referenced by existing R302.5.3), with editorial changes to fit this application.

New R327.3.8: Adds a requirement that when ESS is installed the dwelling must have an interconnected smoke alarm system with a smoke alarm installed in the room or space the ESS is located for early warning of an event. If the space is not conducive to the installation of a smoke alarm a listed heat alarm can be installed and interconnected to the smoke alarm system.

New R327.4: Provides that an ESS that has the potential to release toxic or highly toxic gases during normal use shall be installed outdoors.

New R327.5: Provides for the temporary use of an electric vehicle as an ESS to power the dwelling provide it is done in compliance with the NEC and the manufacturer's instructions. The requirement for the manufacturer's instruction compliance ensures that only electric vehicles designed and manufactured for use as an ESS are utilized as compared to someone adding non-approved electrical connections to an existing electric vehicle not designed for this purpose. Temporary is further defined as 30 days with new Section R327.5.1.

These changes will provide for correlation with the new langauage added to the IFC as well as enhancements made when the language was added to NFPA 855. This correlation provides for consistency or requirments across codes and standards.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposed change does not impact the cost of construction of one- or two-family dwellings and townhouses. ESS are specialty systems typically installed in an existing dwelling by the current owner. In the rare case that a new custom home owner desires installation of ESS as part of the construction of the custom home, these requirements impact the cost of the ESS portion of the installation not the home iteself. The separation requirements were intentionaly matched to the existing private garage separaton requirements for correlation with construction of he home. These requirments will increase the cost of installation of ESS.

Proposal # 4820

RB154-19
RB155-19

IRC®: SECTION R202, 202 (New), SECTION R327, R327.1, R327.2, R327.3, R327.3.1 (New), R327.4, R327.5, R327.6

Proponent: Sharon Bonesteel, representing Salt River Project (sharon.bonesteel@srpnet.com); Matt Paiss, Energy Response Solutions, Inc., representing International Association of Fire Fighters (mpaiss@gmail.com)

2018 International Residential Code

SECTION R202 DEFINITIONS

Add new definition as follows:

ENERGY STORAGE SYSTEM (ESS). One or more devices that are assembled together and capable of storing electric energy for future use.

Revise as follows:

SECTION R327 STATIONARY ENERGY STORAGE BATTERY SYSTEMS

R327.1 General. Stationary <u>Energy</u> storage battery system <u>systems</u> shall comply with the provisions of this section.

R327.2 Equipment listings. Stationary <u>Energy</u> storage battery systems shall be listed and labeled for residential use in accordance with UL 9540.

Exceptions:

- 1. Where *approved*, repurposed unlisted battery systems from electric vehicles are allowed to be installed outdoors or in detached sheds located not less than 5 feet (1524 mm) from exterior walls, property lines and public ways.
- 2. *Battery systems* that are an integral part of an electric vehicle are allowed provided that the installation complies with Section 625.48 of NFPA 70.
- 3. Battery systems less than 1 kWh (3.6 megajoules).

R327.3 Installation. Stationary <u>Energy</u> storage battery systems shall be installed in accordance with the manufacturer's instructions and their *listing*, if applicable, and shall not be installed within the habitable space of a dwelling unit.

Add new text as follows:

R327.3.1 Opening protection. Openings from a garage or energy storage system room or space directly into a room used for sleeping purposes shall not be permitted. Other openings between the garage, or between a room or space containing an energy storage system and the living space or habitable space of a dwelling unit shall be equipped with solid wood doors not less than 1 3/8 inches (35 mm) in thickness, solid or honeycombcore steel doors not less than 1 3/8 inches (35 mm) thick, or 20-minute fire-rated doors. Such doors shall be equipped with a self-closing or automatic-closing device.

Revise as follows:

R327.4 R327.3.2 Electrical installation. Stationary <u>Energy</u> storage battery systems shall be installed in accordance with NFPA 70. Chapters 34 through 43. Inverters shall be *listed* and *labeled* in accordance with UL 1741 or provided as part of the UL 9540 listing. Systems connected to the utility grid shall use inverters listed for utility interaction.

R327.5 <u>R327.3.3</u> Ventilation. Indoor installations of stationary <u>energy</u> storage battery systems that include batteries that produce hydrogen or other flammable gases during charging shall be provided with ventilation in accordance with Section <u>M1307.4. M1307.4.2</u>.

R327.6 R327.3.4 Protection from impact. Stationary <u>Energy</u> storage battery systems installed in a location subject to vehicle damage shall be protected by approved barriers.

R327.3 Installation. *Stationary storage battery systems* shall be installed in accordance with the manufacturer's instructions and their *listing*, if applicable, and shall not be installed within the habitable space of a dwelling unit.

Reason: This proposal addresses three items.

1 - The proposal brings over the definition of Energy Storage Systems from the International Fire Code and the term Stationary Battery Storage Systems has been modified to instead use the Energy Storage Systems term. This will provide consistency with the fire code and the current industry terminology for such systems.

2 - A new section R327.3.1 on openings is added. The proposed language restricts openings from spaces where ESS are installed to protect the dwelling and occupants if a thermal runaway event occurs and applies the same requirements for door type and closure that is utilized for attached private garages. The language was obtained from existing section R302.5.1 with minor editorial modification to fit this new location.

R302.5.1 Opening protection.

Openings from a private garage directly into a room used for sleeping purposes shall not be permitted. Other openings between the garage and residence shall be equipped with solid wood doors not less than 13/8 inches (35 mm) in thickness, solid or honeycombcore steel doors not less than 13/8 inches (35 mm) thick, or 20-minute fire-rated doors, equipped with a self-closing or automatic-closing device.

3 - The section numberings have been modified clarifying that existing Sections R327.4 thru R327.6 are installation requirement subsections.

Cost Impact: The code change proposal will increase the cost of construction The additional requirement of a door or closure will minimally increase the overall cost of ESS installations.

Proposal # 4828

RB155-19

RB156-19

IRC®: R327.3

Proponent: Marcelo Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Revise as follows:

R327.3 Installation. *Stationary storage battery systems* shall be <u>listed and installed in accordance with the</u> manufacturer's instructions and their *listing*, if applicable, and shall not be installed within the habitable space <u>only in the following locations</u> of a dwelling unit.

- 1. In attached garages separated from the dwelling unit living and sleeping spaces in accordance with <u>Section R302.6.</u>
- 2. In detached garages.
- 3. In detached accessory structures.
- 4. Outdoors on exterior walls and located at a distance of not less than 3 ft. from doors and windows.

Reason: This revision corrects a problem with the existing code that allows the installation of ESS units in closets and other storage spaces without any special precautions, which is unsafe. The definition of habitable space in the IRC (A space in a building for living, sleeping, eating or cooking. Bathrooms, toilet rooms, closets, halls, storage or utility spaces and similar areas are not considered habitable spaces.) specifically points out that closets and storage spaces are not habitable spaces. This revision also requires ESS units to be listed.

Cost Impact: The code change proposal will increase the cost of construction This proposal may require special provisions for installation of ESS units.

Proposal # 5157

RB156-19

RB157-19

IRC®: R327.3, R327.3.1 (New)

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Revise as follows:

R327.3 Installation. *Stationary storage battery systems* shall be installed in accordance with the manufacturer's instructions and their *listing,* if applicable, and shall not be installed within the habitable space of a dwelling unit.

Add new text as follows:

R327.3.1 Locations. Stationary storage battery systems installed in a dwelling unit shall be *listed* and marked "For use in residential dwelling units".

Exceptions:

- 1. <u>Stationary storage battery systems installed in an attached garage, that is separated from the dwelling unit in accordance with Section R302.6.</u>
- 2. <u>Stationary storage battery systems installed in a detached garage or detached accessory structure.</u>
- 3. <u>Stationary storage battery systems installed in an enclosed utility room.</u>

Reason: R327.2 already requires stationary battery storage systems covered by this code to be listed for residential use in accordance with UL 9540. This proposal clarifies that stationary battery storage systems installed within the dwelling unit itself shall comply with new UL 9540 listing requirements being developed and clarifies locations where the additional listing requirements do not apply.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This does not increase the cost of construction. It merely provides closer correlation with listing requirements.

Proposal # 4829

RB157-19

RB158-19

IRC®: 202 (New), [RB] 202, SECTION R327, R327.1, R327.2, R327.3, R327.4, R327.5, R327.6

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Add new definition as follows:

[RB] ENERGY STORAGE SYSTEM (ESS). One or more devices, assembled together, that are capable of storing energy for supplying electrical energy at a future time.

Delete without substitution:

[RB] BATTERY SYSTEM, STATIONARY STORAGE. A rechargeable energy storage system consisting of electrochemical storage batteries, battery chargers, controls and associated electrical *equipment* designed to provide electrical power to a building. The system is typically used to provide standby or emergency power, an uninterruptable power supply, load shedding, load sharing or similar capabilities.

Revise as follows:

SECTION R327 STATIONARY ENERGY STORAGE BATTERY SYSTEMS (ESS)

R327.1 General. *Stationary storage battery system <u>Energy Storage Systems (ESS)</u> shall comply with the provisions of this section.*

R327.2 Equipment listings. *Stationary storage battery systems ESS* shall be *listed* and *labeled* for residential use in accordance with UL 9540.

Exceptions:

- 1. Where *approved*, repurposed unlisted battery systems from electric vehicles are allowed to be installed outdoors or in detached sheds located not less than 5 feet (1524 mm) from exterior walls, property lines and public ways.
- 2. *Battery systems* that are an integral part of an electric vehicle are allowed provided that the installation complies with Section 625.48 of NFPA 70.
- 3. Battery systems less than 1 kWh (3.6 megajoules).

R327.3 Installation. *Stationary storage battery systems ESS* shall be installed in accordance with the manufacturer's instructions and their *listing*, if applicable, and shall not be installed within the habitable space of a dwelling unit.

R327.4 Electrical installation. *Stationary storage battery systems ESS* shall be installed in accordance with NFPA 70. Inverters shall be *listed* and *labeled* in accordance with UL 1741 or provided as part of the UL 9540 listing. Systems connected to the utility grid shall use inverters listed for utility interaction.

R327.5 Ventilation. Indoor installations of *stationary storage battery systems* that include batteries *ESS* that produce hydrogen or other flammable gases during charging shall be provided with ventilation in accordance with Section M1307.4.

R327.6 Protection from impact. Stationary storage battery systems ESS installed in a location subject to

vehicle damage shall be protected by approved barriers.

Reason: This proposal is strictly editorial and only changes the term "stationary storage battery systems" to "energy storage systems". It also replaces the current definition of Stationary Storage Battery System with an Energy Storage System (ESS) definition approved for the 2021 IFC. Energy storage system is the common industry term and is used in the IFC and the IBC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This is an editorial change only.

Proposal # 4833

RB159-19

IRC®: SECTION R328 (New), R328.1 (New), R328.2 (New)

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Add new text as follows:

SECTION R328 STATIONARY ENGINE GENERATORS

R328.1 General. Stationary engine generators shall be *listed* and labeled in accordance with UL 2200 and shall comply with this section. The connection of stationary engine generators to the premise wiring system shall be by means of a *listed* transfer switch.

R328.2 Installation. The installation of stationary engine generators shall be in an *approved* location and in accordance with the *listing*, the manufacturer's installation instructions, and Chapters 34 through 43...

Reason: Stationary generators are becoming a more common standby source of electrical power for one and two family dwellings. This proposal provides basic safety requirements for these installations, and the requirements are consistent with those included in Section 915 of the 2018 IMC and Section 616 of the 2018 IFGC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction There are numerous stationary engine generators on the market that are listed to UL 2200, and they are typically installed in accordance with NFPA 70 and the manufacturer's instructions.

Proposal # 4261

RB159-19

RB160-19

IRC®: SECTION R202, 202 (New), SECTION R328 (New), R328.1 (New), R328.2 (New), R328.3 (New), R328.3.1 (New)

Proponent: Robert Davidson, Davidson Code Concepts, LLC, representing Toyota, USA (rjd@davidsoncodeconcepts.com)

2018 International Residential Code

SECTION R202 DEFINITIONS

Add new definition as follows:

[RB] FUEL CELL POWER SYSTEM, STATIONARY. A stationary energy generation system that converts the chemical energy of a fuel and oxidant to electric energy (DC or AC electricity) by an electrochemical process.

Field-fabricated fuel cell power system. A stationary fuel cell power system that is assembled at the job site and is not a preengineered or prepackaged factory-assembled fuel cell power system.

Preengineered fuel cell power system. A stationary fuel cell power system consisting of components and modules that are produced in a factory, and shipped to the job site for assembly.

Prepackaged fuel cell power system. A stationary fuel cell power system that is factory assembled as a single, complete unit and shipped as a complete unit for installation at the job site.

Add new text as follows:

SECTION R328 STATIONARY FUEL CELL POWER SYSTEMS

R328.1 General. *Stationary fuel cell power systems* in new and existing buildings and structures shall comply with this section and Section 1205.1 of the *International Fire Code*.

Exception: The temporary use of a fuel cell powered electric vehicle to power a dwelling unit while parked shall comply with Section R328.3.

R328.2 Residential Listing. *Stationary fuel cell power systems* shall not be installed in dwelling units unless they are specifically listed for residential use.

R328.3 Fuel Cell Vehicle ESS Use. The temporary use of the dwelling unit owner's or occupant's fuel cell powered electric vehicle to power a dwelling while parked in an attached or detached garage or outdoors shall comply with the vehicle manufacturer's instructions and NFPA 70.

R328.3.1 Temporary. The temporary use of the dwelling unit owner's or occupant's fuel cell powered electric vehicle to power the dwelling while parked in an attached or detached garage or outdoors shall not exceed 30 days.

Reason: This proposal builds on work done during last cycle with both the International Fire Code and this code relative to Energy Storage Systems (ESS) and work in the current cycle to update the IFC and this code. Last cycle the International Fire Code was updated with new requirments for ESS and a basic set of requirements

were added to this code last cycle as well. This cycle the IFC requirements for ESS were updated and there is a companion proposal submitted to this code to update the IRC as well.

Part of the work last cycle involved adding a new Section 1205 Stationary Fuel Cell Power Systems to the IFC with core requirements for the installation of fuel cell power systems. This cycle that section was updated to recognize the temporary use of fuel cell powered electric vehicles as ESS to power the dwelling unit on a temporary basis.

This proposal is intended to delete the existing limited language at M1903 and to provide needed guidance in this code for the installation of fuel cells that to correlate the updated language on ESS in the IRC with the IFC. It is important to note that these sytems are designated by the USDOE as ESS, not simply mechanical systems. The same holds true for both the IFC and NFPA 855 Energy Storage Systems. Since these fuel cll power systems are utilized for ESS the code language pertaining to them should directly follow the requirements for ESS in the IRC as they do in the IFC for improved usability.

It should be noted that fuel cell power systems are being actively marketed and installed for one- and two-family homes. This has been occuring for over a decade. Fuel cell powered electric vehicles are also now being marketed with the capability to be used as an ESS for a dwelling unit.

To better address these specialty systems the following is proposed:

Definition: The definition and subdefinitions for stationary fuel cell power systems has been brought over from the IFC.

New R328.1: Requires compliance with this section of the IRC and Section 1205 of the IFC where the bulk of the requirements are located. For temprory use of fuel cell powered vehicles as ESS it points to Section R328.3.

New R328.2: Identifies that only residential use listed fuel cell power systems can be installed in dwelling units.

New R328.3: Provdes for the temporary use of the fuel cell powered electric vehicles to power the dwelling. It is limited to the owner or occupant's vehicle. This is an important distinction as mobile ESS providers are regulated by the IFC.

New R328.3.1: Defines how long the 'temporary' use is.

The language added is intentionally not extensive. The core requirements for these specialty systems are already built into the IFC and the referenced standards of that document. When installed as ESS the requirements for ESS in this code will also apply. The language proposed is enough to ensure proper installation and to address the temporary use of fuel cell powered vehicles as ESS.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposed change does not impact the cost of construction of one- or two-family dwellings and townhouses. Stationary fuel cell power systems are specialty systems typically installed in an existing dwelling by the current owner. In the rare case that a new custom home owner desires installation of a stationary fuel cell power system as part of the construction of the custom home, these requirements impact the cost of the stationary fuel cell power system portion of the installation, not the cost of construction of the home iteself.

Proposal # 5546

RB160-19

RB161-19

IRC®: R328 (New), R328.1 (New), R328.1.1 (New), R328.2 (New), R328.2.1 (New), R328.2.2 (New), R328.2.3 (New), R328.2.4 (New), R328.2.5 (New), R328.3 (New), R328.3.1 (New), R328.3.2 (New), R328.4 (New), R328.5 (New), R328.5.1 (New), R328.5.2 (New), R328.5.3 (New), R328.5.4 (New), R328.5.5 (New), R328.6 (New)

Proponent: Eirene Knott, BRR Architecture, representing Metropolitan Kansas City Chapter of the ICC (Eirene.Knott@brrarch.com); David Allen (davidallen89@att.net); Ron Olberding (ronolberding@sbcglobal.net)

2018 International Residential Code

Add new text as follows:

R328 Physical Security

R328.1 Purpose. The purpose of this section is to establish minimum standards that incorporate physical security to make dwelling units resistant to unlawful entry.

R328.1.1 Scope. The provisions of this section shall apply to all new structures and to additions and alterations made to existing buildings.

R328.2 Doors. All exterior swinging doors of residential dwelling units and attached garages, including doors leading from the garage area into the dwelling unit, shall comply with Sections R328.2.1 through R328.2.5 based on the type of door installed.

Exception: Vehicular access doors

R328.2.1 Wood doors. Exterior wood doors shall be of solid core construction such as high-density particleboard, solid wood, or wood block core with a minimum thickness of 1-3/4 inches (45 mm) at any point. Doors with panel inserts shall be solid wood with the insert being a minimum of 1-inch (25.4 mm) in thickness.

R328.2.2 Steel doors. Exterior steel doors shall be a minimum thickness of 24 gauge and have reinforcement material at the location of the deadbolt.

R328.2.3 Fiberglass doors. Fiberglass doors shall have a minimum skin thickness of one-sixteenth inch and have reinforcement material at the location of the deadbolt.

R328.2.4 Double doors. The inactive leaf of an exterior double door shall be provided with flush bolts having an engagement of not less than 1-inch (25.4 mm) into the head and threshold of the doorframe, or by other approved methods.

R328.2.5 Sliding doors. Exterior sliding doors shall be installed to prevent the removal of the panels from the exterior.

R328.3 Door frames. The exterior door frames shall be installed prior to the rough-in inspection. Horizontal blocking shall be placed between studs at the door lock height for three stud spaces or equivalent bracing on each side of the door opening. Door frames shall comply with Sections R328.3.1 through R328.3.2 based on the type of door installed.

R328.3.1 Wood frames. Wood frame doors shall be set in frame openings constructed of double studding or equivalent construction. Door frames, including those with sidelights, shall be reinforced in accordance with ASTM F476 Grade 40 bolt and hinge impact only.

R328.3.2 Steel frames. Steel door frames shall be constructed of 18 gauge or heavier steel and reinforced at the hinges and strikes. Doors are to be anchored to the wall in accordance with the manufacturer's instructions.

R328.4 Door jambs. Door jambs on wooden jambs for in-swinging doors shall be of one-piece construction.

R328.5 Door hardware. Exterior door hardware shall comply with Sections R328.5.1 through R328.5.5.

R328.5.1 Hinges. Hinges for exterior swinging doors shall comply with the following:

- 1. <u>At least two screws, 3 inches (76 mm) in length, penetrating at least 1-inch (25.4 mm) into the wall</u> <u>structure shall be used. Solid wood fillers or shims shall be used to eliminate any space between the wall</u> <u>structure and the door frame behind each hinge.</u>
- 2. <u>Hinges for out-swinging doors shall be equipped with mechanical interlock to prevent removal of the door</u> <u>from the exterior.</u>

R328.5.2 Escutcheon plates. All exterior doors shall have escutcheon plates protecting the door's edge.

R328.5.3 Locks. Exterior doors shall be provided with a deadbolt with a minimum grade 2 as determined by ANSI/BHMA.

R328.5.4 Entry vision and glazing. All main or front entry doors to dwelling units shall be arranged so that the occupant has a view of the area immediately outside the door without opening the door. The view may be provided by a door viewer having a field of view of not less than 180 degrees, through windows or through view ports.

R328.5.5 Side light entry doors. Side light doors units shall have framing of double stud construction or equivalent construction complying with Sections R328.3.1 or R328.3.2. The door frame that separates the door opening from the side light, whether on the latch side or the hinge side, shall be double stud construction or equivalent construction complying with Sections R328.3.1 or R328.3.2. Double stud construction or equivalent construction shall exist between the glazing unit of the side light and the wall structure of the dwelling.

R328.6 Alternate materials and methods of construction. The provisions of this section are not intended to prevent the use of any material or method of construction not specifically prescribed by this section, provided any such alternate has been approved. Nor is it the intention of this section to exclude any sound method of structural design or analysis not specifically provided for in this section. The materials, method of construction and structural design limitations provided for in this section shall be used, unless otherwise approved. Compliance with ASTM F476 will be deemed to be in compliance with this section.

Reason: In the summer of 1996, Overland Park, Kansas, experienced a series of home invasions resulting in the sexual assault of several women. For the victims of a home invasion, it's more than a property crime; it scares the victim into thinking that the criminal will return only to commit a more violent or heinous crime. To have an emotional investment in their residence is priceless.

As a result of these home invasions, the City's Police Department conducted hundreds of surveys of residents in an effort to develop a solution to the home invasions. The results of the surveys lead the City to develop a building code that makes home more safe and secure. You may ask, why secure the front door? What about installing an alarm? Communities across the country continue to report a growing increase in false alarms. In an effort to provide physical security to the homeowner, there needs to be a more reliable option available.

The longer a criminal spends trying to gain access to a home, the greater the risk of detection. In addition, most home invaders will not attempt to break a window, as that makes noise that neighbors could potentially hear. Rather than face these risks, the invader is more likely to try to kick in an exterior door, where they can easily gain access without being detected.

This code change will provide for minimal provisions to be made to a new home under construction that will give

the homeowner safety and peace of mind, while delaying and frustrating the criminal. Since this proposal is not dependent on electrical power, these provisions will always be available to the homeowner and will require no further action after installation. There is no on-going cost to the homeowner and these provisions will not affect the overall aesthetics of the home.

Cost Impact: The code change proposal will increase the cost of construction

The cost to secure a single door ranges from \$40-\$60 for a single door unit and between \$140 and \$180 for a double sidelite unit.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM F476, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4863

RB162-19

IRC®: 202 (New), R328.1 (New), AO103.1, AO103.2, ASTM Chapter 44 (New), SECTION AO101, AO101.1, SECTION AO102, 202, SECTION AO103, SECTION AO104

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Add new definition as follows:

VEHICULAR GATE. A moveable barrier that is intended for use at a vehicle entrance or exit and not intended for use by pedestrian traffic.

Add new text as follows:

R328.1 General. Automatic vehicular gates shall comply with the requirements of Sections R328.2 and R328.3.

R328.2 Vehicular gates intended for automation. Vehicular gates intended for automation shall be designed, constructed and installed to comply with the requirements of ASTM F2200.

R328.3 Vehicular gate openers. Vehicular gate openers shall be listed in accordance with UL 325.

Add new standard(s) as follows:

ASTM

ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

F2200-14: Standard Specification for Automated Vehicular Gate Construction

Delete without substitution:

SECTION AO101 GENERAL

AO101.1 General. The provisions of this appendix shall control the design and construction of automatic vehicular gates installed on the lot of a one- or two-family dwelling.

SECTION AO102 DEFINITION

VEHICULAR GATE. A gate that is intended for use at a vehicular entrance or exit to the lot of a one- or two-family dwelling, and that is not intended for use by pedestrian traffic.

SECTION AO103 AUTOMATIC VEHICULAR GATES

AO103.1 Vehicular gates intended for automation. Vehicular gates intended for automation shall be designed, constructed and installed to comply with the requirements of ASTM F2200.

AO103.2 Vehicular gate openers. Vehicular gate openers, where provided, shall be listed in accordance with

UL 325.

ASTM F2200 —14	Standard Specification for Automated Vehicular Gate Construction	AO103.1
UL 325—02	Door, Drapery, Gate, Louver and Window Operations and Systems—with revisions through May 2015	AO103.2

SECTION AO104 REFERENCED STANDARDS

Reason: This proposal recognizes the importance of safety by moving the requirements for automatic vehicular gates from Appendix O to the body of the code. It does not require the use of automated vehicular gates, but where vehicular gates are provided, it requires them to meet the same safety standards that are in the IBC (Section 3110) and the IFC (Sections 503.5 and 503.6.).

In 2018, CPSC launched "Operation Safe Gate" to put an end to preventable tragedies caused by automatic security gates. CPSC estimates that there are about 300 emergency room injuries each year due to automatic gates. Many of the injuries have been serious and resulted in cuts, broken bones, hematomas and amputations. In addition, CPSC has received four tragic reports of fatalities in recent years, including an 8 year old, an 11 year old and a 12 year old.

https://onsafety.cpsc.gov/blog/2018/08/06/operation-safe-gate-put-an-end-to-automatic-security-gate-tragedies/

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal does not require vehicular gates to be installed. There are numerous automated vehicular gates that already comply with these safety standards, so when these are used there will be no increase in costs.

Proposal # 4230

RB162-19

RB163-19

IRC®: SECTION R328 (New), R328.1 (New), R328.2 (New), R328.3 (New)

Proponent: Ali Fattah, City of San Diego, representing City of San Diego (afattah@sandiego.gov)

2018 International Residential Code

Add new text as follows:

SECTION R328 ALTERATIONS AND ADDITIONS

R328.1 General. Additions and Alterations to detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories above grade plane in height with a separate means of egress, and their accessory structures not more than three stories above grade plane in height, shall comply with this code or the International Existing Building Code. Where the alteration includes a change of use or occupancy to one not within the scope of the International Residential Code, the alteration shall comply with the International Existing Building Code.

R328.2 Additions. Additions to buildings within the scope of the International Residential Code shall comply with the requirements of the International Residential Code for new construction. Alterations to the existing building or structure shall be such that the existing building or structure together with the addition is not less compliant with the provisions of the International Residential Code than the existing building or structure was prior to the addition. An existing building together with its additions shall comply with the height limits of the International Residential Code.

R328.3 Alterations. Alterations to any building or structure within the scope of the International Residential Code shall comply with the requirements of the International Residential Code for new construction. Alterations shall be such that the existing building or structure is not less compliant with the provisions of the International Residential Code than the existing building or structure was prior to the alteration.

Reason: This proposed code change is editorial in nature and cross reference the IEBC in similar fashion to the way the IEBC provides the IRC as an option for compliance in the exception to Section 101.2. The code change also fills a gap regarding additions and alterations since the two scopes of work that are defined in Chapter 2 are only used within specific sections such as smoke alarm and carbon monoxide alarm requirements for example. The proposed genral text is extracted from the IEBC prescriptive method sections in chapter 5. The alterations section also calrifies that you only need to go to the IEBC if the alteration changes the occuapancy or use to one not regulated by the IRC.

Chapter 3 was selected in lieu of chapter 1 since some jurisdictions may not adopt Chapter 1 of the IRC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposed code change is editorial in nature and does not add new standards.

Proposal # 4839

RB163-19

RB164-19

IRC®: TABLE R403.1(1), TABLE R403.1(2), TABLE R403.1(3), R403.1.1

Proponent: Gary Ehrlich, representing National Association of Home Builders (gehrlich@nahb.org)

2018 International Residential Code

Revise as follows:

TABLE R403.1(1)

MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS FOR LIGHT-FRAME CONSTRUCTION

(inches)^{a, b, c, d}

Portions of table not shown remain unchanged.

		LOAD-BEARING VALUE OF SOIL							
GROUND SNOW LOAD OR				(psf)				
ROOF LIVE LOAD		1500	2000	2500	3000	3500	4000		
	1 story slab on grade	126	12 ×	12 ×	12 ×	12 ×	12 ×		
	i story—slab-on-grade	12 X U	6	6	6	6	6		
	1 story—with crawl space	12 × 6	12 ×	12 ×	12 ×	12 ×	12 ×		
		12 × 0	6	6	6	6	6		
	1 story—plus basement	16 18 x 6	<u>12</u> 14	12 ×	12 ×	12 ×	12 ×		
		1010 ~ 0	× 6	6	6	6	6		
	2 story—slab-on-grade	13 12 × 6	12 ×	12 ×	12 ×	12 ×	12 ×		
		10.2	6	6	6	6	6		
20 psf <u>roof live load or 25</u>	2 story—with crawl space	15 16 × 6	12 ×	12 ×	12 ×	12 ×	12 ×		
ground snow load			6	6	6	6	6		
	2 story—plus basement	19 22 × 6	<u>1416</u>	<u>1213</u>	12 ×	12 ×	12 ×		
			× 6	× 6	6	6	6		
	3 story—slab-on-grade	16 14 × 6	12 ×	12 ×	12 ×	12 ×	12 ×		
			6	6	6	6	6		
	3 story—with crawl space	<u>18 x 6</u> 19	14 ×	12 ×	12 ×	12 ×	12 ×		
		× 6	6	6	6	6	6		
	3 story—plus basement	<u>22 x 725</u>	<u>1619</u>	<u>1315</u>	<u>1213</u>	12 ×	12 ×		
		× 8	× 6	× 6	× 6	6	6		
	1 story—slab-on-grade	12 × 6	12 ×	12 ×	12 ×	12 ×	12 ×		
			6	6	6	6	6		
	1 story—with crawl space	13 × 6	12 ×	12 ×	12 ×	12 ×	12 ×		
			6	6	6	6	6		
	1 story—plus basement	<u>16</u> 19 × 6	<u>1214</u>	12 ×	12 ×	12 ×	12 ×		
			× b	0	0	0	0		
	2 story—slab-on-grade	<u>1312 × 6</u>	12 ×	12 ×	12 ×	12 ×	12 ×		
			1010	10	10	10	10		
	2 story—with crawl space	<u>16</u> 17 × 6	<u>12</u> 13 x 6	12 ×	12 ×	6	12 ×		
30 psf			^ U	5	5	5	5		

	2 story—plus basement	<u>1923 × 6</u>	<u>14</u> 17	<u>12</u> 14	12 ×	12 ×	12 ×
			0 ×	× o	0	0	0
	3 story—slab-on-grade	<u>16</u> 15 × 6	<u>14</u> 12 × 6	12 ×	12 ×	12 ×	12 ×
		19 x 20	14 15	12 v	12 v	12 ~	12 v
	3 story—with crawl space	× 6	× 6	6	6	6	6
	2 story plus becoment	<u>22 x 726 </u>	<u>1620</u>	<u>1316</u>	<u>1213</u>	12 ×	12 ×
	s story—plus basement	× 8	× 6	× 6	× 6	6	6
	1 story—slab-on-grade	12 × 6	12 ×	12 ×	12 ×	12 ×	12 ×
			12	12	12	12	12
	1 story—with crawl space	<u>1416 × 6</u>	6	6	6	12 ×	6
	1 stary plus becoment	1001 0	<u>1316</u>	<u>1213</u>	12 ×	12 ×	12 ×
	i story—plus basement	<u>18</u> 21 × 6	× 6	× 6	6	6	6
	2 story-slab-on-grade	1514 ~ 6	<u>1312</u>	12 ×	12 ×	12 ×	12 ×
		<u>13</u> 14 × 0	× 6	6	6	6	6
50 nsf	2 story—with crawl space	17 19 x 6	<u>13</u> 14	12 ×	12 ×	12 ×	12 ×
		<u>17</u> 10 × 0	× 6	6	6	6	6
	2 story—plus basement	21 25 × 7	<u>15</u> 19	<u>1215</u>	12 ×	12 ×	12 ×
			× 6	× 6	6	6	6
	3 storv—slab-on-grade	18 17 × 6	13 ×	12 ×	12 ×	12 ×	12 ×
			6	6	6	6	6
	3 story—with crawl space	20 22 × 6	<u>15</u> 17	<u>12</u> 13	12 ×	12 ×	12 ×
			× 6	× 6	6	6	6
	3 story—plus basement	<u>24 x 8</u> 28	<u>18</u> 21	<u>14</u> 17	<u>12</u> 14	12 ×	12 ×
		× 9	×b	×b	×b	6	6
	1 story—slab-on-grade	<u>1412 × 6</u>	12 ×	12 ×	12 ×	12 ×	12 ×
			0	0	0	0	0
	1 story—with crawl space	<u>16</u> 18 × 6	<u>12</u> 13 × 6	12 × 6	12 ×	12 × 6	12 ×
		19 x 6 24	14 18	12 14	12 x	12 x	12 x
	1 story—plus basement	×7	× 6	× 6	6	6	6
			12 ×	12 ×	12 ×	12 ×	12 ×
	2 story—slab-on-grade	<u>1/</u> 16 × 6	6	6	6	6	6
70 pot	2 story with srowl space	1001	<u>1416</u>	<u>1213</u>	12 ×	12 ×	12 ×
70 psi	2 story—with crawl space	<u>1921 × 0</u>	× 6	× 6	6	6	6
	2 story plus basement	<u>22 x 7</u> 27	<u>1720</u>	<u>13</u> 16	<u>12</u> 14	12 ×	12 ×
	2 story—plus basement	× 9	× 6	× 6	× 6	6	6
	3 story_slab_on_grade	<u>20 x 6</u> 19	<u>15</u> 14	12 ×	12 ×	12 ×	12 ×
		× 6	× 6	6	6	6	6
	3 story—with crawl space	22 25 ~ 7	<u>16</u> 18	<u>1315</u>	12 ×	12 ×	12 ×
		<u>८८</u> २३ × /	× 6	× 6	6	6	6
		<u>24 x 8</u> 30	<u>19</u> 23	<u>15</u> 18	<u>1315</u>	<u>12</u> 13	12 ×
		× 10	× 6	× 6	× 6	× 6	6

a. Interpolation allowed. Linear interpolation of footing width is permitted between the soil bearing pressures in the table. Extrapolation is not allowed. permitted.

b. Based on 32-foot-wide house with load-bearing center wall that carries half of the tributary attic, and floor framing. For every 2 feet of adjustment to the width of the house, add or subtract 2 inches of footing width and 1 inch of footing thickness (but not less than 6 inches thick). The table is based on the following conditions and loads: Building width: 32 feet; Wall height: 9 feet; Basement wall height: 8 feet; Dead loads: 15 psf roof and ceiling assembly, 10 psf floor assembly, 12 psf wall assembly; Live loads: Roof and ground snow loads as listed, 40 psf first floor, 30 psf second and third floor. Footing sizes are calculated assuming a clear span roof/ceiling assembly and an interior bearing wall or beam at each floor.

c. Where the building width perpendicular to the wall footing is greater than 32 feet, the footing width shall be increased by 2 inches and footing depth shall be increased by 1 inch for every 4 feet of increase in building width.

<u>d. Where the building width perpendicular to the wall footing is less than 32 feet, a 2 inch</u> <u>decrease in footing width and 1 inch decrease in footing depth is permitted for every 4 feet of</u> <u>decrease in building width.</u>



TABLE R403.1(2) MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS FOR LIGHT-FRAME CONSTRUCTION WITH BRICK VENEER <u>OR LATH AND PLASTER (</u>inches)^{a, b, c, d}

GROUND SNOW LOAD OR	STORY AND TYPE OF STRUCTURE	LOAD-BEARING VALUE OF SOIL (psf)							
ROOF LIVE LOAD	WITH BRICK VENEER	1500	2000	2500	3000	3500	4000		
	1 story—slab-on-grade	12 x 6	12 x 6	12 ×	12 ×	12 ×	12 ×		
			12 ~ 0	6	6	6	6		
	1 story—with crawl space	15 × 6	12 ~ 6	12 ×	12 ×	12 ×	12 ×		
	i story with oraw space	10 0	12 × 0	6	6	6	6		
	1 story—plus basement	18216	<u>1415 ×</u>	12 ×	12 ×	12 ×	12 ×		
		<u>10</u> 21 × 0	6	6	6	6	6		
	2 story slab on grado	1915	<u>1312 ×</u>	12 ×	12 ×	12 ×	12 ×		
	2 Story—Slab-On-grade	<u>10</u> 13 × 0	6	6	6	6	6		
20 psf <u>roof live load or 25 psf</u>	2 story—with crawl space	20 × 6	15 ~ 6	12 ×	12 ×	12 ×	12 ×		
		20 X 0	13 × 0	6	6	6	6		
ground snow load									

	2 story—plus basement	<u>2326 × 8</u>	<u>1720 ×</u> 6	<u>1416</u> × 6	<u>1213</u> × 6	12 × 6	12 × 6
	3 story—slab-on-grade	<u>23 x 820 × 6</u>	<u>1715 ×</u> 6	<u>14</u> 12 × 6	12 × 6	12 × 6	12 × 6
	3 story—with crawl space	<u>25 x 926 x 8</u>	19 × 6	15 × 6	13 × 6	12 × 6	12 × 6
	3 story—plus basement	<u>29</u> 32 × 11	<u>2124 ×</u> 7	<u>17</u> 19 × 6	<u>1416</u> × 6	<u>12</u> 14 × 6	12 × 6
	1 story—slab-on-grade	<u>1312 × 6</u>	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—with crawl space	<u>1516 × 6</u>	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—plus basement	<u>1822 × 6</u>	<u>1416 ×</u> 6	<u>1213</u> × 6	12 × 6	12 × 6	12 × 6
	2 story—slab-on-grade	<u>18</u> 16 × 6	<u>1412 ×</u> 6	12 × 6	12 × 6	12 × 6	12 × 6
30 psf	2 story—with crawl space	<u>2022 × 6</u>	<u>1516 ×</u> 6	<u>12</u> 13 × 6	12 × 6	12 × 6	12 × 6
	2 story—plus basement	<u>24 x 8</u> 27 x 9	<u>1821 ×</u> 6	<u>14</u> 16 × 6	<u>12</u> 14 × 6	12 × 6	12 × 6
	3 story—slab-on-grade	<u>23 x 8</u> 21 × 6	<u>18</u> 16 × 6	<u>14</u> 13 × 6	12 × 6	12 × 6	12 × 6
	3 story—with crawl space	<u>26 x 9</u> 27 x 8	<u>19</u> 20 × 6	<u>15</u> 16 × 6	13 × 6	12 × 6	12 × 6
	3 story—plus basement	<u>29</u> 33 × 11	<u>2224 ×</u> 7	<u>1720 × 6</u>	<u>1416</u> × 6	<u>12</u> 14 × 6	12 × 6
	1 story—slab-on-grade	<u>14</u> 13 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—with crawl space	<u>1718 × 6</u>	<u>13</u> 14 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—plus basement	<u>20 x 624 x 7</u>	<u>15</u> 18 × 6	<u>12</u> 14 × 6	12 × 6	12 × 6	12 × 6
	2 story—slab-on-grade	<u>20</u> 18 × 6	<u>15</u> 14 × 6	12 × 6	12 × 6	12 × 6	12 × 6
50 psf	2 story—with crawl space	<u>2224 × 7</u>	<u>17</u> 18 × 6	<u>13</u> 14 × 6	12 × 6	12 × 6	12 × 6
00 pai	2 story—plus basement	<u>25 x 929 × 10</u>	<u>1922 ×</u> 6	<u>15</u> 18 × 6	<u>13</u> 15 × 6	<u>1213</u> × 6	12 × 6
	3 story—slab-on-grade	<u>25 x 9</u> 27 x 7	<u>19 x</u> <u>618 × 6</u>	<u>15</u> 13 × 6	<u>13</u> 12 × 6	12 × 6	12 × 6
	3 story—with crawl space	<u>27 x</u> <u>1029 × 9</u>	21_x 7 22 × 6	<u>16</u> 17 × 6	14 × 6	12 × 6	12 × 6
	3 story—plus basement	<u>3135 ×</u> 12	<u>2326 ×</u> 8	<u>1821</u> × 6	<u>15</u> 17 × 6	<u>1315</u> × 6	<u>1213</u> × 6
				I	I		

	1 story—slab-on-grade	<u>14</u> 15 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—with crawl space	<u>17</u> 20 × 6	<u>14</u> 15 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—plus basement	<u>22 x 7</u> 26 × 8	<u>1620 ×</u> 6	<u>13</u> 16 × 6	<u>12</u> 13 × 6	12 × 6	12 × 6
	2 story—slab-on grade	<u>21 x 7</u> 20 × 6	<u>16</u> 15 × 6	<u>13</u> 12 × 6	12 × 6	12 × 6	12 × 6
70 nsf	2 story—with crawl space	<u>2426 × 8</u>	<u>18</u> 19 × 6	<u>1415</u> × 6	<u>1213</u> × 6	12 × 6	12 × 6
70 ры	2 story—plus basement	27 x 10 32 × 11	<u>20 x</u> <u>6</u> 24 × 7	<u>16</u> 19 × 6	<u>13</u> 16 × 6	<u>12</u> 14 × 6	12 × 6
	3 story—slab-on-grade	<u>27 x</u> <u>10</u> 26 × 8	<u>20</u> 19 × 6	<u>1615</u> × 6	13 × 6	12 × 6	12 × 6
	3 story—with crawl space	<u>29</u> 31 × 11	<u>2223 × 7</u>	<u>17</u> 19 × 6	<u>15</u> 16 × 6	<u>1213</u> × 6	12 × 6
	3 story—plus basement	<u>32 x</u> <u>12</u> 37 × 13	<u>24 x</u> <u>828 × 9</u>	<u>1922 × 6</u>	<u>16</u> 18 × 6	<u>1416</u> × 6	<u>12</u> 14 × 6

For SI: 1 inch = 25.4 mm, 1 plf = 14.6 N/m, 1 pound per square foot = 47.9 N/m^2 .

a. Interpolation allowed. Linear interpolation of footing width is permitted between the soil bearing pressures in the table. Extrapolation is not allowed. permitted.

b. Based on 32-foot-wide house with load-bearing center wall that carries half of the tributary attic, and floor framing. For every 2 feet of adjustment to the width of the house, add or subtract 2 inches of footing width and 1 inch of footing thickness (but not less than 6 inches thick). The table is based on the following conditions and loads: Building width: 32 feet; Above-grade wall height: 9 feet; Slab-on-grade stem wall height: 1 foot; Crawlspace wall height: 4 feet; Dead loads: 15 psf roof and ceiling assembly, 10 psf floor assembly, 45 psf wall assembly; Live loads: Roof and ground snow loads as listed, 10 psf attic floor; 40 psf first floor, 30 psf second and third floor. Footing sizes are calculated assuming a clear span roof/ceiling assembly and an interior bearing wall or beam at each floor.

c. Where the building width perpendicular to the wall footing is greater than 32 feet, the footing width shall be increased by 2 inches and footing depth shall be increased by 1 inch for every 4 feet of increase in building width.

<u>d. Where the building width perpendicular to the wall footing is less than 32 feet, a 2 inch</u> <u>decrease in footing width and 1 inch decrease in footing depth is permitted for every 4 feet of</u> <u>decrease in building width.</u>



TABLE R403.1(3)MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS WITH CAST-IN-PLACE CONCRETE ORFULLY PARTIALLY GROUTED MASONRY WALL CONSTRUCTION (inches)^{a, b, c, d}

GROUND SNOW LOAD	STORY AND TYPE OF STRUCTURE	RE LOAD-BEARING VALUE OF SOIL (psf)						
OR ROOF LIVE LOAD	WITH CMU <u>OR CONCRETE</u>	1500	2000	2500	3000	3500	4000	
	1 story—slab-on-grade	<u>13</u> 14 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6	
	1 story—with crawl space	<u>16</u> 19 × 6	<u>12</u> 14 × 6	12 × 6	12 × 6	12 × 6	12 × 6	
	1 story—plus basement	<u>19 x</u> <u>625 × 8</u>	<u>14</u> 19 × 6	<u>1215 ×</u> 6	<u>12</u> 13 × 6	12 × 6	12 × 6	
20 psf <u>roof live load or 25</u> <u>psf ground snow load</u>	2 story—slab-on-grade	<u>19 x</u> <u>623 × 7</u>	<u>14</u> 18 × 6	<u>12</u> 14 × 6	12 × 6	12 × 6	12 × 6	
	2 story—with crawl space	<u>22 x</u> <u>7</u> 29 × 9	<u>1622 ×</u> 6	<u>13</u> 17 × 6	<u>12</u> 14 × 6	12 × 6	12 × 6	
	2 story—plus basement	<u>25 x</u> <u>9</u> 35 × 12	<u>19 x</u> <u>6</u> 26 × 8	<u>1521 ×</u> 6	<u>12</u> 17 × 6	<u>12</u> 15 × 6	<u>12</u> 13 × 6	
	3 story—slab-on-grade	<u>25 x</u> <u>932 × 11</u>	<u>19 x</u> <u>6</u> 24 × 7	<u>15</u> 19 × 6	<u>13</u> 16 × 6	<u>12</u> 14 × 6	12 × 6	
	3 story—with crawl space	<u>28 x</u> <u>10</u> 38 × 14	<u>21 x</u> <u>7</u> 28 × 9	<u>17</u> 23 × 6	<u>14</u> 19 × 6	<u>12</u> 16 × 6	<u>12</u> 14 × 6	
	3 story—plus basement	<u>31 x</u> <u>12</u> 43 × 17	<u>23 x</u> <u>8</u> 33 × 11	<u>18 x</u> <u>6</u> 26 × 8	<u>1522 ×</u> 6	<u>13</u> 19 × 6	<u>12</u> 16 × 6	
	1 story—slab-on-grade	<u>1315 ×</u> 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6	
	1 story—with crawl space	<u>1620 ×</u> 6	<u>1215 ×</u> 6	12 × 6	12 × 6	12 × 6	12 × 6	
	1 story—plus basement	<u>19 x</u> <u>726 × 8</u>	<u>1420 ×</u> 6	<u>1216 ×</u> 6	<u>12</u> 13 × 6	12 × 6	12 × 6	
	2 story—slab-on-grade	<u>19 x</u> <u>6</u> 24 × 7	<u>15</u> 18 × 6	<u>1215 ×</u> 6	12 × 6	12 × 6	12 × 6	

30 psf	2 story—with crawl space	<u>22 x</u> <u>7</u> 30 × 10	<u>1622 ×</u> 6	<u>13</u> 18 × 6	<u>1215 ×</u> 6	<u>12</u> 13 × 6	12 × 6
	2 story—plus basement	<u>25 x</u> <u>936 *</u> 13	<u>19 x</u> <u>627 × 8</u>	<u>15</u> 21 × 6	<u>13</u> 18 × 6	<u>12</u> 15 × 6	<u>12</u> 13 × 6
	3 story—slab-on-grade	<u>26 x</u> <u>933 *</u> 12	<u>19 x</u> <u>625 × 7</u>	<u>15</u> 20 × 6	<u>13</u> 17 × 6	<u>12</u> 14 × 6	12 × 6
	3 story—with crawl space	<u>28 x</u> <u>10</u> 39 × 14	<u>21 x</u> <u>729 × 9</u>	<u>17 x</u> <u>623 × 7</u>	<u>14</u> 19 × 6	<u>12</u> 17 × 6	<u>12</u> 14 × 6
	3 story—plus basement	<u>31 x</u> <u>12</u> 44 × 17	<u>23 x</u> <u>8</u> 33 * 12	<u>19 x</u> <u>6</u> 27 × 8	<u>1622 ×</u> 6	<u>13</u> 19 × 6	<u>12</u> 17 × 6
	1 story—slab-on-grade	<u>15</u> 17 × 6	<u>1213 ×</u> 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—with crawl space	<u>1822 ×</u> 6	<u>13</u> 17 × 6	<u>1213 ×</u> 6	12 × 6	12 × 6	12 × 6
	1 story—plus basement	<u>21 x</u> <u>7</u> 28 × 9	<u>16</u> 21 × 6	<u>12</u> 17 × 6	<u>12</u> 14 × 6	12 × 6	12 × 6
	2 story—slab-on-grade	<u>21 x</u> <u>7</u> 27 × 8	<u>1620 ×</u> 6	<u>13</u> 16 × 6	<u>12</u> 13 × 6	12 × 6	12 × 6
	2 story—with crawl space	<u>24 x</u> <u>832 × 11</u>	<u>18 x</u> <u>624 × 7</u>	<u>14</u> 19 × 6	<u>12</u> 16 × 6	<u>12</u> 14 × 6	12 × 6
50 psf	2 story—plus basement	<u>27 x</u> <u>10</u> 38 × 14	<u>20 x</u> <u>6</u> 28 × 9	<u>16</u> 23 × 6	<u>13</u> 19 × 6	<u>12</u> 16 × 6	<u>12</u> 14 × 6
	3 story—slab-on-grade	<u>27 x</u> <u>1035 × 13</u>	<u>20 x</u> <u>6</u> 27 × 8	<u>1621 ×</u> 6	<u>14</u> 18 × 6	<u>12</u> 15 × 6	<u>1213</u> × 6
	3 story—with crawl space	<u>30 x</u> <u>11</u> 41 × 15	<u>22 x</u> <u>7</u> 31 × 10	<u>18 x</u> <u>6</u> 24 × 7	<u>15</u> 20 × 6	<u>13</u> 17 × 6	<u>1215</u> × 6
	3 story—plus basement	<u>33 x</u> <u>13</u> 47 × 18	<u>25 x</u> 9 35 × 12	<u>20 x</u> <u>6</u> 28 × 9	<u>16 x</u> <u>6</u> 23 × 7	<u>1420</u> × 6	<u>1217</u> × 6
	1 story—slab-on-grade	<u>17</u> 19 × 6	<u>13</u> 14 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—with crawl space	<u>19 x</u> <u>625 × 7</u>	<u>14</u> 18 × 6	<u>1215 ×</u> 6	12 × 6	12 × 6	12 × 6
	1 story—plus basement	<u>22 x</u> <u>730 × 10</u>	<u>1723 ×</u> 6	<u>13</u> 18 × 6	<u>12</u> 15 × 6	<u>12</u> 13 × 6	12 × 6

	2 story—slab-on-grade	<u>23 x</u> <u>829 × 9</u>	<u>1722 ×</u> 6	<u>14</u> 17 × 6	<u>12</u> 14 × 6	12 × 6	12 × 6
70 psf	2 story—with crawl space	<u>25 x</u> <u>9</u> 34 × 12	<u>19 x</u> <u>6</u> 26 × 8	<u>15</u> 21 × 6	<u>12</u> 17 × 6	<u>1215</u> × 6	<u>12</u> 13 × 6
	2 story—plus basement	<u>28 x</u> <u>10</u> 40 × 15	<u>21 x</u> <u>7</u> 30 * 10	<u>17 x</u> <u>624 × 7</u>	<u>1420 ×</u> 6	<u>12</u> 17 × 6	<u>1215</u> × 6
	3 story—slab-on-grade	<u>29 x</u> <u>11</u> 38 × 14	<u>22 x</u> <u>7</u> 28 × 9	<u>17</u> 23 × 6	<u>14</u> 19 × 6	<u>1216</u> × 6	<u>12</u> 14 × 6
	3 story—with crawl space	<u>31 x</u> <u>12</u> 43 × 16	<u>23 x</u> <u>8</u> 32 × 11	<u>19 x</u> <u>6</u> 26 × 8	<u>16</u> 21 × 6	<u>13</u> 18 × 6	<u>12</u> 16 × 6
	3 story—plus basement	<u>34 x</u> <u>13</u> 49 × 19	<u>26 x</u> <u>9</u> 37 × 13	<u>21 x</u> <u>7</u> 29 × 10	<u>17 x</u> <u>6</u> 24 × 7	<u>15</u> 21 × 6	<u>13</u> 18 × 6

For SI: 1 inch = 25.4 mm, 1 plf = 14.6 N/m, 1 pound per square foot = 47.9 N/m^2 .

a. Interpolation allowed. Linear interpolation of footing width is permitted between the soil bearing pressures in the table. Extrapolation is not allowed. permitted.

b. Based on 32-foot-wide house with load-bearing center wall that carries half of the tributary attic, and floor framing. For every 2 feet of adjustment to the width of the house add or subtract 2 inches of footing width and 1 inch of footing thickness (but not less than 6 inches thick). The table is based on the following conditions and loads: Building width: 32 feet; Above-grade wall height: 9 feet; Slab-on-grade stem wall height: 1 foot; Crawlspace wall height: 4 feet; Dead loads: 15 psf roof and ceiling assembly, 10 psf floor assembly, 100 psf wall assembly; Live loads: Roof and ground snow loads as listed, 10 psf attic floor, 40 psf first floor, 30 psf second and third floor. Footing sizes are calculated assuming a clear span roof/ceiling assembly and an interior bearing wall or beam at each floor.

c. Where the building width perpendicular to the wall footing is greater than 32 feet, the footing width shall be increased by 2 inches and footing depth shall be increased by 1 inch for every 4 feet of increase in building width.

d. Where the building width perpendicular to the wall footing is less than 32 feet, a 2 inch decrease in footing width and 1 inch decrease in footing depth is permitted for every 4 feet of decrease in building width.



R403.1.1 Minimum size. The minimum width, W, and thickness, T, for concrete footings shall be in accordance with Tables R403.1(1) through R403.1(3) and Figure R403.1(1) or R403.1.3, as applicable <u>but not less than 12</u> inches (305 mm) in width and 6 inches (152 mm) in depth. The footing width shall be based on the load-bearing value of the soil in accordance with Table R401.4.1. Footing projections, P, shall be not less than 2 inches (51 mm) and shall not exceed the thickness of the footing. Footing thickness and projection for fireplaces shall be in accordance with Section R1001.2. The size of footings supporting piers and columns shall be based on the tributary load and allowable soil pressure in accordance with Table R401.4.1. Footings for wood foundations shall be in accordance with the details set forth in Section R403.2, and Figures R403.1(2) and R403.1(3). Footings for precast foundations shall be in accordance with the details set forth in Section R403.2, and Figures R403.1(2) and R403.4, Table R403.4, and Figures R403.4(1) and R403.4(2).

Reason: Builders using the new footing tables introduced in the 2015 IRC have found the footing widths required by the table are significantly larger than those required by previous editions of Table R403.1, which dated back to the CABO codes. In many cases they were wider than an engineering analysis would suggest. A careful review of the calculations underlying the 2015 IRC tables found a number of cases where load assumptions and determinations were overly conservative, and a few cases where the calculations were actually unconservative. Problems with the assumptions and calculations included the following:

- The original calculations apply the full ground snow load to the roof. The actual roof snow load per ASCE 7, unadjusted by any other factors, is 70% of the ground snow load or 20 pounds per square foot, whichever is greater. Consistent with the Chapter 8 rafter tables, a thermal factor of 1.1 per ASCE 7 is applied to the calculation of the snow load.
- The original calculations apply a 100 pound per square foot weight for above-grade concrete or masonry walls, representing a solid or fully-grouted 8" CMU wall. Such walls are more likely to be either 8" CMU with reinforcing @ 48" o.c. or 8" insulated concrete forms, both of which have a 55 pound per square foot weight.
- The original calculations use only the ASCE 7 load combination that applies a 0.75 factor for concurrent roof/snow and floor live loads, ignoring the load combinations that apply just the roof/attic LL, just the snow load, or just the total floor live loads.
- The original calculations are based on tributary width, yet Footnote #2 adds 2 inches of footing width for every 2 feet of additional **building width**. As a result of confusing building and tributary width, the footnote adds twice as much footing width as is necessary based on the loads!

Other key changes in the revised code text and footing tables include:

- The original footnote allowing footing width and depth to be adjusted is converted into two footnotes. One footnote requires an increase in footing width and depth when the building width perpendicular to a wall footing exceeds 32 feet. The second footnote permits, but does not require, a decrease in footing width and depth for a building width of 32 feet or narrower.
- The charging text is revised to clarify the minimum width of a footing shall not be less than 12 inches and depth shall not be less than 6 inches. Previously, the limitation on depth was buried in a footnote.

These revised tables correct the inconsistencies in the load assumptions and calculations. The result in many cases is footing widths for one- and two-family dwellings that are more in line with historic practice, while still technically justified under engineering standards and accepted practices. However, it is noted there are cases for houses on weaker soils (1500 and 2000 psf soil bearing strength) as well as for slab-on-grade and crawlspace houses, where corrections to the calculations, the assumption of clear-spanning roof trusses, and other changes to the assumptions increase the loads sufficiently to increase the footing widths.

Cost Impact: The code change proposal will increase the cost of construction

The revised tables increase footing sizes and depths for houses on weaker soils and slab-on-grade or crawlspace houses due to the revised calculations imposing larger loads on the footings. In other cases,

correcting overly conservative assumptions result in modest reductions in footing size. Also, this proposal improves clarity regarding the base assumptions, which may allow more dwellings to be constructed using the table rather than having to rely on engineered design or other, more conservative, engineering-based prescriptive standards, thus some builders may save on both footing size and avoid engineering design fees.

Proposal # 4940

RB164-19

RB165-19

IRC®: TABLE R403.1(1), TABLE R403.1(2), TABLE R403.1(3)

Proponent: Gary Ehrlich, National Association of Home Builders, representing National Association of Home Builders (gehrlich@nahb.org)

2018 International Residential Code

Revise as follows:

TABLE R403.1(1)

MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS FOR LIGHT-FRAME CONSTRUCTION (inches)^{a, b}

Portions of table not shown remain unchanged.

	STORY AND TYPE OF STRUCTURE WITH LIGHT FRAME	LC)AD-B	EARII SOIL	NG VA (psf)		OF
		1500	2000	2500	3000	3500	4000

For SI: 1 inch = 25.4 mm, 1 plf = 14.6 N/m, 1 pound per square foot = 47.9 N/m^2 .

- a. Interpolation allowed. Extrapolation is not allowed.
- b. Based on 32-foot-wide house with load-bearing center wall that carries half of the tributary attic, and floor framing. For every <u>2-4</u> feet of adjustment to the width of the house, add or subtract 2 inches of footing width and 1 inch of footing thickness (but not less than 6 inches thick).

TABLE R403.1(2)

MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS FOR LIGHT-FRAME CONSTRUCTION WITH BRICK VENEER (inches)^{a, b}

Portions of table not shown remain unchanged.

	STORY AND TYPE OF STRUCTURE WITH BRICK VENEER	LC)AD-B	EARII SOIL	NG VA (psf)		OF
		1500	2000	2500	3000	3500	4000

For SI: 1 inch = 25.4 mm, 1 plf = 14.6 N/m, 1 pound per square foot = 47.9 N/m^2 .

- a. Interpolation allowed. Extrapolation is not allowed.
- Based on 32-foot-wide house with load-bearing center wall that carries half of the tributary attic, and floor framing. For every 2 4 feet of adjustment to the width of the house, add or subtract 2 inches of footing width and 1 inch of footing thickness (but not less than 6 inches thick).

TABLE R403.1(3)

MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS WITH CAST-IN-PLACE CONCRETE OR FULLY GROUTED MASONRY WALL CONSTRUCTION (inches)^{a, b}

Portions of table not shown remain unchanged.

ICC COMMITTEE ACTION HEARINGS ::: April, 2019

For SI: 1 inch = 25.4 mm, 1 plf = 14.6 N/m, 1 pound per square foot = 47.9 N/m^2 .

- a. Interpolation allowed. Extrapolation is not allowed.
- b. Based on 32-foot-wide house with load-bearing center wall that carries half of the tributary attic, and floor framing. For every 24 feet of adjustment to the width of the house add or subtract 2 inches of footing width and 1 inch of footing thickness (but not less than 6 inches thick).

Reason: Builders using the new footing tables introduced in the 2015 IRC have found the footing widths required by the table are significantly larger than those required by previous editions of Table R403.1, which dated back to the CABO codes. In many cases they were wider than an engineering analysis would suggest for a house of the same size, configuration, and foundation conditions. In particular, footing sizes for houses greater than 32 feet in width generated using footnote (b) calling for the footing to be increased by 2 inches in width and 1 inch in depth for every 2 feet of increase in building width were significantly higher than those obtained from the traditional table or by an engineering analysis.

A careful review of the calculations underlying the 2015 IRC tables found a number of cases where load assumptions and determinations were overly conservative, and a few cases where the calculations were actually unconservative. As part of this review, it was noted the spreadsheet used to generate the tables for the 2015 IRC is based on entering the **tributary** width, or half the distance between the exterior bearing wall and an interior bearing wall or ridge board, yet footnote (b) specifies 2 inches of footing width shall be added for every 2 feet of additional **building** width. It was clear from the spreadsheet that increasing the **tributary** width by 2 feet did generally increase the footing width by 2 inches and in many cases the depth by 1 inch. However, a 2 foot increase in **tributary** width actually translates to a 4 foot increase in **building** width. As a result, the footnote leads to users increasing the footing width and depth at twice the rate that is necessary based on the actual increase in loads.

If no other adjustment is made to the tables, changing the footnote to reflect the correct rate at which the footing size and depth increases with **building** width will reduce the overly conservative size of footings generated by the current footnote for houses of portions of houses wider than 32 feet.

Cost Impact: The code change proposal will decrease the cost of construction

The code change will decrease the cost of construction for dwellings or portions thereof larger than 32 feet in width where the current footnote increases footing widths and depths at twice the rate that would be required based on the underlying engineering calculations, let alone the footing width and depth that would be determined based on a dwelling-specific engineering analysis. If code users were taking advantage of the footnote for dwellings narrower than 32 feet costs may increase as the footing size would also be reduced at a slower rate. However, it is not known how many users are refining the footing size to that degree.

Proposal # 4810

RB165-19

RB166-19

IRC®: R403.1.6, R404.1.3.3.6

Proponent: Samuel Steele, representing Seattle Department of Construction and Inspection (SDCI) (samuel.steele@seattle.gov)

2018 International Residential Code

Revise as follows:

R403.1.6 Foundation anchorage. Wood sill plates and wood walls supported directly on continuous foundations shall be anchored to the foundation in accordance with this section. Cold-formed steel framing shall be anchored directly to the foundation or fastened to wood sill plates in accordance with Section R505.3.1 or R603.3.1, as applicable. Wood sill plates supporting cold-formed steel framing shall be anchored to the foundation in accordance with this section.

Wood sole plates at all exterior walls on monolithic slabs, wood sole plates of *braced wall panels* at building interiors on monolithic slabs and all wood sill plates shall be anchored to the foundation with minimum 1/2-inch-diameter (12.7 mm) anchor bolts spaced not greater than 6 feet (1829 mm) on center or *approved* anchors or anchor straps spaced as required to provide equivalent anchorage to 1/2-inch-diameter (12.7 mm) anchor bolts. Bolts shall extend not less than 7 inches (178 mm) into concrete or grouted cells of concrete masonry units. The bolts shall be located in the middle third of the width of the plate. A nut and washer shall be tightened on each anchor bolt. There shall be not fewer than two bolts per plate section with one bolt located not more than 12 inches (305 mm) or less than seven bolt diameters from each end of the plate section. Interior bearing wall sole plates on monolithic slab foundation that are not part of a *braced wall panel* shall be positively anchored with *approved* fasteners. Sill plates and sole plates shall be protected against decay and termites where required by Sections R317 and R318. Anchor bolts shall be located after the concrete is placed and before it has set in accordance with ACI 332.

Exceptions:

- 1. Walls 24 inches (610 mm) total length or shorter connecting offset braced wall panels shall be anchored to the foundation with not fewer than one anchor bolt located in the center third of the plate section and shall be attached to adjacent braced wall panels at corners as shown in Item 9 of Table R602.3(1).
- 2. Connection of walls 12 inches (305 mm) total length or shorter connecting offset *braced wall panels* to the foundation without anchor bolts shall be permitted. The wall shall be attached to adjacent braced wall panels at corners as shown in Item 9 of Table R602.3(1).

R404.1.3.3.6 Form materials and form ties. Forms shall be made of wood, steel, aluminum, plastic, a composite of cement and foam insulation, a composite of cement and wood chips, or other *approved* material suitable for supporting and containing concrete. Forms shall <u>be accurately positioned and secured before</u> <u>placing concrete and shall</u> provide sufficient strength to contain concrete during the concrete placement operation.

Form ties shall be steel, solid plastic, foam plastic, a composite of cement and wood chips, a composite of cement and foam plastic, or other suitable material capable of resisting the forces created by fluid pressure of fresh concrete.

Reason: <u>ACI 332 Residential Code Requirements for Structural Concrete and Commentary</u> is a standard used for residential concrete construction. Many residential foundation installations include "wet-set" anchor bolts to attach wood sills to foundations. This code change will codify a common practice that is not recognized as an

accepted practice in <u>ACI 318 Building Code Requirements for Structural Concrete and Commentary</u> but is allowed in ACI 332. In some cases, "wet-setting" the anchor bolt is the only method by which the bolt can be placed. Insulated concrete forms (ICF's) as well as Concrete Masonry Units (CMU) allow this type of installation. The code change is limited to the wet setting of the anchor bolt connection to the wood sill. Forms that are to be embedded would need to be tied down or secured prior to the concrete pour.

Cost Impact: The code change proposal will decrease the cost of construction It will reduce the labor and time in foundation construction in one and two family dwellings.

Proposal # 4452

RB166-19

RB167-19

IRC®: R403.1.6

Proponent: Terry Kozlowski, representing Southern Nevada Chapter; Cassidy Wilson, representing SN-ICC Member; Amanda Moss, representing SN-ICC Member; Valarie Evans, representing Southern Nevada Chapter

2018 International Residential Code

Revise as follows:

R403.1.6 Foundation anchorage. Wood sill plates and wood walls supported directly on continuous foundations shall be anchored to the foundation in accordance with this section. Cold-formed steel framing shall be anchored directly to the foundation or fastened to wood sill plates in accordance with Section R505.3.1 or R603.3.1, as applicable. Wood sill plates supporting cold-formed steel framing shall be anchored to the foundation in accordance with this section.

Wood sole plates at all exterior walls on monolithic slabs, wood sole plates of *braced wall panels* at building interiors on monolithic slabs and all wood sill plates shall be anchored to the foundation with minimum ¹/₂-inch-diameter (12.7 mm) anchor bolts spaced not greater than 6 feet (1829 mm) on center or *approved* anchors or anchor straps spaced as required to provide equivalent anchorage to ¹/₂-inch-diameter (12.7 mm) anchor bolts. Bolts shall extend not less than 7 inches (178 mm) into concrete or grouted cells of concrete masonry units. The bolts shall be located in the middle third of the width of the plate. A nut and washer shall be tightened on each anchor bolt. There shall be not fewer than two bolts per plate section with one bolt located not more than 12 inches (305 mm) or less than seven bolt diameters from each end of the plate section. Interior bearing wall sole plates on monolithic slab foundation that are not part of a *braced wall panel* shall be positively anchored with *approved* fasteners. Sill plates and sole plates shall be protected against decay and termites where required by Sections R317 and R318.

Exceptions:

- 1. Walls 24 inches (610 mm) total length or shorter connecting offset braced wall panels shall be anchored to the foundation with not fewer than one anchor bolt located in the center third of the plate section and shall be attached to adjacent braced wall panels at corners as shown in Item 9 of Table R602.3(1).
- 2. Connection of walls 12 inches (305 mm) total length or shorter connecting offset *braced wall panels* to the foundation without anchor bolts shall be permitted. The wall shall be attached to adjacent braced wall panels at corners as shown in Item 9 of Table R602.3(1).
- 3. <u>Where field conditions prohibit the placement of the minimum required bottom plate</u> <u>anchors, a *registered design professional* shall provide a design for the attachment in <u>accordance with accepted engineering practice.</u></u>

Reason: Bottom plate is preferentially referenced in lieu of sill plate to match that same evolution in the IBC and AF&PA references. In residential construction many times there are short length wall framing for door openings, exterior built-up columns and post framing and similar construction where it is impractical to comply with the R403.1.6 completely. The exception is provided to explicitly allow a design professional the ability to design appropriate attachment for these conditions. Insertion within the "Foundation anchorage" requirements, section R403.1.6 is to clarify that this change also applies to prescriptive design requirements.

Cost Impact: The code change proposal will not increase or decrease the cost of construction .This proposal simply adds an additional accepted method of attachment by allowing a registered design professional to determine placement of foundation anchorage based on field conditions.

RB167-19

RB168-19

IRC®: TABLE R404.1.1(1), TABLE R404.1.1(2), TABLE R404.1.1(3), TABLE R404.1.1(4), TABLE R404.1.2(1), TABLE R404.1.2(8)

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations (stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

TABLE R404.1.1(1) PLAIN MASONRY FOUNDATION WALLS^f

Portions of table not shown remain unchanged.

		PLAIN MA	SONRY ^a MINIMU THICKNESS (ir	M NOMINAL WALL nches)		
WALL HEIGHT (feet)	BACKFILL HEIGHT ^c (feet)	Soil classes ^b				
		GW, GP, SW and SP	GM, GC, SM, SM-SC and MI	SC, MH, ML-CL		
		Sw and SP	SIM-SC and ML	and morganic CL		

TABLE R404.1.1(2)

8-INCH MASONRY FOUNDATION WALLS WITH REINFORCING WHERE d \ge 5 INCHES^{a, c, f}

Portions of table not shown remain unchanged.

		MINIMUM VERTICAL REINFORCEMENT AND SPACING (INCHES) ^{b, c}								
MAXIMUMHEIGHT OFUNSUPPORTEDWALLUNBALANCED		Soil classes and lateral soil load ^d (psf per foot below grade)								
HEIGHT	HEIGHT BACKFILL [®]	GW, GP, SW and SP soils 30	GM, GC, SM, SM-SC and ML soils 45	SC, ML-CL and inorganic CL soils 60						

TABLE R404.1.1(3)

10-INCH MASONRY FOUNDATION WALLS WITH REINFORCING WHERE d \geq 6.75 **INCHES**^{a, c, f} Portions of table not shown remain unchanged.

		MINIMUM VERTICAL REINFORCEMENT AND SPACING (INCHES) ^{b, c}							
MAXIMUM UNSUPPORTED WALL HEIGHT BACKFILL ^e	Soil classes and later soil load ^d (psf per foot below grade)								
	GW, GP, SW and SP soils 30	GM, GC, SM, SM-SC and ML soils 45	SC, ML-CL and inorganic CL soils 60						

TABLE R404.1.1(4)

12-INCH MASONRY FOUNDATION WALLS WITH REINFORCING WHERE $d \ge 8.75$ INCHES^{a, c, f} Portions of table not shown remain unchanged.

		MINIMUM VERTICAL REINFORCEMENT AND SPACING (INCHES) ^{b, c}							
MAXIMUM UNSUPPORTED WALL HEIGHT BACKFILL ^e	HEIGHT OF UNBALANCED	Soil classes and lateral soil load ^d (psf per foot below grade)							
	GW, GP, SW and SP soils 30	GM, GC, SM, SM-SC and ML soils 45	SC, ML-CL and inorganic CL soils 60						

TABLE R404.1.2(1)

MINIMUM HORIZONTAL REINFORCEMENT FOR CONCRETE BASEMENT WALLS^{a, b}

Portions of table not shown remain unchanged.

MAXIMUM UNSUPPORTED HEIGHT OF BASEMENT WALL	LOCATION OF HORIZONTAL					
HEIGHT (feet)	REINFORCEMENT					

TABLE R404.1.2(8)

MINIMUM VERTICAL REINFORCEMENT FOR 6-, 8-, 10- AND 12-INCH NOMINAL FLAT BASEMENT WALLS^{b, c, d, e, f, h, i, k, n, o}

Portions of table not shown remain unchanged.

MAXIMUM <u>UNSUPPORTED</u> WALL HEIGHT (feet) BACKFILL HEIGHT ^g (feet)	MAXIMUM UNBALANCED	MINIMUM VERTICAL REINFORCEMENT-BAR SIZE AND SPACING (inches)											
		Soil classes ^a and design lateral soil (psf per foot of depth)											
	G S\	àW W,	/, G SP	P, 30	GN S	I, G C a	C, SM nd MI	, SM- - 45	S in	C, N orga	IL-CL anic C	and L 60	
		Minimum nominal wall thickness (inches)											es)
		6	8	10	12	6	8	10	12	6	8	10	12

Reason: To add some uniformity to the IRC Code, the following modification is proposed to the Table headers. Section R404.1 applies to foundation walls, which could be constructed with either masonry or concrete. Since the creation of the IRC, the masonry and concrete wall sections have been written and modified by different interest groups. In some instances there has been a lack of coordination between code provisions for the two materials. This is an attempt to bridge some of those differences so that the users of the IRC can see uniform language across the code.

It is proposed that all affected Tables use the header "MAXIMUM UNSUPPORTED WALL HEIGHT" to describe these similar conditions.

Cost Impact: The code change proposal will not increase or decrease the cost of construction No change in the design requirements, simply an attempt to unify language across material sections.

Proposal # 4605

RB168-19

RB169-19

IRC®: R404.1.2.1

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations (stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

R404.1.2.1 Masonry foundation walls. Concrete masonry and clay masonry foundation walls shall be constructed as set forth in Table R404.1.1(1), R404.1.1(2), R404.1.1(3) or R404.1.1(4) and shall comply with applicable provisions of Section R606. In buildings assigned to Seismic Design Categories D₀, D₁ and D₂, concrete masonry and clay masonry foundation walls shall also comply with Section R404.1.4.1. Rubble stone masonry foundation walls shall be constructed in accordance with Sections R404.1.8 and R606.4.2. Rubble stone masonry walls shall not be used in Seismic Design Categories D₀, D₁ and D₂.

Reason: For rubble stone masonry walls, the limit set forth in this section conflicts with the limitations contained in Section R404.1.8. Section R404.1.8 prohibits rubble stone masonry walls in Seismic Categories D0, D_1 and D_2 , as indicated in this section, but it also prohibits the use in Townhouses in Seismic Design Category C. The intent of this proposal is to align the two code sections. The sentence prior to the struck text already requires the user to refer to Section R404.1.8 for all rubble walls, so there should be no harm in removing the conflicting sentence.

Cost Impact: The code change proposal will not increase or decrease the cost of construction No changes to the design requirements for rubble stone masonry are proposed.

Proposal # 4606

RB169-19

RB170-19

IRC®: R404.1.3.3.6.2 (New)

Proponent: Felix Zemel, representing ICC Region 6 -- North East Regional Coalition (felix@pracademicsolutions.com); Peter Zvingilas, ICC Region 6- North East Regional Coalition, Town of Groton and Voluntown CT (pzvingilas@voluntown.gov)

2018 International Residential Code

Add new text as follows:

R404.1.3.3.6.2 Removal of form ties Form ties shall be removed from the both faces of the foundation walls which enclose basements or other enclosed habitable and occupiable spaces. Remaining holes shall be parged with hydraulic cement, portland cement, or any other approved material.

Reason: Modern concrete foundation installation practices frequently utilize form ties. When the forms are removed, the ends of the form ties are typically removed, and a cone or hole remains in the place of the old end. The metal form tie is still still remaining in the wall, and may be subject to corrosion due to acidity of the soil and exposure to water. Many builders already implement parging and sealing these holes with cementitous products as a best practice. This proposal will codify a current industry best practice. The requirement is only applicable to areas that may be subject to human contact where items can be damaged due to resulting moisture.

Cost Impact: The code change proposal will increase the cost of construction This code change proposal may minimally increase the cost of construction by implementing a current best practice. Where the affected holes are so small, the resulting cost increase is expected to be minimal.

Proposal # 4767

RB170-19

RB171-19

IRC®: R404.1.3.3.7.1

Proponent: Stephanie Young, representing National Council of Structural Engineers Associations (stephanie@mattsonmacdonald.com)

2018 International Residential Code

Revise as follows:

R404.1.3.3.7.1 Steel reinforcement. Steel reinforcement shall comply with the requirements of ASTM A615, A706, or A996. ASTM A996 bars produced from rail steel shall be Type R. In buildings assigned to Seismic Design Category A, B or C, the minimum yield strength of reinforcing steel shall be 40,000 psi (Grade 40) (276 MPa). In buildings assigned to Seismic Design Category D₀, D₁ or D₂, reinforcing steel shall comply with the requirements of ASTM A706 for low-alloy steel with a minimum yield strength of shall be 60,000 psi (Grade 60) (414 MPa).

Reason: The proposal is intended to remove the unnecessary requirement for the use of A706 reinforcing steel in non-demand critical residential foundation walls. ASTM A706 reinforcing steel was developed to address the need to have reinforcing steel with controlled tensile properties for earthquake-resisting structures and controlled chemical composition for weldability. When looking at the American Concrete Institute Building Code Requirements for Structural Concrete (ACI 318-14), deformed bars of either A615, A706 or A996 are allowed for foundation walls (ACI 318-14, Section 20.2.1.3). ACI 318-14, Section 20.2.2.5 places requirements on the reinforcing steel grade for longitudinal reinforcement used to resist earthquake-induced forces in special moment frames, special structural walls and components of structural walls. Residential foundation walls, as those specified in IRC Section R404.1.3 are not elements that are expected to experience the inelastic demands that necessitate the need for the ductility that is provided for with A706 reinforcing.

Bibliography: American Concrete Institute Building Code Requirements for Structural Concrete (ACI 318-14), Sections 20.2.1.3 and 20.2.2.5

Cost Impact: The code change proposal will decrease the cost of construction Will remove requirement for higher grade of reinforcing steel for residential foundations.

Proposal # 4608

RB171-19
RB172-19

IRC: R404.1.10 (New)

Proponent: Josh OConnor, representing Self (joshoc@aol.com)

2018 International Residential Code

Add new text as follows:

R404.1.10 HVAC connection opening. Where a dwelling unit has HVAC equipment or appliances that are located exterior to the dwelling unit and next to the foundation wall, openings through the foundation wall shall be sized so that the supply and return air connections are not reduced in area.

Reason: I have seen that national home builders are only making this opening 32 inches wide, and that is not wide enough for the supply and return air flex ducts to come off of the back of a packaged HVAC unit without having to veer in sharply to enter the foundation opening. This causes pinching which restricts airflow. HVAC manufacturers make the openings/ports on the back of the packaged units further apart than 32 inches. Because the units are forced to sit very close to the house the supply and return air ducts need a straight run off of the unit into the foundation opening, and the opening has to be wide enough to allow this. At a relative's house, I saw the inside of a supply duct pinched to half of its normal diameter because of having to veer off of the unit into a foundation opening that was only 32 inches wide.

Bibliography: .

Cost Impact: The code change proposal will not increase or decrease the cost of construction There will be no change to construction requirements. This is a coordination issue.

Proposal # 3896

RB172-19

RB173-19

IRC®: R406.2

Proponent: donald sivigny, State of MN, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Residential Code

Revise as follows:

R406.2 Concrete and masonry foundation waterproofing. In areas where a high water table or other severe soil-water conditions are known to exist, exterior foundation walls that retain earth and enclose interior spaces and floors below *grade* shall be waterproofed from the higher of (a) the top of the footing or (b) 6 inches (152 mm) below the top of the basement floor, to the finished *grade*. Walls shall be waterproofed in accordance with one of the following:

- 1. Two-ply hot-mopped felts.
- 2. Fifty-five-pound (25 kg) roll roofing.
- 3. Six-mil (0.15 mm) polyvinyl chloride.
- 4. Six-mil (0.15 mm) polyethylene.
- 5. Forty-mil (1 mm) polymer-modified asphalt.
- 6. Sixty-mil (1.5 mm) flexible polymer cement.
- 7. One-eighth-inch (3 mm) cement-based, fiber-reinforced, waterproof coating.
- 8. Sixty-mil (1.5 mm) solvent-free liquid-applied synthetic rubber.

All joints in membrane waterproofing shall be lapped and sealed with an adhesive compatible with the membrane.

Exception: Organic-solvent-based products such as hydrocarbons, chlorinated hydrocarbons, ketones and esters shall not be used for ICF walls with expanded polystyrene form material. Use of plastic roofing cements, acrylic coatings, latex coatings, mortars and pargings to seal ICF walls is permitted. Cold-setting asphalt or hot asphalt shall conform to Type C of ASTM D449. Hot asphalt shall be applied at a temperature of less than 200°F (93°C).

Reason: Section R406 is amended by deleting Items 3 and 4 from the list of approved products that can be used as a waterproofing material. Both 6 mil poly vinyl chloride and 6 mil polyethylene products, do not have the thickness and strength to be effective and durable waterproofing products, during construction of a foundation, especially during backfilling of the foundations. Waterproofing is the formation of a durable and impervious barrier designed to prevent water from entering a specific section or sections of the building envelope system (i.e. Foundations). To be effective, a waterproofing system consists of a durable and continuous material applied to all areas of the foundation, subject to hydrostatic pressure. Typically, during backfill, other materials are improperly placed along the foundation; materials containing debris, frost, sharp stones, rocks and/or items that will rip and tear the 6 mil products. When the back fill materials are not placed properly, 6 mil poly, used as waterproofing, will create durability issues. These holes allow water to get behind the waterproofing material and trap it there. This creates moisture issues on the interior of the building. The other products as listed in the code allowed as a waterproofing material, are all made of heavy materials that are more resistant to tearing or ripping during backfill, such as 50 pound materials or at a minimum, 40 mil in thickness. It is reasonable to take out a product that is not performing as it is intended. This will increase the cost of construction of the home, but this cost will be offset with savings in the reduction of service calls and repairs for moisture mold and mildew issues.

Cost Impact: The code change proposal will increase the cost of construction

This will increase the cost of construction of the Home by requiring a more durable product be used on the foundation wall, However this cost will be offset with any savings in the reduction of service calls and repairs for moisture mold and mildew issues. The Typical Service call costs a Builder a minimum of \$350 on average. Call backs for wet basements or mold and mildew are frequent and numerous, costing builders of today a lot of time and money to solve the Problem. Removal of these non-durable products will save money in the long run and perform better for the building.

Proposal # 5063

RB173-19

RB174-19

IRC®: R406.2

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing self (joe@buildingscience.com)

2018 International Residential Code

Revise as follows:

R406.2 Concrete and masonry foundation waterproofing. In areas where a high water table or other severe soil-water conditions are known to exist, exterior foundation walls that retain earth and enclose interior spaces and floors below *grade* shall be waterproofed from the higher of (a) the top of the footing or (b) 6 inches (152 mm) below the top of the basement floor, to the finished *grade*. Walls shall be waterproofed in accordance with one of the following:

- 1. Two-ply hot-mopped felts.
- 2. Fifty-five-pound (25 kg) roll roofing.
- 3. Six-mil (0.15 mm) polyvinyl chloride.
- 4. Six-mil (0.15 mm) polyethylene.
- 5. Forty-mil (1 mm) polymer-modified asphalt.
- 6. Sixty-mil (1.5 mm) flexible polymer cement.
- 7. One-eighth-inch (3 mm) cement-based, fiber-reinforced, waterproof coating.
- 8. Sixty-mil (1.5 mm) solvent-free liquid-applied synthetic rubber.
- 9. A drainage layer of not less than 4 inches (102 mm) of free draining granular material.
- 10. <u>A drainage layer that provides equivalent performance to not less than 4 inches (102 mm) of free draining granular material.</u>

All joints in membrane waterproofing shall be lapped and sealed with an adhesive compatible with the membrane.

Exception: Organic-solvent-based products such as hydrocarbons, chlorinated hydrocarbons, ketones and es-ters shall not be used for ICF walls with expanded polystyrene form material. Use of plastic roofing cements, acrylic coatings, latex coatings, mortars and pargings to seal ICF walls is permitted. Cold-setting asphalt or hot asphalt shall conform to Type C of ASTM D449. Hot asphalt shall be applied at a temperature of less than 200°F (93°C).

Reason: Obejective:

Provide more options for foundations waterproofing and dampproofing.

This code change provides additonal options for foundation waterproofing and dampproofing.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This provides additional options. Options seldom add costs and sometimes can reduce costs.

Proposal # 5428

RB174-19

RB175-19

IRC: R406.2

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing self (joe@buildingscience.com)

2018 International Residential Code

R406.1 Concrete and masonry foundation dampproofing. Except where required by Section R406.2 to be waterproofed, foundation walls that retain earth and enclose interior spaces and floors below *grade* shall be dampproofed from the higher of (a) the top of the footing or (b) 6 inches (152 mm) below the top of the basement floor, to the finished grade. Masonry walls shall have not less than ³/₈-inch (9.5 mm) Portland cement parging applied to the exterior of the wall. The parging shall be dampproofed in accordance with one of the following:

- 1. Bituminous coating.
- 2. Three pounds per square yard (1.63 kg/m²) of acrylic modified cement.
- 3. One-eighth-inch (3.2 mm) coat of surface-bonding cement complying with ASTM C887.
- 4. Any material permitted for waterproofing in Section R406.2.
- 5. Other *approved* methods or materials.

Exception: Parging of unit masonry walls is not required where a material is approved for direct application to the masonry.

Concrete walls shall be dampproofed by applying any one of the listed dampproofing materials or any one of the waterproofing materials listed in Section R406.2 to the exterior of the wall.

Revise as follows:

R406.2 Concrete and masonry foundation waterproofing. In areas where a high water table or other severe soil-water conditions are known to exist, exterior foundation walls that retain earth and enclose interior spaces and floors below *grade* shall be waterproofed from the higher of (a) the top of the footing or (b) 6 inches (152 mm) below the top of the basement floor, to the finished *grade*. Walls shall be waterproofed in accordance with one of the following:

- 1. Two-ply hot-mopped felts.
- 2. Fifty-five-pound (25 kg) roll roofing.
- 3. Six-mil (0.15 mm) polyvinyl chloride.
- 4. Six-mil (0.15 mm) polyethylene.
- 5. Forty-mil (1 mm) polymer-modified asphalt.
- 6. Sixty-mil (1.5 mm) flexible polymer cement.
- 7. One-eighth-inch (3 mm) cement-based, fiber-reinforced, waterproof coating.
- 8. Sixty-mil (1.5 mm) solvent-free liquid-applied synthetic rubber.

All joints in membrane waterproofing shall be lapped and sealed with an adhesive compatible with the membrane.

Exception Exceptions:

1. Organic-solvent-based products such as hydrocarbons, chlorinated hydrocarbons, ketones and es-ters shall not be used for ICF walls with expanded polystyrene form material. Use of plastic roofing cements, acrylic coatings, latex coatings, mortars and pargings to seal ICF

walls is permitted. Cold-setting asphalt or hot asphalt shall conform to Type C of ASTM D449. Hot asphalt shall be applied at a temperature of less than 200°F (93°C).

- 2. <u>In areas where insulation is installed on the interior side of a foundation wall that extends</u> more than 36 inches (914 mm) below the adjacent exterior ground level, a drainage layer shall be installed adjacent to the exterior surface of the foundation wall in accordance with one of the following:
 - 2.1. <u>A drainage layer of not less than 4 inches (102 mm) of free draining granular</u> <u>material.</u>
 - 2.2. <u>A drainage layer that provides equivalent performance to not less than 4 inches</u> (102 mm) of free draining granular material.

Reason: Objective: Reduce risk for interior basement insulation.

This code chance reduces risk associated with interior insulation strategies in basement foundations. Basement water leakage occurs in 1 in 10 basements. Interior insulation reduces the ability to identify leakage early prior to significant damage occurring.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This code change provides additional options for foundation waterproofing and dampproofing

Proposal # 5429

RB175-19

RB176-19

IRC: R408.1, R408.2, R408.3

Proponent: Ronald Clements Jr, representing Chesterfield County (clementsro@chesterfield.gov)

2018 International Residential Code

SECTION R408 UNDER-FLOOR SPACE

Revise as follows:

R408.1 <u>Ventilation.</u> <u>Moisture Control.</u> The under-floor space between the bottom of the floor joists and the earth under any building (except space occupied by a *basement*) shall have ventilation openings through foundation walls or exterior walls. The minimum net area of ventilation openings shall be not less than 1 square foot (0.0929 m²) for each 150 square feet (14 m²) of under-floor space area, unless the ground surface is covered by a Class 1 vapor retarder material. Where a Class 1 vapor retarder material is used, the minimum net area of ventilation openings shall be not less than 1 square foot (0.0929 m²) for each 1,500 square feet (14 m²) of under-floor space area of ventilation openings shall be not less than 1 square foot (0.0929 m²) for each 1,500 square feet (140 m²) of under-floor space area. One such ventilating opening shall be within 3 feet (914 mm) of each corner of the building. comply with Section R408.2 or Section R408.3.

R408.2 Openings for under-floor ventilation. <u>Ventilation openings through foundation or exterior walls</u> <u>surrounding the under-floor space shall be provided in accordance with this section.</u> The minimum net area of ventilation openings shall be not less than 1 square foot (0.0929 m²) for each 150 square feet (14 m²) of under-floor area. One ventilation opening shall be within 3 feet (915 mm) of each <u>external</u> corner of the building. <u>under-floor space.</u> Ventilation openings shall be covered for their height and width with any of the following materials provided that the least dimension of the covering shall not exceed ¹/₄ inch (6.4 mm), and operational <u>louvers are permitted</u>:

- 1. Perforated sheet metal plates not less than 0.070 inch (1.8 mm) thick.
- 2. Expanded sheet metal plates not less than 0.047 inch (1.2 mm) thick.
- 3. Cast-iron grill or grating.
- 4. Extruded load-bearing brick vents.
- 5. Hardware cloth of 0.035 inch (0.89 mm) wire or heavier.
- 6. Corrosion-resistant wire mesh, with the least dimension being 1/8 inch (3.2 mm) thick.

Exception Exceptions:

- The total area of ventilation openings shall be permitted to be reduced to ¹/_{1,500} of the under-floor area where the ground surface is covered with an *approved* Class I vapor retarder material and the required openings are placed to provide cross ventilation of the space. The installation of operable louvers shall not be prohibited.
- 2. Where the ground surface is covered with an approved class 1 vapor retarder material, ventilation openings are not required to be within 3 feet (915 mm) of each external corner of the under-floor space provided the openings are placed to provide cross ventilation of the space.

R408.3 Unvented crawl space. Ventilation openings in For unvented under-floor spaces specified in Sections R408.1 and R408.2 shall not be required where the following items are shall be provided:

1. Exposed earth is shall be covered with a continuous Class I vapor retarder. Joints of the vapor retarder shall overlap by 6 inches (152 mm) and shall be sealed or taped. The edges of the

vapor retarder shall extend not less than 6 inches (152 mm) up the stem wall and shall be attached and sealed to the stem wall or insulation.

- 2. One of the following is shall be provided for the under-floor space:
 - 2.1. Continuously operated mechanical exhaust ventilation at a rate equal to 1 cubic foot per minute (0.47 L/s) for each 50 square feet (4.7 m²) of *crawl space* floor area, including an air pathway to the common area (such as a duct or transfer grille), and perimeter walls insulated in accordance with Section N1102.2.11 of this code.
 - 2.2. *Conditioned air* supply sized to deliver at a rate equal to 1 cubic foot per minute (0.47 L/s) for each 50 square feet (4.7 m²) of under-floor area, including a return air pathway to the common area (such as a duct or transfer grille), and perimeter walls insulated in accordance with Section N1102.2.11 of this code.
 - 2.3. Plenum in existing structures complying with Section M1601.5, if under-floor space is used as a plenum.
 - 2.4. Dehumidification sized to provide 70 pints (33 liters) of moisture removal per day for every 1,000 square feet (93 m²) of *crawl space* floor area.

Reason: Section R408 was the subject of numerous code changes which resulted in R408.1 and R408.2 being essentially the same code section. R408.1 provides for the 1/1500 vent area provision in the body of the code section and R408.2 provides it in an exception. R408.2 provides for the screening of the openings and R408.1 does not. The provisions in the two sections should be combined into one section. This change accomplishes that and better formats the section for the two methods of treating under-floor spaces: vented and ventless. The code change also addresses some confusion with regards to placement of the vents. R408.1 states to place the vents 3 feet from building corners. The exception to R408.2 allows the vents to be placed to provide cross ventilation, not 3 feet from each corner, when the vapor retarder is used, which was the intent per code change G107.99. When vents are required 3 feet from each corner the current text states corner of the building. The provision for vent placement has been corrected to require the vents 3 feet from the exterior corners of the under-floor space because the current text is confusing to apply when the entire footprint of the dwelling is not on a crawls space.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This code change is not changing the intent, it is a clarification.

Proposal # 5584

RB176-19

RB177-19

IRC: R408.3

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing self (joe@buildingscience.com)

2018 International Residential Code

SECTION R408 UNDER-FLOOR SPACE

Revise as follows:

R408.3 Unvented crawl space. Ventilation openings in under-floor spaces specified in Sections R408.1 and R408.2 shall not be required where the following items are provided:

- 1. Exposed earth is covered with a continuous Class I vapor retarder. Joints of the vapor retarder shall overlap by 6 inches (152 mm) and shall be sealed or taped. The edges of the vapor retarder shall extend not less than 6 inches (152 mm) up the stem wall and shall be attached and sealed to the stem wall or insulation.
- 2. One of the following is provided for the under-floor space:
 - 2.1. Continuously operated mechanical exhaust ventilation at a rate equal to 1 cubic foot per minute (0.47 L/s) for each 50 square feet (4.7 m²) of *crawl space* floor area, including an air pathway to the common area (such as a duct or transfer grille), and perimeter walls insulated in accordance with Section N1102.2.11 of this code.
 - 2.2. *Conditioned air* supply sized to deliver at a rate equal to 1 cubic foot per minute (0.47 L/s) for each 50 square feet (4.7 m²) of under-floor area, including a return air pathway to the common area (such as a duct or transfer grille), and perimeter walls insulated in accordance with Section N1102.2.11 of this code.
 - 2.3. Plenum in existing structures complying with Section M1601.5, if under-floor space is used as a plenum.
 - 2.4. Dehumidification sized to provide 70 pints (33 liters) of moisture removal per day for every 1,000 square feet (93 m²) of *crawl space* floor area. in accordance with the manufacturer's specifications.

Reason: Objective: Address dehumidifier sizing

Rating standards for moisture removal per day are changing (DOE) and moisture performance curves differ for different installations and entering air conditions from manufacturer to manufacturer.

Additionally, requirements may vary from climate to climate. Manufacturers update their sizing charts on a regular basis to take these factors into account.

Cost Impact: The code change proposal will decrease the cost of construction Need for moisture removal is changing.

Proposal # 5431

RB177-19

RB178-19

IRC: R408.8(New)

Proponent: Gary Ehrlich, National Association of Home Builders, representing National Association of Home Builders (gehrlich@nahb.org)

2018 International Residential Code

Add new text as follows:

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

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

Reason: The purpose of this code change is to address issues that have been observed with moisture accumulation in floors above vented and open crawl spaces in hot-humid climates. Water vapor migrating from under-floor spaces in hot-humid climates such as vented crawlspaces or open foundation systems towards cooler and drier indoor spaces is causing mold, mildew, and decay within floor assemblies, especially where an impermeable floor covering or underlayment is used, as moisture can get trapped within the wood subfloor and condense. Such moisture problems have occurred even where crawl spaces are constructed in accordance with the IRC, including the appropriate size and location of ventilation openings and use of Class I vapor retarders on the ground.

This change will require a Class I or Class II vapor retarder between the exposed face of air-permeable insulation materials installed between the floor framing over the crawl space and the under-floor grade. The vapor retarder can be a separate layer of material such as a 6 mil polyethylene sheet, applied over permeable or semi-permeable insulation, or incorporated as part of the insulation, such as a foil facing on fiberglass batts or polyisocyanurate rigid foam, or polypropylene-faced XPS.

An exception is provided for unvented crawl spaces (also referred to as sealed, closed or conditioned crawl spaces) constructed per the IRC. In unvented crawl spaces, mechanical exhaust ventilation, supply ventilation, or dehumidification is provided for the under-floor space to control moisture.

Bibliography: Floors Above Crawl Spaces: Reducing the Risk of Moisture Accumulation within Wood Floor Assemblies for Residential Buildings in Hot-Humid Climates, prepared by Home Innovation Research Labs for National Association of Home Builders, June 2014.

Cost Impact: The code change proposal will increase the cost of construction

The code change will increase cost where a sheet polyethylene vapor retarder, foil-faced rigid or batt insulation, or other materials meeting the properties of a Class I or II vapor retarder would now be required. The additional material cost for 6 mil polyethylene sheet is about 6 to 10 cents per square foot. The additional material cost for 6 batt insulation is about 15 to 30 cents per square foot.

Proposal # 5058

RB178-19

RB179-19

IRC®: TABLE R502.3.3(1), TABLE R502.3.3(2)

Proponent: Paul Coats, American Wood Council, representing American Wood Council (pcoats@awc.org); Philip Line (pline@awc.org)

2018 International Residential Code

Revise as follows:

TABLE R502.3.3(1)

CANTILEVER SPANS FOR FLOOR JOISTS SUPPORTING LIGHT-FRAME EXTERIOR BEARING WALL AND ROOF ONLY^{a, b, c, f, g, h} (Floor Live Load ≤ 40 psf, Roof Live Load ≤ 20 psf)

	MAXIMUM CANTILEVER SPAN (uplift force at backspan support in lbs.) ^{d, e}											
MEMBER & SPACING	Ground Snow Load											
	≤ 20 psf			30 psf		50 psf			70 psf			
	Roof Width			Roof Width			Roof Width			Roof Width		
	24 ft	32 ft	40 ft	24 ft	32 ft	40 ft	24 ft	32 ft	40 ft	24 ft	32 ft	40 ft
2 × 8 @ 12″	20″ (177)	15″ (227)	—	18″ (209)	_	_	—	_	_	_	_	—
2 × 10 @ 16″	29″ (228)	21″ (297)	16″ (364)	26″ (271)	18″ (354)	_	20″ (375)	_	—	_	_	_
2 × 10 @ 12″	36″ (166)	26″ (219)	20″ (270)	34″ (198)	22″ (263)	16″ (324)	26″ (277)	_	—	19″ (356)	—	—
2 × 12 @ 16″	_	32″ (287)	25″ (356)	36″ (263)	29″ (345)	21″ (428)	29″ (367)	20″ (484)	—	23″ (471)	—	—
2 × 12 @ 12″	_	42″ (209)	31″ (263)	_	37″ (253)	27″ (317)	36″ (271)	27″ (358)	17″ (447)	31″ (348)	19″ (462)	_
2 × 12 @ 8″	_	48″ (136)	45″ (169)	_	48″ (164)	38″ (206)	_	40″ (233)	26″ (294)	36″ (230)	29″ (304)	18″ (379)

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

- a. Tabulated values are for clear-span roof supported solely by exterior bearing walls.
- b. Spans are based on No. 2 Grade lumber of Douglas fir-larch, <u>Southern pine</u>, hem-fir, and spruce-pine-fir for repetitive (three or more) members. No.1 or better shall be used for Southern pine.
- c. Ratio of backspan to cantilever span shall be not less than 3:1.
- d. Connections capable of resisting the indicated uplift force shall be provided at the backspan support.
- e. Uplift force is for a backspan to cantilever span ratio of 3:1. Tabulated uplift values are permitted to be reduced by multiplying by a factor equal to 3 divided by the actual backspan ratio provided (3/backspan ratio).
- f. See Section R301.2.2.6, Item 1, for additional limitations on cantilevered floor joists for detached one- and two-family dwellings in Seismic Design Category D, D₁, or D₂ and townhouses in Seismic Design Category C, D, D₁ or D₂.
- g. A full-depth rim joist shall be provided at the unsupported end of the cantilever joists. Solid

blocking shall be provided at the supported end. Where the cantilever length is 24 inches or less and the building is assigned to Seismic Design Category A, B or C, solid blocking at the support for the cantilever shall not be required.

Linear interpolation shall be permitted for building widths and ground snow loads other than h. shown.

CANTILEVER SPANS FOR FLOOR JOISTS SUPPORTING EXTERIOR BALCONY ^{a, b, e, f}							
MEMBER SIZE	SPACING	MAXIMUM CANTILEVER SPAN(uplift force at backspan support in					
		Ground Snow Load					
		≤ 30 psf	50 psf	70 psf			
2 × 8	12″	42″ (139)	39″ (156)	34″ (165)			
2 × 8	16″	36″ (151)	34″ (171)	29″ (180)			
2 × 10	12″	61″ (164)	57″ (189)	49″ (201)			
2 × 10	16″	53″ (180)	49″ (208)	42″ (220)			
2 × 10	24″	43″ (212)	40″ (241)	34″ (255)			
2 × 12	16″	72″ (228)	67″ (260)	57″ (268)			
2 × 12	24″	58″ (279)	54″ (319)	47″ (330)			

TABLE R502.3.3(2)

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa.

- a. Spans are based on No. 2 Grade lumber of Douglas fir-larch, Southern pine, hem-fir, and spruce-pine-fir for repetitive (three or more) members. No.1 or better shall be used for Southern pine.
- Ratio of backspan to cantilever span shall be not less than 2:1. b.
- Connections capable of resisting the indicated uplift force shall be provided at the backspan C. support.
- d. Uplift force is for a backspan to cantilever span ratio of 2:1. Tabulated uplift values are permitted to be reduced by multiplying by a factor equal to 2 divided by the actual backspan ratio provided (2/backspan ratio).
- A full-depth rim joist shall be provided at the unsupported end of the cantilever joists. Solid e. blocking shall be provided at the supported end. Where the cantilever length is 24 inches or less and the building is assigned to Seismic Design Category A, B or C, solid blocking at the support for the cantilever shall not be required.
- f. Linear interpolation shall be permitted for ground snow loads other than shown.

Reason: In 2012, full-scale testing of visually-graded southern pine lumber was underway and preliminary results indicated that some changes to visually-graded southern pine design values would be required. Unfortunately, the testing and certification of design values were not going to be completed in time to submit new design tables to the 2015 IRC, if required. Several 2012 IRC tables, which had been based on minimum design values for No. 2 grade Hem-Fir or SPF lumber, also applied to No. 2 grade southern pine. As an interim recommendation until new design values could be certified, a sentence was added to those tables restricting the applicability to No.1 grade or better southern pine lumber. Since that time, new design values for southern pine have been certified. Bending design values for No. 2 grade southern pine are slightly less than No. 2 grade Hem-Fir lumber, but Modulus of Elasticity (MOE) and shear design values are higher than those for Hem-Fir. Analysis of the tabulated cantilever spans in Tables R502.3.3(1) and R502.3.3(2) has confirmed that the spans were deflection-controlled based on the MOE of No. 2 grade of Hem-Fir lumber. Since No. 2 grade southern

pine lumber has a higher MOE value than No. 2 grade Hem-Fir lumber, there is no need for the added sentence at the end of footnote "b" in Table R502.3.3(1) and at the end of footnote "a" in Table R502.3.3(2) restricting the applicability to No. 1 or better southern pine lumber.

Cost Impact: The code change proposal will decrease the cost of construction

Cost of construction will usually decrease if No. 2 grade Southern Pine is used instead of No. 1 grade as a result of the current restriction on No. 2 grade being removed.

Proposal # 4279

RB179-19

RB180-19

IRC: R505.1.1.1(New), R603.1.1.1(New). R804.1.1.1(New)

Proponent: Jon-Paul Cardin, American Iron and Steel Institute, representing American Iron and Steel Institute (JCardin@steel.org)

2018 International Residential Code

Add new text as follows:

R505.1.1.1 Alternate Applications Cold-formed steel floor framing for buildings exceeding the applicability limits of Section R505.1.1 are permitted to be designed and constructed in accordance with AISI S230, subject to the limits therein.

R603.1.1.1 Alternate Applications. Cold-formed steel wall framing for buildings exceeding the applicability limits of Section R603.1.1 are permitted to be designed and constructed in accordance with AISI S230, subject to the limits therein.

R804.1.1.1 Alternate Applications Cold-formed steel roof and ceiling framing for buildings exceeding the applicability limits of Section R804.1.1 are permitted to be designed and constructed in accordance with AISI S230, subject to the limits therein.

Reason: The intent of this code change proposal is to direct the user AISI S230 – *Standard for Cold-Formed Steel Framing - Prescriptive Method for One- and Two-Family Dwellings (AISI S230-18)* for cold-formed steel framed buildings and structures exceeding the building size limits of 60 feet long and 40 feet wide as prescribed in the *Applicability Limits* of each section (R603.1.1, R505.1.1, R804.1.1).

The 2018 edition of AISI S230 removed the building dimension limitations (in plan dimension) listed in Table A1-1 and moved to an interior braced wall line approach. Rather than significantly expanding the cold-formed steel framing provisions within the IRC, AISI is proposing to direct the user to AISI S230-18 for conditions utilizing interior braced wall lines. While AISI S230 is already permitted as an alternate standard via Section R301.1.1 – *Alternate Provisions,* the proposed language is intended to provide the user with knowledge that additional prescriptive provisions for expanded conditions are available in the AISI S230 standard. The approach proposed in this code change coincides with the approach of AISI over the past few cycles to streamline the cold-formed steel provisions within the IRC.

There is a concurrent code change proposal to update Chapter 44 to AISI S230-18. A draft version of AISI S230-18 is currently available for review at www.aisistandards.org. AISI anticipates the final published edition of AISI S230-18 will be available at the same website free of charge by March 1, 2019.

Bibliography: AISI (2018), *Standard for Cold-Formed Steel Framing - Prescriptive Method for One- and Two-Family*

Dwellings, ANSI/AISI S230-18, American Iron and Steel Institute, Washington D.C.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal does not make technical changes to the provisions of the IRC.

Proposal # 4070

RB180-19

RB181-19

IRC: R505.1.2, FIGURE R505.1.2, R505.1.3, R505.2.2, R505.2.3, TABLE R505.2.3, FIGURE R505.2.3(1), FIGURE R505.2.3(2), R505.2.4, R505.2.5, R505.2.6, R505.2.6.1, FIGURE R505.2.6.2, R505.2.6.3, FIGURE R505.2.6.3, R603.1.2, FIGURE R603.1.2, R603.2.1, R603.2.2, R603.2.3, TABLE R603.2.3, FIGURE R603.2.3(1), FIGURE R603.2.3(2), R603.2.4, R603.2.6, R603.2.6.1, FIGURE R603.2.6.1, R603.2.6.2, R603.2.6.3, FIGURE R603.2.6.1, R603.2.6.3, R804.1.2, FIGURE R804.2.3, FIGURE R603.2.6, R804.2.3, FIGURE R804.2.6, R804

Proponent: Jon-Paul Cardin, American Iron and Steel Institute, representing American Iron and Steel Institute (JCardin@steel.org)

2018 International Residential Code

Revise as follows:

R505.1.2 In-line framing. Where supported by cold-formed steel-framed walls in accordance with Section R603, cold-formed steel floor framing shall be constructed with floor joists located in-line with load-bearing studs located below the joists in accordance with <u>the tolerances specified in AISI S240 Section B1.2.3.</u> Figure R505.1.2 and the tolerances specified as follows:

- 1. The maximum tolerance shall be ³/₄inch (19.1 mm) between the centerline of the horizontal framing member and the centerline of the vertical framing member.
- 2. Where the centerline of the horizontal framing member and bearing stiffener are located to one side of the centerline of the vertical framing member, the maximum tolerance shall be ¹/₈inch (3 mm) between the web of the horizontal framing member and the edge of the vertical framing member.

Delete without substitution:



For SI: 1 inch = 25.4 mm.

FIGURE R505.1.2 IN-LINE FRAMING

Revise as follows:

R505.1.3 Floor trusses. Cold-formed steel trusses shall be designed, braced and installed in accordance with AISI <u>S230 Section D8.</u> <u>S240. In the absence of specific bracing requirements, trusses shall be braced in accordance with accepted industry practices, such as the SBCA *Cold-Formed Steel Building Component Safety Information (CFSBCSI), Guide to Good Practice for Handling, Installing & Bracing of Cold-Formed Steel Trusses*. Truss members shall not be notched, cut or altered in any manner without an *approved* design.</u>

R505.2 Structural framing. Load-bearing cold-formed steel floor framing members shall be in accordance with this section.

Revise as follows:

R505.2.1 Material. Load-bearing cold-formed steel framing members shall be cold formed to shape from structural quality sheet steel complying with the requirements of ASTM A1003: Structural Grades 33 Type H and 50 Type H. AISI S240 Section A3.

R505.2.2 Corrosion protection. Load-bearing cold-formed steel framing shall have a metallic coating complying with <u>AISI S240 Section A4.</u> ASTM A1003 and one of the following:

- 1. Not less than G 60 in accordance with ASTM A653.
- 2. Not less than AZ 50 in accordance with ASTM A792.

R505.2.3 Dimension, thickness and material grade. Load-bearing cold-formed steel floor framing members shall comply with Figure R505.2.3(1) and with the dimensional and thickness requirements specified in Table R505.2.3. Additionally, all C-shaped sections shall have a minimum flange width of 1.625 inches (41 mm) and a maximum flange width of 2 inches (51 mm). The minimum lip size for C-shaped sections shall be ¹/₂ inch (12.7)

mm). Track sections shall comply with Figure R505.2.3(2) and shall have a minimum flange width of 1⁴/₄ inch (32 mm). Minimum Grade 33 ksi steel shall be used wherever 33 mil and 43 mil thicknesses are specified. Minimum Grade 50 ksi steel shall be used wherever 54 and 68 mil thicknesses are specified. AISI S230 Section A4.3 and material grade requirements as specified in AISI S230 Section A4.4.

Delete without substitution:

TABLE R505.2.3 COLD-FORMED STEEL JOIST SIZES AND THICKNESS

MEMBER DESIGNATION [®]	WEB DEPTH(inches)	MINIMUM BASE STEEL THICKNESSmil (inches)
550S162-t	5.5	33 (0.0329), 43 (0.0428), 54 (0.0538), 68 (0.0677)
800S162-t	8	33 (0.0329), 43 (0.0428), 54 (0.0538), 68 (0.0677)
1000S162-t	10	43 (0.0428), 54 (0.0538), 68 (0.0677)
1200S162-t	12	4 3 (0.0428), 54 (0.0538), 68 (0.0677)

For SI: 1 inch = 25.4 mm, 1 mil = 0.0254 mm.

a. The member designation is defined by the first number representing the member depth in 0.01 inch, the letter "S" representing a stud or joist member, the second number representing the flange width in 0.01 inch, and the letter "t" shall be a number representing the minimum base metal thickness in mils.



FIGURE R505.2.3(1) C-SHAPED SECTION



FIGURE R505.2.3(2) TRACK SECTION

Revise as follows:

R505.2.4 Identification. Load-bearing cold-formed steel framing members shall <u>meet the product identification</u> requirements of AISI S240 Section A5.5. have a legible *label*, stencil, stamp or embossment with the following information as a minimum:

- 1. Manufacturer's identification.
- 2. Minimum base steel thickness in inches (mm).
- 3. Minimum coating designation.
- 4. Minimum yield strength, in kips per square inch (ksi) (MPa).

R505.2.6 Web holes, web hole reinforcing and web hole patching. Web holes , web hole reinforcing, and web hole patching shall be in accordance with this section. in floor framing members shall comply with the conditions as prescribed in AISI S230 Section A4.5. Web holes not in conformance with the conditions as prescribed in AISI S230 Section A4.5 shall be reinforced in accordance with the provisions of AISI S230 Section A4.6 or patched in accordance with the provisions of AISI S230 Section A4.7.

Delete without substitution:

R505.2.6.1 Web holes. Web holes in floor joists shall comply with all of the following conditions:

- 1. Holes shall conform to Figure R505.2.6.1.
- 2. Holes shall be permitted only along the centerline of the web of the framing member.
- 3. Holes shall have a center-to-center spacing of not less than 24 inches (610 mm).
- 4. Holes shall have a web hole width not greater than 0.5 times the member depth, or $2^{+}/_{2}$ inches (64.5 mm).
- 5. Holes shall have a web hole length not exceeding $4^{+}/_{2}$ inches (114 mm).
- 6. Holes shall have a minimum distance between the edge of the bearing surface and the edge of the web hole of not less than 10 inches (254 mm).

Framing members with web holes not conforming to these requirements shall be reinforced in accordance with Section R505.2.6.2, patched in accordance with Section R505.2.6.3 or designed in accordance with accepted engineering practices.



For SI: 1 inch = 25.4 mm.

FIGURE R505.2.6.1 FLOOR JOIST WEB HOLES

R505.2.6.2 Web hole reinforcing. Reinforcement of web holes in floor joists not conforming to the requirements of Section R505.2.6.1 shall be permitted if the hole is located fully within the center 40 percent of the span and the depth and length of the hole does not exceed 65 percent of the flat width of the web. The reinforcing shall be a steel plate or C-shaped section with a hole that does not exceed the web hole size limitations of Section R505.2.6.1 for the member being reinforced. The steel reinforcing shall be not thinner than the thickness of the receiving member and shall extend not less than 1 inch (25 mm) beyond all edges of the hole. The steel reinforcing shall be fastened to the web of the receiving member with No. 8 screws spaced not more than 1 inch (25 mm) center-to-center along the edges of the patch with minimum edge distance of ¹/₂ inch (12.7 mm).

R505.2.6.3 Hole patching. Patching of web holes in floor joists not conforming to the requirements in Section R505.2.6.1 shall be permitted in accordance with either of the following methods:

- 1. Framing members shall be replaced or designed in accordance with accepted engineering practices where web holes exceed the following size limits:
 - 1.1. The depth of the hole, measured across the web, exceeds 70 percent of the flat width of the web.
 - **1.2.** The length of the hole, measured along the web, exceeds 10 inches (254 mm) or the depth of the web, whichever is greater.
- 2. Web holes not exceeding the dimensional requirements in Section R505.2.6.3, Item 1, shall be patched with a solid steel plate, stud section or track section in accordance with Figure R505.2.6.3. The steel patch shall, as a minimum, be of the same thickness as the receiving member and shall extend not less than 1 inch (25 mm) beyond all edges of the hole. The steel patch shall be fastened to the web of the receiving member with No. 8 screws spaced not more than 1 inch (25 mm) center-to-center along the edges of the patch with minimum edge distance of ⁻¹/₂ inch (12.7 mm).



FIGURE R505.2.6.3 FLOOR JOIST WEB HOLE PATCH

Revise as follows:

R603.1.2 In-line framing. Load-bearing cold-formed steel studs constructed in accordance with Section R603 shall be located in-line with joists, trusses and rafters in accordance with <u>the tolerances specified in AISI S240</u> <u>Section B1.2.3.</u> Figure R603.1.2 and the tolerances specified as follows:

- 1. The maximum tolerance shall be ³/₄inch (19 mm) between the centerline of the horizontal framing member and the centerline of the vertical framing member.
- 2. Where the centerline of the horizontal framing member and bearing stiffener is located to one side of the centerline of the vertical framing member, the maximum tolerance shall be ¹/₈inch (3 mm) between the web of the horizontal framing member and the edge of the vertical framing member.

Delete without substitution:



FIGURE R603.1.2 IN-LINE FRAMING

R603.2 Structural framing. Load-bearing cold-formed steel wall framing members shall be in accordance with this section.

Revise as follows:

R603.2.1 Material. Load-bearing cold-formed steel framing members shall be cold formed to shape from structural- quality sheet steel complying with the requirements of ASTM A1003: Structural Grades 33 Type H and 50 Type H. AISI 240 Section A3.

R603.2.2 Corrosion protection. Load-bearing cold-formed steel framing shall have a metallic protective coating complying with <u>AISI S240 Section A4. ASTM A1003 and one of the following:</u>

- 1. Not less than G 60 in accordance with ASTM A653.
- 2. Not less than AZ 50 in accordance with ASTM A792.

R603.2.3 Dimension, thickness and material grade. Load-bearing cold-formed steel wall framing members shall comply with Figure R603.2.3(1) and with the dimensional and thickness requirements specified in Table R603.2.3. Additionally, C-shaped sections shall have a minimum flange width of 1⁵/₈ inches (41 mm) and a maximum flange width of 2 inches (51 mm). The minimum lip size for C-shaped sections shall be ¹/₂ inch (12.7 mm). Track sections shall comply with Figure R603.2.3(2) and shall have a minimum flange width of 1¹/₄ inches (32 mm). Minimum Grade 33 ksi steel shall be used wherever 33 mil and 43 mil thicknesses are specified. Minimum Grade 50 ksi steel shall be used wherever 54 and 68 mil thicknesses are specified. AISI S230 Section A4.3 and material grade requirements as specified in AISI S230 Section A4.4.

Delete without substitution:

TABLE R603.2.3 LOAD-BEARING COLD-FORMED STEEL STUD SIZES AND THICKNESSES

MEMBER DESIGNATION [®]	WEB DEPTH(inches)	MINIMUM BASE STEEL THICKNESS mil (inches)
350S162-t	3.5	33 (0.0329), 43 (0.0428), 54 (0.0538)
550S162-t	5.5	33 (0.0329), 43 (0.0428), 54 (0.0538), 68 (0.0677)

For SI: 1 inch = 25.4 mm; 1 mil = 0.0254 mm.

a. The member designation is defined by the first number representing the member depth in hundredths of an inch, "S" representing a stud or joist member, the second number representing the flange width in hundredths of an inch, and the letter "t" shall be a number representing the minimum base metal thickness in mils.



FIGURE R603.2.3(1) C-SHAPED SECTION



FIGURE R603.2.3(2) TRACK SECTION

Revise as follows:

R603.2.4 Identification. Load-bearing cold-formed steel framing members shall <u>meet the product identification</u> requirements of AISI S240 Section A5.5. have a legible label, stencil, stamp or embossment with the following information as a minimum:

- 1. Manufacturer's identification.
- 2. Minimum base steel thickness in inches (mm).
- 3. Minimum coating designation.
- 4. Minimum yield strength, in kips per square inch (ksi) (MPa).

R603.2.6 Web holes, web hole reinforcing and web hole patching. Web holes , web hole reinforcing and web hole patching shall be in accordance with this section. in wall studs shall comply with the conditions a prescribed in AISI S230 Section A4.5. Web holes not in conformance with the conditions as prescribed in AISI S230 Section A4.5 shall be reinforced in accordance with the provisions of AISI S230 Section A4.6 or patched in accordance with the provisions of AISI S230 Section A4.6 or patched in accordance with the provisions of AISI S230 Section A4.7.

Delete without substitution:

R603.2.6.1 Web holes. Web holes in wall studs and other structural members shall comply with all of the following conditions:

- 1. Holes shall conform to Figure R603.2.6.1.
- 2. Holes shall be permitted only along the centerline of the web of the framing member.
- 3. Holes shall have a center-to-center spacing of not less than 24 inches (610 mm).
- 4. Holes shall have a web hole width not greater than 0.5 times the member depth, or $1^{+}/_{2}$ inches (38 mm).
- 5. Holes shall have a web hole length not exceeding $4^{+}/_{2}$ inches (114 mm).
- 6. Holes shall have a minimum distance between the edge of the bearing surface and the edge of the web hole of not less than 10 inches (254 mm).

Framing members with web holes not conforming to the above requirements shall be reinforced in accordance with Section R603.2.6.2, patched in accordance with Section R603.2.6.3 or designed in accordance with accopted engineering practice.



For SI: 1 inch = 25.4 mm.

FIGURE R603.2.6.1 WALL STUD WEB HOLES

R603.2.6.2 Web hole reinforcing. Web holes in gable endwall studs not conforming to the requirements of Section R603.2.6.1 shall be permitted to be reinforced if the hole is located fully within the center 40 percent of the span and the depth and length of the hole does not exceed 65 percent of the flat width of the web. The reinforcing shall be a steel plate or C-shaped section with a hole that does not exceed the web hole size limitations of Section R603.2.6.1 for the member being reinforced. The steel reinforcing shall be the same thickness as the receiving member and shall extend not less than 1 inch (25 mm) beyond all edges of the hole. The steel reinforcing shall be fastened to the web of the receiving member with No. 8 screws spaced not more than 1 inch (25 mm) center-to-center along the edges of the patch with minimum edge distance of ¹/₂ inch (12.7 mm).

R603.2.6.3 Hole patching. Web holes in wall studs and other structural members not conforming to the requirements in Section R603.2.6.1 shall be permitted to be patched in accordance with either of the following methods:

- 1. Framing members shall be replaced or designed in accordance with accepted engineering practice where web holes exceed the following size limits:
 - **1.1.** The depth of the hole, measured across the web, exceeds 70 percent of the flat width of the web.
 - **1.2.** The length of the hole measured along the web exceeds 10 inches (254 mm) or the depth of the web, whichever is greater.
- 2. Web holes not exceeding the dimensional requirements in Section R603.2.6.3, Item 1, shall be patched with a solid steel plate, stud section or track section in accordance with Figure R603.2.6.3. The steel patch shall, as a minimum, be the same thickness as the receiving member and shall extend not less than 1 inch (25 mm) beyond all edges of the hole. The steel patch shall be fastened to the web of the receiving member with No. 8 screws spaced not more than 1 inch (25 mm) center to-center along the edges of the patch with a minimum edge distance of ⁻¹/₂ inch (12.7 mm).



For SI: 1 inch = 25.4 mm.

FIGURE R603.2.6.3 WALL STUD WEB HOLE PATCH

Revise as follows:

R804.1.2 In-line framing. Cold-formed steel roof framing constructed in accordance with Section R804 shall be located in line with load-bearing studs in accordance with <u>the tolerances specified in AISI S240 Section B1.2.3.</u> Figure R804.1.2 and the tolerances specified as follows:

- 1. The maximum tolerance shall be ³/₄inch (19.1 mm) between the centerline of the horizontal framing member and the centerline of the vertical framing member.
- 2. Where the centerline of the horizontal framing member and bearing stiffener are located to one side of the centerline of the vertical framing member, the maximum tolerance shall be ¹/₈inch (3.2 mm) between the web of the horizontal framing member and the edge of the vertical framing member.

Delete without substitution:



For SI: 1 inch = 25.4 mm.

FIGURE R804.1.2 IN-LINE FRAMING

R804.2 Structural framing. Load-bearing, cold-formed steel roof framing members shall be in accordance with this section.

Revise as follows:

R804.2.1 Material. Load-bearing, cold-formed steel framing members shall be cold formed to shape from structural quality sheet steel complying with the requirements of ASTM A1003, Structural Grades 33 Type H and 50 Type H. AISI S240 Section A3.

R804.2.2 Corrosion protection. Load-bearing, cold-formed steel framing shall have a metallic protective coating complying with <u>AISI S240 Section A4.</u> ASTM A1003 and one of the following:

- 1. Not less than G 60 in accordance with ASTM A653.
- 2. Not less than AZ 50 in accordance with ASTM A792.

R804.2.3 Dimension, thickness and material grade. Load-bearing, cold-formed steel roof framing members shall comply with Figure R804.2.3(1) and with the dimensional and thickness requirements specified in Table R804.2.3. Additionally, C-shaped sections shall have a minimum flange width of 1.625 inches (41 mm) and a maximum flange width of 2 inches (51 mm). The minimum lip size for C-shaped sections shall be ¹/₂ inch (12.7 mm). Tracks shall comply with Figure R804.2.3(2) and shall have a minimum flange width of 1⁺/₄ inches (32 mm). Minimum Grade 33 ksi steel shall be used wherever 33 mil and 43 mil thicknesses are specified. Minimum Grade 50 ksi steel shall be used wherever 54 and 68 mil thicknesses are specified. AISI S230 Section A4.3 and material grade requirements as specified in AISI S230 Section A4.4.

Delete without substitution:

TABLE R804.2.3

LOAD-BEARING COLD-FORMED STEEL ROOF FRAMING MEMBER SIZES AND THICKNESSES

MEMBER DESIGNATION [®]	WEB DEPTH (inches)	MINIMUM BASE STEEL THICKNESS mil (inches)
350S162-t	3.5	33 (0.0329), 43 (0.0428), 54 (0.0538)
550S162-t	5.5	33 (0.0329), 43 (0.0428), 54 (0.0538), 68 (0.0677)
800S162-t	8	33 (0.0329), 43 (0.0428), 54 (0.0538), 68 (0.0677)
1000S162-t	10	43 (0.0428), 54 (0.0538), 68 (0.0677)
1200S162-t	12	43 (0.0428), 54 (0.0538), 68 (0.0677)

For SI: 1 inch = 25.4 mm

a. The member designation is defined by the first number representing the member depth in hundredths of an inch, the letter "s" representing a stud or joist member, the second number representing the flange width in hundredths of an inch and the letter "t" shall be a number representing the minimum base metal thickness in mils.



C-SHAPED SECTION



TRACK SECTION

Revise as follows:

R804.2.4 Identification. Load-bearing, cold-formed steel framing members shall <u>meet the product identification</u> requirements of AISI S240 Section A5.5. have a legible *label*, stencil, stamp or embossment with the following information as a minimum:

- 1. Manufacturer's identification.
- 2. Minimum base steel thickness in inches (mm).
- 3. Minimum coating designation.
- 4. Minimum yield strength, in kips per square inch (ksi) (MPa).

R804.2.6 Web holes, web hole reinforcing and web hole patching. Web holes , web hole reinforcing and web hole patching shall be in accordance with this section. in roof or ceiling joists shall comply with the conditions as prescribed in AISI S230 Section A4.5. Web holes not in conformance with the conditions of AISI S230 Section A4.5 shall be reinforced in accordance with the provisions of AISI S230 Section A4.6 or patched in accordance with the provisions of AISI S230 Section A4.7.

Delete without substitution:

R804.2.6.1 Web holes. Web holes in roof framing members shall comply with all of the following conditions:

- 1. Holes shall conform to Figure R804.2.6.1.
- 2. Holes shall be permitted only along the centerline of the web of the framing member.
- 3. Center-to-center spacing of holes shall be not less than 24 inches (610 mm).
- 4. The web hole width shall be not greater than one-half the member depth, or 2¹/₂ inches (64 mm).
- 5. Holes shall have a web hole length not exceeding $4^{4}/_{2}$ inches (114 mm).
- 6. The minimum distance between the edge of the bearing surface and the edge of the web hole shall be not less than 10 inches (254 mm).

Framing members with web holes not conforming to Items 1 though 6 shall be reinforced in accordance with Section R804.2.6.2, patched in accordance with Section R804.2.6.3 or designed in accordance with accepted engineering practices.



For SI: 1 inch = 25.4 mm.

FIGURE R804.2.6.1 ROOF FRAMING MEMBER WEB HOLES

R804.2.6.2 Web hole reinforcing. Reinforcement of web holes in ceiling joists not conforming to the requirements of Section R804.2.6.1 shall be permitted if the hole is located fully within the center 40 percent of the span and the depth and length of the hole do not exceed 65 percent of the flat width of the web. The reinforcing shall be a steel plate or C-shaped section with a hole that does not exceed the web hole size limitations of Section R804.2.6.1 for the member being reinforced. The steel reinforcing shall be the same thickness as the receiving member and shall extend not less than 1 inch (25 mm) beyond all edges of the hole. The steel reinforcing shall be fastened to the web of the receiving member with No. 8 screws spaced not greater than 1 inch (25 mm) center to center along the edges of the patch with minimum edge distance of ⁴/₂ inch (12.7 mm).

R804.2.6.3 Hole patching. Patching of web holes in roof framing members not conforming to the requirements in Section R804.2.6.1 shall be permitted in accordance with either of the following methods:

- 1. Framing members shall be replaced or designed in accordance with accepted engineering practices where web holes exceed either of the following size limits:
 - 1.1. The depth of the hole, measured across the web, exceeds 70 percent of the flat width of the web.
 - **1.2.** The length of the hole measured along the web, exceeds 10 inches (254 mm) or the depth of the web, whichever is greater.
- 2. Web holes not exceeding the dimensional requirements in Section R804.2.6.3, Item 1, shall be patched with a solid steel plate, stud section or track section in accordance with Figure R804.2.6.3. The steel patch shall, as a minimum, be the same thickness as the receiving member and shall extend not less than 1 inch (25 mm) beyond all edges of the hole. The steel patch shall be fastened to the web of the receiving member with No. 8 screws spaced not greater than 1 inch (25 mm) center-to-center along the edges of the patch with minimum edge distance of ¹/₂ inch (12.7 mm).



For SI: 1 inch = 25.4 mm.

FIGURE R804.2.6.3 ROOF FRAMING MEMBER WEB HOLE PATCH

Revise as follows:

R804.3.6 Roof trusses. Cold-formed steel trusses shall be designed and installed in accordance with AISI S240. In the absence of specific bracing requirements, trusses shall be braced in accordance with accepted industry practices, such as the SBCA *Cold-Formed Steel Building Component Safety Information (CFSBCSI) Guide to Good Practice for Handling, Installing & Bracing of Cold-Formed Steel Trusses*. <u>S230 Section F6.</u> Trusses shall be connected to the top track of the load-bearing wall in accordance with Table R804.3, either with two the required number of No. 10 screws applied through the flange of the truss or by using a 54-mil (1.37 mm) clip angle with two the required number of No. 10 screws in each leg.

Reason: This proposal is the continuation of efforts by the American Iron and Steel Institute (AISI) over the past few ICC code cycles to streamline and consolidate cold-formed steel framing provisions within the International Residential Code (IRC). The intent of this proposal is to direct the user to AISI S230 – *Standard for Cold-Formed Steel Framing - Prescriptive Method for One- and Two-Family Dwellings (AISI S230-18)* and AISI S240 - *North American Standard for Cold-Formed Steel Structural Framing* (AISI S240-15) for cold-formed steel framing provisions related to specific material and member requirements.

The provisions in this proposal identified to be replaced with reference to AISI standards are repeated verbatim in all cold-formed steel framing sections in the IRC (Sections 505, 603, and 804). In addition, all of the provisions proposed to be replaced are identical to those being referenced in AISI standards. Therefore, there are no technical changes being proposed through this code change proposal. To aid the committee, an AISI-IRC cross reference document has been attached to this proposal. The cross reference document displays all sections from AISI standards being referenced to the corresponding IRC sections (in the order as they appear in the code change proposal).

There is a concurrent proposal updating the reference in Chapter 44 to AISI S230-18.

AISI standards are free of charge and available for download at www.aisistandards.org.

Bibliography: AISI (2018), *Standard for Cold-Formed Steel Framing - Prescriptive Method for One- and Two-Family*

Dwellings, ANSI/AISI S230-18, American Iron and Steel Institute, Washington D.C. AISI (2015), *North American Standard for Cold-Formed Steel Structural Framing*, ANSI/AISI S240-15, American Iron and Steel Institute, Washington D.C. **Cost Impact:** The code change proposal will not increase or decrease the cost of construction This code change does not propose any technical changes to the material requirements or framing practices for cold-formed steel framing. The intention is simply to direct the user to the appropriate AISI standard for the necessary information. All AISI standards are available free of charge at www.aisistandards.org.

Proposal # 3968

RB181-19

RB182-19

IRC: R506.1, CHAPTER 44 PTI (New)

Proponent: Amy Dowell, representing Post-Tensioning Institute (amy.dowell@post-tensioning.org); Stephen Szoke, representing American Concrete Institute (steve.szoke@concrete.org)

2018 International Residential Code

Revise as follows:

R506.1 General. Concrete slab-on-ground floors, other than post-tensioned slab-on-ground floors, shall be designed and constructed in accordance with the provisions of this section or ACI 332. Floors-Such floors shall be a minimum 3¹/₂ inches (89 mm) thick (for expansive soils, see Section R403.1.8). Post-tensioned concrete slabs-on-ground floors placed on expansive or stable soils shall be designed and constructed in accordance with PTI DC—10.5. The specified compressive strength of concrete shall be as set forth in Section R402.2.

Add new text as follows:

PTI

Post-Tensioning Institute 38800 Country Club Drive Farmington Hills MI 48331 US

Add new standard(s) as follows:

PTI

Post-Tensioning Institute 38800 Country Club Drive Farmington Hills MI 48331 US

DC—10.5-12: Standard Requirements for Design and Analysis of Shallow Concrete Foundations on Expansive and Stable Soils

Reason: There are currently no provisions for designing post-tensioned slabs on expansive or stable soils in IRC. This proposal includes a new reference to PTI standard PTI DC10.5-19, Standard Requirements for Design and Analysis of Shallow Concrete Foundations on Expansive and Stable Soils. Post-tensioned slabs are commonly used on stable soils for crack control as well as reduced slab thickness and nonprestressed steel use. This reduction in material use typically offsets the cost of the post-tensioning materials and labor.

Additional documentation can be viewed at <u>http://ww2.post-tensioning.org/PDF_FILES/190102-DC10.5-</u> Expansive and Stable Soils-Public Review.pdf.

Bibliography: .

Cost Impact: The code change proposal will not increase or decrease the cost of construction Post-tensioned slabs are commonly used on expansive and stable soils for crack control as well as reduced slab thickness and nonprestressed steel use. This reduction in material use typically offsets the cost of the posttensioning materials and labor.

Staff Analysis: The referenced standard, PTI-DC-10.5-12, is currently referenced in other 2018 I-codes.

RB182-19
RB183-19

IRC®: R506.2.3, ASTM Chapter 44 (New)

Proponent: Terry Kozlowski, representing Southern Nevada Chapter; Valarie Evans, representing Southern Nevada Chapter; Amanda Moss, representing SN-ICC Member; Cassidy Wilson, representing SN-ICC Member; Nenad Mirkovic, representing City of Las Vegas

2018 International Residential Code

Revise as follows:

R506.2.3 Vapor retarder. A 6-mil-10-mil (0.006 0.010 inch; $152 \mu m$ 0.254 mm) polyethylene or *approved* vapor retarder <u>conforming to ASTM E 1745 Class A requirements</u> with joints lapped not less than 6 inches (152 mm) shall be placed between the concrete floor slab and the base course or the prepared subgrade where a base course does not exist.

Exception: The vapor retarder is not required for the following:

- 1. Garages, utility buildings and other unheated *accessory structures*.
- 2. For unheated storage rooms having an area of less than 70 square feet (6.5 m²) and carports.
- 3. Driveways, walks, patios and other flatwork not likely to be enclosed and heated at a later date.
- 4. Where *approved* by the *building official*, based on local site conditions.

Add new text as follows:



ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

E1745-17: Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

Reason: By coordinating the requirements for the vapor retarder with the American Concrete Institute (ACI) recommendations, this proposal will promote consistency across codes and standards for various moisture conditions.

Bibliography: ACI 302.2R Section 9.3:

"...ACI 302.1R recommends a minimum 10 mil (0.25 mm) vapor retarder thickness when the retarder is protected with a granular fill. When the vapor retarder is not protected by a fill, some specifiers require a 15 mil (0.38 mm) thickness or greater..."

Cost Impact: The code change proposal will increase the cost of construction This proposal will increase the cost of construction for an average 2,200 square foot single-family dwelling by an estimated \$28.60, based on cost analysis in current market conditions.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM E1745-17, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

RB183-19

RB184-19

IRC: R507.1, TABLE R507.3.1, R507.4, TABLE R507.4, R507.5, TABLE R507.5, TABLE R507.5(2) (New), TABLE R507.5(3) (New), TABLE R507.5(4) (New), R507.6, TABLE R507.6, TABLE R507.9.1.3(1)

Proponent: Deck Code Coalition, Charles Bajnai (chair), North American Deck and Railing Assoc (NADRA), Retired from Chesterfield County, VA, representing Deck Code Coalition (csbajnai@gmail.com)

2018 International Residential Code

Revise as follows:

R507.1 Decks. Wood-framed decks shall be in accordance with this section. <u>Decks shall be designed for the</u> <u>live load required in Section R301.5 or the ground snow load indicated in Table R301.2(1), whichever is greater.</u> For decks using materials and conditions not prescribed in this section, refer to Section R301.

3	8	С	SOIL BEARING CAPACITY ^{B, c, d}													
LIVE OR		2	1500 pst			2000 psf			2500°		2	≥ 3000 pst				
GROUND SNOW LOAD ^b	TRIBUTARY AREA ^e	Side of a square footing	Diameter of a round footing	Thickness 1	Side of a square footing	Diameter of a round footing	Thickness I	Side of a square footing	Diameter of a round-footing	Thickness	Side of a square footing	Diameter of a round footing	Thickness			
(psf)	(sq. ft.)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)			
40	5	Z	8	6	Z	8	6	Z	<u>B</u>	6			77			
	20	42 <u>10</u>	44 <u>10</u>	6	42 9	44 9	6	42	44	6	12 <u>7</u>	44 8	6			
	40	14	46 <u>14</u>	<u>6 7</u>	12	44 <u>13</u>	6	42	44	6	4 <u>2</u> <u>10</u>	44 <u>10</u>	6			
	60	17	49 <u>18</u>	6 2	15	17 - <u>15</u>	<u>6 8</u>	43	46	6	12	44 <u>13</u>	6			
	80	20	22	7	17	19	6	45	47	6	14	16	6			
	100	22	25	8	19	21	6	47	49	6	15	17	6			
	120	24	27	9	21	23	7	19	21	6	17	19	6			
	140	26	29	10	22	25	8	20	23	7	18	21	6			
	160	28	31	11	24	27	9	21	24	8	20	22	7			
50	5	Z	8	6	Z	8	6	Z	8	6						
	20	42 11	44 <u>12</u>	6	42 <u>10</u>	44 <u>10</u>	6	42	44	6	<u>42 8</u>	<u>44 8</u>	6			
	40	45 <u>16</u>	47 <u>16</u>	6	13 <u>8</u>	45 <u>14</u>	6	42	44	6	12 <u>11</u>	<u>44 12</u>	6			
	60	19	21	6	16	18	6	44	46	6	13	15	6			
	80	21	24	8	19	21	6	47	19	6	15	17	6			
	100	24	27	9	21	23	7	49	24	6	17	19	6			
	120	26	30	10	23	26	8	20	23	¥	19	21	6			
	140	28	32	11	25	28	9	22	25	8	20	23	7			
	160	30	34	12	26	30	10	24	27	9	21	24	8			
60	5	Z	8	6	Z	8	6	Z	8	6						
	20	12	14 <u>13</u>	6	42-11	14 <u>11</u>	6	+12	44	6	42 9	44 9	6			
	40	46 <u>17</u>	<u> 19 18</u>	.6	44 <u>15</u>	16 <u>15</u>	<u>6 8</u>	13	44	6	12	14 <u>13</u>	6			
	60	20	23	7	17	20	6	46	48	6	14	16	6			
	80	23	26	9	20	23	7	48	20	6	16	19	6			
	100	26	29	10	22	25	8	20	23	7	18	21	6			
	120	28	32	11	25	28	9	22	25	8	20	23	7			
	140	31	35	12	27	30	10	24	27	9	22	24	8			
	160	33	37	13	28	32	11	25	29	40	23	26	9			

TABLE R507.3.1 MINIMUM FOOTING SIZE FOR DECKS

70	5	Z	8	6	Z	8	6	Z	8	6			
	20	42 13	14	<u>6 Z</u>	42 11	44 12	6	42	-14	6	42 9	44 <u>10</u>	6
	40	18	20 19	6 9	45 16	17	6 §	44	45	6	42 13	14	6 <u>7</u>
	60	21	24	8	19	21	6	47	49	6	15	17	6
	80	25	28	9	21	24	8	49	22	7	18	20	6
	100	28	31	11	24	27	9	21	24	8	20	22	7
	120	30	34	12	26	30	10	24	27	9	21	24	8
	140	33	37	13	28	32	11	25	29	-10	23	26	9
	160	35	40	15	30	34	12	27	31	41	25	28	9

For SI: 1 inch = 25.4 mm, 1 square foot = 0.0929 m², 1 pound per square foot = 0.0479 kPa.

a. Interpolation permitted, extrapolation not permitted.

b. Based on highest load case: Dead + Live or Dead + Snow.

c. Assumes minimum square footing to be 12 inches x 12 inches x 6 inches for 6 x 6 post Footing dimensions shall allow complete bearing of the post.

d. If the support is a brick or CMU pier, the footing shall have a minimum 2-inch projection on all sides.

e. Area, in square feet, of deck surface supported by post and footings.

f. Minimum thickness shall only apply to plain concrete footings.

R507.4 Deck posts. For single-level wood-framed decks with beams sized in accordance with Table R507.5, <u>wood</u> deck post size shall be in accordance with Table R507.4.

Delete and substitute as follows:

TABLE R507.4 DECK POST HEIGHT^a

DECK POST SIZE	MAXIMUM HEIGHT ^{a, b} (feet-inches)
4 × 4	6-9°
4 × 6	8
6 × 6	14
8 × 8	-14

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

- a. Measured to the underside of the beam.
- b. Based on 40 psf live load.
- c. The maximum permitted height is 8 feet for one-ply and two-ply beams. The maximum permitted height for three-ply beams on post cap is 6 feet 9 inches.

TABLE R507.4 DECK POST HEIGHT

			<u>T</u> F	RIBUT	ARY AI	REA ^g	<u>l, h</u> (S	qft)		
LOADS b	1001	<u>POST</u>	<u>20</u>	<u>40</u>	<u>60</u>	<u>80</u>	<u>100</u>	<u>120</u>	<u>140</u>	<u>160</u>
<u>(psf)</u>	<u>SPECIES ^c</u>	<u>SIZE^d</u>		<u>MAX</u>	IMUM	DECK	POS	T HEI	<u>GHT ª</u>	
					Ĺ	feet-in	ches)		
		<u>4 x 4</u>	14-0	<u>13-8</u>	<u>11-0</u>	<u>9-5</u>	<u>8-4</u>	<u>7-5</u>	<u>6-9</u>	<u>6-2</u>
	Southern Pine	<u>4 x 6</u>	<u>14-0</u>	<u>14-0</u>	<u>13-11</u>	<u>12-0</u>	<u>10-8</u>	<u>9-8</u>	<u>8-10</u>	<u>8-2</u>
	<u>Southern rine</u>	<u>6 x 6</u>	<u>14-0</u>	<u>14-0</u>	<u>11-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>
		<u>8 x 8</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>
	<u>Douglas Fir ^e,</u>	<u>4 x 4</u>	<u>14-0</u>	<u>13-6</u>	<u>10-10</u>	<u>9-3</u>	<u>8-0</u>	<u>7-0</u>	<u>6-2</u>	<u>5-3</u>
	Lisus fin A	<u>4 x 6</u>	<u>14-0</u>	<u>14-0</u>	<u>13-10</u>	<u>11-10</u>	<u>10-6</u>	<u>9-5</u>	<u>8-7</u>	<u>7-10</u>
<u>40</u>	<u>Hem-tir ≃,</u>	<u>6 x 6</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>
1.5	<u>SPF ^e</u>	<u>8 x 8</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>
Live	<u>Redwood ^{<u>f</u>},</u>	<u>4 x 4</u>	<u>14-0</u>	<u>12-1</u>	<u>9-8</u>	<u>8-22</u>	<u>7-1</u>	<u>6-2</u>	<u>5-3</u>	<u>4-2</u>
Load	Marka Callar f	<u>4 x 6</u>	<u>14-0</u>	<u>14-0</u>	<u>12-4</u>	<u>10-7</u>	<u>9-4</u>	<u>8-4</u>	<u>7-7</u>	<u>6-11</u>
	Western Cedars	<u>6 x 6</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>12-10</u>
	<u>Ponderosa Pine ^f,</u>									
	<u>Red Pine ^f</u>	<u>8 x 8</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>
		<u>4 x 4</u>	<u>14-0</u>	<u>12-2</u>	<u>9-10</u>	<u>8-5</u>	<u>7-5</u>	<u>9-7</u>	<u>5-11</u>	<u>5-4</u>
	Southern Pine	<u>4 x 6</u>	<u>14-0</u>	<u>14-0</u>	<u>12-6</u>	10-9	<u>9-6</u>	<u>8-7</u>	<u>7-10</u>	<u>7-3</u>
		6 x 6	14-0	14-0	14-0	14-0	14-0	14-0	14-0	13-4
		<u>8 x 8</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	14-0	<u>14-0</u>	<u>14-0</u>
		<u>4 x 4</u>	<u>14-0</u>	12-1	<u>9-8</u>	<u>8-2</u>	<u>7-1</u>	<u>6-2</u>	<u>5-3</u>	<u>4-2</u>
		<u>4 x 6</u>	<u>14-0</u>	<u>14-0</u>	<u>12-4</u>	<u>10-7</u>	<u>9-4</u>	<u>8-4</u>	<u>7-7</u>	<u>6-11</u>
	<u>Douglas Fir ^e,</u>	<u>6 x 6</u>	<u>14-0</u>	14-0	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>12-10</u>
<u>50</u> <u>Ground</u>	<u>Hem-fir ^e,</u> <u>SPF ^e</u>	<u>8 x 8</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>
<u>Snow</u>					<u> </u>	<u> </u>		<u> </u>		<u> </u>

Load

	<u>Redwood ^f,</u>	<u>4 x 4</u>	<u>14-0</u>	<u>11-8</u>	<u>9-0</u>	<u>6-10</u>	<u>3-7</u>	NP	NP	<u>NP</u>
		<u>4 x 6</u>	<u>14-0</u>	<u>14-0</u>	<u>12-0</u>	<u>10-0</u>	<u>8-6</u>	<u>7-0</u>	<u>5-3</u>	<u>NP</u>
	<u>Western Cedars ^I,</u>	<u>6 x 6</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>10-8</u>	<u>2-4</u>
	<u>Ponderosa Pine ^f.</u> Red Pine ^f	<u>8 x 8</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>
		1 × 1	14.0	44 4	0 1 1	77	67	E 10	5.0	1.6
	Southern Pine	<u>4 x 4</u>	14-0	11-1	<u>8-11</u>	<u>/-/</u>	<u>6-7</u> 0 7	<u>5-10</u> 7 0	<u>5-2</u>	<u>4-6</u>
		<u>4 x o</u>	14-0	14-0	11-4	<u>9-9</u>	<u>8-7</u>	14.0	<u>/-1</u>	<u>0-0</u>
		<u>0 x 0</u>	14-0	14-0	14-0	14-0	14-0	14-0	12-9	11-2
		<u>8 X 8</u>	14-0	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>
	<u>Dougias Fir≚,</u>	<u>4 x 4</u>	14-0	10-11	<u>8-8</u>	<u>7-3</u>	<u>6-2</u>	<u>5-0</u>	<u>3-7</u>	
60	Hem-fir ^e .	<u>4 x 6</u>	<u>14-0</u>	<u>13-11</u>	<u>112-</u>	<u>9-7</u>	<u>8-4</u>	<u>7-5</u>	<u>6-8</u>	<u>5-11</u>
<u>60</u>	<u> </u>	<u>6 x 6</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>12-2</u>	<u>10-2</u>
<u>Ground</u> <u>Snow</u>	<u>SPF</u> ^e	<u>8 x 8</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>
<u>Load</u>	<u>Redwood ^f,</u>	<u>4 x 4</u>	<u>14-0</u>	<u>10-6</u>	<u>7-9</u>	<u>4-7</u>	<u>NP</u>	<u>NP</u>	NP	<u>NP</u>
		<u>4 x 6</u>	14-0	13-7	<u>10-9</u>	<u>8-9</u>	<u>7-0</u>	4-9	NP	NP
	Western Cedars f,	<u>6 x 6</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>9-9</u>	NP	<u>NP</u>
	<u>Ponderosa Pine f,</u> <u>Red Pine f</u>	<u>8 x 8</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>
		<u>4 x 4</u>	<u>14-0</u>	<u>10-2</u>	<u>8-2</u>	<u>6-11</u>	<u>5-11</u>	<u>5-2</u>	4-4	<u>3-4</u>
	Southern Pine	<u>4 x 6</u>	<u>14-0</u>	<u>12-11</u>	<u>10-5</u>	<u>8-11</u>	<u>7-10</u>	<u>7-1</u>	<u>6-5</u>	<u>5-10</u>
		<u>6 x 6</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>12-9</u>	<u>10-11</u>	<u>8-7</u>
		<u>8 x 8</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>
		<u>4 x 4</u>	14-0	10-1	<u>7-11</u>	<u>6-6</u>	<u>5-3</u>	3-7	NP	NP
		<u>4 x 6</u>	<u>14-0</u>	<u>12-10</u>	<u>10-3</u>	<u>8-9</u>	<u>7-7</u>	<u>6-8</u>	<u>5-10</u>	<u>4-11</u>
		<u>6 x 6</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	12-2	<u>9-9</u>	<u>5-9</u>
	<u>Douglas Fir ^e,</u>									
<u>70</u>	<u>Hem-fir ^e,</u>	<u>8 x 8</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>
<u>Ground</u>	<u>SPF ^e</u>									
<u>Snow</u>										
Load										

<u>Redwood ^f,</u>	<u>4 x 4</u>	14-0	<u>9-5</u>	<u>6-5</u>	<u>NP</u>	NP	NP	<u>NP</u>	<u>NP</u>
	<u>4 x 6</u>	<u>14-0</u>	<u>12-6</u>	<u>9-8</u>	<u>7-7</u>	<u>5-3</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
Western Cedars 1,	<u>6 x 6</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>14-0</u>	<u>10-8</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
<u>Ponderosa Pine ^f,</u>									
<u>Red Pine ^f</u>	<u>8 x 8</u>	<u>14-0</u>							

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa., NP = Not Permitted

a. Measured from the underside of the beam to top of footing or pier.

b. 10 psf dead load. Snow load not assumed to be concurrent with live load.

c. No. 2 grade, wet service factor included.

d. Notched deck posts shall be sized to accommodate beam size per in accordance with Section R507.5.2

e. Includes incising factor.

f. Incising factor not included.

g. Area, in square feet, of deck surface supported by post and footings.

h. Interpolation permitted. Extrapolation not permitted.

Revise as follows:

R507.5 Deck Beams. Maximum allowable spans for wood deck beams, as shown in Figure R507.5, shall be in accordance with Table R507.5..<u>Tables R507.5(1) through R507(4)</u>. Beam plies shall be fastened with two rows of 10d (3-inch \times 0.128-inch) nails minimum at 16 inches (406 mm) on center along each edge. Beams shall be permitted to cantilever at each end up to one-fourth of the allowable beam span. Deck beams of other materials shall be permitted where designed in accordance with accepted engineering practices.

TABLE R507.5(1) MAXIMUM DECK BEAM SPAN LENGTHS^{a, b, g}(feet - inches) - 40 PSF LIVE LOAD ^c

		DECK JOIST SPAN ^{a, <u>i</u>}							
		LESS THAN OR EQUAL TO:							
BEAM	BEAM								
		(feet)							
SPECIES ^{e_d}	SIZE ^d e	6	8	10	12	14	16	18	
			MAXI	MUM B	EAM	SPAN	<u>a, b, f</u>		
				<u>(feet</u>	-inch	<u>es)</u>			

		4-11	1-0	3.7	3-3	3-0	2-10	2-8
	1 – 2 × 6	47	4-0	5-7	5-5	3-0	2-10	0.7
		<u>4-7</u>						<u>2-7</u>
	1 – 2 × 8	5-11	5-1	4-7	4-2	2-10 -	3-7	3-5
		<u>5-10</u>		<u>4-6</u>	4-1	3-10		<u>3-4</u>
	1 – 2 × 10	7-0	6-0	5-5	4-11	4-7	4-3	4-0
		<u>6-11</u>		<u>5-4</u>		<u>4-6</u>		
	1 – 2 × 12	8-3	7-1	6-4	5-10	5-5	5-0	4-9
		<u>8-2</u>			<u>5-9</u>	<u>5-4</u>		<u>4-8</u>
	2-2×6	6-11	5-11	5-4	4-10	4-6	4-3	4-0
	2 2 0	<u>6-10</u>	0.11	<u>5-3</u>			<u>4-2</u>	<u>3-11</u>
	2 – 2 × 8	8-9	7-7	6-9	6-2	5-9	5-4	5-0
	_	<u>8-8</u>	<u>7-6</u>			<u>5-8</u>		
			9-0		7-4			6-0
	2 – 2 × 10	10-4		8-0		6-9	6-4	
			<u>8-11</u>		<u>7-3</u>			<u>5-11</u>
	2 - 2 - 12	12-2	10-7	9-5	8-7	8-0	7-6	7-0
Southern p_P ine		122	<u>10-6</u>	00		<u>7-11</u>	<u>7-5</u>	
		8-2				5-8		5-0
	3 – 2 × 6		7-5	6-8	6-1		5-3	
		<u>8-6</u>				<u>5-7</u>		<u>4-11</u>
		10-10	9-6	8-6	7-9	7-2		6- 4
	3 – 2 × 8		o -	0.5	7.0		6-8	
		<u>10-11</u>	<u>9-5</u>	<u>8-5</u>	<u>/-8</u>	<u>/-1</u>		<u>6-3</u>
	2 2 10	13-0	11-3	10.0	9-2	8-6	7 1 1	7-6
	$3 - 2 \times 10$	12-11	11-2	10-0	9-1	8-5	7-11	7-5
		<u> </u>	13-2	11-10	<u> </u>	<u> </u>		<u>· </u>
	3 – 2 × 12	15-3	100		10-9		9-4	
			<u>13-2</u>	<u>11-9</u>		<u>9-11</u>		<u>8-9</u>

	3 × 6 or 2	5-5	4-8	4-2	3-10	3-6	3-1	2-9
	<u>1</u> – 2 x 6	<u>4-1</u>	<u>3-6</u>	<u>3-0</u>	<u>2-6</u>	<u>2-1</u>	<u>1-10</u>	<u>1-7</u>
	3 × 8 or 2	6-10	5-11	5- 4	4-10	4 -6	4-1	3-8
	1–2 × 8	5-6	4-9	4-0	3-3	2-9	2-5	2-1
		8-4	7-3	6-6	5-11	5-6	5-1	<u> </u>
	1-2 × 10	6-8	5-10	5-1	4-2	3-6	3-1	2-8
		9-8	8-5	7-6	6-10	6-4	<u></u>	5-7
	$1 - 2 \times 12$	7-9	6-9	6-0	5-1	4-4	3-9	3-3
Douglas fir-larch ^e g,	<u>4 × 6</u>	<u>5</u>	<u>5-6</u>	<u></u>	<u> </u>	<u>+ +</u> 4-2	<u>3-11</u>	<u>3-8</u>
hHem-fir ^e ⊈.	2276	6 1	5.2	4.0	1 1	10	20	2.2
	$\frac{2 - 2 \times 0}{4 \times 8}$	<u>0-1</u> 8-5	<u> </u>	<u>4-9</u> 6-6	<u>4-4</u> 5-11	<u>4-0</u> 5-6	<u>5-0</u>	<u>3-3</u> 4-10
Spruce-pine-fir ^e g,	4 ^ 0	00	/ 0	00			52	- 10
redwood,	<u>2-2 x 8</u>	<u>8-2</u>	<u>7-1</u>	<u>6-4</u>	<u>5-9</u>	<u>5-4</u>	<u>4-10</u>	<u>4-3</u>
	4 × 10	9-11	8-7	7-8	7-0	6-6	6-1	5-8
western cedars,	<u>2-2 x 10</u>	<u>10-0</u>		<u>7-9</u>				<u>5-5</u>
ponderosa pine^f,	4 × 12	11-5	9-11	8-10	8-1	7-6	7-0	6-7
red pine ^f	<u>2-2 x 12</u>	<u>11-7</u>	<u>10-0</u>	<u>8-11</u>	<u>8-2</u>	<u>7-7</u>	<u>7-1</u>	
		7-4	6-8	6-0	5-6	5-1	4-9	4 -6
	3 – 2 × 6	7.9	67	5 11	5 5	5.0	1 9	15
		<u>7-0</u>	<u>0-7</u> 0 6	<u> </u>	<u>5-5</u> 6 1 1	<u> </u>	<u>4-0</u>	<u>4-5</u> 5.0
	3 – 2 × 8	5-0	0-0	7-7	0-11	0-5	0-0	5-0
		<u>10-3</u>	<u>8-10</u>	<u>7-11</u>	<u>7-3</u>	<u>6-8</u>	<u>6-3</u>	<u>5-11</u>
	$3 - 2 \times 10$	12-0	10-5	9-4	8-6	7-10	7-4	6-11
	0 2 × 10	<u>12-6</u>	<u>10-10</u>	<u>9-8</u>	<u>8-10</u>	<u>8-2</u>	<u>7-8</u>	<u>7-2</u>
	0 0 10	13-11	12-1	10-9	9-10	9-1	8-6	8-1
	3-2×12	<u>14-6</u>	<u>12-7</u>	<u>11-3</u>	<u>10-3</u>	<u>9-6</u>	<u>8-11</u>	<u>8-5</u>
	<u>1 - 2 x 6</u>	<u>4-2</u>	<u>3-7</u>	<u>3-1</u>	<u>2-7</u>	<u>2-2</u>	<u>1-10</u>	<u>1-8</u>
	1 - 2 x 8	5-4	4-7	4-1	3-4	2-10	2-6	2-2
	<u>1 - 2 x 10</u>	<u>6-6</u>	<u>5-7</u>	<u>5-0</u>	<u>4-3</u>	<u>3-8</u>	<u>3-2</u>	<u>2-9</u>
<u>Redwood ^{<u>h</u>,}</u>	<u>1 - 2 x 12</u>	<u>7-6</u>	<u>6-6</u>	<u>5-10</u>	<u>5-3</u>	<u>4-5</u>	<u>3-10</u>	<u>3-5</u>
	<u>2 - 2 x 6</u>	<u>6-2</u>	<u>5-4</u>	<u>4-10</u>	<u>4-5</u>	<u>4-1</u>	<u>3-9</u>	<u>3-4</u>
<u>Western Cedars ⁿ,</u>	<u>2 - 2 x 8</u>	<u>7-10</u>	<u>6-10</u>	<u>6-1</u>	<u>5-7</u>	<u>5-2</u>	<u>4-10</u>	<u>4-4</u>
Ponderosa Pine <u>h</u>	<u>2 - 2 x10</u>	<u>9-7</u>	<u>8-4</u>	<u>7-5</u>	<u>6-9</u>	<u>6-3</u>	<u>5-10</u>	<u>5-6</u>
	<u>2 - 2 x 12</u>	<u>11-1</u>	<u>9-8</u>	<u>8-7</u>	<u>7-10</u>	<u>7-3</u>	<u>6-10</u>	<u>6-5</u>
<u>Red Pine ^h</u>								

<u>3 - 2 x 6</u>	<u>7-8</u>	<u>6-9</u>	<u>6-0</u>	<u>5-6</u>	<u>5-1</u>	<u>4-9</u>	<u>4-6</u>
<u>3 - 2 x 8</u>	<u>9-10</u>	<u>8-6</u>	<u>7-7</u>	<u>6-11</u>	<u>6-5</u>	<u>6-0</u>	<u>5-8</u>
<u>3 - 2 x 10</u>	<u>12-0</u>	<u>10-5</u>	<u>9-4</u>	<u>8-6</u>	<u>7-10</u>	<u>7-4</u>	<u>6-11</u>
<u>3 - 2 x 12</u>	<u>13-11</u>	<u>12-1</u>	<u>10-9</u>	<u>9-10</u>	<u>9-1</u>	<u>8-6</u>	<u>8-1</u>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg.

a. Interpolation permitted. Extrapolation not permitted.

b. Beams supporting a single span of joists with or without cantilever.

<u>c.</u> a. Ground snow load, live load = 40 psf, dead <u>Dead</u> load = 10 psf, L/Δ = 360 at main span, L/Δ = 180 at cantilever with a 220-pound point load applied at the end. Snow load not assumed to be concurrent with live load.

b.Beams supporting deck joists from one side only.

d. e.No. 2 grade, wet service factor included.

e. d-Beam depth shall be equal to or greater than or equal to depth of joists with the depth intersecting joist for a flush beam condition connection.

f. g. Beam cantilevers are limited to the adjacent beam's span divided by 4.

g. e.Includes incising factor.

h. f. Northern species. Incising factor not included.

i. Deck joist span as shown in Figure R507.5

Add new text as follows:

TABLE R507.5(2) MAXIMUM DECK BEAM SPAN - 50 PSF GROUND SNOW LOAD [⊆]

		<u>DECK JOIST SPAN (feet)^{a, j}</u>							
<u>BEAM</u>	<u>BEAM</u>	<u>6</u>	<u>8</u>	<u>10</u>	<u>12</u>	<u>14</u>	<u>16</u>	<u>18</u>	
<u>SPECIES ^d</u>	<u>SIZE ^e</u>	MAXIN	MUM	BEAN	<u>1 SPA</u>	<u>.N</u>			
		<u>(feet-i</u>	nches	<u>s) a, b,</u>	<u>f</u>				
	<u>1-2x6</u>	<u>4-2</u>	<u>3-8</u>	<u>3-3</u>	<u>2-11</u>	<u>2-9</u>	<u>2-5</u>	<u>2-2</u>	
	<u>1-2x8</u>	<u>5-4</u>	<u>4-7</u>	<u>4-1</u>	<u>3-9</u>	<u>3-6</u>	<u>3-3</u>	<u>2-10</u>	
	<u>1-2x10</u>	<u>6-4</u>	<u>5-6</u>	<u>4-11</u>	<u>4-6</u>	<u>4-2</u>	<u>3-10</u>	<u>3-8</u>	
	<u>1-2x12</u>	<u>7-6</u>	<u>6-5</u>	<u>5-9</u>	<u>5-3</u>	<u>4-10</u>	<u>4-7</u>	<u>4-3</u>	
	<u>2-2x6</u>	<u>6-3</u>	<u>5-5</u>	<u>4-10</u>	<u>4-5</u>	<u>4-1</u>	<u>3-10</u>	<u>3-7</u>	
	<u>2-2x8</u>	<u>7-11</u>	<u>6-10</u>	<u>6-2</u>	<u>5-7</u>	<u>5-2</u>	<u>4-10</u>	<u>4-7</u>	

Southern Pine

	<u>2-2x10</u>	<u>9-5</u>	<u>8-2</u>	<u>7-3</u>	<u>6-8</u>	<u>6-2</u>	<u>5-9</u>	<u>5-5</u>
	2-2x12	<u>11-1</u>	<u>9-7</u>	<u>8-7</u>	7-10	7-3	6-9	<u>6-5</u>
	<u>3-2x6</u>	<u>7-10</u>	<u>6-9</u>	<u>6-1</u>	<u>5-6</u>	<u>5-1</u>	<u>4-9</u>	<u>4-6</u>
	<u>3-2x8</u>	<u>9-11</u>	<u>8-7</u>	<u>7-8</u>	<u>7-0</u>	<u>6-6</u>	<u>6-16</u>	<u>5-9</u>
	<u>3-2x10</u>	<u>11-9</u>	<u>10-2</u>	<u>9-1</u>	<u>8-4</u>	<u>7-8</u>	<u>7-2</u>	<u>6-9</u>
	<u>3-2x12</u>	13-11	12-0	10-9	<u>9-10</u>	<u>9-1</u>	8-6	<u>8-0</u>
	<u>1-2x6</u>	<u>3-9</u>	<u>3-3</u>	<u>2-6</u>	<u>2-1</u>	<u>1-9</u>	<u>1-6</u>	<u>1-4</u>
	<u>1-2x8</u>	<u>5-0</u>	<u>4-3</u>	<u>3-4</u>	<u>2-9</u>	<u>2-3</u>	<u>2-0</u>	<u>1-9</u>
Develop fin Joneh (<u>1-2x10</u>	<u>6-1</u>	<u>5-4</u>	<u>4-3</u>	<u>3-6</u>	<u>2-11</u>	<u>2-6</u>	<u>2-3</u>
Dougias fir-larch 9,	<u>1-2x12</u>	<u>7-1</u>	<u>6-2</u>	<u>5-2</u>	<u>4-3</u>	<u>3-7</u>	<u>3-1</u>	<u>2-9</u>
Hem-fir ^g ,	<u>2-2x6</u>	<u>5-7</u>	4-10	4-4	3-11	<u>3-6</u>	3-0	<u>2-8</u>
	<u>2-2x8</u>	<u>7-5</u>	<u>6-5</u>	<u>5-9</u>	<u>5-3</u>	<u>4-7</u>	<u>4-0</u>	<u>3-6</u>
<u>Spruce-pine-fir ^g</u>	<u>2-2x10</u>	<u>9-1</u>	<u>7-10</u>	<u>7-0</u>	<u>6-5</u>	<u>5-11</u>	<u>5-1</u>	<u>4-6</u>
	<u>2-2x12</u>	<u>10-7</u>	<u>9-2</u>	<u>8-2</u>	<u>7-5</u>	<u>6-11</u>	<u>6-3</u>	<u>5-6</u>
	<u>3-2x6</u>	<u>7-0</u>	6-0	<u>5-5</u>	4-11	4-7	<u>4-3</u>	<u>4-0</u>
	<u>3-2x8</u>	<u>9-4</u>	<u>8-1</u>	<u>7-3</u>	<u>6-7</u>	<u>6-1</u>	<u>5-8</u>	<u>5-4</u>
	<u>3-2x10</u>	<u>11-5</u>	<u>9-10</u>	<u>8-10</u>	<u>8-1</u>	<u>7-5</u>	<u>7-0</u>	<u>6-7</u>
	<u>3-2x12</u>	<u>13-3</u>	<u>11-6</u>	<u>10-3</u>	<u>9-5</u>	<u>8-8</u>	<u>8-1</u>	<u>7-8</u>
	<u>1-2x6</u>	<u>3-10</u>	<u>3-4</u>	<u>2-7</u>	2-2	1-10	1-7	<u>1-5</u>
	<u>1-2x8</u>	<u>4-10</u>	<u>4-2</u>	<u>3-5</u>	<u>2-10</u>	<u>2-4</u>	<u>2-1</u>	<u>1-10</u>
	<u>1-2x10</u>	<u>5-11</u>	<u>5-1</u>	<u>4-4</u>	<u>3-7</u>	<u>3-0</u>	<u>2-8</u>	<u>2-4</u>
<u>Redwood ^{<u>h</u>,}</u>	<u>1-2x12</u>	<u>6-10</u>	<u>5-11</u>	<u>5-4</u>	<u>4-4</u>	<u>3-8</u>	<u>3-2</u>	<u>2-10</u>
	<u>2-2x6</u>	<u>5-8</u>	<u>4-11</u>	<u>4-5</u>	<u>4-0</u>	<u>3-7</u>	<u>3-1</u>	<u>2-9</u>
<u>Western Cedars ⁿ,</u>	<u>2-2x8</u>	<u>7-2</u>	<u>6-3</u>	<u>5-7</u>	<u>5-1</u>	<u>4-8</u>	<u>4-1</u>	<u>3-8</u>
Ponderosa Pine <u>h</u>	<u>2-2x10</u>	<u>8-9</u>	<u>7-7</u>	<u>6-9</u>	<u>6-2</u>	<u>5-9</u>	<u>5-3</u>	<u>4-8</u>
	<u>2-2x12</u>	<u>10-2</u>	<u>8-10</u>	<u>7-10</u>	<u>7-2</u>	<u>6-8</u>	<u>6-3</u>	<u>5-8</u>
<u>Red Pine ^{<u>h</u>}</u>	<u>3-2x6</u>	<u>7-1</u>	<u>6-2</u>	<u>5-6</u>	<u>5-0</u>	<u>4-8</u>	<u>4-4</u>	<u>4-1</u>
	<u>3-2x8</u>	<u>9-0</u>	<u>7-9</u>	<u>6-11</u>	<u>6-4</u>	<u>5-11</u>	<u>5-6</u>	<u>5-2</u>
	<u>3-2x10</u>	<u>11-0</u>	<u>9-6</u>	<u>8-6</u>	<u>7-9</u>	<u>7-2</u>	<u>6-9</u>	<u>6-4</u>
	<u>3-2x12</u>	<u>12-9</u>	<u>11-0</u>	<u>9-10</u>	<u>9-0</u>	<u>8-4</u>	<u>7-9</u>	<u>7-4</u>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg.

a. Interpolation allowed. Extrapolation is not allowed.

b. Beams supporting a single span of joists with or without cantilever.

<u>c. Dead load = 10 psf, L/Δ = 360 at main span, L/Δ = 180 at cantilever. Snow load not assumed to be concurrent with live load.</u>

d. No. 2 grade, wet service factor included.

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e. Beam depth shall be equal to or greater than the depth of intersecting joist for a flush beam connection.
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f. Beam cantilevers are limited to the adjacent beam's span divided by 4.

g. Includes incising factor

h. Incising factor not included.

i. Deck joist span as shown in Figure R507.5

TABLE R507.5(3) MAXIMUM DECK BEAM SPAN - 60 PSF GROUND SNOW LOAD [©]

		DECK JOIST SPAN a, h						
BEAM	BEAM							
		<u>(feet)</u>		[[[[
<u>SPECIES d</u>	<u>SIZE ^e</u>	<u>6</u>	<u>8</u>	<u>10</u>	<u>12</u>	<u>14</u>	<u>16</u>	<u>18</u>
		MAXIN	ЛUМ	BEAM	1 SPA	<u>N a, b</u>	<u>, f</u>	1
	<u>1-2x6</u>	<u>3-11</u>	<u>3-4</u>	<u>3-0</u>	<u>2-9</u>	<u>2-5</u>	<u>2-1</u>	<u>1-10</u>
	<u>1-2x8</u>	<u>4-11</u>	<u>4-3</u>	<u>3-10</u>	<u>3-6</u>	<u>3-2</u>	<u>2-9</u>	<u>2-5</u>
	<u>1-2x10</u>	<u>5-10</u>	<u>5-1</u>	<u>4-6</u>	<u>4-2</u>	<u>3-10</u>	<u>3-6</u>	<u>3-1</u>
	<u>1-2x10</u>	<u>6-11</u>	<u>6-0</u>	<u>5-4</u>	<u>4-10</u>	<u>4-6</u>	<u>4-3</u>	<u>3-10</u>
	<u>2-2x6</u>	<u>5-9</u>	<u>5-0</u>	<u>4-6</u>	<u>4-1</u>	<u>3-9</u>	<u>3-6</u>	<u>3-4</u>
Southorn pipo	<u>2-2x8</u>	<u>7-4</u>	<u>6-4</u>	<u>5-8</u>	<u>5-2</u>	<u>4-9</u>	<u>4-6</u>	<u>4-3</u>
<u>Southern pine</u>	<u>2-2x10</u>	<u>8-8</u>	<u>7-6</u>	<u>6-9</u>	<u>6-2</u>	<u>5-8</u>	<u>5-4</u>	<u>5-0</u>
	<u>2-2x12</u>	<u>10-3</u>	<u>8-11</u>	<u>7-11</u>	<u>7-3</u>	<u>6-8</u>	<u>6-3</u>	<u>5-11</u>
	<u>3-2x6</u>	<u>7-3</u>	<u>6-3</u>	<u>5-7</u>	<u>5-1</u>	<u>4-9</u>	<u>4-5</u>	<u>4-2</u>
	<u>3-2x8</u>	<u>9-2</u>	<u>7-11</u>	<u>7-1</u>	<u>6-6</u>	<u>6-0</u>	<u>5-7</u>	<u>5-3</u>
	<u>3-2x10</u>	<u>10-11</u>	<u>9-5</u>	<u>8-5</u>	<u>7-8</u>	<u>7-2</u>	<u>6-8</u>	<u>6-3</u>
	<u>3-2x12</u>	<u>12-10</u>	<u>11-2</u>	<u>9-11</u>	<u>9-1</u>	<u>8-5</u>	<u>7-10</u>	<u>7-5</u>
	<u>1-2x6</u>	<u>3-5</u>	<u>2-9</u>	<u>2-2</u>	<u>1-9</u>	<u>1-6</u>	<u>1-3</u>	<u>1-1</u>
	<u>1-2x8</u>	<u>4-8</u>	<u>3-8</u>	<u>2-10</u>	<u>2-4</u>	<u>1-11</u>	<u>1-8</u>	<u>1-6</u>
	<u>1-2x10</u>	<u>5-8</u>	<u>4-8</u>	<u>3-8</u>	<u>3-0</u>	<u>2-6</u>	<u>2-2</u>	<u>1-11</u>
	<u>1-2x12</u>	<u>6-7</u>	<u>5-8</u>	<u>4-5</u>	<u>3-7</u>	<u>3-1</u>	<u>2-7</u>	<u>2-3</u>
	<u>2-2x6</u>	<u>5-2</u>	<u>4-5</u>	<u>4-0</u>	<u>3-6</u>	<u>3-0</u>	<u>1-11</u>	<u>1-8</u>
Douglas fir-larch 9	<u>2-2x8</u>	<u>6-11</u>	<u>5-11</u>	<u>5-4</u>	<u>4-8</u>	<u>3-11</u>	<u>3-5</u>	<u>3-0</u>
<u>Douglas melaren -,</u>	<u>2-2x10</u>	<u>8-5</u>	<u>7-3</u>	<u>6-6</u>	<u>5-11</u>	<u>5-1</u>	<u>4-5</u>	<u>3-10</u>
<u>Hem-fir ^g,</u>	<u>2-2x12</u>	<u>9-9</u>	<u>8-5</u>	<u>7-7</u>	<u>6-11</u>	<u>6-2</u>	<u>5-4</u>	<u>4-8</u>
	<u>3-2x6</u>	<u>6-5</u>	<u>5-7</u>	<u>5-0</u>	<u>4-7</u>	<u>4-3</u>	<u>3-11</u>	<u>3-5</u>
<u>Spruce-pine-fir ^g</u>	<u>3-2x8</u>	<u>8-8</u>	<u>7-6</u>	<u>6-8</u>	<u>6-1</u>	<u>5-8</u>	<u>5-2</u>	<u>4-7</u>
	<u>3-2x10</u>	10-7	9-2	<u>8-2</u>	<u>7-5</u>	<u>6-11</u>	<u>6-5</u>	<u>5-10</u>
	<u>3-2x12</u>	<u>12-3</u>	<u>10-8</u>	<u>9-6</u>	<u>8-8</u>	<u>8-0</u>	<u>7-6</u>	<u>7-1</u>

	<u>1-2x6</u>	<u>3-6</u>	<u>2-10</u>	<u>2-3</u>	<u>1-10</u>	<u>1-7</u>	<u>1-4</u>	<u>1-2</u>
	<u>1-2x8</u>	<u>4-6</u>	<u>3-9</u>	<u>2-11</u>	<u>2-5</u>	<u>2-0</u>	<u>1-9</u>	<u>1-7</u>
	<u>1-2x10</u>	<u>5-6</u>	<u>4-9</u>	<u>3-9</u>	<u>3-1</u>	<u>2-7</u>	<u>2-3</u>	<u>2-0</u>
<u>Redwood ^h,</u>	<u>1-2x12</u>	<u>6-4</u>	<u>5-6</u>	<u>4-7</u>	<u>3-9</u>	<u>3-2</u>	<u>2-9</u>	<u>2-5</u>
Masterna Oasterna h	<u>2-2x6</u>	<u>5-3</u>	<u>4-6</u>	<u>4-1</u>	<u>3-8</u>	<u>3-1</u>	<u>2-8</u>	<u>2-4</u>
western Cedars ",	<u>2-2x8</u>	<u>6-8</u>	<u>5-9</u>	<u>5-2</u>	<u>4-8</u>	<u>4-1</u>	<u>3-6</u>	<u>3-1</u>
Ponderosa Pine <u>h</u> ,	<u>2-2x10</u>	<u>8-1</u>	<u>7-0</u>	<u>6-3</u>	<u>5-9</u>	<u>5-2</u>	<u>4-6</u>	<u>4-0</u>
	<u>2-2x12</u>	<u>9-5</u>	<u>8-2</u>	<u>7-3</u>	<u>6-8</u>	<u>6-2</u>	<u>5-6</u>	<u>4-10</u>
<u>Red Pine ^h</u>	<u>3-2x6</u>	<u>6-7</u>	<u>5-8</u>	<u>5-1</u>	<u>4-8</u>	<u>4-4</u>	<u>4-0</u>	<u>3-7</u>
	<u>3-2x8</u>	<u>8-4</u>	<u>7-2</u>	<u>6-5</u>	<u>5-11</u>	<u>5-5</u>	<u>5-1</u>	<u>4-8</u>
	<u>3-2x10</u>	<u>10-2</u>	<u>8-10</u>	<u>7-10</u>	<u>7-2</u>	<u>6-8</u>	<u>6-3</u>	<u>5-10</u>
	<u>3-2x12</u>	<u>11-9</u>	<u>10-2</u>	<u>9-1</u>	<u>8-4</u>	<u>7-8</u>	<u>7-3</u>	<u>6-10</u>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg.

- a. Interpolation allowed. Extrapolation is not allowed.
- b. Beams supporting a single span of joists with or without cantilever.

<u>c. Dead load = 10 psf, L/Δ = 360 at main span, L/Δ = 180 at cantilever. Snow load not assumed to be concurrent with live load.</u>

- d. No. 2 grade, wet service factor included.
- e. Beam depth shall be equal to or greater than the depth of intersecting joist for a flush beam connection.
- f. Beam cantilevers are limited to the adjacent beam's span divided by 4.
- g. Includes incising factor
- h. Incising factor not included.
- i. Deck joist span as shown in Figure R507.5

TABLE R507.5(4) MAXIMUM DECK BEAM SPAN - 70 PSF GROUND SNOW LOAD [©]

		DECK JOIST SPAN (feet) a. i							
<u>BEAM</u>	<u>BEAM</u>	<u>6</u>	<u>8</u>	<u>10</u>	<u>12</u>	<u>14</u>	<u>16</u>	<u>18</u>	
d		MAXIMUM BEAM SPAN a, b, f							
<u>SPECIES <u>a</u></u>	<u>SIZE ^e</u>								
		(feet-inches)							
	<u>1-2x6</u>	<u>3-8</u>	<u>3-2</u>	<u>2-10</u>	<u>2-1</u>	<u>1-10</u>	<u>1-4</u>	<u>1-7</u>	
	<u>1-2x8</u>	<u>4-7</u>	<u>4-0</u>	<u>3-7</u>	<u>3-3</u>	<u>2-9</u>	<u>2-5</u>	<u>2-2</u>	
	<u>1-2x10</u>	<u>5-6</u>	<u>4-9</u>	<u>4-3</u>	<u>3-10</u>	<u>3-7</u>	<u>3-1</u>	<u>2-9</u>	

	1-2x12	<u>6-5</u>	<u>5-7</u>	<u>5-0</u>	<u>4-7</u>	<u>4-3</u>	<u>3-9</u>	<u>3-4</u>
	<u>2-2x6</u>	<u>5-5</u>	<u>4-8</u>	<u>4-2</u>	<u>3-10</u>	<u>3-6</u>	<u>3-3</u>	<u>3-1</u>
Southern Pine	<u>2-2x8</u>	<u>6-10</u>	<u>5-11</u>	<u>5-4</u>	<u>4-10</u>	<u>4-6</u>	<u>4-2</u>	<u>3-11</u>
	<u>2-2x10</u>	<u>8-2</u>	<u>7-1</u>	<u>6-4</u>	<u>5-9</u>	<u>5-4</u>	<u>5-0</u>	<u>4-8</u>
	<u>2-2x12</u>	<u>9-7</u>	<u>8-4</u>	<u>7-5</u>	<u>6-9</u>	<u>6-3</u>	<u>5-10</u>	<u>5-6</u>
	<u>3-2x6</u>	<u>6-9</u>	5-10	<u>5-3</u>	<u>4-9</u>	<u>4-5</u>	<u>4-2</u>	<u>3-11</u>
	<u>3-2x8</u>	<u>8-7</u>	<u>7-5</u>	<u>6-8</u>	<u>6-1</u>	<u>5-7</u>	<u>5-3</u>	<u>4-11</u>
	<u>3-2x10</u>	<u>10-2</u>	<u>8-10</u>	<u>7-11</u>	<u>7-2</u>	<u>6-8</u>	<u>6-3</u>	<u>5-10</u>
	<u>3-2x12</u>	12-0	<u>10-5</u>	<u>9-4</u>	<u>8-6</u>	<u>7-10</u>	<u>7-41</u>	<u>6-11</u>
	<u>1-2x6</u>	<u>3-3</u>	<u>2-5</u>	1-10	<u>1-6</u>	<u>1-3</u>	<u>1-1</u>	<u>1-0</u>
	<u>1-2x8</u>	<u>4-4</u>	<u>3-2</u>	<u>2-6</u>	<u>2-0</u>	<u>1-8</u>	<u>1-6</u>	<u>1-4</u>
	<u>1-2x10</u>	<u>5-4</u>	<u>4-1</u>	<u>3-2</u>	<u>2-7</u>	<u>2-2</u>	<u>1-11</u>	<u>1-8</u>
	<u>1-2x12</u>	<u>6-2</u>	<u>5-0</u>	<u>3-10</u>	<u>3-2</u>	<u>2-8</u>	<u>2-4</u>	<u>2-0</u>
<u>Douglas fir-larch ^g,</u>	<u>2-2x6</u>	<u>4-10</u>	<u>4-2</u>	<u>3-9</u>	<u>3-1</u>	<u>2-7</u>	<u>2-3</u>	<u>2-0</u>
Hom fir ^Q	<u>2-2x8</u>	<u>6-5</u>	<u>5-7</u>	<u>5-0</u>	<u>4-1</u>	<u>3-5</u>	<u>3-0</u>	<u>2-8</u>
<u>nem-m²,</u>	<u>2-2x10</u>	<u>7-10</u>	<u>6-10</u>	<u>6-1</u>	<u>5-39</u>	<u>4-5</u>	<u>3-10</u>	<u>3-5</u>
<u>Spruce -pine-fir ^g</u>	<u>2-2x12</u>	<u>9-2</u>	<u>7-11</u>	<u>7-1</u>	<u>6-4</u>	<u>5-5</u>	<u>4-8</u>	<u>4-1</u>
	<u>3-2x6</u>	<u>6-0</u>	<u>5-31</u>	<u>4-8</u>	<u>4-3</u>	<u>3-11</u>	<u>3-5</u>	<u>3-0</u>
	<u>3-2x8</u>	<u>8-1</u>	<u>7-0</u>	<u>6-3</u>	<u>5-8</u>	<u>5-2</u>	<u>4-6</u>	<u>4-0</u>
	<u>3-2x10</u>	<u>9-10</u>	<u>8-6</u>	<u>7-8</u>	<u>7-0</u>	<u>6-5</u>	<u>5-9</u>	<u>5-1</u>
	<u>3-2x12</u>	<u>11-6</u>	<u>9-11</u>	<u>8-11</u>	<u>8-1</u>	<u>7-6</u>	<u>7-0</u>	<u>6-3</u>
	<u>1-2x6</u>	<u>3-4</u>	<u>2-6</u>	<u>1-11</u>	<u>1-7</u>	<u>1-4</u>	<u>1-2</u>	<u>1-0</u>
	<u>1-2x8</u>	<u>4-2</u>	<u>3-3</u>	<u>2-7</u>	<u>2-1</u>	<u>1-9</u>	<u>1-7</u>	<u>1-4</u>
	<u>1-2x10</u>	<u>5-1</u>	<u>4-2</u>	<u>3-3</u>	<u>2-8</u>	<u>2-3</u>	<u>2-0</u>	<u>1-9</u>
<u>Redwood ^h,</u>	<u>1-2x12</u>	<u>5-11</u>	<u>5-1</u>	<u>4-0</u>	<u>3-3</u>	<u>2-9</u>	<u>2-5</u>	<u>2-1</u>
	<u>2-2x6</u>	<u>4-11</u>	<u>4-3</u>	<u>3-10</u>	<u>3-2</u>	<u>2-8</u>	<u>2-4</u>	<u>2-1</u>
<u>Western Cedars ",</u>	<u>2-2x8</u>	<u>6-3</u>	<u>5-5</u>	<u>4-10</u>	<u>4-2</u>	<u>3-7</u>	<u>3-1</u>	<u>2-9</u>
Poderosa Pine <u>h</u>	<u>2-2x10</u>	<u>7-7</u>	<u>6-7</u>	<u>5-10</u>	<u>5-4</u>	<u>4-7</u>	<u>3-11</u>	<u>3-6</u>
<u> </u>	<u>2-2x12</u>	<u>8-10</u>	<u>7-7</u>	<u>6-10</u>	<u>6-3</u>	<u>5-6</u>	<u>4-10</u>	<u>4-3</u>
<u>Red Pine ^h</u>	<u>3-2x6</u>	<u>6-2</u>	<u>5-4</u>	<u>4-9</u>	<u>4-4</u>	<u>4-0</u>	<u>3-6</u>	<u>3-1</u>
	<u>3-2x8</u>	<u>7-9</u>	<u>6-9</u>	<u>6-0</u>	<u>5-6</u>	<u>5-1</u>	<u>4-8</u>	<u>4-1</u>
	<u>3-2x10</u>	<u>9-6</u>	<u>8-3</u>	<u>7-4</u>	<u>6-9</u>	<u>6-3</u>	<u>5-10</u>	<u>5-3</u>
	<u>3-2x12</u>	<u>11-0</u>	<u>9-6</u>	<u>8-6</u>	7-9	7-3	<u>6-9</u>	<u>6-4</u>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg.

a. Interpolation allowed. Extrapolation is not allowed.

b. Beams supporting a single span of joists with or without cantilever.

<u>c. Dead load = 10 psf, L/Δ = 360 at main span, L/Δ = 180 at cantilever. Snow load not assumed to be concurrent with live load.</u>

d. No. 2 grade, wet service factor included.

e. Beam depth shall be equal to or greater than the depth of intersecting joist for a flush beam connection.

f. Beam cantilevers are limited to the adjacent beam's span divided by 4.

- g. Includes incising factor
- h. Incising factor not included.

i. Deck joist span as shown in Figure R507.5

Revise as follows:

R507.6 Deck joists. Maximum allowable spans for wood deck joists, as shown in Figure R507.6, shall be in accordance with Table R507.6. The maximum joist spacing shall be limited by the decking materials in accordance with Table R507.7. The maximum joist cantilever shall be limited to one-fourth of the joist span or the maximum cantilever length specified in Table R507.6, whichever is less.

Delete and substitute as follows:

TABLE R507.6 DECK JOIST SPANS FOR COMMON LUMBER SPECIES (ft. - in.)

SIZE		ALLO	WABLE SPAN ^b	JOIST	MAXIMUM CANTILEVER ^{s, f}				
SPECIES*	JILE	SPAC JOI	NG OF STS(incl	DECK nes)	SPACING OF DECK JOISTS WITH CANTILEVERS ^e (inches)				
		12	16	24	12	-16	24		
	2 × Ф	9-11	9-0	7-7	1-3	1-4	1-6		
Southorn pipo	2 × 8	13-1	11-10	9-8	2-1	2-3	2-5		
	2 × 10	16-2	14-0	11-5	3-4	3-6	2-10		
	2 × 12	18-0	16-6	13-6	4-6	4-2	3-4		
	2 * \$	9-6	8-8	7-2	1-2	1-3	1-5		
Douglas fir-larch^d, hem-fir^d spruce-	2 * &	12-6	11-1	9-1	1-11	2-1	2-3		
pine-fir^d,	2 × 10	15-8	13-7	11-1	3-1	3-5	2-9		
	2 * 12	18-0	15-9	12-10	4-6	3-11	3-3		
	2 × 6	8-10	8-0	7-0	1-0	1-1	1-2		

Redwood,western cedars, ponderosa pine^e, red pine^e	2 × ₿	11-8	10-7	8-8	1-8	1-10	2-0
	2 × 10	14-11	13-0	10-7	2-8	2-10	2-8
	2 × 12	17-5	15-1	12-4	3-10	3-9	3-1

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg.

- a. No. 2 grade with wet service factor.
- b. Ground snow load, live load = 40 psf, dead load = 10 psf, L/Δ = 360.
- c. Ground snow load, live load = 40 psf, dead load = 10 psf, L/Δ = 360 at main span, L/Δ = 180 at cantilever with a 220-pound point load applied to end.
- d. Includes incising factor.
- e. Northern species with no incising factor.
- f. Cantilevered spans not exceeding the nominal depth of the joist are permitted.

		JOIST SPACING		ADJACENT JOIST SPAN ^g								
JOIST		<u>(inches)</u>						<u>(f</u>	eet)			
	JOIST SIZE	<u>12</u>	<u>16</u>	<u>24</u>	<u>4</u>	<u>6</u>	<u>8</u>	<u>10</u>	<u>12</u>	<u>14</u>	<u>16</u>	<u>18</u>
<u>SPECIES b</u>		MAXIMU	IM JOIST	SPAN º	MAXIMUM CANTILEVER d							
		<u>(fe</u>	et-inche	<u>es)</u>				(feet-	inch	<u>es)</u>	T	
	<u>2x6</u>	<u>9-11</u>	<u>9-0</u>	<u>7-7</u>	<u>1-0</u>	<u>1-6</u>	<u>1-5</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
Southorn Pino	<u>2x8</u>	<u>13-1</u>	<u>11-10</u>	<u>9-8</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>2-3</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
<u>Southern Fine</u>	<u>2x10</u>	<u>16-2</u>	<u>14-0</u>	<u>11-5</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>3-0</u>	<u>3-4</u>	<u>3-4</u>	<u>NP</u>
	<u>2x12</u>	<u>18-0</u>	<u>16-6</u>	<u>13-6</u>	1-0	<u>1-6</u>	<u>2-0</u>	<u>-6</u>	<u>3-0</u>	<u>3-6</u>	<u>4-0</u>	<u>4-1</u>
<u>Douglas fir-larch ^e,</u>	<u>2x6</u>	<u>9-6</u>	<u>8-4</u>	<u>6-10</u>	<u>1-0</u>	<u>1-6</u>	<u>1-4</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
	<u>2x8</u>	<u>12-6</u>	<u>11-1</u>	<u>9-1</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-3</u>	<u>2-0</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
<u>Hem-tir ≊,</u>	<u>2x10</u>	<u>15-8</u>	<u>13-7</u>	<u>11-1</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>3-0</u>	<u>3-3</u>	<u>NP</u>	<u>NP</u>
<u>Spruce-pine-fir ^e</u>	<u>2x12</u>	<u>18-0</u>	<u>15-9</u>	<u>12-10</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>3-0</u>	<u>3-6</u>	<u>3-11</u>	<u>3-11</u>
	<u>2x6</u>	<u>8-10</u>	<u>8-0</u>	<u>6-10</u>	<u>1-0</u>	<u>1-4</u>	<u>1-1</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
	<u>2x8</u>	<u>11-8</u>	<u>10-7</u>	<u>8-8</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>1-11</u>	<u>NP</u>	NP	<u>NP</u>	<u>NP</u>
<u>Redwood f.</u>	<u>2x10</u>	<u>14-11</u>	<u>13-0</u>	<u>10-7</u>	1-0	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>3-0</u>	<u>2-9</u>	NP	<u>NP</u>
<u>Western Cedars ^{f.}</u> Ponderosa Pine ^f .	<u>2x12</u>	<u>17-5</u>	<u>15-1</u>	<u>12-4</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>3-0</u>	<u>3-6</u>	<u>3-8</u>	<u>NP</u>
	JOIST SPECIES b Southern Pine Douglas fir-larch e, Hem-fir e, Spruce-pine-fir e Redwood f, Western Cedars f. Ponderosa Pine f,	JOIST SPECIES b 301351 SIZE 30135 SIZE	JOIST JOIST SIZE JOIST SIZE SPECIES b JOIST SIZE 12 MAXIMU MAXIMU Species $2x6$ 9-11 2x8 13-1 2x10 16-2 2x10 16-2 2x10 16-2 2x12 18-0 16-2 2x10 16-2 Douglas fir-larch e 2x6 9-6 2x8 12-6 Hem-fir e 2x10 15-8 2x10 15-8 Spruce-pine-fir e 2x6 8-10 2x8 11-8 Redwood f. 2x8 11-8 2x10 14-11 Western Cedars f_i 2x12 14-11 17-5 Ponderosa Pine f. 2x12 17-5 17-5	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	JOIST JOIST SPACING JOIST $(inches)$ SPECIES b 12 16 24 MAXIMUM JOIST SPAN C MAXIMUM JOIST SPAN C $(ieet-inches)$ Southern Pine 2x6 9-11 9-0 7-7 2x8 13-1 11-10 9-8 2x10 16-2 14-0 11-5 2x12 18-0 16-6 13-6 Douglas fir-larch C 2x6 9-6 8-4 6-10 Hem-fir C 2x8 12-6 11-1 9-1 Spruce-pine-fir C 2x12 18-0 15-9 12-10 Spruce-pine-fir C 2x6 8-10 8-0 6-10 2x8 11-8 10-7 8-8 8-10 Redwood f. 2x12 18-0 15-9 12-10 2x8 11-8 10-7 8-8 10-7 Mestern Cedars fi 2x12 17-5 15-1 12-4 Ponderosa Pine fi 2x12 17-5 15-1 1	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c c c c c c } & \textbf{JOIST SPACING} & \textbf{JOIST SPACING} & \textbf{JOIST SPACING} \\ \hline \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	JOIST SPACING ADJACENT JOIST SPACING JOIST SUE (inches) Employed Stress SPECIES b JOIST SIZE 12 16 24 4 6 8 10 12 14 MAXIMUM JOIST SPAN P (feet-inches) Employed Stress Employed Stress Maximum Joist Span P Maximum Joist Span P <td>JOIST JOIST SPACING ADJACENT JOIST SPAN⁴ JOIST Image: space sp</td>	JOIST JOIST SPACING ADJACENT JOIST SPAN ⁴ JOIST Image: space sp

TABLE R507.6 MAXIMUM DECK JOIST SPANS

<u>Red Pine ^f</u>

		<u>2x6</u>	<u>9-2</u>	<u>8-4</u>	7-4	<u>1-0</u>	1-6	1-5	NP	NP	NP	NP	<u>NP</u>
	Couthorn Dino	<u>2x8</u>	<u>12-1</u>	<u>11-0</u>	<u>9-7</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-5</u>	<u>2-3</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
	Southern Pine	<u>2x10</u>	<u>15-5</u>	<u>14-1</u>	<u>12-3</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>3-0</u>	<u>3-1</u>	<u>NP</u>	<u>NP</u>
		<u>2x12</u>	<u>18-0</u>	<u>17-1</u>	<u>14-6</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>3-0</u>	<u>3-6</u>	<u>3-10</u>	<u>3-10</u>
<u>50</u>	Douglas fir-larch <u>e</u> ,	<u>2x6</u>	<u>8-10</u>	<u>8-0</u>	<u>7-0</u>	<u>1-0</u>	<u>1-6</u>	<u>1-4</u>	NP	<u>NP</u>	<u>NP</u>	<u>NP</u>	NP
		<u>2x8</u>	<u>11-7</u>	<u>10-7</u>	<u>9-3</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-3</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
<u>Ground</u>	<u>Hem-tir ≌,</u>	<u>2x10</u>	<u>14-10</u>	<u>13-6</u>	<u>11-9</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>3-0</u>	<u>3-0</u>	<u>NP</u>	<u>NP</u>
Snow	<u>Spruce-pine-fir ^e</u>	<u>2x12</u>	<u>18-0</u>	<u>16-5</u>	<u>13-9</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>3-0</u>	<u>3-6</u>	<u>3-8</u>	<u>NP</u>
	Redwood f,	<u>2x6</u>	<u>8-3</u>	<u>7-6</u>	<u>6-8</u>	<u>1-0</u>	<u>1-4</u>	<u>1-1</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
<u>Load</u>	uu i o i f	<u>2x8</u>	<u>10-10</u>	<u>9-10</u>	<u>8-7</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>1-11</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
	Western Cedars <u>h</u>	<u>2x10</u>	<u>13-10</u>	<u>12-7</u>	<u>11-0</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>2-9</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
	<u>Ponderosa Pine ^f,</u>	<u>2x12</u>	<u>16-10</u>	<u>15-3</u>	<u>13-2</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>3-0</u>	<u>3-5</u>	<u>3-5</u>	<u>NP</u>
	<u>Red Pine ^I</u>												
		<u>2x6</u>	<u>8-8</u>	<u>7-10</u>	<u>6-10</u>	<u>1-0</u>	<u>1-6</u>	<u>1-5</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
	Southern Pine	<u>2x8</u>	<u>11-5</u>	<u>10-4</u>	<u>9-1</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-4</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
		<u>2x10</u>	<u>14-7</u>	<u>13-3</u>	<u>11-7</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>2-11</u>	<u>2-11</u>	<u>NP</u>	<u>NP</u>
		<u>2x12</u>	<u>17-8</u>	<u>16-1</u>	<u>14-0</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>3-0</u>	<u>3-6</u>	<u>3-7</u>	<u>NP</u>
<u>60</u>	<u>Douglas fir-larch ^e,</u>	<u>2x6</u>	<u>8-4</u>	<u>7-6</u>	<u>6-7</u>	<u>1-0</u>	<u>1-6</u>	<u>1-4</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
	Hom_fir ^e	<u>2x8</u>	<u>10-11</u>	<u>9-11</u>	<u>8-8</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-2</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
Ground	<u></u> _,	<u>2x10</u>	<u>13-11</u>	<u>12-8</u>	<u>11-1</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>2-10</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
<u>Snow</u>	<u>Spruce-pine-fir ^e</u>	<u>2x12</u>	<u>17-0</u>	<u>15-5</u>	<u>13-6</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>3-0</u>	<u>3-5</u>	<u>3-5</u>	<u>NP</u>
	<u>Redwood f,</u>	<u>2x6</u>	<u>7-9</u>	<u>7-0</u>	<u>6-2</u>	<u>1-0</u>	<u>1-4</u>	NP	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
<u>Load</u>	h i c i f	<u>2x8</u>	<u>10-2</u>	<u>9-3</u>	<u>8-1</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>1-11</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
	Western Cedars <u>'</u>	<u>2x10</u>	<u>13-0</u>	<u>11-10</u>	<u>10-4</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>2-7</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
	<u>Ponderosa Pine ^f,</u>	<u>2x12</u>	<u>15-10</u>	<u>14-4</u>	<u>12-7</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>3-0</u>	<u>3-2</u>	<u>NP</u>	<u>NP</u>
	<u>Red Pine ^{<u>f</u>}</u>												
		<u>2x6</u>	<u>8-3</u>	<u>7-6</u>	<u>6-6</u>	<u>1-0</u>	<u>1-6</u>	<u>1-5</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
	Southern Pine	<u>2x8</u>	<u>10-10</u>	<u>9-10</u>	<u>8-7</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-2</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
		<u>2x10</u>	<u>13-10</u>	<u>12-7</u>	<u>11-0</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>2-9</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
		<u>2x12</u>	<u>16-10</u>	<u>15-3</u>	<u>13-4</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>3-0</u>	<u>3-5</u>	<u>3-5</u>	<u>NP</u>
		<u>2x6</u>	<u>7-11</u>	<u>7-2</u>	<u>6-3</u>	<u>1-0</u>	<u>1-6</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
		<u>2x8</u>	<u>10-5</u>	<u>9-5</u>	<u>8-3</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-1</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
<u>70</u>	<u>Douglas fir-larch ^e,</u>	<u>2x10</u>	<u>13-3</u>	<u>12-0</u>	<u>10-6</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>2-8</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
<u>Ground</u>	<u>Hem-fir ^e,</u>	<u>2012</u>	<u>16-1</u>	<u>14-8</u>	<u>12-10</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>3-0</u>	<u>3-3</u>	<u>3-3</u>	<u>NP</u>
<u>Snow</u>	<u>Spruce-pine-fir ^e</u>												

<u>Load</u>

Re	edwood f <u>,</u>	<u>2x6</u>	<u>7-4</u>	<u>6-8</u>	<u>5-10</u>	<u>1-0</u>	<u>1-4</u>	<u>NP</u>	NP	<u>NP</u>	NP	NP	<u>NP</u>
	, , , f	<u>2x8</u>	<u>9-8</u>	<u>8-10</u>	<u>7-8</u>	<u>1-0</u>	1-6	<u>1-11</u>	<u>NP</u>	NP	<u>NP</u>	<u>NP</u>	NP
We	<u>estern Cedars ^{I.}</u>	<u>2x10</u>	<u>12-4</u>	<u>11-3</u>	<u>9-10</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>2-6</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>
Poi	nderosa Pine <u>f</u> ,	<u>2x12</u>	<u>15-0</u>	<u>13-8</u>	<u>11-11</u>	<u>1-0</u>	<u>1-6</u>	<u>2-0</u>	<u>2-6</u>	<u>2-0</u>	<u>3-0</u>	<u>NP</u>	<u>NP</u>
Re	ed Pine <u>f</u>												

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg. NP = Not Permitted

a. Dead load = 10 psf. Snow load not assumed to be concurrent with live load.

b. No. 2 grade, wet service factor included.

c. $L/\Delta = 360$ at main span.

<u>d. L/Δ = 180 at cantilever with 220-pound point load applied to end.</u>

e. Includes incising factor.

f. Incising factor not included.

g. Interpolation permitted. Extrapolation is not permitted.

TABLE R507.9.1.3(1)

DECK LEDGER CONNECTION TO BAND JOIST^{a, b}(Deck live load = 40 psf, deck dead load = 10 psf, snow load ≤ 40 psf)

	JOIST SPAN									
CONNECTION DETAILS	6′ and less	6′1″ to 8′	8′1″ to 10′	10′1″ to 12′	12′1″ to 14′	14′1″ to 16′	16′1″ to 18′			
	On-center spacing of fasteners									
¹ / ₂ -inch diameter lag screw with ¹ / ₂ -inch maximum sheathing ^{c, d}	30	23	18	15	13	11	10			
⁺ / ₂ -inch diameter bolt with ⁺ / ₂ -inch maximum sheathing ^d	36	36	3 4	29	2 4	21	19			
¹ / ₂ -inch diameter bolt with 1-inch maximum sheathing ^e	36	36	29	24	21	18	16			

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

a. Ledgers shall be flashed in accordance with Section R703.4 to prevent water from contacting the house band joist.

- b. Snow load shall not be assumed to act concurrently with live load.
- c. The tip of the lag screw shall fully extend beyond the inside face of the band joist.
- d. Sheathing shall be wood structural panel or solid sawn lumber.
- e. Sheathing shall be permitted to be wood structural panel, gypsum board, fiberboard, lumber or

foam sheathing. Up to $\frac{1}{2}$ -inch thickness of stacked washers shall be permitted to substitute for up to $\frac{1}{2}$ inch of allowable sheathing thickness where combined with wood structural panel or lumber sheathing.

TABLE R507.9.1.3(1) DECK LEDGER CONNECTION TO BAND JOIST

		1/2-inch diameter	1/2-inch diameter	1/2-inch diameter
		lag screw	<u>bolt</u>	<u>bolt</u>
<u>LOAD </u> ေ	<u>JOIST SPAN ª</u>	<u>with</u>	<u>with</u>	<u>with</u>
<u>(psf)</u>	<u>(feet)</u>	<u>1/2-inch maximum</u>	<u>1/2-inch maximum</u>	<u>1-inch maximum</u>
		<u>sheathing ^{d, e}</u>	<u>sheathing ^e</u>	<u>sheathing ^f</u>
		On-CENTE	R SPACING OF FAS	STENERS b
			<u>(inches)</u>	
	<u>6</u>	<u>30</u>	<u>36</u>	<u>36</u>
<u>40</u>	<u>8</u>	<u>23</u>	<u>36</u>	<u>36</u>
	<u>10</u>	<u>18</u>	<u>34</u>	<u>29</u>
<u>Live</u>	<u>12</u>	<u>15</u>	<u>29</u>	<u>24</u>
Lood	<u>14</u>	<u>13</u>	<u>24</u>	<u>21</u>
LUAU	<u>16</u>	<u>11</u>	<u>21</u>	<u>18</u>
	<u>18</u>	<u>10</u>	<u>19</u>	<u>16</u>
50	<u>6</u>	<u>29</u>	<u>36</u>	<u>36</u>
<u> </u>	<u>8</u>	<u>22</u>	<u>36</u>	<u>35</u>
Ground	<u>10</u>	<u>17</u>	<u>33</u>	<u>28</u>
	<u>12</u>	<u>14</u>	27	<u>23</u>
<u>Snow</u>	<u>14</u>	<u>12</u>	<u>23</u>	<u>20</u>
Load	<u>16</u>	<u>11</u>	<u>20</u>	<u>17</u>
	<u>18</u>	<u>9</u>	<u>18</u>	<u>15</u>
	<u>6</u>	<u>25</u>	<u>36</u>	<u>36</u>
	<u>8</u>	<u>18</u>	<u>35</u>	<u>30</u>
60	<u>10</u>	<u>17</u>	<u>33</u>	<u>28</u>
	<u>12</u>	<u>14</u>	27	<u>23</u>
Ground	<u>14</u>	<u>12</u>	<u>23</u>	<u>20</u>
	<u>16</u>	<u>11</u>	20	<u>17</u>
Snow	<u>18</u>	<u>9</u>	<u>18</u>	<u>15</u>

Load

70	6	<u>22</u>	<u>36</u>	<u>35</u>
<u>70</u>	8	<u>16</u>	<u>31</u>	<u>26</u>
Ground	<u>10</u>	<u>13</u>	<u>25</u>	<u>21</u>
	<u>12</u>	<u>11</u>	<u>20</u>	<u>17</u>
<u>Snow</u>	<u>14</u>	<u>9</u>	<u>17</u>	<u>15</u>
Laad	<u>16</u>	8	<u>15</u>	13
<u>L0a0</u>	<u>18</u>	7	<u>13</u>	<u>11</u>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

a. Interpolation permitted. Extrapolation is not permitted.

b. Ledgers shall be flashed in accordance with Section R703.4 to prevent water from contacting the house band joist.

c. Dead Load = 10 psf. Snow load shall not be assumed to act concurrently with live load.

d. The tip of the lag screw shall fully extend beyond the inside face of the band joist.

e. Sheathing shall be wood structural panel or solid sawn lumber.

<u>f. Sheathing shall be permitted to be wood structural panel, gypsum board, fiberboard, lumber or foam</u> sheathing. Up to $\frac{1}{2}$ -inch thickness of stacked washers shall be permitted to substitute for up to $\frac{1}{2}$ inch of allowable sheathing thickness where combined with wood structural panel or lumber sheathing.

Reason: From roughly scanning Figure R301.2(6) Ground Snow Loads, it appears that as much as ten percent of the country lives in areas where the ground snow load exceeds the live load in Table R301.5. The Deck Code Coalition proposes to prescriptively offer the people in these areas with revised tables. The IRC's prescriptive deck provisions currently only include a 40 psf live load and 10 psf dead load. This proposal is to widen the deck provisions to include up to 70 psf ground snow load to more closely match the scope of the IRC.

For snow loading, an increase in wood strength is accounted for the load duration per the NDS®. While the geometry of the deck and nearby structures can affect the snow loading by causing drifts or snow falling from a nearby roof, these effects are neglected just as in other IRC tables, such as roof rafters. Similarly, elevated decks would have a snow load less than the ground snow load, but this reduction is neglected for simpler tables that are easy to use.

• <u>Table R507.3.1 Minimum Footing Size for Decks</u> - currently the table includes footings from 40 to 70 psf, but limits the minimum size of footing to $12^{\circ} \times 12^{\circ}$, which is significantly oversized for small areas such as a stair landing. New rows have been added for a smaller $7^{\circ} \times 7^{\circ}$ footing which is more appropriate and allows for some precast concrete solutions.

• <u>Table R507.4 Maximum Deck Post Height</u> - the table is based now on tributary area 40,50,60, and 70 psf loading.

Table R507.5(1) Maximum Deck Beam Span was replaced with four new tables R507.5(1) – (4) to account for the 40, 50, 60, and 70 psf loading. Section R507.5.2 now includes information that was previously in a footnote.

The load from tributary areas are altered to reflect joists and beams with cantilevers.

• <u>Table R507.6 Maximum Deck Joist Spans</u> was amended to account for the 40, 50, 60, and 70 psf loading. The formatting of the table is significantly altered to clarify common confusion on allowable cantilevers. Previously, the table gave the allowable cantilever in terms of joist spacing. Since the assumed main span was the allowable span for that spacing, the maximum cantilevers sometimes became smaller as joist spacing became tighter. The new format has the cantilevers be more accurately based upon the main span. The previous table included a cantilever limit of 1/4 the main span, and this limit is preserved. Where cantilevers are not permitted, the size of lumber is too small to support that main span.

• <u>Table R507.9.1.3(1)</u> Deck Ledger Connection to Band Joist - the table is based now on tributary area 40,50,60, and 70 psf loading, but uses the same empirical capacities from the original table.

Cost Impact: The code change proposal will increase the cost of construction

In those parts of the country where the ground snow load exceeds 40 psf, it could be assumed that there would be an increased cost of construction if the local jurisdictions allowed decks to be built with a lesser live load than the ground snow load might warrant for their areas. However, by adding 50,60, and 70 psf to the prescriptive tables, some builders may save money by eliminating the cost of engineering that might otherwise be required.

For the other ninety percent of the country, there would not be an anticipated increased cost of construction, in fact there could be a reduced cost for some situations where a smaller footing requirement may be applicable.

Proposal # 4302

RB184-19

RB185-19

IRC: R312.1.4, 507.10 through 507.10.4(New)

Proponent: Deck Code Coalition, Charles Bajnai (chair), North American Deck and Railing Assoc (NADRA), Retired from Chesterfield County, VA, representing Deck Code Coalition (csbajnai@gmail.com)

2018 International Residential Code

Revise as follows:

R312.1.4 Exterior plastic composite guards. Plastic composite exterior <u>Exterior</u> guards shall comply with the requirements of Section R317.4. R507.10.

Add new text as follows:

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

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

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

R507.10.1.2 Guards supported on top of deck framing. Where guards are mounted on top of the decking, the guards shall be connected to the deck framing or blocking and installed in accordance with approved manufacturer's instructions to transfer the guard loads to the adjacent joists.

R507.10.2 Wood guards. Wood posts supporting guard loads shall be a minimum 4x4. Such 4x4 wood posts supporting guard loads shall not be notched at the connection to the supporting structure.

R507.10.3 Plastic composite guards. Plastic composite guards shall comply with the provisions of Section R507.2.2.

R507.10.4 Other guards. Other approved guards shall be in accordance with manufacturer's instructions or in accordance with accepted engineering principles.

Reason: The Deck Code Coalition submits this code change to include direction for constructing exterior guards on decks where the code is currently silent. Guards provide the first line of defense against significant falls, which can result in serious and sometimes fatal injuries. Exterior guards on decks, particularly the connection of the guard system to the deck framing, are rarely engineered and even more rarely tested in a manner that proves that they are adequate to meet the requirements of Table R301.5. Exterior guards and the framing supporting them are susceptible to deterioration, and therefore require a level of care that we think should be addressed in the code.

While the language of the proposal does not define a prescriptive detail for either guard construction or a guard connection to deck framing, the intent of the language is to guide both the builder and the building officials toward an understanding of the behavior of the guard and the structure supporting the guard. The language provides guidance for developing details that will resist the action of a guard on the deck framing when the guard is protecting an occupant from falling to a lower level. This proposal should save lives.

Cost Impact: The code change proposal will increase the cost of construction Current building practices may not meet the requirements of Table R301.5 when typical code-required safety factors are applied, it is reasonable to assume that there will be an increase in cost as the construction techniques and details of these elements are modified to meet the proposed language. A direct result will likely be an increase in the number of fasteners, blocking labor associated with the construction of exterior guards. For those currently construction code-compliant guards, there will be little, if any, additional costs.

For those that need to update their construction techniques and wish to do so using proprietary fasteners, the material cost increase may be approximately \$20 per post, or approximately \$140 for a 12 foot by 12 foot attached deck. The extra cost has to be weighed against the increased safety and potential life savings that will occur across the country over many years.

Proposal # 4305

RB186-19

IRC®: TABLE R507.2.3 (New)

Proponent: Rick Allen, International Staple, Nail and Tool Association, representing International Staple, Nail and Tool Association (rallen@isanta.org)

2018 International Residential Code

Revise as follows:

TABLE R507.2.3 FASTENER AND CONNECTOR SPECIFICATIONS FOR DECKS^{a, b}

ITEM	MATERIAL	MINIMUM FINISH/COATING	ALTERNATE FINISH/COATING ^e
Nails and timber rivets	In accordance with ASTM F1667	Hot-dipped galvanized per ASTM A153 <u>. Class D</u> for <u>³/₈-inch diameter and less</u>	Stainless steel, silicon bronze or copper
Bolts ^c Lag screws ^d (including nuts and washers)	In accordance with ASTM A307 (bolts), ASTM A563 (nuts), ASTM F844 (washers)	Hot-dipped galvanized per ASTM A153, Class C (Class D for ³ / ₈ -inch diameter and less) or mechanically galvanized per ASTM B695, Class 55 or 410 stainless steel	Stainless steel, silicon bronze or copper
Metal connectors	Per manufacturer's specification	ASTM A653 type G185 zinc coated galvanized steel or post hot-dipped galvanized per ASTM A123 providing a minimum average coating weight of 2.0 oz./ft ² (total both sides)	Stainless steel

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

- a. Equivalent materials, coatings and finishes shall be permitted.
- b. Fasteners and connectors exposed to salt water or located within 300 feet of a salt water shoreline shall be stainless steel.
- c. Holes for bolts shall be drilled a minimum $\frac{1}{32}$ inch and a maximum $\frac{1}{16}$ inch larger than the bolt.
- d. Lag screws ¹/₂ inch and larger shall be predrilled to avoid wood splitting per the National Design Specification (NDS) for Wood Construction.
- e. Stainless-steel-driven fasteners shall be in accordance with ASTM F1667.

Reason: Timber Rivets are not addressed in ASTM F1667

Nails are 3/8" in diameter or less. ASTM A153 calls for Class D coating (minimum 1 oz. / ft²) for this size fastener.

These changes align with the requirements of these ASTM standards.

Cost Impact: The code change proposal will not increase or decrease the cost of construction There will be no change is cost of construction. The proposal just clarifies the standards.

Proposal # 3866

RB187-19

RC: R403.1.4, R403.1.4.1, R507.3, R507.3.2, R507.3.3(New)

Proponent: Deck Code Coalition, Charles Bajnai (chair), North American Deck and Railing Assoc (NADRA), Retired from Chesterfield County, VA, representing Deck Code Coalition (csbajnai@gmail.com)

2018 International Residential Code

Revise as follows:

R507.3 Footings. Decks shall be supported on concrete footings or other approved structural systems designed to accommodate all loads in accordance with Section R301. Deck footings shall be sized to carry the imposed loads from the deck structure to the ground as shown in Figure R507.3. The footing depth shall be in accordance with Section R403.1.4.

Exception Exceptions:

- 1. <u>Footings shall not be required for free</u> Free-decks consisting of joists directly supported on grade over their entire length.
- 2. Footings shall not be required for freestanding decks that meet all of the following criteria:
 - 2.1. <u>The joists bear directly on precast concrete pier blocks at grade without support by beams or posts.</u>
 - 2.2. The area of the deck does not exceed 200 square feet,
 - 2.3. <u>The walking surface is not more than 20 inches above grade at any point within 36 inches measured horizontally from the edge.</u>

R507.3.2 Minimum depth. Deck footings shall extend below the frost line specified in Table R301.2(1) in accordance with Section R403.1.4.1. Deck footings shall be placed not less than 12 inches below the undisturbed ground surface.

Exceptions:

- 1. Free-standing decks that meet all of the following criteria:
 - 1.1. The joists bear directly on precast concrete pier blocks at grade without support by beams or posts.
 - 1.2. The area of the deck does not exceed 200 square feet (18.9 m²).
 - 1.3. The walking surface is not more than 20 inches (616 mm) above grade at any point within 36 inches (914 mm) measured horizontally from the edge.
- 2. Free-standing decks need not be provided with footings that extend below the frost line.

Add new text as follows:

R507.3.3 Frost protection. Where decks are attached to a frost protected structure, deck footings shall be protected from frost by one or more of the following methods:

- 1. By extending below the frost line specified in Table R301.2(1).
- 2. By erecting on solid rock.
- 3. Other approved methods of frost protection.

Revise as follows:

R403.1.4 Minimum depth. Exterior footings shall be placed not less than 12 inches (305 mm) below the undisturbed ground surface. Where applicable, the depth of footings shall also conform to Sections R403.1.4.1 through R403.1.4.2. Deck footings shall be in accordance with Section R507.3.

R403.1.4.1 Frost protection. Except where otherwise protected from frost, foundation walls, piers and other permanent supports of buildings and structures shall be protected from frost by one or more of the following methods:

- 1. Extended below the frost line specified in Table R301.2.(1).
- 2. Constructed in accordance with Section R403.3.
- 3. Constructed in accordance with ASCE 32.
- 4. Erected on solid rock.

Footings shall not bear on frozen soil unless the frozen condition is permanent.

Exceptions:

- 1. Protection of free-standing *accessory structures* with an area of 600 square feet (56 m²) or less, of light-frame construction, with an eave height of 10 feet (3048 mm) or less shall not be required.
- 2. Protection of free-standing *accessory structures* with an area of 400 square feet (37 m²) or less, of other than light-frame construction, with an eave height of 10 feet (3048 mm) or less shall not be required.
- 3. Decks not supported by a dwelling need not be provided with footings that extend below the frost line.

Reason: The Deck Code Coalition (DCC) is intending to clean up Chapter 4 by pointing out that deck footing details are in Section R507.

Section R507 is further cleaned up by relocating exceptions of R507.3.2 into R507.3 because the exceptions are not related to footing depth but rather about when footings not required.

The DCC added a new section dealing with footings in frost prone areas by borrowing from R403.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The Deck Code Coalition does not anticipate any cost impact.

The text exceptions were not modified, only relocated to a more appropriate section.

The new section on frost protection was moved from Chapter 4 to Chapter 5.

Proposal # 4303

RB187-19

RB188-19

IRC®: R507.5

Proponent: Deck Code Coalition, Charles Bajnai (chair), North American Deck and Railing Assoc (NADRA), Retired from Chesterfield County, VA, representing Deck Code Coalition (csbajnai@gmail.com)

2018 International Residential Code

Revise as follows:

R507.5 Deck Beams. Maximum allowable spans for wood deck beams, as shown in Figure R507.5, shall be in accordance with Table R507.5. Beam plies shall be fastened <u>together</u> with two rows of 10d (3-inch \times 0.128-inch) nails minimum at 16 inches (406 mm) on center along each edge. Beams shall be permitted to cantilever at each end up to one-fourth of the allowable beam span. Deck beams of other materials shall be permitted where designed in accordance with accepted engineering practices.

Reason: As the original authors of Section R507 in the 2015 IRC, the DCC wanted to clarify that Section R507.5 intended to mean that multi-ply beams are required to be fastened *together* in order to perform as intended. When multi-ply beams are connected together with 10d nails at 16" o.c., their depth to width ratio resists top chord bending.

It appears that some folks are still building deck beams and separating plies .

Figures R507.5.1(1) and (2) tried to cover this, but it appears that some folks do not understand the intent. Hopefully the new word will strengthen the understanding and eliminate the poor construction practice.



Cost Impact: The code change proposal will not increase or decrease the cost of construction There should be no increased cost related to this proposal. There is no change in the intent of the code from the 2018 version.

RB189-19

IRC®: R507.5

Proponent: Deck Code Coalition, Charles Bajnai (chair), North American Deck and Railing Assoc (NADRA), retired, representing Deck Code Coalition (csbajnai@gmail.com)

2018 International Residential Code

Revise as follows:

R507.5 Deck Beams. Maximum allowable spans for wood deck beams, as shown in Figure R507.5, shall be in accordance with Table R507.5. Beam plies shall be fastened with two rows of 10d (3-inch × 0.128-inch) nails minimum at 16 inches (406 mm) on center along each edge. Beams shall be permitted to cantilever at each end up to one-fourth of the allowable actual beam span. Deck beams of other materials shall be permitted where designed in accordance with accepted engineering practices.

Reason: The Deck Code Coalition (DCC) submits this code change because the cantilever length should be governed by the <u>actual</u> beam span, not the <u>allowable</u> beam span. Example:

- A 2x12 beam may be *allowed* to span 16 feet based on the imposed load, but may be *actually* only spanning 4 feet.
- The maximum cantilever should be 1 foot, not 4 feet.
- In this example, the old text would have *allowed* a 4 foot cantilever with a 4' back span.
- Back span must be at least 4x the cantilever length.

Cost Impact: The code change proposal will increase the cost of construction

This proposal might increase the cost of construction because the contractor would not be able to extend cantilevers out as far without increasing beam size.

Proposal # 4300

RB189-19

RB190-19

IRC®: TABLE R507.5

Proponent: Deck Code Coalition, Charles Bajnai (chair), North American Deck and Railing Assoc (NADRA), representing Deck Code Coalition (csbajnai@gmail.com)

2018 International Residential Code

Revise as follows:

TABLE R507.5	
DECK BEAM SPAN LENGTHS ^{a, b, g} (feet - inches)

		EFFECTIVE DECK JOIST SPAN LENGTH ^h						
SPECIES ^c	SIZE ^d	LESS THAN OR EQUAL TO: (feet)						
		6	8	10	12	14	16	18
		DECK BEAM SPAN LENGTH						
			<u>a, r</u>	<u>, d (te</u>	et-in	<u>nches)</u>		
	1 – 2 × 6	4-11	4-0	3-7	3-3	3-0	2- 10	2-8
	1 – 2 × 8	5-11	5-1	4-7	4-2	2- 10	3-7	3-5
	1 – 2 × 10	7-0	6-0	5-5	4- 11	4-7	4-3	4-0
	1 – 2 × 12	8-3	7-1	6-4	5- 10	5-5	5-0	4-9
	2 – 2 × 6	6-11	5- 11	5-4	4- 10	4-6	4-3	4-0
Southern pine	2 – 2 × 8	8-9	7-7	6-9	6-2	5-9	5-4	5-0
	2 – 2 × 10	10-4	9-0	8-0	7-4	6-9	6-4	6-0
	2 – 2 × 12	12-2	10- 7	9-5	8-7	8-0	7-6	7-0
	3 – 2 × 6	8-2	7-5	6-8	6-1	5-8	5-3	5-0
	3 – 2 × 8	10- 10	9-6	8-6	7-9	7-2	6-8	6-4
	3 – 2 × 10	13-0	11- 3	10-0	9-2	8-6	7- 11	7-6
	3 – 2 × 12	15-3	13- 3	11- 10	10- 9	10- 0	9-4	8- 10
	3 × 6 or 2 – 2 × 6	5-5	4-8	4-2	3- 10	3-6	3-1	2-9
	3 × 8 or 2 – 2 × 8	6-10	5- 11	5-4	4- 10	4-6	4-1	3-8

	3 × 10 or 2 – 2 × 10	8-4	7-3	6-6	5- 11	5-6	5-1	4-8
	3 × 12 or 2 – 2 × 12	9-8	8-5	7-6	6- 10	6-4	5- 11	5-7
	4 × 6	6-5	5-6	4-11	4-6	4-2	3- 11	3-8
Douglas fir-larch ^e ,hem-fir ^e ,spruce-pine-fir ^e ,redwood,western cedars,ponderosa pine ^f ,red pine ^f	4 × 8	8-5	7-3	6-6	5- 11	5-6	5-2	4- 10
	4 × 10	9-11	8-7	7-8	7-0	6-6	6-1	5-8
	4 × 12	11-5	9- 11	8-10	8-1	7-6	7-0	6-7
	3 – 2 × 6	7-4	6-8	6-0	5-6	5-1	4-9	4-6
	3 – 2 × 8	9-8	8-6	7-7	6- 11	6-5	6-0	5-8
	3 – 2 × 10	12-0	10- 5	9-4	8-6	7- 10	7-4	6- 11
	3 – 2 × 12	13- 11	12- 1	10-9	9- 10	9-1	8-6	8-1

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg.

- a. Ground snow load, live load = 40 psf, dead load = 10 psf, L/Δ = 360 at main span, L/Δ = 180 at cantilever with a 220-pound point load applied at the end.
- b. Beams supporting deck joists from one side only.
- c. No. 2 grade, wet service factor.
- d. Beam depth shall be greater than or equal to depth of joists with a flush beam condition.
- e. Includes incising factor.
- f. Northern species. Incising factor not included.
- g. Beam cantilevers are limited to the adjacent beam's span divided by 4.
- h. <u>For calculation of effective deck joist span, the actual joist span length shall be multiplied by the joist span factor from the following table.</u>

<u>C/J</u>	<u>Joist span factor</u>
<u>0 (no cantilever)</u>	<u>0.66</u>
<u>1/12 (0.87)</u>	<u>0.72</u>
1/10 (0.10)	0.80
<u>1/8 (0.125)</u>	<u>0.84</u>
<u>1/6 (0.167)</u>	<u>0.90</u>
1/4 (0.250)	1.00

<u>J = actual joist span length (feet)</u>

C= actual joist cantilever length (feet)

Reason: The current beam span table incorporates a conservative assumption that all deck joists cantilever the

allowable ¼ of the main span past the beam. This assumption is included in the calculated tributary area of the beam design within the headings of deck joist span. The proposed footnote adds a factor that allows this assumption to be counteracted so that designers that do not use a full cantilever do not have to overdesign the beam.

Example:

A deck is designed using Southern Pine, (2) 2x10

Joist span is 12' and no cantilever.

	Effective Deck Joist Span Length								
	(feet) <u>h</u>								
	6	8	10	12	14	16	18		
SIZE ^d	<u> DECK BEAM SPAN LENGTH ^{a,b,g} (feet – inches)</u>								
1 – 2 × 6	4-11	4-0	3-7	3-3	3-0	2-10	2-8		
1 – 2 × 8	5-11	5-1	4-7	4-2	2-10	3-7	3-5		
1 – 2 × 10	7-0	6-0	5-5	4-11	4-7	4-3	4-0		
1 – 2 × 12	8-3	7-1	6-4	5-10	5-5	5-0	4-9		
2 – 2 × 6	6-11	5-11	5-4	4-10	4-6	4-3	4-0		
2 – 2 × 8	8-9	7-7	6-9	6-2	5-9	5-4	5-0		
2 – 2 × 10	10-4	9-0	8-0	7-4	6-9	6-4	6-0		
2 – 2 × 12	12-2	10-7	9-5	8-7	8-0	7-6	7-0		
3 – 2 × 6	8-2	7-5	6-8	6-1	5-8	5-3	5-0		
3 – 2 × 8	10-10	9-6	8-6	7-9	7-2	6-8	6-4		
3 – 2 × 10	13-0	11-3	10-0	9-2	8-6	7-11	7-6		
3 – 2 × 12	15-3	13-3	11-10	10-9	10-0	9-4	8-10		

• C = 0 feet

• J = 12 feet

• The existing table would say the maximum beam span length would be 7'-4"

Applying the adjustment factor

- C /J= 0 and the joist span factor calculates out to .66
- The effective joist span can be adjusted as .66 x 12 = 8 feet
- The maximum <u>beam span length</u> is 9'-0" since there is no cantilever.

Note: The beam length is not reduced by .66, but rather the effective joist span length is reduced by .66.

Also there were a few minor adjustments to the titles in the table. They were done to help add clarity to the table.

Cost Impact: The code change proposal will decrease the cost of construction If the deck is constructed with a cantilevered beam, the beam may be able to be downsized if it is constructed with a cantilever that is not at its maximum length. For some decks this could save a few dollars with smaller beam material.

Proposal # 4830

RB190-19

RB191-19

IRC®: R507.7, TABLE R507.7

Proponent: Deck Code Coalition, Charles Bajnai (chair), North American Deck and Railing Assoc (NADRA), representing Deck Code Coalition (csbajnai@gmail.com)

2018 International Residential Code

Revise as follows:

R507.7 Decking. Maximum allowable spacing for joists supporting <u>wood</u> decking <u>, excluding stairways</u>, shall be in accordance with Table R507.7. Wood decking shall be attached to each supporting member with not less than two 8d threaded nails or two No. 8 wood screws. <u>Maximum allowable spacing for joists supporting plastic composite decking shall be in accordance with Section R507.2.</u> Other approved decking or fastener systems shall be installed in accordance with the manufacturer's installation requirements.

 TABLE R507.7

 MAXIMUM JOIST SPACING FOR WOOD DECKING

	MAXIMUM ON-CENTER JOIST SPACING *							
DECKING MATERIAL TYPE AND	Decking perpen	dicular to joist	Decking diagonal to joist ^a					
NOMINAL SIZE	<u>Single Span ^c</u>	<u>Multi-Span ^c</u>	<u>Single Span ^c</u>	<u>Multi-Span ^c</u>				
	MAXIMUM ON-CENTER JOIST SPACING							
$+^{+}_{-}$ <u>5/4</u> inch-thick wood deck boards b	<u>12 inches</u>	16 inches	<u>8 inches</u>	<u>12 inches</u>				
2-inch-thick wood	24 inches	24 inches	<u>18 inches</u>	16 _24 inches				
Plastic composite	In accordance wit	n Section R507.2	In accordance with	n Section R507.2				

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 degree = 0.01745 rad.

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

b. Or other maximum span provided by an accredited lumber grading or inspection agency.

c. Individual wood deck boards supported by two joists shall be considered *single span* and three or more joists shall be considered *multi-span*.

Reason: The Deck Code Coalition proposes to replace the existing decking span table to correct:

- 1. the allowable span for 2x wood,
- 2. allow lumber grading or inspection agencies to rate 5/4" decking for longer spans, and
- 3. provide values for single span conditions.

Currently, the table is overly conservative for 2x material. When evaluated per the American Lumber Standards Committee's (ALSC) decking policy, 2x nominal material can span 24 inches instead of the 16 inches currently allowed.

Similarly, 5/4 inch decking is rated per ALSC's decking policy. While the minimum rated span is 16 inches, for stronger species or grades, the allowable rated span can be larger. The proposed table keeps the conservative baseline while increasing flexibility to manufacturers and designers.

Lastly, the ALSC policy is for evaluation of decking with two-span conditions, which is an unstated assumption in the current table. The proposed table not only exposes that assumption but also gives values for single-span conditions that may be impossible to avoid for some decking layouts.

For information for the ALSC decking policy refer to

http://www.alsc.org/greenbook%20collection/UntreatedProgram_EvaluationofRecommendedSpans.PDF

Cost Impact: The code change proposal will decrease the cost of construction The code change proposal will decrease the cost of construction. There might be a reduced cost if a builder is laying decking on the diagonal. The other items in the table remain the same.

Proposal # 4301
RB192-19

IRC®: R507.9.1.2

Proponent: Borjen Yeh, APA - The Engineered Wood Association, representing APA - The Engineered Wood Association (borjen.yeh@apawood.org); Ralph Leyva, representing APA- The Engineered Wood Assoc (ralph.leyva@apawood.org)

2018 International Residential Code

Revise as follows:

R507.9.1.2 Band joist details. Band joists supporting a ledger shall be a minimum 2-inch-nominal (51 mm), solid-sawn, spruce-pine-fir or better lumber or a minimum 1-inch by $9^{1}/_{2}$ -inch (25 mm \times 241 mm) dimensional, Douglas fir or better, laminated veneer lumber.) nominal engineered wood rim boards in accordance with Section R502.1.7. Band joists shall bear fully on the primary structure capable of supporting all required loads.

Reason: This proposal requires the band joists used to attach the deck ledger to be in compliance with sawn lumber or the engineered wood rim board, which is recognized in R502.1.7. The current language restricts the band joists to be a minimum of 1-inch by 9-1/2-inch dimensional, Douglas fir or better, laminated veneer lumber. This proposal retains the minimum rim joist thickness of 1 inch but removes the minimum depth of 9-1/2-inch because the framing members might be less than 9-1/2 inches, such as 10x dimension lumber with a net depth of 9-1/4 inches or 8x with a net depth of 7-1/4 inches. In addition, based on Section R502.1.7, band joists qualified under ANSI/APA PRP 410 or ASTM D7672 include engineered wood products beyond "Douglas-fir laminated veneer lumber" (LVL). It should be noted that the ledger connection for the qualified band joists is required by ANSI/APA PRP 410 or ASTM D7672 to be tested at 5 times or more of the design capacity used to develop the current IRC Table R507.9.1.3(1).

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal is intended to clarify the reference of the band joists based on the code.

Proposal # 4663

RB192-19

RB193-19

IRC®: TABLE R602.3(1) (New)

Proponent: Rick Allen, International Staple, Nail and Tool Association, representing International Staple, Nail and Tool Association (rallen@isanta.org)

2018 International Residential Code

Revise as follows:

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING AND LOCATION
	22. •	Roof	
1	Blocking between ceiling joists or rafters <u>or trusses</u> to top plate <u>or other</u> <u>framing below</u>	4-8d box $(2^{1}/_{2}" \times 0.113")$ or 3-8d common $(2^{1}/_{2}" \times 0.131")$; or 3-10d box $(3" \times 0.128")$; or 3-3" $\times 0.131"$ nails; or 3-3" 14 gage staples $\frac{7}{16}$ " crown	Toe nail
	Blocking between rafters or truss not at the wall top plate, to rafter or truss	2-8d common (2½" x 0.131"); or 2- (3" x 0.131") nails or 2- 3" 14 gage staples 7/15" crown	Each end toe nail
		2-16d common (3½" x 0.162"); or 3-(3" x 0.131") nails or 3 -3" 14 gage staples 7/16" crown	<u>End nail</u>
	Flat blocking to truss and web filler	<u>16d common (3½" x</u> 0.162"); or (3" x 0.131") nails; or 3" 14 gage staples 7/16" crown	<u>6" o.c. Face nail</u>
2	Ceiling joists to top plate	Stainless Steel Fasteners Are Not Applicable In This Connection 4-8d box $(2^{1}/_{2}" \times 0.113")$; or 3-8d common $(2^{1}/_{2}" \times 0.131")$; or 3-10d box $(3" \times 0.128")$; or 3-3" $\times 0.131"$ nails; or 3-3" 14 gage staples $7/_{16}$ " crown	Per joist, toe nail
3	Ceiling joist not attached to parallel rafter, laps over partitions (see Section R802.5.2 and Table R802.5.2)	4-10d box $(3" \times 0.128")$; or 3-16d common $(3!/_2" \times 0.162")$; or 4-3" $\times 0.131"$ nails <u>or 4- 3" 14</u> <u>gage staples $\frac{7}{16}$" crown</u>	Face nail
4	Ceiling joist attached to parallel rafter (heel joint) (see Section R802.5.2 and Table R802.5.2)	Table R802.5.2	Face nail
5	Collar tie to rafter, face nail or $1\frac{1}{4}$ × 20	4-10d box (3" × 0.128"); or 3-10d common (3" × 0.148"); or 4-3" × 0.131"	Face nail each rafter

TABLE R602.3(1) FASTENING SCHEDULE

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING AND LOCATION
	ga. ridge strap to rafter	nails <u>or 4- 3" 14</u> gage staples 7/16" crown	
6	Rafter or roof truss to plate	Stainless Steel Fasteners Are Not Applicable In This Connection	2 toe nails on one side and 1 toe nail on opposite side of each rafter or truss
		3-16d box nails (3 ¹ / ₂ " × 0.135"); or 3-10d common nails (3" × 0.148"); or 4- 10d box (3" × 0.128"); or 4-3" × 0.131" nails; <u>or</u> <u>4-3" 14 gage staples ⁷/₁₆"</u> <u>crown</u>	
7	Roof rafters to ridge, valley or hip rafters or roof rafter to minimum 2" ridge beam	4-16d (3 ¹ / ₂ " × 0.135"); or 3-10d common (3" × 0.148"); or 4-10d box (3" × 0.128"); or 4-3" × 0.131" nails; <u>or 4- 3" 14</u> <u>gage staples ⁷/₁₆" crown</u>	Toe nail
		3-16d box 31/2" × 0.135"); or 2-16d common (31/2" × 0.162"); or 3-10d box (3" × 0.128"); or 3-3" × 0.131" nails; <u>or 4- 3" 14</u> <u>gage staples 7/16" crown</u>	End nail
	r.	Wall	-
8	Stud to stud (not at braced wall panels)	16d common (3¹/₂" × 0.162")	24" o.c. face nail
		10d box (3" × 0.128"); or 3" × 0.131" nails; <u>or</u> <u>4- 3" 14 gage staples ⁷/₁₆"</u> <u>crown</u>	16″ o.c. face nail
9	Stud to stud and abutting studs at intersecting wall corners (at braced	16d box (3 ¹ / ₂ " × 0.135"); or 3" × 0.131" nails; <u>or</u> <u>4- 3" 14 gage staples ⁷/₁₆"</u> <u>crown</u>	12" o.c. face nail
	wali panels)	16d common (3¹/₂″ × 0.162″)	16" o.c. face nail
10	Built-up header (2" to 2" header with 1/2"	16d common (3¹/₂″ × 0.162″)	16" o.c. each edge face nail
	spacer)	16d box (3 ¹ / ₂ " × 0.135")	12" o.c. each edge face nail
11	Continuous header to stud	5-8d box (2 ¹ / ₂ " × 0.113"); or 4-8d common (2 ¹ / ₂ " ×	Toe nail

ІТЕМ	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING AND LOCATION
		0.131"); or 4-10d box (3" × 0.128")	
12	Top plate to top plate	16d common (3¹/₂" × 0.162")	16" o.c. face nail
		10d box (3" × 0.128"); or 3" × 0.131" nails; <u>or 3"</u> <u>14 gage staples 7/₁₆"</u> <u>crown</u>	12" o.c. face nail
13	3 Double top plate splice 8-16d common (31/2" × 0.162"); or 12-16d box (31/2" × 0.135"); or 12-10d box (3" × 0.128"); or 12-3" × 0.131" nails; <u>or 12-3"</u> 14 gage staples 7/15" crown		Face nail on each side of end joint (minimum 24" lap splice length each side of end joint)
14	Bottom plate to joist, rim joist, band joist	16d common (3¹/₂" × 0.162")	16" o.c. face nail
	or blocking (not at braced wall panels)	16d box (3 ¹ / ₂ " × 0.135"); or 3" × 0.131" nails; <u>or 3"</u> <u>14 gage staples 7/₁₆"</u> <u>crown</u>	12" o.c. face nail
15	Bottom plate to joist, rim joist, band joist or blocking (at braced wall panel)	3-16d box (3 ¹ / ₂ " × 0.135"); or 2-16d common (3 ¹ / ₂ " × 0.162"); or 4-3" × 0.131" nails; <u>or 4- 3" 14</u> <u>gage staples ⁷/₁₆" crown</u>	3 each 16" o.c. face nail2 each 16" o.c. face nail4 each 16" o.c. face nail <u>16" o.c.</u> <u>face nail</u>
16	Top or bottom plate to stud	4-8d box $(2^{1}/_{2}" \times 0.113")$; or 3-16d box $(3^{1}/_{2}" \times 0.135")$; or 4-8d common $(2^{1}/_{2}" \times 0.131")$; or 4-10d box $(3" \times 0.128")$; or 4-3" \times 0.131" nails; <u>or 4-3" 14</u> <u>gage staples $7/_{16}$" crown</u>	Toe nail
		3-16d box $(3^{1}/_{2}" \times 0.135")$; or 2-16d common $(3^{1}/_{2}" \times 0.162")$; or 3-10d box $(3" \times 0.128")$; or 3-3" $\times 0.131"$ nails; <u>or 3-3" 14</u> <u>gage staples $7/_{16}$" crown</u>	End nail
17	Top plates, laps at corners and intersections	3-10d box (3" × 0.128"); or 2-16d common (31/2" × 0.162"); or 3-3" × 0.131" nails; <u>or 3-3" 14</u> gage staples 7/18" crown	Face nail

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING AND LOCATION
18	1" brace to each stud and plate	Stainless Steel Fasteners Are Not Applicable In This Connection	Face nail
		3-8d box $(2^{1}/_{2}" \times 0.113")$; or 2-8d common $(2^{1}/_{2}" \times 0.131")$; or 2-(3" x 0.131"); or 2-10d box (3" $\times 0.128"$); or 2-staples $\frac{1^{2}/_{4}"}{2}$ 2-3" 14 gage staples $\frac{7}{16}$ " crown	
19	1" × 6" sheathing to each bearing	Stainless Steel Fasteners Are Not Applicable In This Connection	Face nail
		3-8d box (2 ¹ / ₂ " × 0.113"); or 2-8d common (2 ¹ / ₂ " × 0.131"); or 2-10d box (3" × 0.128"); or2 staples, 1" crown, 16 ga., 1 ³ / ₄ " long	
20	1" × 8" and wider sheathing to each bearing	Stainless Steel Fasteners Are Not Applicable In This Connection	Face nail
		3-8d box (2 ¹ / ₂ " × 0.113"); or3-8d common (2 ¹ / ₂ " × 0.131"); or 3-10d box (3" × 0.128"); or3 staples, 1" crown, 16 ga., 1 ³ / ₄ "long	
		Stainless Steel Fasteners Are Not Applicable In This Connection	
		Wider than $1" \times 8"4-8d$ box $(2!/_2" \times 0.113")$; or3- 8d common $(2!/_2" \times 0.131")$; or 3-10d box $(3" \times 0.128")$; or 4 staples, 1" crown, 16 ga., $1^{3}/_{4}"$ long	
		Floor	
21	Joist to sill, top plate or girder	4-8d box (2 ¹ / ₂ " × 0.113"); o r3-8d common (2 ¹ / ₂ " × 0.131"); or 3-10d box (3" × 0.128"); or 3-3" × 0.131" nails; <u>or 3-3" 14</u> <u>gage staples ⁷/₁₆" crown</u>	Toe nail

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER A. 5. 0	SPACING AND LOCATION
22	Rim joist, band joist	8d box (21/2" × 0.113")	4" o.c. toe nail
	or blocking to sill or top plate (roof applications also)	8d common (2 ¹ / ₂ " × 0.131"); or 10d box (3" × 0.128"); or 3" × 0.131" nails; or <u>3" 14</u> <u>gage staples ⁷/₁₆" crown</u>	6" o.c. toe nail
23	1" × 6" subfloor or less to each joist	Stainless Steel Fasteners Are Not Applicable In This Connection	Face nail
		3-8d box (2 ¹ / ₂ " × 0.113"); or 2-8d common (2 ¹ / ₂ " × 0.131"); or 3-10d box (3" × 0.128"); or2 staples, 1" crown, 16 ga., 1 ³ / ₄ " long	
		Floor	
24	2" subfloor to joist or girder	3-16d box $(3^{1}/_{2}" \times 0.135")$; or 2-16d common $(3^{1}/_{2}" \times 0.162")$	Blind and face nail
25	2" planks (plank & beam—floor & roof)	3-16d box $(3^{1}/_{2}" \times 0.135")$; or 2-16d common $(3^{1}/_{2}" \times 0.162")$	At each bearing, face nail
26	Band or rim joist to joist	3-16d common (3 ¹ / ₂ " × 0.162"); or 4-10 box (3" × 0.128"), or 4-3" × 0.131" nails; or 4-3" × 14 ga. staples, ⁷ / ₁₆ " crown	End nail
27	Built-up girders and beams, 2-inch	20d common (4" × 0.192"); or	Nail each layer as follows: 32" o.c. at top and bottom and staggered.
	lumber layers	10d box (3" × 0.128"); or3" × 0.131" nails; <u>or 3"</u> <u>14 gage staples 7/16"</u> <u>crown</u>	24" o.c. face nail at top and bottom staggered on opposite sides
		And:2-20d common (4" × 0.192"); or 3-10d box (3" × 0.128"); or 3-3" × 0.131" nails <u>: or 4- 3" 14</u> gage staples 7/ ₁₆ " crown	Face nail at ends and at each splice
28	Ledger strip supporting joists or rafters	4-16d box $(3^{1}/_{2}" \times 0.135")$; or 3-16d common $(3^{1}/_{2}" \times 0.162")$; or 4-10d box $(3" \times 0.128")$; or 4-3" $\times 0.131"$ nails; <u>or 3- 3" 14</u> <u>gage staples $^{7}/_{16}$" crown</u>	At each joist or rafter, face nail

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING	AND LOCATION				
29	Bridging or blocking to joist, rafter or truss	2-10d box (3" × 0.128"), or 2-8d common (2½" × 0.131"; or 2-3" × 0.131") nails; <u>or</u> 2- <u>3" 14</u> gage staples 7/ ₁₆ " crown	Each	end, toe nail				
ITEM	DESCRIPTION OF	NUMBER AND TYPE OF	SPACING	OF FASTENERS				
	ELEMENTS	FASTENER	Edges (inches) [»]	Intermediate supports ^{e,} •(inches)				
	Wood structural pan particleboard wall si pa	els, subfloor, roof and intented intented intented in the set of t	erior wall sheathi able R602.3(3) fo g to wall framing)	ng to framing and or wood structural				
30	3/8'' - 1/2''	6d common <u>or</u> <u>deformed (2" ×</u> 0.113"); <u>or $2^{3}/_{e}$" ×</u> <u>0.113"</u> nail (subfloor, wall)8d common ($2^{1}/_{e}$ " × 0.131") nail (roof); or RSRS-01 ($2^{a}/_{e}$" × 0.113") nail (roof)	6	12				
		8d common (21/2" × 0.131") nail (roof); or RSRS-01 (23/8" × 0.113") nail (roof)	6	12'				
		<u>2³/₈" × 0.113" (roof)</u>	<u>4</u>	<u>8</u>				
31	¹⁹ / ₃₂ " - 1" <u>3/4</u> "	8d common nail (2 ¹ / ₂ " × 0.131"); or RSRS-01; (2 ³ / ₃ " × 0.113") nail (roof)	6	12 [,]				
		<u>2³/₈" × 0.113" (roof)</u>	<u>4</u>	<u>8</u>				
		deformed 2" x 0.113" (wall or subfloor)	<u>6</u>	<u>12</u>				
32	$4^{1/2} + \frac{1}{2} + \frac{1}{2} - \frac{1}{4} + \frac{1}$	10d common (3" × 0.148") nail; or 8d (2'/ ₂ " × 0.131") deformed nail	6	12				
	-	Other wall sheat	hing [®]					
33	1/2" structural cellulosic fiberboard sheathing	$1^{1/2}$ " <u>x 0.120</u> " galvanized roofing nail, $7/_{16}$ " head diameter, or $1^{1/4}$ " long 16 ga. staple with $7/_{16}$ " or 1" crown	3	6				
34	^{25/} ₃₂ " structural cellulosic fiberboard sheathing	$1^{3/4}$ " <u>x 0.120</u> " galvanized roofing nail, $7/16$ " head diameter, or $1^{1/2}$ " long 16	3	6				

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING	AND LOCATION
		ga. staple with 7/16" or 1" crown		
35	¹ /2" gypsum sheathing ^d	1 ¹ / ₂ " <u>x 0.120</u> galvanized roofing nail, 7/ ₁₆ " head diameter; or 16 gage staple galvanized,1 ¹ / ₂ " long;7/ ₁₆ " <u>or 1" crown or</u> 1 ¹ / ₄ " screws, Type W or S	7	7
36	⁵/₀" gypsum sheathingª	1 ³ / ₄ " <u>x 0.120</u> " galvanized roofing nail; <u>7/₁₆" head</u> <u>diameter; or 16</u> <u>gage</u> staple galvanized,1 ⁵ / ₈ " long; <u>7/₁₆"</u> <u>or 1" crown; or</u> 1 ⁵ / ₉ " screws, Type W or S	7	7
	Wood structura	I panels, combination sub	floor underlayme	nt to framing
37	³/₄″ and less	$\frac{\text{deformed (2"}}{(2" \times 0.113")} \text{ or } \frac{\text{de}}{\text{deformed}} \text{ deformed} \\ (2" \times 0.120") \text{ nail; or 8d} \\ \text{common } (2^{1}/_{2}" \times 0.131") \\ \text{nail}$	6	12
38	7/ ₈ " – 1"	8d common (2 ¹ / ₂ " × 0.131") nail; or <u>deformed</u> (<u>2¹/₂" x 0.131");</u> <u>or 8d-deformed</u> (2 ¹ / ₂ " × 0.120") nail	6	12
39	1 ¹ / ₈ " - 1 ¹ / ₄ "	10d common (3" × 0.148") nail; or <u>deformed (2½" x</u> <u>0.131"); or 8d deformed</u> ($2^{1}/_{z}$ " × 0.120") nail	6	12

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s; 1 ksi = 6.895 MPa.

a. Nails are smooth-common, box or deformed shanks except where otherwise stated. Nails used for framing and sheathing connections shall have minimum average bending yield strengths as shown: 80 ksi for shank diameter of 0.192 inch (20d common nail), 90 ksi for shank diameters larger than 0.142 inch but not larger than 0.177 inch, and 100 ksi for shank diameters of 0.142 inch or less.

b. Staples are 16 gage wire and have a minimum ²/₄₆-inch on diameter crown width.

c .Nails shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater.

d. Four-foot by 8-foot or 4-foot by 9-foot panels shall be applied vertically.

e. Spacing of fasteners not included in this table shall be based on Table R602.3(2).

f. For wood structural panel roof sheathing attached to gable end roof framing and to intermediate supports within 48 inches of roof edges and ridges, nails shall be spaced at 6 inches on center where the ultimate design wind speed is less than 130 mph and shall be spaced 4 inches on center where the ultimate design wind speed is 130 mph or greater but less than 140 mph.

g. Gypsum sheathing shall conform to ASTM C1396 and shall be installed in accordance with GA 253. Fiberboard sheathing shall conform to ASTM C208.

h. Spacing of fasteners on floor sheathing panel edges applies to panel edges supported by framing members and required blocking and at floor perimeters only. Spacing of fasteners on roof sheathing panel edges applies to panel edges supported by framing members and required blocking. Blocking of roof or floor sheathing panel edges perpendicular to the framing members need not be provided except as required by other provisions of this code. Floor perimeter shall be supported by framing members or solid blocking.

i. Where a rafter is fastened to an adjacent parallel ceiling joist in accordance with this schedule, provide two toe nails on one side of the rafter and toe nails from the ceiling joist to top plate in accordance with this schedule. The toe nail on the opposite side of the rafter shall not be required.

j. RSRS-01 is a Roof Sheathing Ring Shank nail meeting the specifications in ASTM F1667.

Reason: IRC Table R602.3(1) and IBC Table 2304.10.1 are essentially the same table in terms or structural connections. Although the connections are closely aligned, there are variations in the prescribed fastener in the

two tables. Some fasteners are prescribed in the IRC table and not in the IBC table and others are prescribed in the IBC table and not the IRC table. This proposal is written to harmonize the fasteners between the two tables. In addition, where additional information exists in one table and not the other, this too is being harmonized.

For connection # 2,6,18,19, 20 & 23 there was a code change proposal RB272-13 entered in by the American Wood Council for the 2015 IRC. The reference nail values for the nailing schedule were based on Reference Lateral Values <u>and Reference Withdrawal values</u>. All other connections in the table were based on Reference Lateral Design Values. In the 2018 NDS, the reference withdrawal values for stainless steel nails were tabulated in a new NDS table (12.2D). The withdrawal values for stainless steel are lower than the values for carbon steel (bright or galvanized) nails of equivalent diameters.

As such, the lower stainless steel withdrawal values combined with the publication date of the 2018 NDS and the 2015 code proposal date would indicate that the basis of the original code proposal is relevant to only carbon steel nails and not to stainless steel nails. The added note to these connections is to exclude stainless steel from these connections based on the lower withdrawal values.

Connection 1:

Added 14 gage staple from IBC 2304.10.1

Added Blocking Between Rafters or Truss not at the wall top plate to rafter or truss from IBC 2304.10.1

Added flat blocking to truss and web filler from IBC 2304.10.1

Connection 2:

Added note regarding stainless steel fasteners

Added 14 gage staples from IBC 2304.10.1

Connection 3, 5

Added 14 gage staples from IBC 2304.10.1

Connection 6

Added note regarding stainless steel fasteners

Added 14 gage staples from IBC 2304.10.1

Connections 7, 8, 9, 12, 13, 14, 15, 16, 17

Added 14 gage staples from IBC 2304.10.1

Connection 15

Changed fastener spacing and location description to match IBC 2304.10.1

Connection 18

Added note regarding stainless steel fasteners

Added 3" x 0.131" nails from IBC 2304.10.1

Added 14 gage staples from IBC 2304.10.1 and eliminated the 16 gage staple reference

Connections 19 & 20

Added note regarding stainless steel fasteners

Connection 21 & 22

Added 14 gage staples from IBC 2304.10.1

Connection 23

Added note regarding stainless steel fasteners

Connections 27, 28 & 29

Added 14 gage staples from IBC 2304.10.1

Connection 30:

The roof fasteners have been separated from the subfloor and wall fasteners for better clarification when reading

Connection 31:

Panel thickness range is changed to match the thickness range in the IBC.

Connection 32:

Panel thickness range is changed to match the thickness range in the IBC. Additionally, the description <u>8d</u> deformed ($2\frac{1}{2}$ " x 0.131") in an incorrect description. ASTM F1667 does not have a classification for 8d deformed. The correct description is a <u>deformed $2\frac{1}{2}$ " x 0.131"</u> nail.

Connections 33 - 34

The current nail descriptions are incomplete and missing a shank diameter. These changes match SDPWS

Connection 35-36

The current nail descriptions are incomplete and missing a shank diameter.

Connection 37:

Adding the deformed 2" x 0.113" nail will harmonize with the IBC table. A <u>6d</u> deformed 2" x 0.120" nail is not addressed in ASTM F1667. The correct description is a <u>deformed 2" x 0.120" nail</u> and should be used to avoid

confusion

Connection 38 & 39:

An <u>**8d**</u> deformed $2\frac{1}{2}$ " x 0.120 nail is not addressed in ASTM F1667. The correct description is a <u>deformed $2\frac{1}{2}$ " x 0.120 nail and should be used to avoid confusion</u>

Footnote b. deleted because of the addition of the 14 gage staples to the table

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposed changes should not change cost of construction as it harmonizes the fasteners between the IBC and IRC

Proposal # 3958

RB193-19

RB194-19

IRC®: TABLE R602.3(1), R602.7.5

Proponent: Paul Coats, representing American Wood Council (pcoats@awc.org)

2018 International Residential Code

Revise as follows:

TABLE R602.3(1) FASTENING SCHEDULE

Portions of table not shown remain unchanged.

ITEM	DESCRIPTION OF NUMBER AND TYPE OF FASTENER ^{a, b, c} BUILDING ELEMENTS NUMBER AND TYPE OF FASTENER ^{a, b, c}		SPACING AND LOCATION						
	Wall								
<u>12</u>	Adjacent full-height stud to end of header	4-16d box (3 1/2' x 0.135"; or 3-16d common (3 1/2" x 0.162"); or 4-10d box (3" x 0.128"); or 4 - 3" x 0.131"	<u>End nail</u>						

R602.7.5 Supports for headers. Headers shall be supported on each end with one or more jack studs or with approved framing anchors in accordance with Table R602.7(1) or R602.7(2). The full-height stud adjacent to each end of the header shall be end nailed to each end of the header in accordance with four-16d nails (3.5 inches \times 0.135 inches Table R602.3(1). The minimum number of full-height studs at each end of a header shall be in accordance with Table R602.7.5.

Reason: This proposal makes no technical changes, but simply places the required nailing of the first full-height stud adjacent to the header into the fastening schedule table with the other structural connections, so it can be found more easily and to avoid correlation problems in the future. Additional full-height studs would be fastened to each other in accordance with row 8 of Table R602.3(1), "Stud to stud (not at braced wall panels)" or row 9, "Stud to stud and abutting studs at intersection wall corners (at braced wall panels)." The only change to Table R602.3(1) is the addition of a new row 12 and the renumbering of subsequent rows.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposal does not change requirements but changes location of a requirement and adds options for nailing.

Proposal # 4274

RB194-19

RB195-19

IRC®: TABLE R602.3(1), ASTM Chapter 44 (New)

Proponent: Tim Earl, representing The Gypsum Association (tearl@gbhinternational.com)

2018 International Residential Code

Revise as follows:

TABLE R602.3(1) FASTENING SCHEDULE

Portions of table not shown remain unchanged.

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING AND LOCATION						
			SPACING OF FASTENERS						
ITEM	BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	Edges (inches) ^h	Intermediate supports ^{c,} ^e (inches)					
	Other wall sheathing ^g								
33	¹ /2 ["] structural cellulosic fiberboard sheathing	$1^{1}/_{2}^{''}$ galvanized roofing nail, $^{7}/_{16}^{''}$ head diameter, or $1^{1}/_{4}^{''}$ long 16 ga. staple with $^{7}/_{16}^{''}$ or 1″ crown	3	6					
34	²⁵ / ₃₂ ″ structural cellulosic fiberboard sheathing	$1^{3}\!/_{4}''$ galvanized roofing nail, $^{7}\!/_{16}$ " head diameter, or $1^{1}\!/_{2}''$ long 16 ga. staple with $^{7}\!/_{16}''$ or 1″ crown	3	6					
35	¹ /2 ["] gypsum sheathing ^d	$1^{1}\!/_{2}{}''$ galvanized roofing nail; staple galvanized, $1^{1}\!/_{2}{}''$ long; $1^{1}\!/_{4}{}''$ screws, Type W or S	7	7					
36	⁵ /8 ["] gypsum sheathing ^d	$1^{3}\!/_{4}$ galvanized roofing nail; staple galvanized, $1^{5}\!/_{8}$ long; $1^{5}\!/_{8}$ screws, Type W or S	7	7					

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s; 1 ksi = 6.895 MPa.

g. Gypsum sheathing shall conform to ASTM C1396 and shall be installed in accordance with GA 253 <u>or ASTM</u> <u>C1280.</u> Fiberboard sheathing shall conform to ASTM C208.

Add new standard(s) as follows:



ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

C1280-18: Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing

Reason: This adds the ASTM standard as an alternative to the GA (industry) standard for those who may wish to refer preferentially to the ASTM document. In practice there is no difference between the two documents.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This simply adds another referenced standard as an option, with no impact on cost.

Staff Analysis: The referenced standard, ASTM C1280-18, is currently referenced in other 2018 I-codes.

Proposal # 4021

RB195-19

RB196-19

IRC®: TABLE R602.3(1)

Proponent: James Smith, American Wood Council, representing American Wood Council (jsmith@awc.org)

2018 International Residential Code

Revise as follows:

TABLE R602.3(1) FASTENING SCHEDULE

Portions of table not shown remain unchanged.

ITEM	DESCRIPTION OF BUILDING ELEMENTS	SPACING AND LOCATION						
	DESCRIPTION OF	SPA FAS	SPACING OF FASTENERS					
ITEM	I BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	Edges (inches) ^h	Intermediate supports ^{c,} ^e (inches)				
Wood	Wood structural panels, subfloor, roof and interior wall sheathing to framing and particleboard wall sheathing to framing [see Table R602.3(3) for wood structural panel exterior wall sheathing to wall framing]							
30	³ /8″ – ¹ /2″	6 ^f	12 6 [†]					
31	¹⁹ / ₃₂ ″ – 1″	8d common nail (2 ¹ /2″ × 0.131″); or RSRS-01 ; (2 ³ /8″ × 0.113″) nail (roof) ^j	6 ^f	12 6 ^f				
32	$1^{1}/_{8}'' - 1^{1}/_{4}''$	6	12					

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s; 1 ksi = 6.895 MPa.

f. For wood structural panel roof sheathing attached to gable end roof framing and to intermediate supports within 48 inches of roof edges and ridges, nails shall be spaced at 6 <u>4</u> inches on center where the ultimate design wind speed is less than 130 mph and shall be spaced 4 inches on center where the ultimate design wind speed is 130 mph or greater but less than 140 mph. greater than 130 mph in Exposure B or greater than 110 mph in Exposure C.

Reason: AWC submitted two proposals on roof sheathing nailing last cycle, RB222-16 that included modifications for ASCE 7-16 wind loads and RB221-16 that included modifications for ASCE 7-10 wind loads. AWC requested disapproval of the ASCE 7-16 wind load version based on the approval of RB221-16 which updated roof sheathing nailing in Table R602.3(1) to ASCE 7-10 wind loads. AWC is now resubmitting a proposal to update roof sheathing nailing in Table R602.3(1) to be based on ASCE7-16 wind loads and to agree with roof sheathing nailing in the 2018 Wood Frame Construction Manual. Wind uplift nailing requirements for common species of roof framing with specific gravities of 0.42 or greater (e.g. SPF, Hem-Fir) are the basis of the proposed nail spacing requirements in Table R602.3(1) to meet the wind uplift loading requirements per ASCE 7-16 without being overly complex in specification of roof sheathing nailing. The basic nailing proposed is 6" o.c. at panel edges and 6" o.c. at intermediate supports in the field of the panel. As shown in the boxed cells

of 2018 WFCM, Table 3.10A for the common case of roof framing spaced at 24 inches on center, nailing at intermediate supports in the interior portions of the roof is 6" o.c. for wind speeds within the scope of IRC. The 6" o.c. spacing is also appropriate for edge zones except where ultimate wind speeds equal or exceed 130 mph in Exposure B and 110 mph in Exposure C where 4" o.c. nailing is needed. These special cases are addressed by the proposed modification to footnote f.

Table 3.10ARoof Sheathing Attachment Requirements for Wind
Loads (7/16", PANEL SG=0.50)

E)

(Prescriptive Alternative to Table 3.10)

Wind Speed 3-second gust (mph) (See Figure 1.1)		9	90	9)5	1	00	1	05	1	10	1	15	1	20	1	30	14	40	1	50	
STRUCTURAL SHEATHING																						
			Ε	F	Ε	F	Ε	F	Ε	F	Ε	F	Ε	F	Ε	F	Ε	F	Ε	F	Ε	F
Sheathing Location ¹	Rafter/Truss Framing Specific Gravity, G	Rafter/Truss Spacing (in.)					_	Max	imu	m Na	il Sp	oacin	g foi	r 8d (Com	mon	Nail	s, or	10d	Box	Nai	s (in
		12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
	0.49	16	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
		19.2	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
Interior Zone		24	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
		12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
	0.42	10 2	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
		24	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	6	6	6	6	6
		12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
		16	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	6	6	6
	0.49	19.2	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	6	6	6	6	6
		24	6	12	6	12	6	12	6	12	6	12	6	6	6	6	6	6	6	6		E
Perimeter Edge Zone		12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	6	6	6
	0.42	16	6	12	6	12	6	12	6	12	6	12	6	12	6	6	6	6	6	6	6	6
	0.42	19.2	6	12	6	12	6	12	6	12	6	12	6	6	6	6	6	6	6	6	4	4
		24	6	12	6	6	6	6	6	6	6	6	6	6	6	6	6	6	4	4		E
Gable Endwall Rake or Bake Truss, with up to	0.49	-		6		6		6		6		6		6		6	(5	f	6		5
9" Rake Overhang	0.42	-		6		6		6		6		6		6		6	(5	(6		4

BOARD SHEATHING

Sheathing Size	Rafter/Truss Spacing (in.)				I	Minimun	n Numbe	r of 8d C	ommon l	Nails Per	Support
1x6 or 1x8 Sheathing	12-19.2	2	2	2	2	2	2	2	2	2	2
1x10 or Larger Sheathing	3	3	3	3	3	3	3	3	3	3	

E - Nail spacing at panel edges (in.)

F - Nail spacing at intermediate supports in the panel field (in.)

1 For roof sheathing within 4 feet of the perimeter edge of the roof, including 4 feet on each side of the roof peak, the 4 foot perimeter edge : shall be used.

2 For wind speeds greater than 130 mph, blocking is required which transfers lateral load to two additional joists (3 joists total).

3 See Table 3.10 for other fastener and sheathing combinations.

4 Tabulated values for 8d common and 10d box nails are applicable to carbon steel nails (bright or galvanized).

Table 3.10ARoof Sheathing Attachment Requirements for Wind
Loads (7/16", PANEL G=0.50)

Wind Speed 3-second gust (mph) (See Figure 1.1)			9	0	9)5	1	00	1(05	1	10	1	15	1	20	1	30	14	40	19	50
														STR	UCTI	URAL	SH	EATH	IING			
			Ε	F	Ε	F	Ε	F	Ε	F	Ε	F	Ε	F	Ε	F	Ε	F	Ε	F	Ε	F
	Rafter/Truss																					
charable a transford	Framing	Rafter/Truss															N	-	404		N - 1	- (!
Sheathing Location	Specific	Spacing (in.)						wax	Imur	m Na	iii Sp	acin	g toi	80.0	Lom	mon	Nai	s, or	100	вох	Nai	s (in
	Gravity, G																					
		12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
	0.49	16	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
Interior Zone	0.45	19.2	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	6
		24	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	6	6	6
		12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12
	0.42	16	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	6	6	6
		19.2	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	6	6	6	6	6
		24	6	12	6	12	6	12	6	12	6	12	6	6	6	6	6	6	6	6	6	6
		12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	6	6	6
	0.49	16	6	12	6	12	6	12	6	12	6	12	6	12	6	6	6	6	6	6	6	6
		19.2	6	12	6	12	6	12	6	12	6	12	6	6	6	6	6	6	6	6	6	6
Perimeter Edge Zone		24	6	12	6	12	6	6	6	6	6	12	6	6	6	6		-				
-		12	6	12	6	12	6	12	6	12	6	12	6	6	6	6	6	6	6	6	6	6
	0.42	16	6	12	6	12	6	6	6	6	6	12	6	6	6	6	6	6	4	4	4	4
		19.2	6	6	6	6	6	6	6	6	6	6	6	6	6	6	4	4	4	4	4	4
Gable Endwall Rake or	0.49	-		6		6		6	(6	(6	-7	6		6		6		6	4	1
Rake Truss with up to 9" Rake Overhang	0.42	-		6		6	(6	(6	(6		6		4		4		4		3

(Prescriptive Alternative to Table 3.10)

BOARD SHEATHING

Sheathing Size	Rafter/Truss Spacing (in.)	Minimum Number of 8d Common Nails Per Suppor								Support ⁴	
1x6 or 1x8 Sheathing	12-19.2	2	2	2	2	2	2	2	2	2	2
1x10 or Larger Sheathing	12-19.2	3	3	3	3	3	3	3	3	3	3

Nail spacing at panel edges (in.)

F - Nail spacing at intermediate supports in the panel field (in.)

1 For roof sheathing within 4 feet of the perimeter edge of the roof, including 4 feet on each side of the roof peak, the 4 foot perimeter edge z shall be used.

2 For wind speeds greater than 130 mph, blocking is required which transfers lateral load to two additional joists (3 joists total).

3 See Table 3.10 for other fastener and sheathing combinations.

4 Tabulated values for 8d common and 10d box nails are applicable to carbon steel nails (bright or galvanized).

Cost Impact: The code change proposal will increase the cost of construction

The change in the spacing of the nails for the small portions of roofs will result in an increase in the cost due to a the increased number of nails and the time to install them, but that cost should be negligible when considering the overall cost for the construction of a dwelling.

Proposal # 4037

RB196-19

RB197-19

IRC: TABLE R602.3(2)

Proponent: Rick Allen, International Staple, Nail and Tool Association, representing International Staple, Nail and Tool Association (rallen@isanta.org)

2018 International Residential Code

Revise as follows:

TABLE R602.3(2)ALTERNATE ATTACHMENTS TO TABLE R602.3(1)

Portions of table not shown remain unchanged.

		SPA FA	ACING [©] OF STENERS
THICKNESS (inches)	DESCRIPTION ^{a, b} OF FASTENER AND LENGTH (inches)	Edges (inches)	Intermediate supports (inches)
NOMINAL MATERIAL THICKNESS (inches)	DESCRIPTION ^{a, b} OF FASTENER AND LENGTH (inches)	Edges (inches)	Body of panel ^d (inches)
Fl	oor underlayment; plywood-hardboard-particleboard ^f -fiber-cen	nent ^h	
	Fiber-cement		
	3d, 1¹/4" x 0.099" corrosion-resistant, ring shank nails (finished flooring other than tile)	3	6
1/4	Staple 18 ga., ⁷ / ₈ long, ¹ / ₄ crown (finished flooring other than tile)	3	6
	1 ¹ / ₄ long × .121 shank × .375 head diameter corrosion- resistant (galvanized or stainless steel) roofing nails (for tile finish)	8	8
	1 ¹ / ₄ long, No. 8 × .375 head diameter, ribbed wafer-head screws(for tile finish)	8	8
	Hardboard ^f		
	1 ¹ / ₂ <u>x 0.080"</u> long ring -grooved shank underlayment nail	6	6
0.200	4d <u>1³/8" x 0.080" polymer cement-</u> coated sinker nail	6	6
	Staple 18 ga., $7/8$ long (plastic coated)	3	6
	Particleboard		
1/,	4d <u>1½" x 0.099"</u> ring- grooved <u>shank</u> underlayment nail	3	6
/4	Staple 18 ga., ⁷ / ₈ long, ³ / ₁₆ crown	3	6
3/2	6d <u>2" x 0.120"</u> ring- grooved <u>shank</u> underlayment nail	6	10
′δ	Staple 16 ga., 1 ¹ / ₈ long, ³ / ₈ crown	3	6
1/2 5/2	6d <u>2" x 0.120"</u> ring- grooved <u>shank</u> underlayment nail	6	10
<i>'</i> ∠, 'δ	Staple 16 ga., 1 ⁵ / ₈ long, ³ / ₈ crown	3	6

- a. Nail is a general description and shall be permitted to be T-head, modified round head or round head.
- b. Staples shall have a minimum crown width of $7/_{16}$ -inch on diameter except as noted.
- c. Nails or staples shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater. Nails or staples shall be spaced at not more than 12 inches on center at intermediate supports for floors.
- d. Fasteners shall be placed in a grid pattern throughout the body of the panel.
- e. For 5-ply panels, intermediate nails shall be spaced not more than 12 inches on center each way.
- f. Hardboard underlayment shall conform to CPA/ANSI A135.4
- g. Specified alternate attachments for roof sheathing shall be permitted where the ultimate design wind speed is less than 130 mph. Fasteners attaching wood structural panel roof sheathing to gable end wall framing shall be installed using the spacing listed for panel edges.
- h. Fiber-cement underlayment shall conform to ASTM C1288 or ISO 8336, Category C.

Reason: Under Floor Underlayment - Fiber Cement - 1/4 thick

The description '3d' does not describe an actual length and shank diameter of the nail. These dimensions have been added to provide the requirements of the nails.

Under Floor Underlayment - Hardboard - .200 thick

a 1½ long ring grooved underlayment nail is an incomplete and incorrect description. A shank diameter needs to be provided and per ASTM F1667 a diameter of 0.080 is provided, which matches the diameter of the sinker nail on the second line of the table. The term "ring-grooved" should read "ring shank" to be consistent with other descriptions in the code.

a 4d sinker nail is $1^{3}/_{8}$ " long x 0.080" shank diameter. Providing dimensions of $1^{3}/_{8}$ x 0.080" will be consistent with other descriptions in the code. The term "<u>cement</u>" coated has been removed from ASTM F1667 and replaced with "<u>polymer</u>" coated

Under Floor Underlayment - Particle board - all three material thickness, the terms 4d and 6d underlayment nail are not referenced in ASTM F1667 and the descriptions do not provide dimensional requirements for the nails. The correct designation is $1\frac{1}{2}$ " x 0.099" and 2" x 0.120" respectively. The term ring-grooved should read ring shank to be consistent with other descriptions in the code.

Footnote b., staple crowns are not "on diameter". Simply stating the crown width is corrects.

Cost Impact: The code change proposal will not increase or decrease the cost of construction These changes just provide clarity to incorrect or incomplete descriptions and do not affect the cost of construction.

Proposal # 3883

RB197-19

RB198-19

IRC®: TABLE R602.3(2)

Proponent: James Smith, American Wood Council, representing American Wood Council (jsmith@awc.org)

2018 International Residential Code

TABLE R602.3(2)ALTERNATE ATTACHMENTS TO TABLE R602.3(1)

Portions of table not shown remain unchanged.

		SPACING ^c OF FASTENERS			
THICKNESS (inches)	LENGTH (inches)	Edges (inches)	Intermediate supports (inches)		
Wood structural panels subflo	oor, roof ^g and wall sheathing to framing	and particl	eboard wall sheathing		
	to framing ^t				
	Staple 15 ga. 1 ³ / ₄	4	8		
Up to ¹ / ₂	0.097 - 0.099 Nail 2 ¹ / ₄	3	6		
	Staple 16 ga. 1 ³ / ₄	3	6		
	0.113 Nail 2	3	6		
¹⁹ / ₃₂ and ⁵ / ₈	Staple 15 and 16 ga. 2	4	8		
	0.097 - 0.099 Nail 2 ¹ / ₄	4	8		
	Staple 14 ga. 2	4	8		
23/100 and $3/100$	Staple 15 ga. 1 ³ / ₄	3	6		
-°/32 and °/4	0.097 - 0.099 Nail 2 ¹ / ₄	4	8		
	Staple 16 ga. 2	4	8		
	Staple 14 ga. 2 ¹ / ₄	4	8		
4	0.113 Nail 2 ¹ /4	3	6		
	Staple 15 ga. 2 ¹ / ₄	4	8		
	0.097 - 0.099 Nail 2 ¹ / ₂	4	8		

For SI: 1 inch = 25.4 mm.

- a. Nail is a general description and shall be permitted to be T-head, modified round head or round head.
- b. Staples shall have a minimum crown width of $7/_{16}$ -inch on diameter except as noted.
- c. Nails or staples shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater. Nails or staples shall be spaced at not more than 12 inches on center at intermediate supports for floors.
- d. Fasteners shall be placed in a grid pattern throughout the body of the panel.
- e. For 5-ply panels, intermediate nails shall be spaced not more than 12 inches on center each way.
- f. Hardboard underlayment shall conform to CPA/ANSI A135.4
- g. Specified alternate attachments for roof sheathing shall be permitted where <u>Where</u> the ultimate design wind speed is less than 130 mph. Fasteners attaching wood structural panel roof

sheathing to gable end wall framing shall be installed using the spacing listed for panel edges. or equal to 110 mph, roof sheathing attachment using the specified alternate fasteners shall be permitted where fasteners are installed 3 inches on center at all supports.

h. Fiber-cement underlayment shall conform to ASTM C1288 or ISO 8336, Category C.

Reason: The proposed revision to footnote g is intended to update the alternative fastening to uplift loading requirements per ASCE 7-16 without being overly complex in specification of roof sheathing attachment schedules. The reference calculation leading to use of 3" o.c. spacing at all locations is based on the 0.099" diameter and 0.113" diameter nail shank withdrawal from wood framing with specific gravity equal to 0.42 and pre-calculated wind uplift loads in WFCM Table 3.10. The use of a single 3" spacing at all supports was extended to staples based on the assumption that the ASCE 7-16 load increase would similarly require reduced spacing. This assumption was applied to staples because a withdrawal value is not available for staples in the NDS.

Cost Impact: The code change proposal will increase the cost of construction

The reduced spacing of fasteners to meet wind uplift loading will increase cost of construction, but given the increase only applies to the roof, that cost increase should be negligible when considering the overall cost for the construction of a dwelling.

Proposal # 5529

RB198-19

RB199-19

IRC: R602.10.1.2

Proponent: Kelly Cobeen, representing self (KCobeen@wje.com)

2018 International Residential Code

Revise as follows:

R602.10.1.2 Offsets along a Location of braced wall line. lines and permitted offsets. Where braced wall panels along a braced wall line fall in a single line, the braced wall line shall be located at those braced wall panels. Where braced wall panels are offset out of plane, the braced wall line shall be located at or between the braced wall panels, and the braced wall line shall not be located outboard or inboard of all the braced wall panels in that braced wall line. Where 2/3 or more of the length of braced wall panels in a braced wall line fall in a single line, the braced wall panels in a braced wall line shall be located at those braced wall panels in a braced wall line fall in a single line, the braced wall line shall be located at those braced wall panels; or the braced wall line shall be located at the centroid of the braced wall panels, as seen in Figure R602.10.1.1. Exterior braced wall panels parallel to a *braced wall line* shall be offset not more than 4 feet (1219 mm) from the designated *braced wall line* location as shown in Figure R602.10.1.1.

Exterior walls parallel to a *braced wall line* shall be offset not more than 4 feet (1219 mm) from the designated *braced wall line* location as shown in Figure R602.10.1.1.

Interior walls used as bracing shall be offset not more than 4 feet (1219 mm) from a *braced wall line* through the interior of the building as shown in Figure R602.10.1.1.



For SI: 1 foot = 304.8 mm.

FIGURE R602.10.1.1 BRACED WALL LINES

Reason: Over a series of cycles, changes to the IRC Section R602.10 wall bracing provisions have caused some of the important concepts fundamental to the development of the bracing provisions to be lost. This was highlighted in a recent request for interpretation of the location of braced wall lines relative to exterior walls. Going back to the 2006 IRC, and previous IRC and legacy codes, braced wall panels were required at the exterior walls, and additional interior braced wall panels and lines were required when needed to meet braced wall line spacing requirements. The concept that exterior walls are to be braced appears to not be specifically stated in the IRC from the 2009 edition forward. With this concept not included, these provisions are lacking specific requirements as to where the braced wall lines are to be located.

This proposal fills this gap by adding discussion of the location of braced wall lines relative to the braced wall panels. The current provisions discussing the location of braced wall lines relative to exterior walls are retained as these will control permitted locations of exterior walls if other than at the braced wall panels.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal is editorial to clarify the intent of the current provisions.

Proposal # 5272

RB199-19

RB200-19

IRC®: R602.10.2.2, R602.10.2.2.1

Proponent: Randy Shackelford, Simpson Strong-Tie Co., representing Simpson Strong-Tie Co. (rshackelford@strongtie.com)

2018 International Residential Code

Revise as follows:

R602.10.2.2 Locations of braced wall panels. A *braced wall panel* shall begin within 10 feet (3810 mm) from each end of a *braced wall line* as determined in Section R602.10.1.1. The distance between adjacent edges of *braced wall panel*s along a *braced wall line* shall be not greater than 20 feet (6096 mm) as shown in Figure R602.10.2.2.

Exceptions:

- 1. <u>Braced wall panels in Seismic Design Categories D0, D1, and D2 shall comply with Section</u> <u>R602.10.2.2.1.</u>
- 2. <u>Braced wall panels with continuous sheathing in Seismic Design Categories A, B, or C shall comply</u> with Section R602.10.7.

R602.10.2.2.1 Location of braced wall panels in Seismic Design Categories DDD, **D1** and **D2**. Braced wall panels shall be located at each end of a braced wall line.

Exception Exceptions:

<u>1.</u> Braced wall panels constructed of Method WSP or BV-WSP and continuous sheathing methods as specified in Section R602.10.4 shall be permitted to begin not more than 10 feet (3048 mm) from each end of a braced wall line provided that each end complies with one of the following:

1. <u>1.1.</u> A minimum 24-inch-wide (610 mm) panel for Methods WSP, CS-WSP, CS-G and CS-PF is applied to each side of the building corner as shown in End Condition 4 of Figure R602.10.7.

2. <u>1.2.</u> The end of each braced wall panel closest to the end of the braced wall line shall have an 1,800 lb (8 kN) hold-down device fastened to the stud at the edge of the braced wall panel closest to the corner and to the foundation or framing below as shown in End Condition 5 of Figure R602.10.7.

2. Braced wall panels constructed of Method PFH or ABW, or of Method BV-WSP where a hold-down is provided in accordance with Table R602.10.6.5, shall be permitted to begin not more than 10 feet from each end of a braced wall line.

Reason: The goal of this code change is to resolve conflicts in the code and prevent confusion on how to interpret this section.

This section deals with placement of braced wall panels on a wall. The main requirement is that the panel can be placed up to 10 feet from the wall. But there are two exceptions. One is the SDC D0, D1, and D2 requirements of the next section, and the other are the continuous sheathing requirements that are located pages and pages away in the code. Since they conflict, it make sense to combine them into one section so that they work together. By adding the exceptions, it clarifies in which case each of the rules on corner panels is to be applied.

The second part of this change is to clarify the exception in R602.10.2.2.1 for bracing in Seismic Design Categories D0, D1, and D2. Braced wall panels are allowed to be located up to 10 feet from the corner when the braced wall panel has an 1800 pound hold-down. There are certain kinds of braced wall panels that already have a holdown of this capacity or higher. ABW has a minimum of an 1800 pound hold-down required, and PFH has a 3500 pound hold-down required. Also, most cases of BW-WSP require a hold-down with a capacity in excess of 1800 pounsd. However, there is one case where BV-WSP does not require a holdown, to that is taken into account here by adding the wording "where a hold-down is provided in accordance with Table R602.10.6.5."

The purpose of the corner panels or hold-downs in this section is to restrain the first braced wall panel from overturning, either by having it located at a corner, or by providing a hold-down. These braced wall panel methods that already have the hold-down are restrained from overturning so they can be located away from the corner.

This change also attempts to answer the question that arises sometimes of whether the capacity of the holdown of an ABW, PFH, or BV-WSP needs to be increased by 1800 pounds when it is located up to 10 feet from a corner. The intent is for the ABW, PFH, or BV-WSP to be adequate as specified. That is why they are broken out into a second exception.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The goal of this change is just to clarify the code. No additional requirements are added.

Proposal # 5168

RB200-19

RB201-19

IRC®: TABLE R602.10.3(2), TABLE R602.10.3(4)

Proponent: Ralph Leyva, APA- The Engineered Wood Assoc, representing APA- The Engineered Wood Assoc (ralph.leyva@apawood.org); Borjen Yeh, representing APA - The Engineered Wood Association (borjen.yeh@apawood.org)

2018 International Residential Code

Revise as follows:

TABLE R602.10.3(2)

WIND ADJUSTMENT FACTORS TO THE REQUIRED LENGTH OF WALL BRACING

Portions of table not shown remain unchanged.

ITEM NUMBER	ADJUSTMENT BASED ON	STORY/SUPPORTING	CONDITION	ADJUSTMENTFACTOR ^{a,} ^b [multiply length fromTable R602.10.3(1) bythis factor]	APPLICABLE METHODS
8	Horizontal blocking	Any story	Horizontal block is omitted	2.0	WSP, <u>SEB,</u> <u>PBS, HPS,</u> CS-WSP

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 4.48 N.

- a. Linear interpolation shall be permitted.
- b. The total adjustment factor is the product of all applicable adjustment factors.
- c. The adjustment factor is permitted to be 1.0 when determining bracing amounts for intermediate braced wall lines provided the bracing amounts on adjacent braced wall lines are based on a spacing and number that neglects the intermediate braced wall line.
- d. The same adjustment factor shall be applied to all braced wall lines on all floors of the structure, based on the worst-case exposure category.

TABLE R602.10.3(4)

SEISMIC ADJUSTMENT FACTORS TO THE REQUIRED LENGTH OF WALL BRACING

Portions of table not shown remain unchanged.

ITEMNUMBER	ADJUSTMENTBASED ON	STORY	CONDITION	ADJUSTMENTFACTOR ^{a,} ^b [Multiply lengthfrom Table R602.10.3(3) by thisfactor]	APPLICABLEMETHODS
10	Horizontal blocking	Any story	Horizontal blocking omitted	2.0	WSP, <u>SEB, PBS, HPS,</u> CS-WSP

For SI: 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

- a. Linear interpolation shall be permitted.
- b. The total length of bracing required for a given wall line is the product of all applicable adjustment factors.

- c. The length-to-width ratio for the floor/roof diaphragm shall not exceed 3:1.
- d. Applies to stone or masonry veneer exceeding the first story height.
- e. The adjustment factor for stone or masonry veneer shall be applied to all exterior braced wall lines and all braced wall lines on the interior of the building, backing or perpendicular to and laterally supporting veneered walls.
- f. See Section R602.10.6.5 for requirements where stone or masonry veneer does not exceed the first-story height.

Reason: While the current adjustment factor is based on blocked and unblocked full-scale wood structural panel testing, it is only logical that other panel products, including SFB, PBS, and HPS, would respond to the same nailing omissions. It is also reasonable to conclude that these other panel products would be equally affected by omitting panel blocking at horizontal joints. As it stands, the SFB, PBS, and HPS can be used without horizontal blocking and do not need to take the same reduction as wood structural panels. This is not supported by testing or common sense, is not conservative, and needs to be updated. This code change adds SFB, PBS, and HPS to both wind and seismic adjustment tables.

Cost Impact: The code change proposal will increase the cost of construction

This code change could increase the cost of construction when using the SFB, HPS, and PBS products as it requires additional nailing and blocking at horizontal panel joints. It does however clarify the intent of the code over a wider range of panel products, common or otherwise.

Proposal # 4697

RB201-19

RB202-19

IRC®: TABLE R602.10.3(3)

Proponent: Kelly Cobeen, representing self (KCobeen@wje.com)

2018 International Residential Code

Revise as follows:

TABLE R602.10.3(3)

BRACING REQUIREMENTS BASED ON SEISMIC DESIGN CATEGORY

Portions of table not shown remain unchanged.

• SOIL CLASS D^b • WALL HEIGHT = 10 FEET											
			RAINURA								
• 10 PSF FLOOR DEAD LOAD			PANELS	PANELS REQUIRED ALONG EACH BRACED WALL LINE ^a							
• 15 PSF ROOF/CEILING DEAD LOAD											
• BRACED WALL	LINE SP	ACING ≤ 25 FEET									
Seismic DesignCategory ^{<u>b</u>}	Story Location	Braced Wall LineLength(feet) ^c	Method LIB ^d	Method GB	MethodsDWB, SFB, PBS,PCP, HPS,CS-SFB ^e	MethodWSP	MethodsCS- WSP,CS-G, CS-PF				

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

NP = Not Permitted.

- a. Linear interpolation shall be permitted.
- b. Wall bracing lengths are based on a soil site class "D." Interpolation of bracing length between the S_{ds} values associated with the seismic design categories shall be permitted when a site-specific S_{ds} value is determined in accordance with Section 1613.2 of the International Building Code.
- c. Where the braced wall line length is greater than 50 feet, braced wall lines shall be permitted to be divided into shorter segments having lengths of 50 feet or less, and the amount of bracing within each segment shall be in accordance with this table.
- d. Method LIB shall have gypsum board fastened to not less than one side with nails or screws in accordance with Table R602.3(1) for exterior sheathing or Table R702.3.5 for interior gypsum board. Spacing of fasteners at panel edges shall not exceed 8 inches.
- e. Methods PFG and CS-SFB do not apply in Seismic Design Categories D₀, D₁ and D₂.
- f. Where more than one bracing method is used, mixing methods shall be in accordance with Section R602.10.4.1.

Reason: As of the last code update cycle, the Seismic Design Categories were no longer based exclusively on

site class D, so this statement is in error. Because it is not needed for application of the provisions, this statement can be deleted. It is still permitted to determine Seismic Design Category per the provisions of the IBC, so footnote b is retained and is now referenced from the top of the Seismic Design Category column.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal is an editorial clarification of existing provisions and has no cost impact.

Proposal # 5273

RB202-19

RB203-19

IRC®: TABLE R602.10.3(3)

Proponent: Randy Shackelford, representing Simpson Strong-Tie Co. (rshackelford@strongtie.com)

2018 International Residential Code

Revise as follows:

TABLE R602.10.3(3)

BRACING REQUIREMENTS BASED ON SEISMIC DESIGN CATEGORY

Portions of table not shown remain unchanged.

• SOIL CLASS D ^t PSF FLOOR DEAI DEAD LOAD• BRA	• WALL HE D LOAD• 15 ACED WALI FEET	IGHT = 10 FEET∙ 10 PSF ROOF/CEILING LINE SPACING ≤ 25	MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE ^{a, f}							
Seismic DesignCategory	Story Location	Braced Wall LineLength(feet) ^c	Method LIB ^d	Method GB	MethodsDWB, SFB, PBS,PCP, HPS,CS-SFB ^e	Method <u>s</u> WSP <u>,</u> <u>PFH,</u> <u>PFG^e,</u> <u>and</u> <u>ABW</u>	MethodsCS- WSP,CS-G, CS-PF			

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

NP = Not Permitted.

- a. Linear interpolation shall be permitted.
- b. Wall bracing lengths are based on a soil site class "D." Interpolation of bracing length between the S_{ds} values associated with the seismic design categories shall be permitted when a site-specific S_{ds} value is determined in accordance with Section 1613.2 of the International Building Code.
- c. Where the braced wall line length is greater than 50 feet, braced wall lines shall be permitted to be divided into shorter segments having lengths of 50 feet or less, and the amount of bracing within each segment shall be in accordance with this table.
- d. Method LIB shall have gypsum board fastened to not less than one side with nails or screws in accordance with Table R602.3(1) for exterior sheathing or Table R702.3.5 for interior gypsum board. Spacing of fasteners at panel edges shall not exceed 8 inches.
- e. Methods PFG and CS-SFB do not apply in Seismic Design Categories D0, D₁ and D₂.
- f. Where more than one bracing method is used, mixing methods shall be in accordance with Section R602.10.4.1.

Reason:

Last cycle, the tables for Bracing Requirements Based on Wind Speed and Bracing Requirements Based on Seismic Design Category were revised so that they included all the permissible bracing methods. For some reason, three permissible bracing methods were left off of Table R602.10.3(3). So we are proposing to add methods ABW, PFH, and PFG in to the table in the WSP column heading. ABW, PFH, and PFG are intermittent bracing methods that have amounts of bracing based on their equivalency to a WSP braced wall panel.

Note that Method PFG is only permitted in Seismic Design Categories A, B, and C per Section R602.10.6, but footnote e already reflects that. so the only action needed is to add the reference to footnote e. This method has to be listed because there are also requirements for Townhouses in SDC C in this table.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal is meant to only clarify that Braced Wall Panel methods ABW, PFH, and PFG are permitted to be used in SDC C townhomes and that ABW and PFH are permitted to be used in Seismic Design Categories D0, D1, and D2. If anything, there could be a decrease in cost if builders were able to use a more economical method because of this clarification.

Proposal # 5106

RB204-19

IRC®: TABLE R602.10.3(3), TABLE R602.10.3(4), TABLE R602.10.6.5

Proponent: Kelly Cobeen, Wiss Janney Elstner Associates, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (KCobeen@wje.com); Julie Furr, Rimkus Consulting Group, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (jfurr@rimkus.com); Michael Mahoney, representing Federal Emergency Management Agency (mike.mahoney@fema.dhs.gov)

2018 International Residential Code

Revise as follows:

SOIL CLASS D ^b • WALL HEIGHT = 10 FEET• 10 PSF FLOOR DEAD _OAD• 15 PSF ROOF/ CEILING DEAD _OAD• BRACED WALL LINE SPACING ≤ 25 FEET		MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE ^{a, f}									
Seismic Design Category	Story Location	Braced Wall Line Length(feet)°	Method LI B ^d	Method GB	MethodsD W B, SFB, PBS,PCP, HPS,CS- SFB ^e	Method WSP	Methods CS- WSP,CS- G, CS-PF				
		10	NP	4.0	4.0	2.5	2.1				
		20	NP	8.0	8.0	5.0	4.3				
		30	NP	12.0	12.0	7.5	6.4				
		40	NP	16.0	16.0	10.0	8.5				
		50	NP	20.0	20.0	12.5	10.6				
		10	NP	7.5	7.5	5.5	4.7				
	1	20	NP	15.0	15.0	11.0	9.4				
		30	NP	22.5	22.5	16.5	14.0				
		40	NP	30.0	30.0	22.0	18.7				
Do 9		50	NP	37.5	37.5	27.5	23.4				
02		10	NP	NP	NP	NP	NP				
	XX	20	NP	NP	NP	NP	NP				
	X	30	NP	NP	NP	NP	NP				
		40	NP	NP	NP	NP	NP				
		50	NP	NP	NP	NP	NP				
		10	NP	NP	NP	7.5	6.4				
	Cripple wall	20	NP	NP	NP	15.0	12.8				
	pelow one-	30	NP	NP	NP	22.5	19.1				
	dwellina	40	NP	NP	NP	30.0	25.5				
	uwennig	50	NP	NP	NP	37.5	31.9				

TABLE R602.10.3(3) BRACING REQUIREMENTS BASED ON SEISMIC DESIGN CATEGORY

Portions of table not shown remain unchanged.

g. One- and two-family dwellings in Seismic Design Category D₂exceeding two stories shall be designed in accordance with accepted engineering practice.

TABLE R602.10.3(4)SEISMIC ADJUSTMENT FACTORS TO THE REQUIRED LENGTH OF WALL BRACING

ITEMNUMBER	ADJUSTMENTBASED ON	STORY	CONDITION	ADJUSTMENTFACTOR ^{a,} ^b [Multiply lengthfrom Table R602.10.3(3) by thisfactor]	APPLICABLEMETHODS
1	Story height(Section	Any	≤ 10 feet > 10 feet	1.0	-
			feet	1.2	-
	Braced wall		≤ 35 feet	1.0	-
2	linespacing, townhousesin SDC C	Any story	> 35 feet and ≤ 50 feet	1.43	
2	Braced wall	Any	> 25 feet and ≤ 30 feet	1.2	
5	D_0, D_1, D_2^c	story	> 30 feet and ≤ 35 feet	1.4	
4	Wall dead load	Any	> 8 psf and < 15 psf	1.0	All methods
		SIDLY	< 8psf	0.85	
		1-, 2- or 3-story building	≤15 psf	1.0	
5	Roof/ceiling dead	2- or 3- story building	> 15 psf and ≤ 25 psf	1.1	
5	loadfor wall supporting				

		1-story building or top story	> 15 psf and ≤ 25 psf	1.2		
	Walls with stone ormasonry veneer, townhouses in SDCC ^{d,} e			1.0		
6				1.5	All methods	
7	Walls with stone ormasonry veneer, detached one- and two-family dwellings in SDC $D_0 - D_2^{d, f}$	Any story	See	Table R602.10.6.5	BV-WSP	
8	Walls with stone ormasonry veneer, detached one- and two-family dwellings in SDC $D_0 - D_2^{d, f}$	First and second story of two-story dwelling	See Table R602.10.6.5	1.2	WSP, CS-WSP	
9	Interior gypsum board finish (or equivalent)	Any story	Omitted frominside face of bracedwall panels	1.5	DWB, WSP, SFB, PBS, PCP, HPS, CS-WSP, CS- G, CS-SFB	
10	Horizontal blocking	Any story	Horizontal blocking omitted	2.0	WSP, CS-WSP	

For SI: 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

- a. Linear interpolation shall be permitted.
- b. The total length of bracing required for a given wall line is the product of all applicable adjustment factors.
- c. The length-to-width ratio for the floor/roof diaphragm shall not exceed 3:1.
- d. Applies to stone or masonry veneer exceeding the first story height.
- e. The adjustment factor for stone or masonry veneer shall be applied to all exterior braced wall lines and all braced wall lines on the interior of the building, backing or perpendicular to and laterally supporting veneered walls.
- f. See Section R602.10.6.5 for requirements where stone or masonry veneer does not exceed the first-story height.
- g. <u>One- and two-family dwellings in Seismic Design Category D₂ exceeding two stories shall be</u> <u>designed in accordance with accepted engineering practice.</u>

TABLE R602.10.6.5

METHOD BV-WSP WALL BRACING REQUIREMENTS

Portions of table not shown remain unchanged.
		BRACED WALL LINE LENGTH (FEET)							
SEISMIC		10 20 30 40 50							
		-	Mini	mum	Tota	ıl	SINGLE-STORYHOLD-	CUMULATIVEHOLD-	
DESIGNCATEGORY	STORY	Length (feet) of					DOWNFORCE(pounds)*	DOWNFORCE(pounds	
		Braced Wall					⊻	<u> </u>	
			Pane	IsRe	quire	d			
		Along each Braced							
	Ealt ligure by								
	deleting 3-story	5.5	11.0	16.5	22.0	27.5	2300	_	
	stack								
	Edit figure by								
D2.ª	deleting 3-story	5.5	11.0	16.5	22.0	27.5	3900	6200	
	stack								
	Delete figure								
	and replace with	NP	NP	NP	NP	NP	NA	NA	
	"Three- story dwelling"								

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.479 kPa, 1 pound-force = 4.448 N. NP = Not Permitted.

NA = Not Applicable.

<u>a. One- and two-family dwellings in Seismic Design Category D₂ exceeding two stories shall be designed in accordance with accepted engineering practice.</u>

a. <u>b.</u> Hold-down force is minimum allowable stress design load for connector providing uplift tie from wall framing at end of braced wall panel at the noted story to wall framing at end of braced wall panel at the story below, or to foundation or foundation wall. Use single-story hold-down force where edges of braced wall panels do not align; a continuous load path to the foundation shall be maintained.

b. <u>c.</u> Where hold-down connectors from stories above align with stories below, use cumulative hold-down force to size middle- and bottom-story hold-down connectors.

Reason: Table R602.10.3(3): This proposal is editorial. Table symbols are modified to clarify intent and for consistency with modifications proposed to Table R602.10.6.5, as discussed in the reason for Part 3. A footnote is added to call the designer's attention to the existing limitation.

Table R602.10.3(4): This proposal is editorial. A footnote is added to call the designer's attention to the existing limitation in a location that benefits the user.

Table R602.10.6.5: This is an editorial clarification of existing provisions. The proposed modification to the table symbols clarifies that in SDC D_2 these bracing provisions are only applicable to one- and two-story dwellings. This proposal is prompted by comment from the Brick Industry Association that the table may be mistakenly interpreted to permit prescriptive bracing of dwellings with veneer in the second and third stories of three story buildings. The original intent and justification for the provisions, however, only permitted use with one- and two-story dwellings, as demonstrated by the historical description that follows.

The BV-WSP bracing provisions were brought into the IRC in the 2006 Edition as a collaborative effort involving BIA and FEMA/BSSC-CRSC, among others. The justification included engineering calculations to support the bracing requirements and hold-down forces. Because of this basis and the seismic forces calculated, prescriptive bracing requirements in SDC D₂ were limited to one- and two-story dwellings. The proposed modification will make clear this intent.

The following is as adopted in the 2006 IRC.

SEISMIC DESIGN CATEGORY	NUMBER OF WOOD FRAMED STORIES ⁸	MAXIMUM HEIGHT OF VENEER ABOVE NONCOMBUSTIBLE FOUNDATION OR FOUNDATION WALL (feet)	MAXIMUM NOMINAL THICKNESS OF VENEER (Inches)	MAXIMUM WEIGHT OF VENEER (psf) ^b	WOOD FRAMED STORY	MINIMUM SHEATHING AMOUNT (percent of braced wall line length) ^c	MINIMUM SHEATHING THICKNESS AND FASTENING	SINGLE STORY HOLD DOWN FORCE (Ib) ^d	CUMULATIVE HOLD DOWN FORCE (Ib) ⁶
	1	20'	4	40	1 only	35	7/16-inch wood	N/A	_
2	201	1.1	10	top	35	structural panel	1900	-	
	34	20	4	40	bottom	45	common nails	3200	5100
00	1.1	NET LAST			top	40	spaced at 4 inches	1900	
3	3	30#	4	40	middle	45	edges, 12 inches	3500	5400
					bottom	60	on center at	3500	8900
	1	201	4	40	1 only	45	supports. 8d common nails at 4	2100	
	-	201			top	45		2100	-
n	.2	20	4	40	bottom	45	braced wall panel	3700	5800
<i>D</i> ₁					top	45	end posts with	2100	1000
	3	201	4	40	middle	45	attached.	3700	5800
					bottom	60		3700	9500
	I	20 ^f	3	30	1 only	55		2300	-
D ₂	2	201		20	top	55		2300	1000
	2	20	3.3	30	bottom	55		3900	6200

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.479 kPa, 1 pound-force = 4.448 N.

a. Cripple walls are not permitted in Seismic Design Categories Do, D1 and D2.

b. Maximum weight is installed weight and includes weight of mortar, grout and lath, and other materials used for installation.

c. Applies to exterior and interior braced wall lines.

d. Hold down force is minimum allowable stress design load for connector providing uplift tie from wall framing at end of braced wall panel at the noted story to wall framing at end of braced wall panel at the story below, or to foundation or foundation wall. Use single story hold down force where edges of braced wall panels do not align; a continuous load path to the foundation shall be maintained. [See Figure R703.7(1)(b)].

e. Where hold down connectors from stories above align with stories below, use cumulative hold down force to size middle and bottom story hold down connectors. [See Figure R703.7(1)(a)].

f. The veneer shall not exceed 20 feet in height above a noncombustible foundation, with an additional 8 feet permitted for gable cod walls, or 30 feet in height with an additional 8 feet for gable and walls when the lower 10 feet has a backing of concrete or managemental. See also step: biological backing of section 12 feet has a backing of concrete or managemental.

additional 8 feet for gable end walls where the lower 10 feet has a backing of concrete or masonry wall. See also story height limitations of Section R301.3. g. The veneer shall not exceed 30 feet in height above a noncombustible foundation, with an additional 8 feet permitted for gable end walls. See also story height limitations of Section R301.3.

This information was relocated in from Chapter 7 to Chapter 6 in the 2009 IBC:

TABLE R602.12(2) STONE OR MASONRY VENEER WALL BRACING REQUIREMENTS, ONE- AND TWO-FAMILY DETACHED DWELLINGS, SEISMIC DESIGN CATEGORIES De, D, and De

SEISMIC DESIGN CATEGORY	NUMBER OF STORIES*	STORY	MINIMUM SHEATHING AMOUNT (length of braced wall line length in feet) ^b	MINIMUM SHEATHING THICKNESS AND FASTENING	SINGLE STORY HOLD DOWN FORCE (Ib) ⁶	CUMULATIVE HOLD
	1	1 only	35		N/A	-
D ₀	2	top	35		1900	3.
	- 4	bottom	45		3200	5100
	3	top	40		1900	
		middle	45	7/16-inch wood structural	3500	5400
		bottom	60	common nails spaced at	3500	8900
	1	1 only	45	4 inches on center at nanel edges 12 inches	2100	100 B
		top	45	on center at intermediate	2100	
D	4	bottom	45	supports; 8d common nails at 4 inches on	3700	5800
<i>D</i> 1		top	45	center at braced wall	2100	-
	3	middle	45	hold down attached	3700	5800
		bottom	60		3700	9500
	1	I I only 55		2300		
D ₂	2	top	55		2300	
	-	bottom	55		3900	6200

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.479 kPa, 1 pound-force = 4.448 N.

a. Cripple walls are not permitted in Seismic Design Categories Do, D1 and D2.

b. Applies to exterior and interior braced wall lines,

c. Hold down force is minimum allowable stress design load for connector providing uplift tie from wall framing at end of braced wall panel at the noted story to wall framing at end of braced wall panel at the story below, or to foundation or foundation wall. Use single story hold down force where edges of braced wall panels do not align; a continuous load path to the foundation shall be maintained. [See Figure R602.12].

d. Where hold down connectors from stories above align with stories below, use cumulative hold down force to size middle and bottom story hold down connectors. (See Figure R602.12).

Presentation of the information was editorially modified by code change RB107-09/10 to the current presentation. The proposal was AM at the committee hearings and was on the consent agenda for the public comment hearings.

			BRACED V	SINGLE-STORY	CUMULATIVE			
SEISMIC DESIGN	STORY	10	20	30	40	50	HOLD-DOWN	HOLD-DOWN
CATEGONY		M	nimum Total La Required A	ingth (Net) of D long each Brac	naced Wall Pan ed Wall Line	ola	(pounds)"	(pounds)*
D _s	≙ÊÊ	4.0	7.0	10.5	14.0	17.5	NA	÷.
	a ê Ê	4.0	7.0	10.5	14.0	17.5	1900	-
		45	9.0	13.5	18.0	22.5	3500	5400
	ĉ₿₿	6.0	12.0	18.0	24.0	30.0	3500	8900
	≙ÊÊ	45	9.0	13.5	18.0	22.5	2100	Ξ.
Ds	ĉ₽Ê	45	9.0	13.5	18.0	22.5	3700	5800
	â₿	6.0	12.0	18.0	24.0	30.0	3700	9500
Ds		55	11.0	16.5	22.0	27.5	2300	-
		5.5	11.0	16.5	22.0	27.5	3900	6200
	ĉ₿₿	NP	NP	NP	NP	NP	NA	NA

TABLE Registration of the temperature of temp

For SI: 1 inch = 25.4 mm, 1 fost = 304.8 mm, 1 pound per aquare foot = 0.479 kPa, 1 pound-force = 4.448 N.

NP :: Not Permitted.

NA = Not Applicable.

a. Hold-down force is existences allowable stress design load for connector providing uptiff the from wall framing at end of braced wall pand at the noise below, or to foundation or foundation wall. Use single-skery hold-down force where edges of braced wall pands do not allow a continuous load path to the foundation shall be maintained.

b. Where hold-down connectors from stories above align with stories helew, use cumulative hold-down force to state middle- and boltons-story hold-down connectors.

The reason statement of RB107-09/10 indicates that (with minor noted exceptions) it is intended to be an editorial code change. There was no discussion of intent to permit three story BV-WSP dwellings in SDC D₂.

Reason: Last cycle, the special wall bracing requirements for wood-framed buildings with stone or masonry veneer were moved from Section R703.7 to Section R602.12, so they would follow the rest of the wall bracing provisions. This was a substantial clarification to the code. However, with the changes introduced by the Ad-Hoc Wall Bracing Committee to introduce tables of seismic adjustment factors, bracing methods, and other improvements, an opportunity now exists to further simplify matters, bring the special veneer provisions into the main bracing section, and remove duplicated text. As such, this proposal implements the following changes:

- A new intermittent method, BV-WSP, is defined. The basic sheathing and nailing requirements are relocated from Section R602.12.1.3 to a new row in Table R602.10.2. The hold-down requirement is relocated from Section R602.12.1.3 to Section R602.10.1.4. The reference to Table R602.3(5), the wood stud table, is no longer needed. Once this language was moved to Section R602, that table automatically governs.
- A new exception is added to R602.10.1.2, replacing the original charging language for R602.12. The remaining SDC-specific requirements are incorporated into new Section R602.10.3.5.
- A reference to Method BV-WSP is added to the high-seismic end panel location requirements of Section R602.10.1.4.1. The duplicate language in Section R602.12.1.2 is no longer required and can be deleted.
- The adjustments for SDC A, B, and C are inserted directly into Table R602.10.1.2(3), the seismic adjustment factor. Table R602.12(1) is no longer required and can be deleted.
- A reference to Method BV-WSP is added to the minimum braced wall panel length requirements of Section R602.10.3 and to Table R602.10.3.1. The duplicate language in Section R602.12.1.4 is no longer required and can be deleted.
 A pare Section R602.10.3 is added for the pare Method BV/WSP. The requirements of R602.12.1 and R602.12.1.1 are moved into
- A new Section R602.10.3.5 is added for the new Method BV-WSP. The requirements of R602.12, R602.12.1, and R602.12.1.1 are moved into the new section. A subsection, R602.10.3.5.1, is defined for the length of bracing, with language similar to Section R602.10.1.2. Figure R602.12 is moved to the new section.
- Table R602.12(2) is moved to Section R602.10.3.5 and revised to convert the percentages to lengths, similar to Table R602.10.1.2(2).
 Figure R602.12 is replaced by new Figure R602.10.3.5, which provides a number of clarifications regarding the location and type of hold-down
- Figure R602.12 is replaced by new Figure R602.10.3.5, which provides a number of clarifications regarding the location and type of hold-down devices
- Since BV-WSP is now defined as its own separate intermittent bracing method. Sections R602.10.1.5 and R602.12.1.6 are no longer needed and can be deleted.

This change represents an editorial relocation and reorganization of the special wall bracing provisions for structures with veneer. Section R602.12 is effectively deleted and all of its provisions incorporated under the scope of Section R602.10. While the intent was purely editorial, two minor technical changes were made. First, the previous provisions do not indicate whether a gypsum board finish is required. But, Method BV-WSP is essentially a fully-restrained engineered shear wall segment, and typically the effect of finishes is not incorporated in such designs. Thus, we believe the interior finish is not required, and amend Section R602.10.2.1 accordingly. Second, in the new Table R602.10.3.5, which replaces Table R602.12(2), the hold-down requirements were combined as part of the reformating to make the table look like Table R602.10.1.2(2). In the process, the 3200 bit and 5400 bit hold-downs for a bottom of two-story are now required to be 5500 bit and 5400 bit respectively. However, this does not change the actual required strap or hold-down size which a user would select from a connector manufacturer's catalog.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee: Assembly:	AS ASF	AM AMF	D	
		0.52	20024	12 C	ICCFILENAME: BAJNAI-AHWB-RB-4-R602.10

ICC PUBLIC HEARING ::: October 2009

Cost Impact: The code change proposal will not increase or decrease the cost of construction This is a editorial clarification of the intent of existing provisions.

Proposal # 4579

RB204-19

IRC- RB143

RB205-19

IRC®: TABLE R602.10.4 (New)

Proponent: Rick Allen, International Staple, Nail and Tool Association, representing International Staple, Nail and Tool Association (rallen@isanta.org)

2018 International Residential Code

Revise as follows:

TABLE R602.10.4 BRACING METHODS

Portions of table not shown remain unchanged.

METHODS, MATERIAL		MINIMUM	EIGUDE	E CONNECTION CRITERIA ^a			
		THICKNESS	FIGURE	Fasteners	Spacing		
Intermittent Bracing Methods	PCP Portland cement plaster	See Section R703.6 formaximum 16" stud spacing		$1^{1}/2^{"}$ long, 11 gage, <u>0.120" dia.</u> $7/_{16}^{"}$ dia. head nailsor $7/_{8}^{"}$ long, 16 gage staples	6″ o.c. on all framingmembers		

Reason: ASTM F1667-18 requires that when gage is used as a diameter for nails, a decimal equivalent must also be shown. This requirement was put in place because of the multiple and conflicting wire gage tables that are used in the manufacturing of nails.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal will not change the cost of production. It only provides clarification required by ASTM F1667-18

Proposal # 4083

RB205-19

RB206-19

IRC: FIGURE R602.10.6.2

Proponent: Randy Shackelford, P.E., Simpson Strong-Tie Co., representing Simpson Strong-Tie Co. (rshackelford@strongtie.com)

2018 International Residential Code

R602.10.6.2 Method PFH: Portal frame with hold-downs. Method PFH *braced wall panel*s shall be constructed in accordance with Figure R602.10.6.2.

Revise as follows:



FIGURE R602.10.6.2 METHOD PFH—PORTAL FRAME WITH HOLD-DOWNS

Reason: The purpose of this code change is to caution the user regarding the installation of the strap-type hold-down for the Method PFH Portal Frame braced wall panel. Method PFH requires a 3600 pound embedded strap-type hold-down at each edge to restrain the frame against overturning. The drawing gives the impression that the holdown can be installed right at the edge of the concrete.

However, the two major manufacturers of this type of hold-down, Simson Strong-Tie and USP/MiTek, both require that the holdown be installed a minimum of 1/2 inch from the edge of the concrete in order to achieve the published allowable loads. There may be other manufacturers that have different required edge distances, though, so instead of specifying the 1/2 inch it was just modified to require the Manufacturer's Required Edge Distance.

Here is the installation detail from Simpson Strong-Tie showing the required edge distance.



Corner Installation

Here is the installation footnotes from the MiTek Evaluation Report for the Strap-Type Hold-down

1) Predrilled holes are not required.

2) Wood thickness shall be no less than 3" (2 - 2x members).

- 3) Corner strap location implies that the distance from the corner of the wall to the edge of the strap is no less than 1/2".
- 4) Middle strap location implies that the minimum distance from the corner of the wall to the centerline of the strap is no less than 1.5 times the embed
- 5) For edge distances between 1/2" and $1.5 ext{ x}$ IE calculate loads using straight line interpolation.
- 6) Minimum anchor spacing for full capacity is 2 x IE. For spacing less than that reduce capacity proportionally.
- 7) Allowable tension loads are for Doug-Fir, Southern Pine, Spruce-Pine-Fir and Hem Fir.
- 8) The strap should be fastened with nails starting from lowest pair of nail holes and working up towards the top of the strap. In many cases, not all nail holes are needed to be filled.
- 9) Minimum concrete strength f'c = 2,500 psi.
- 10) Minimum 1-#4 rebar shall be installed in the shear cone.
- 11) Deflection at highest allowable loads for installation over wood double studs are as follows:
 - LSTAD8 = 0.037", STAD8 = 0.048", STAD10 = 0.059", STAD14 = 0.122".

12) NAILS: 16d sinkers are 0.148" dia. x 3-1/4" long. 10d common (0.148" dia. x 3" long) nails may be substituted with no load reduction.

Bibliography: Simpson Strong-Tie Co., Inc. ICC-Es Evaluation Report number ESR-2920 MiTek USA, Inc. ICC-ES Evaluation Report number ESR-2787

Cost Impact: The code change proposal will not increase or decrease the cost of construction The main impact of this is to ensure that if a Method PFH braced wall panel is used, the strap style hold down is located at least 1/2" from the corner, in accordance with the manufacturer's instructions. If that forces the builder to build their foundation 1/2" wider, then it could increase costrs. If the builder just moves the garage door location over by 1/2", though, then there is no impact on cost. If the builder installs the strap right next to the edge of the foundation, and then is failed on inspeciton because the hold down is not installed per the manufacturer's instructions, then there is a large increase in cost for the builder to fix the issue.

Proposal # 5108

RB206-19

RB207-19

IRC®: R602.10.6.4, R602.12.6.2

Proponent: Ralph Leyva, representing APA- The Engineered Wood Assoc (ralph.leyva@apawood.org); Borjen Yeh, APA - The Engineered Wood Association, representing APA - The Engineered Wood Association (borjen.yeh@apawood.org)

2018 International Residential Code

Revise as follows:

R602.10.6.4 Method CS-PF: Continuously sheathed portal frame. Continuously sheathed portal frame *braced wall panels* shall be constructed in accordance with Figure R602.10.6.4 and Table R602.10.6.4. The number of continuously sheathed portal frame panels in a single *braced wall line* shall not exceed four.

R602.12.6.2 Method CS-PF. Braced wall panels constructed as Method CS-PF in accordance with Section R602.10.6.4 shall be permitted where all framed portions of all exterior walls are sheathed with wood structural panels. Each CS-PF panel shall equal 0.75 bracing units. Not more than four CS-PF panels shall be permitted on all segments of walls parallel to each side of the circumscribed rectangle. Segments of wall that include a Method CS-PF panel shall meet the requirements of Section R602.10.4.2.

Reason: This provision first appeared in the 2009 IRC and was based on full-scale, whole-house testing conducted at the APA Research Center in Tacoma, Washington. In testing conducted in 2007 (APA Report T2007-73, https://www.apawood.org/data/tsd-links/t2007-73-3d-house-test-results.pdf), a single wall was tested with 9 each 16-inch long CS-PFs in line for a total braced length of 12 ft. This testing was compared with 3 each 48-inch long Type WSP walls, also a total length of 12 ft. The results of this testing showed the CS-PF wall had a significantly higher strength at 2.5% drift and stiffer than the equivalent length Type WSP walls. The evidence was considered sufficient by the then Wall Bracing Ad Hoc Committee to support its inclusion in the 2009 IRC, with the limitation of 4 CS-PFs in any single wall even though the testing was conducted with 9 CS-PFs. This provision was added because the portal frame concept was quite original and the committee wanted a little more experience before expanding the number of permitted CS-PFs. Fast forward to 2019 and we are writing provisions for the 2021 IRC in which the current limitation of a maximum of 4 CS-PFs per wall will have been in the IRC for 10 years and can no longer be considered as original. During the last decade, APA has not been apprised of any problems associated with this provision. It is inconceivable that there will be more than 9 CS-PFs in a given wall line within the scope of the IRC. As a result, APA proposes to remove the limitation for the number of CS-PFs.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This change proposal will not add cost to the design and construction of a new home.

Proposal # 5532

RB207-19

RB208-19

IRC®: R602.10.6.5

Proponent: Kelly Cobeen, Wiss Janney Elstner Associates, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (KCobeen@wje.com); Julie Furr, Rimkus Consulting Group, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (jfurr@rimkus.com); Michael Mahoney, representing Federal Emergency Management Agency (mike.mahoney@fema.dhs.gov)

2018 International Residential Code

Revise as follows:

R602.10.6.5 Wall bracing for dwellings with stone and masonry veneer in Seismic Design Categories D₀, **D**₁ and **D**₂. Townhouses in Seismic Design Categories D₀, D₁ and D₂ with stone or masonry veneer exceeding the first-story height shall be designed in accordance with accepted engineering practice. One- and two-family dwellings in Seismic Design Category D₂ exceeding two stories and having stone or masonry veneer shall be designed in accordance with accepted engineering practice.

Where stone and masonry veneer are installed in accordance with Section R703.8, wall bracing on exterior *braced wall lines* and *braced wall lines* on the interior of the building, backing or perpendicular to and laterally supporting veneered walls shall comply with this section.

Where dwellings in Seismic Design Categories D_0 , D_1 and D_2 have stone or masonry veneer installed in accordance with Section R703.8, and the veneer does not exceed the first-story height, wall bracing shall be in accordance with Section R602.10.3.

Where detached one- or two-family dwellings in Seismic Design Categories D₀, D₁ and D₂ have stone or masonry veneer installed in accordance with Section R703.8, and the veneer exceeds the first-*story height*, wall bracing at exterior *braced wall lines* and *braced wall lines* on the interior of the building shall be constructed using Method BV-WSP in accordance with this section and Figure R602.10.6.5. Cripple walls shall not be permitted, and required interior *braced wall lines* shall be supported on continuous foundations.

Where detached one- or two-family *dwellings* in Seismic Design Categories D_0 , D_1 and D_2 have exterior veneer installed in accordance with Section R703.8 and are braced in accordance with Method WSP or CS-WSP, veneer shall be permitted in the second story in accordance with Item 1 or 2, provided that the *dwelling* does not extend more than two stories above grade plane, the veneer does not exceed 5 inches (127 mm) in thickness, the height of veneer on gable-end walls does not extend more than 8 feet (2438 mm) 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*.

- 1. The total area of the veneer on the second-story exterior walls shall be permitted to extend up to 25 percent of the occupied second floor area.
- 2. The veneer on the second-story exterior walls shall be permitted to cover one side of the *dwelling*, including walls on bay windows and similar appurtenances within the one dwelling side.

Townhouses in Seismic Design Categories D_0 , D_1 and D_2 with stone or masonry veneer exceeding the first-story height shall be designed in accordance with accepted engineering practice.

Reason: This proposal provides editorial clarification of existing provisions. Townhouses exceeding the first

ICC COMMITTEE ACTION HEARINGS ::: April, 2019

story are currently scoped out of the R602.10.6.5 provisions permitting veneer in SDC D0, D₁, and D₂; relocating this limitation to the front of the section places it where it is of most benefit to the designer. Similarly, a sentence is added communicating the current Table R602.10.6.5 limitations for veneer on one- and two-family dwellings that exceed two stories in SDC D₂, again to clearly communicate scope limitations to the designer.

Cost Impact: The code change proposal will not increase or decrease the cost of construction No cost impact. This is an editorial clarification of the intent of current provisions.

Proposal # 4580

RB208-19

RB209-19

IRC: TABLE R602.10.3(4), TABLE R602.10.4, R602.10.6.5, Figure R602.10.6.5, R602.10.6.5.1, R602.10.6.5.2 (New), R602.10.6.5.3 (New), R602.10.6.5.4 (New)

Proponent: Randy Shackelford, Simpson Strong-Tie Co., representing Simpson Strong-Tie Co. (rshackelford@strongtie.com)

2018 International Residential Code

R602.10.6 Construction of Methods ABW, PFH, PFG, CS-PF and BV-WSP. Methods ABW, PFH, PFG, CS-PF and BV-WSP shall be constructed as specified in Sections R602.10.6.1 through R602.10.6.5.

Revise as follows:

R602.10.6.5 Wall bracing for dwellings with stone and masonry veneer in Seismic Design Categories D0, D1 and D2. Where stone and masonry veneer are installed in accordance with Section R703.8, wall bracing on exterior *braced wall lines* and *braced wall lines* on the interior of the building, backing or perpendicular to and laterally supporting veneered walls shall comply with this section.

Where dwellings in Seismic Design Categories D0, D₁and D₂have stone or masonry veneer installed in accordance with Section R703.8, and the veneer does not exceed the first-story height, wall bracing shall be in accordance with Section R602.10.3. Where detached one- or two-family dwellings in Seismic Design Categories D0, D₁and D₂have stone or masonry veneer installed in accordance with Section R703.8, and the veneer exceeds the first-*story height*, wall bracing at exterior *braced wall lines* and *braced wall lines* on the interior of the building shall be constructed using Method BV-WSP in accordance with this section and Figure R602.10.6.5. Cripple walls shall not be permitted, and required interior *braced wall lines* shall be supported on continuous foundations. Where detached one- or two-family *dwellings* in Seismic Design Categories D0, D₁and D₂have exterior veneer installed in accordance with Section R703.8 and are braced in accordance with Method WSP or CS-WSP, veneer shall be permitted in the second story in accordance with ltem 1 or 2, provided that the *dwelling* does not extend more than two stories above grade plane, the veneer does not exceed 5 inches (127 mm) in thickness, the height of veneer on gable-end walls does not extend more than 8 feet (2438 mm) 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.*

- 1. 1. The total area of the veneer on the second-story exterior walls shall be permitted to extend up to 25 percent of the occupied second floor area.
- 2. 2. The veneer on the second-story exterior walls shall be permitted to cover one side of the *dwelling*, including walls on bay windows and similar appurtenances within the one dwelling side.

Townhouses in Seismic Design Categories D0, D₁ and D₂ with stone or masonry veneer exceeding the first-story height shall be designed in accordance with accepted engineering practice.

Add new text as follows:

R602.10.6.5.1 Veneer on First Story Only. Where dwellings in Seismic Design Categories D0, D_1 and D_2 have stone or masonry veneer installed in accordance with Section R703.8, and the veneer does not exceed the first-story height, wall bracing shall be in accordance with Section R602.10, exclusive of this section.

R602.10.6.5.2 Veneer Exceeding First Story Height. Where detached one- or two-family dwellings in Seismic Design Categories D0, D_1 and D_2 have stone or masonry veneer installed in accordance with Section R703.8, and the veneer exceeds the first-*story height*, wall bracing at exterior *braced wall lines* and *braced wall lines* on the interior of the building shall be constructed using Method BV-WSP in accordance with this section and

Figure R602.10.6.5.2. Cripple walls shall not be permitted, and required interior *braced wall lines* shall be supported on continuous foundations.



Note: Hold downs should be strap ties, tension ties, or other approved hold-down devices and shall be installed in accordance with the manufacturer's instructions.

FIGURE R602.10.6.5 R602.10.6.5.2 METHOD BV-WSP—WALL BRACING FOR DWELLINGS WITH STONE AND MASONRY VENEER IN SEISMIC DESIGN CATEGORIES D0, D_1 and D_2

Add new text as follows:

R602.10.6.5.3 Limited Veneer Exceeding First Story Height. Where detached one- or two-family *dwellings* in Seismic Design Categories D0, D₁ and D₂ have exterior veneer installed in accordance with Section R703.8 and brick veneer installed above the first story height meets the following limitations, bracing in accordance with Method WSP or CS-WSP shall be permitted provided the total length of *braced wall panels* specified by Table R602.10.3(3) is multiplied by 1.2 for each first- and second-story *braced wall line.*

- 1. The dwelling does not extend more than two stories above grade plane.
- 2. The veneer does not exceed 5 inches (127 mm) in thickness.
- 3. <u>The height of veneer on gable-end walls does not extend more than 8 feet (2438 mm) above the bearing</u> wall top plate elevation.
- 4. <u>Where veneer is installed on multiple walls above the first story, the total area of the veneer on the second-story exterior walls shall not exceed 25 percent of the occupied second floor area.</u>
- 5. Where the veneer is installed on one entire second-story exterior wall, including walls on bay windows and similar appurtenances, brick veneer shall not be installed on any of the other walls on that floor.

R602.10.6.5.4 Townhouses. Townhouses in Seismic Design Categories D0, D₁ and D₂ with stone or masonry veneer exceeding the first-story height shall be designed in accordance with accepted engineering practice.

Revise as follows:

R602.10.6.5.1 <u>R602.10.6.5.5</u> Length of bracing. The length of bracing along each *braced wall line* shall be the greater of that required by the ultimate design wind speed and *braced wall line* spacing in accordance with Table R602.10.3(1) as adjusted by the factors in Table R602.10.3(2) or the seismic design category and *braced wall line* length in accordance with <u>either</u> Table <u>R602.10.6.5</u> <u>R602.10.6.5.5</u> when using Method BV-WSP, or <u>Table R602.10.3(3) as adjusted by the factors in Table R602.10.3(4)</u> when using Method WSP or CS-WSP. Angled walls shall be permitted to be counted in accordance with Section R602.10.1.4, and *braced wall panel* location shall be in accordance with Section R602.10.2.2. Spacing between *braced wall lines* shall be in accordance with Table R602.10.1.3. The seismic adjustment factors in Table R602.10.3(4) shall not be applied to the length of bracing determined using Table R602.10.6.5, except that the bracing amount increase for *braced wall line* spacing greater than 25 feet (7620 mm) in accordance with Table R602.10.1.3 shall be required. The minimum total length of bracing in a *braced wall line*, after all adjustments have been taken, shall be not less than 48 inches (1219 mm) total.

TABLE R602.10.6.5 R602.10.6.5.5 METHOD BV-WSP WALL BRACING REQUIREMENTS

Portions of table not shown remain unchanged.

SEISMIC DESIGNCATEGORY		BRA	ACED W	/ALL LII (FEET)	NE LEN	GTH	SINGLE-	
	STORY	10 Mini Braceo	20 mum To d Wall F	30 otal Len PanelsR	40 Igth (fe equirec	50 et) of I Along	STORYHOLD- DOWN FORCE (pounds) ^a	CUMULATIVEHOLD- DOWN FORCE (pounds) ^b
			each B	raced W	/all Line	e		

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.479 kPa, 1 pound-force = 4.448 N. NP = Not Permitted.

NA = Not Applicable.

- a. Hold-down force is minimum allowable stress design load for connector providing uplift tie from wall framing at end of braced wall panel at the noted story to wall framing at end of braced wall panel at the story below, or to foundation or foundation wall. Use single-story hold-down force where edges of braced wall panels do not align; a continuous load path to the foundation shall be maintained.
- b. Where hold-down connectors from stories above align with stories below, use cumulative holddown force to size middle- and bottom-story hold-down connectors.

TABLE R602.10.3(4) SEISMIC ADJUSTMENT FACTORS TO THE REQUIRED LENGTH OF WALL BRACING

ITEMNUMBER	ADJUSTMENTBASED ON	STORY	CONDITION	ADJUSTMENTFACTOR ^{a,} ^b [Multiply length from Table R602.10.3(3) by this factor]	APPLICABLEMETHOD:
7	Walls with stone ormasonry veneer, detached one- and two-family dwellings in SDC D ₀ – D ₂ ^{d, f}	Any story	See Tabk <u>F</u>	9 R602.10.6.5 <u>Section</u> 8602.10.6.5.5	BV-WSP

8 veneer, detached one- andtwo-family dwellingsin SDC D ₀ – $D_2^{d, f}$ story of See Table 1.2 WSP, C two- $D_2^{d, f}$ story Section dwelling B602.10.6.5.3	8 8 dw	8
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For SI: 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

- a. Linear interpolation shall be permitted.
- b. The total length of bracing required for a given wall line is the product of all applicable adjustment factors.
- c. The length-to-width ratio for the floor/roof diaphragm shall not exceed 3:1.
- d. Applies to stone or masonry veneer exceeding the first story height.
- e. The adjustment factor for stone or masonry veneer shall be applied to all exterior braced wall lines and all braced wall lines on the interior of the building, backing or perpendicular to and laterally supporting veneered walls.
- f. See Section R602.10.6.5 for requirements where stone or masonry veneer does not exceed the first-story height.

TABLE R602.10.4 BRACING METHODS

Portions of table not shown remain unchanged.

		MINIMUM	FIGURE	CONNECTION CRITERIA ^a		
	METHODS, MATERIAL	THICKNESS	FIGUNE	Fasteners Spacing		
Intermittent Bracing Methods	BV-WSP^eWood structuralpanels with stoneor masonry veneer(See Section R602.10.6.5)	⁷ / ₁₆ ″	See Figure R602.10.6.5 <u>R602.10.6.5.2</u>	8d common (2 ¹ /2 ["] × 0.131) nails	4" at panel edges12" at intermediatesupports 4" at bracedwall panel end posts	

Reason: The purpose of this change is to clarify wall bracing of dwellings that have brick veneer. Last cycle a section was added to permit limited brick veneer on the second story without triggering the use of BV-WSP, but there were conflicts in how this was to be applied. The main goal is to clarify this appliction.

Table R602.10.3(4) is proposed to be modified to refer to Section R602.10.6.5.3, which states when methods WSP and CS-WSP can be used to brace brick veneer, instead of Table R602.10.6.5, which gives bracing amonts for Method BV-WSP bracing. The assumption I make here is that the intent was that when this limited brick veneer was installed, then the bracing lengths in Table R602.10.3(3) were to be used for the WSP and CS-WSP bracing, adjusted by the 1.2 factor, and *not* the BV-WSP bracing amounts.

Seciton R602.10.6.5 is broken into several sub-sections in order to make it easier to read and use. Except for clarifying the bracing length to use for WSP and CS-WSP, there is no intent to make any substantive changes, just re-wording. The long paragraph of limitations in new R602.10.6.5.3 is broken into a list for clarification and ease of use.

Finally, Section R602.10.6.5.5 (formerly R602.10.6.5.1) is clarified along the lines stated above to specify which table to use to calculate the required length of bracing for each permitted method. If this is not changed, then

the WSP and CS-WSP would be required to use the BV-WSP bracing amounts in Table R602.0.6.5 for seismic bracing.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The main intent of this code change is to clarify the section and not make any technical changes.

Proposal # 5197

RB209-19

RB210-19

IRC®: TABLE R602.10.6.5

Proponent: Ralph Leyva, APA- The Engineered Wood Assoc, representing APA- The Engineered Wood Assoc (ralph.leyva@apawood.org); Borjen Yeh, representing APA - The Engineered Wood Association (borjen.yeh@apawood.org)

2018 International Residential Code

Revise as follows:

TABLE R602.10.6.5

METHOD BV-WSP WALL BRACING REQUIREMENTS[©]

Portions of table not shown remain unchanged.

		BF	RACE LENC	D WA GTH (F	LL LI FEET)	NE		
SEISMIC DESIGNCATEGORY	STORY	10 Mir (fe Par eac	20 nimur eet) o nelsR ch Bra	30 n Tota of Brac Require aced N	40 al Len ced W ed Alo Wall L	50 gth all ong .ine	SINGLE-STORYHOLD- DOWNFORCE(pounds) ^a	CUMULATIVEHOLD- DOWNFORCE(pounds) ^b

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.479 kPa, 1 pound-force = 4.448 N. NP = Not Permitted.

NA = Not Applicable.

a. Hold-down force is minimum allowable stress design load for connector providing uplift tie from wall framing at end of braced wall panel at the noted story to wall framing at end of braced wall panel at the story below, or to foundation or foundation wall. Use single-story hold-down force where edges of braced wall panels do not align; a continuous load path to the foundation shall be maintained.

b. Where hold-down connectors from stories above align with stories below, use cumulative hold-down force to size middle- and bottom-story hold-down connectors.

c. Interpolation between braced wall lengths is permitted.

Reason: Table and section does not state one way or another on interpolation and needs clarification. Based on the way the table was developed, the interpolation should be permitted.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal permits interpolation between specified braced wall lengths and will not increase the construction cost.

Proposal # 4693

RB210-19

RB211-19

IRC®: R602.10.10.1

Proponent: Kelly Cobeen, Wiss Janney Elstner Associates, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (KCobeen@wje.com); Julie Furr, Rimkus Consulting Group, representing Federal Emergency Management Agency and Applied Technology Council Seismic Code Support Committee (FEMA/ATC SCSC) (jfurr@rimkus.com); Michael Mahoney, representing Federal Emergency Management Agency (mike.mahoney@fema.dhs.gov)

2018 International Residential Code

Revise as follows:

R602.10.10.1 Cripple wall bracing for Seismic Design Categories D0 and D1 and townhouses in Seismic

Design Category C. In addition to the requirements in Section R602.10.10, <u>cripple wall bracing shall comply</u> <u>with the following:</u>

- 1. Cripple wall sheathing shall be limited to methods WSP and CS-WSP.
- 2. <u>Cripple walls in one-story dwellings shall be braced with the length and method of bracing required for the first story of a two-story dwelling.</u>
- 3. <u>Cripple walls in two-story dwellings shall be braced with the length and methods of bracing required for</u> <u>the first story of a three-story dwelling.</u>
- 4. <u>Cripple walls in three-story dwellings shall be braced with the length and the method of bracing required</u> for this first story of a three-story dwelling, further multiplied by 1.5.
- 5. <u>The multiplication factor of 1.15 in Section R602.10.10 is not required.</u>
- Where gypsum wall board is not used on the inside of the cripple wall bracing, the length adjustments for the elimination of the gypsum wallboard, or equivalent, shall be applied as indicated in Tables R602.10.3(2) and R602.10.3(4) to the length of cripple wall bracing required.
- 7. <u>The</u> distance between adjacent edges of *braced wall panels* for cripple walls along a *braced wall line* shall be 14 feet (4267 mm) maximum.
- 8. Where braced wall lines at interior walls are not supported on a continuous foundation below, the adjacent parallel cripple walls, where provided, shall be braced with Method WSP or Method CS-WSP in accordance with Section R602.10.4. The have the length of bracing required in accordance with Table R602.10.3(3) for the cripple walls Items 2 through 4 and shall be further multiplied by 1.5. Where the cripple walls do not have sufficient length to provide the required bracing, the spacing of panel edge fasteners shall be reduced to 4 inches (102 mm) on center and the required bracing length adjusted multiplied by 0.7. If the required length can still not be provided, the cripple wall shall be designed in accordance with accepted engineering practice.

Reason: This proposal requires the use of wood structural panel (plywood or OSB) sheathing on cripple walls for townhouses in SDC C and all dwellings in SDC D0 and D_1 . This extends a requirement already in place for dwellings in SDC D_2 . In addition, the length of sheathing is specified based on the cripple wall being an additional story below the occupied stories. This is consistent with the seismic demand that the cripple walls resist.

This change is proposed because recent studies have reconfirmed the need for and benefit of providing wood structural panel sheathing on cripple walls in regions of moderate to high seismic hazard. As part of work contributing to the FEMA P-1100 (*Vulnerability-Based Seismic Assessment and Retrofit of One- and Two-Family Dwellings Volume 1 - Prestandard*), it was identified that the use of wood structural panel sheathing is needed for cripple walls in light-frame dwellings in order to meet the seismic performance objectives targeted by the residential and building codes. This is believed to be largely due to there being significantly less total wall length

and little or no finish material contribution to seismic bracing at the cripple wall level. As a result cripple walls subject to earthquake loading must withstand higher shear forces and significantly greater horizontal displacement levels than the stories above. The need for and improvement provided with the addition of wood structural panel cripple wall bracing was demonstrated in numerical studies by the probability of collapse reducing by one-half to two-thirds with the addition of wood structural panel sheathing. Given that the cost of providing wood structural panel sheathing is estimated to be less than one percent of the construction cost of the home, the benefit significantly outweighs the cost.

Cost Impact: The code change proposal will increase the cost of construction

This will modestly increase the cost of dwellings in moderate and high seismic hazard regions by requiring the use of wood structural panel sheathing on the cripple walls. This is estimated to be less than one percent of the construction cost of the dwelling.

Proposal # 4577

RB212-19 Part I

PART I - IRC: R602.13 (New)

PART II — IECC: R402.1.6 (New), TABLE R402.1.2

Proponent: Vladimir Kochkin, Home Innovation Research Labs, representing Home Innovation Research Labs (vkochkin@homeinnovation.com); Patricia Gunderson, Home Innovation Research Labs, representing Home Innovation Research Labs (pgunderson@homeinnovation.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IRC-BUILDING COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL ENERGY COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2018 International Residential Code

Add new text as follows:

R602.13 Extended Plate Wall. Extended plate wall (EPW) construction shall comply with all applicable provisions of Sections R602.1 through R602.12 as modified by the provisions of Section R602.13. EPW shall be limited to Seismic Design Categories A, B, and C for detached one- and two-family dwellings and to Seismic Design Categories A and B for townhomes.

R602.13.1 Framing. The 2x6 top and bottom plates and 2x4 studs shall be used in accordance with Figures R602.13.1(1) and R602.13.1(2). A single top plate shall not be permitted.





Figure R602.13.1(1) Extended Plate Wall (EPW) System, Section View



Figure R602.13.1(2) Extended Plate Wall, Elevation View

R602.13.2 Wood structural panel sheathing. Wood structural panel sheathing with a minimum nominal thickness of 7/16-inch (11 mm) shall be installed vertically and attached to wall plates and studs per Table R602.13.2 and Figure R602.13.1(2). The vertical joints between adjacent wood structural panels shall occur only at framing members. Where used as part of wall bracing, each wood structural panel shall be continuous, without horizontal joints between the extended top and bottom plates.

TABLE R602.13.2. Sheathing Fastener Requirements for EPW

	Maximum Fastener Spacing					
Minimum Nail Length and Diameter	At Perimeter of Wood Structural Panels (inches)	<u>In Field of Wood Structural</u> <u>Panels (inches)</u>				
<u>No. 37 Power-tool Driven Common Nail</u> (3-1/2" x 0.131") ^{a.b.c. d}	<u>3 O.C.</u>	<u>6 O.C.</u>				
<u>16d Box Nail (3-1/2" x 0.135")^{a,b,d}</u>	<u>3 O.C.</u>	<u>6 O.C.</u>				

For SI: 1-inch = 25.4 mm

a. Where wood structural panel nominal thickness exceeds 1/2 inch (13 mm), the minimum nail length shall be increased by 1/4 inch (6 mm).

b. At top and bottom plates where the wood structural panel is in direct contact with the framing, 8d common nail (2-1/2" x 0.131") shall be permitted.

c. Full round head nail with minimum head diameter of 0.281 inches (7 mm).

d. Nails are in accordance with ASTM F1667.

R602.13.3 Wall bracing. Wall bracing for EPW shall be in accordance with the requirements for WSP or CS-WSP or CS-G bracing methods in Section R602.10 except the sheathing fasteners shall be in accordance with Table R602.13.2.

R602.13.3.1 Simplified wall bracing. With the exception of Section R602.12.2 Item 2, provisions of Section R602.12 shall be applicable to the EPW. The fastening schedule for wood structural panels shall be in accordance with Table R602.13.2.

R602.13.4 Rim joist. Sawn 2x lumber or engineered wood rim board shall be used to construct rim joists. Engineered wood rim board shall be in compliance with Section R602.1.7. The minimum bearing length requirements for the floor joists shall be satisfied or joists shall be supported with metal hangers. Rim joist (band joist) supporting an EPW shall be in accordance with one of the following methods.

- 1. <u>A double member rim joist installed flush to the exterior face of the wall in accordance with Figure</u> <u>R602.13.4(1). The thickness of individual rim joist members shall not be less than 1-1/2 inches (38 mm).</u>
- A double member rim joist recessed by 1 inch (25 mm) from the exterior face of the wall in accordance with Figure R602.13.4(2). The thickness of individual rim joist members shall not be less than 1 inch (25 mm). Foam plastic insulative sheathing shall be installed in the 1 inch (25 mm) recess.
- 3. <u>Approved engineered design.</u>



Figure R602.13.4(1) Rim Joist Construction for EPW – Double Member



Figure R602.13.4(2) Rim Joist Construction for EPW – Inset Double Member

R602.13.5 Rim joist used as rim header. Wood rim boards, or band joists, that serve as rim board headers shall be constructed in accordance with Section R602.7.2.

R602.13.6 Foam plastic insulating sheathing. Foam plastic insulating sheathing (FPIS) with a total thickness of 2 inches (51 mm) shall be installed between top and bottom plates directly to the exterior surface of studs and flush with the 2x6 top and bottom plates. FPIS shall comply with ASTM C578 or ASTM C1289, with a minimum compressive strength of 15 psi. FPIS shall be permitted to be installed in one or more layers.

R602.13.7 Wall coverings. Interior and exterior coverings and wall finishes shall be in accordance with all applicable provisions of Sections R701 through R703 as modified by the provisions of Sections R602.13.7.1 and

R602.13.7.2.

R602.13.7.1 Vapor retarder. A vapor retarder on the interior side of the EPW frame shall be in accordance with Section R702.7. Where a Class III interior vapor retarder is used in accordance with Table R702.7.1, EPW shall be designated as a 2x4 wall with continuous insulation and, in Climate Zones 4, 5, 6, 7, and 8, the foam plastic insulating sheathing layer including any facers or surface film shall have a water vapor permeance of less than or equal to 1.5 perms.

R602.13.7.2 Cladding attachment. Cladding shall be specified and installed in accordance with Section R703 and one of the following:

- 1. <u>Table R703.3.3 for siding attachment to wood structural panels only.</u>
- 2. <u>Table R703.8.4(2) for brick tie-spacing and attachment to wood structural panels only.</u>
- 3. <u>Fastening schedule and fasteners as required by Table R703.3.(1), except fastener length shall be</u> selected to meet or exceed the minimum required penetration into framing.

R602.13.8 Uplift connections. Where roof uplift tie-downs are selected in accordance with Section R802.11, the roof tie-downs shall be fastened to either side of the double top plate or, if required to be fastened to studs, shall be installed from the interior face of the wall in accordance with manufacturer's installation instructions. Where uplift forces determined in accordance with R602.3.5 require approved uplift connectors between floors or between foundation and the floor, these uplift connectors shall not rely on wood structural panel sheathing for resisting roof wind uplift forces.

Proposal # 4671

RB212-19 Part I

RB212-19 Part II

IECC: R402.1.6 (New), TABLE R402.1.2

Proponent: Vladimir Kochkin, Home Innovation Research Labs, representing Home Innovation Research Labs (vkochkin@homeinnovation.com); Patricia Gunderson, Home Innovation Research Labs, representing Home Innovation Research Labs (pgunderson@homeinnovation.com)

2018 International Energy Conservation Code

Add new text as follows:

R402.1.6 Extended Plate Wall (EPW). EPW wall systems constructed in accordance with all applicable provisions of Sections R602.1 through R602.13 of the International Residential Code shall be considered to be in compliance with continuous insulation provisions of Table R402.1.2. For use with the prescriptive minimum insulation requirements, the foam plastic insulating sheathing layer installed outboard of the studs and the cavity insulation shall be in accordance with the required levels of insulation specified in Table R402.1.2.

CLIMATEZONE	FENESTRATION <i>U</i> -FACTOR ^b	SKYLIGHT [♭] <i>U</i> - FACTOR	GLAZEDFENESTRATION SHGC ^{b, e}	CEILING <i>R</i> - VALUE	WOODFRAME WALL <i>R</i> - VALUE	MASSWAL <i>R</i> -VALUE
1	NR	0.75	0.25	30	13	3/4
2	0.40	0.65	0.25	38	13	4/6
3	0.32	0.55	0.25	38	20 or 13+5 ^h	8/13
4 exceptMarine	0.32	0.55	0.40	49	20 or 13+5 ^{h<u>, j</u>}	8/13
5 andMarine 4	0.30	0.55	NR	49	20 or 13+5 ^{h<u>, j</u>}	13/17
6	0.30	0.55	NR	49	20+5 ^{h, j} or 13+10 ^{h, j}	15/20
7 and 8	0.30	0.55	NR	49	20+5 ^{h, j} or 13+10 ^{h, j}	19/21

TABLE R402.1.2 INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a

NR = Not Required. For SI: 1 foot = 304.8 mm.

- a. *R*-values are minimums. U-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.
- b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

c. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation on the interior of the basement wall. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. Alternatively, compliance with "15/19" shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.

- d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs. as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.
- e. There are no SHGC requirements in the Marine Zone.
- f. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.
- g. Alternatively, insulation sufficient to fill the framing cavity and providing not less than an *R*-value of R-19.
- h. The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.
- i. Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.
- j. <u>EPW wood-frame wall system utilizing foam plastic and cavity insulation equal to or exceeding</u> the prescribed R-values shall satisfy the prescriptive minimum insulation requirements for CZ 3-<u>8.</u>

Proposal # 5800

RB212-19 Part II

RB213-19

IRC®: R608.1

Proponent: Samuel Steele, representing Seattle Department of Construction and Inspection (SDCI) (samuel.steele@seattle.gov)

2018 International Residential Code

Revise as follows:

R608.1 General. Exterior concrete walls shall be designed and constructed in accordance with the provisions of this section or in accordance with the provisions of PCA 100, or ACI 318, or ACI 332. Where PCA 100, ACI 318, <u>ACI 332</u> or the provisions of this section are used to design concrete walls, project drawings, typical details and specifications are not required to bear the seal of the architect or engineer responsible for design, unless otherwise required by the state law of the jurisdiction having authority.

Reason: This change updates the exterior concrete wall construction section, R608.1, by including a reference to ACI 332 Residential Code Requirements for Structural Concrete. ACI 332 addresses the design and construction concrete basement or foundation walls constructed with removable forms or with flat insulating concrete forms. ACI 332 is already a referenced standard in section R404.1.3 of the 2018 IRC which also deals with the design of concrete foundation walls.

Cost Impact: The code change proposal will not increase or decrease the cost of construction It simply puts in a reference to a standard that was overlooked.

Proposal # 4347

RB213-19

RB214-19

IRC®: R609.1

Proponent: Jeff Inks, WDMA, representing Window and Door Manufacturers Association (jinks@wdma.com); Jennifer Hatfield, representing American Architectural Manufacturers Association (jen@jhatfieldandassociates.com)

2018 International Residential Code

Revise as follows:

R609.1 General. This section prescribes performance and construction requirements for exterior windows and doors installed in walls. Windows and doors shall be installed and flashed anchored in accordance with the fenestration manufacturer's written instructions. Section R609.7. Window and door openings shall be flashed in accordance with Section R703.4. Written installation Installation instructions shall be provided by the fenestration manufacturer for each window or door.

Reason: The long standing intent of Section R609 is to provide the appropriate performance and construction requirements for window and door products, and anchoring requirements with respect to the installation of them. As the general provision for Section R609, R609.1 should make that clear and for further clarification, make clear that flashing requirements for the window and door opening are provided in Chapter 7 Wall Coverings where they belong and manufacturers are still required to provide installation instructions. As currently written, the inclusion of flashing requirements in this section is not necessary and more importantly conflicts with the provisions of Section R703.4 which does not restrict builders from using other proper flashing installation methods in addition to those included in the manufacturer's instructions when those instructions may not cover a particular installation aspect/s. This proposal corrects that and brings the general provisions of R609.1 back in-line with the intent of Section R609 on the w hole by clarifying anchoring must comply with Section R609.7 and flashing of the opening with Section R703.4. The requirement that manufacturers must provide installation instructions remains and more clearly reflects how installation instructions are being provided by manufacturers.

Cost Impact: The code change proposal will decrease the cost of construction

This amendment will reduce the cost of construction when alternatives to the flashing instructions provided by the manufacturer are needed or preferred by the builder because of project specific conditions. Section R703.4 allows the builder to use alternative, code compliant methods under those circumstances. If the flashing provisions of this section are enforced over the flashing provisions of section R703.4, the manufacturer would need to develop project specific alternatives which is costly, results in construction delays, and not practical.

Proposal # 5390

RB214-19

RB215-19

IRC: R609.4.1 (New)

Proponent: T. Eric Stafford, representing Insurance Institute for Business and Home Safety (testafford@charter.net)

2018 International Residential Code

R609.4 Garage doors. Garage doors shall be tested in accordance with either ASTM E330 or ANSI/DASMA 108, and shall meet the acceptance criteria of ANSI/DASMA 108.

Add new text as follows:

R609.4.1 Garage door labeling. Garage doors shall have a permanent label identifying the garage door manufacturer, the garage door model/series number, the positive and negative design wind pressure rating, the installation instruction drawing reference number, and the applicable test standard.

Reason: This proposal is one of several that are addressing labeling of critical components of the building envelope. The primary purpose of this code change is to require that garage doors have a permanent label that provides a way for building owners, homeowners, and others to be able to determine their performance characteristics after the building has been occupied. The 2018 IRC does not require any type of label for garage doors. For products that don't have permanent labels, it becomes nearly impossible for the owner to determine the structural wind load resistance and/or energy efficiency of the garage doors after they've occupied the building. This proposal would simply require some type of permanent marking on the garage door indicating the manufacturer and model/series number, and performance characteristics so that the specific performance characteristics could be retrieved at a later date.

This same proposal was submitted for the 2018 IRC but was not approved by the IRC B Committee. However, it was nearly unanimously approved at the final action hearings, but did not get the required majority during the OGVC.

For the past 10-15 years, there has been a push towards considering sustainability in the way our buildings are constructed in this country. If this goal is to be successful and building owners and occupants increasingly want more information about the sustainability of the buildings they occupy, they need to be provided with information needed to determine how critical components are expected to perform in the buildings they use. Garage doors are important components of the building envelope and their performance is critical in preventing wind and water infiltration as well as to maintaining the overall structural integrity of the building.

Some manufacturers already include permanent labels on their products that provide traceability to the manufacture and the product characteristics. The Florida Building Code has required this type of label since the 2007 edition and has continued to require it in subsequent editions. The following is the relevant text from the 6th Edition (2017) Florida Building Code, Residential:

R612.4.1 Garage door labeling. Garage doors shall be labeled with a permanent label provided by the garage door manufacturer. The label shall identify the garage door manufacturer, the garage door model/series number, the positive and negative design pressure rating, indicate impact rated if applicable, the installation instruction drawing reference number, the Florida Product Approval or Miami-Dade Product Approval number if applicable, and the applicable test standards. The required garage door components for an approved garage door assembly may be indicated using a checklist form on the label. If a checklist format is used on the label, the door installer or the garage door manufacturer shall mark the selected components on the checklist that are required to assemble an approved garage door system. The installation instructions shall be provided and available on the job site.

Also, Oklahoma Uniform Building Code Commission Rules in their Appendix Y require that garage doors be wind rated to135 mph. Having a permanent label will facilitate verification that the right type of garage door is installed.

Another consideration is that insurance incentives are now being offered in some states for homes, new and existing, that comply with certain levels of the Fortified program administered by IBHS. The Fortified program is a set of engineering and building standards designed to help strengthen new and existing homes through system-specific building upgrades to minimum building code requirements that will reduce damage from specific natural hazards. Fortified offers three different levels of designation (bronze, silver, and gold) depending on the extent of the recommended "upgrades" to the building's wind resistance. To qualify for a designation, the home has to be inspected. Without a permanent label indicating the manufacturer and product model/series number, the performance characteristics often cannot be determined, and certain Fortified designations become difficult or impossible to be given.

Approval of this proposal will assure, going forward, that new or replaced garage doors will be labeled such that building owners and those considering the purchase of buildings with these products will be able to obtain information necessary for determining the expected performance of these critical components of the building envelope.

Cost Impact: The code change proposal will increase the cost of construction Will impact cost for some manufacturers. The code does not currently require a permanent label. However, some garage door manufacturers voluntarily apply a permanent label that identifies the critical performance characteristics. There will be no cost impact to those manufacturers.

Proposal # 4360

RB215-19
RB216-19

IRC: TABLE R702.3.5

Proponent: Rick Allen, International Staple, Nail and Tool Association, representing International Staple, Nail and Tool Association (rallen@isanta.org)

2018 International Residential Code

Revise as follows:

TABLE R702.3.5

MINIMUM THICKNESS AND APPLICATION OF GYPSUM BOARD AND GYPSUM PANEL PRODUCTS Portions of table not shown remain unchanged.

THICKNESS OFGYPSUMBOARD ORGYPSUM	APPLICATION	ORIENTATION OFGYPSUM BOARD ORGYPSUM	MAXIMUMSPACING OFFRAMINGMEMBERS(inches o.c.)	MAXIMUM SPACING OFFASTENEF (inches)	
PANELPRODUCTS(inches) PANELPRODUCTS		,	Nails ^a	Screws	
		Application v	without adhesive		<u> </u>
	Ceiling ^d	Perpendicular	16	7	12
3 _{/8}	Wall	Either direction	16	8	16
	Ceiling	Either direction	16	7	12
	Ceiling ^d	Perpendicular	24	7	12
	Wall	Either direction	24	8	12
1/2	Wall	Either direction	16	8	16

	Ceiling	Either direction	16	7	12
⁵ /8	Ceiling	Perpendicular	24	7	12
	Type X atgarage ceiling beneath habitable rooms	Perpendicular	24	6	6
	Wall	Either direction	24	8	12
	Wall	Either direction	16	8	16

For SI: 1 inch = 25.4 mm.

- a. For application without adhesive, a pair of nails spaced not less than 2 inches apart or more than $2^{1}/_{2}$ inches apart shall be permitted to be used with the pair of nails spaced 12 inches on center.
- b. Screws shall be in accordance with Section R702.3.5.1. Screws for attaching gypsum board or gypsum panel products to structural insulated panels shall penetrate the wood structural panel facing not less than 7 /₁₆ inch.
- c. Where cold-formed steel framing is used with a clinching design to receive nails by two edges of metal, the nails shall be not less than ⁵/₈ inch longer than the gypsum board or gypsum panel product thickness and shall have ringed shanks. Where the cold-formed steel framing has a nailing groove formed to receive the nails, the nails shall have barbed shanks or be 5d, 13¹/₂ gage, 1⁵/₈ inches long, ¹⁵/₆₄-inch head for ¹/₂-inch gypsum board or gypsum panel product; and

6d, 13 gage, $1^{7}/_{8}$ inches long, $1^{5}/_{64}$ -inch head for $5/_{8}$ -inch gypsum board or gypsum panel product.

d. Three-eighths-inch-thick single-ply gypsum board or gypsum panel product shall not be used on a ceiling where a water-based textured finish is to be applied, or where it will be required to support insulation above a ceiling. On ceiling applications to receive a water-based texture material, either hand or spray applied, the gypsum board or gypsum panel product shall be applied perpendicular to framing. Where applying a water-based texture material, the minimum gypsum board thickness shall be increased from 3/8 inch to 1/2 inch for 16-inch on center framing, and from 1/2 inch to 5/8 inch for 24-inch on center framing or 1/2-inch sag-resistant gypsum ceiling board shall be used.

Reason: renaming to "ring shank" from "annular ringed" to be consistent with existing terminology in the code.

For the 5/8" Type X at garage ceiling, the description of a $1^7/_8$ " 6d coated nail does not provide a complete description.

Providing a nail diameter (0.099 inches) and "galvanized" provides a complete description for the nail.

Cost Impact: The code change proposal will not increase or decrease the cost of construction These changes provide clarification to existing language and will not affect cost

Proposal # 3875

RB216-19

RB217-19

IRC: R702.7, R702.7.1(New)

Proponent: Cesar Lujan, representing National Association of Home Builders (clujan@nahb.org); Gary Ehrlich, representing National Association of Home Builders (gehrlich@nahb.org)

2018 International Residential Code

Revise as follows:

R702.7 Vapor retarders. <u>Vapor retarders on the interior side of frame walls shall be installed in accordance with</u> <u>this section.</u> Class I or II vapor retarders are required shall be provided on the interior side of frame walls in Climate Zones 5, 6, 7, 8 and Marine 4.

Exceptions:

- 1. Basement walls.
- 2. Below-grade portion of any wall.
- 3. Construction where <u>accumulation</u>, <u>condensation</u>, <u>or freezing of</u> moisture or its freezing will not damage the materials.

Add new text as follows:

702.7.1 Class I and II vapor retarders. Class I and II vapor retarders shall not be provided on the interior side of frame walls in Climate Zone 1A, 2A, and portions of Climate Zone 3A south of the warm-humid line.

Reason: The purpose of this code change is to provide appropriate limitations on the use of Class I or II interior vapor retarders in the warm-humid climate zones. The intent of providing a vapor retarder in the wall assembly is to control the migration of moisture from the warm side of the wall assembly to the colder side, where it can condense against colder surfaces and, if trapped within a portion of the wall assembly, cause mold growth or material decay. The existing vapor retarder requirements are intended for colder climates where the most concerning direction of vapor drive is from the warm inside of the house towards the colder outside, occurruing during the heating (winter) season. In warmer climates, the direction of concern would be from the warm outside towards the colder inside of the house, occurring during the cooling (summer) season. In the latter case, a vapor retarder on the inside of the wall assembly would provent the wall from drying inwards and could result in condensation occuring on the interior gypsum board or on the back side of the vapor retarder. Either one could result in mold growth and decay. To minimize the risk of interior vapor retarders being installed where they are not necessary, and could cause issues within the wall, an explicit limitation on interior vapor retarders in the warm-humid climate zones is proposed.

The code change also provides several editorial revisions. A separate section under 702.7 for the Class I and II vapor retarder requirements is created, and new charging language for the entire vapor retarder provisions added. The third exception to providing Class I or II vapor retarders is revised to clarify what the moisture conditions of concern are that need to be evaluated in deciding whether a wall assembly can be exempted from the vapor retarder requirements.

The proposed limitations are consistent with industry guidance from Home Innovation Research Labs, Building Science Corporation, DOE's Building America program, NAIMA, and others.

Bibliography: *Moisture Performance of Walls in Energy-Efficient Homes*, prepared by Home Innovation Research Labs for National Association of Home Builders, August 2015. Building Science Digest 106, *Understanding Vapor Barriers*, Building Science Corporation, October 2006 (Revised April 2011). NAIMA, *Insulation and Vapor Retarders*, http://www.naima.org/insulation-knowledge-base/residential-home-insulation/insulation-and-vapor-retarders.html.

No Class I Vapor Retarders on Interior Side of Exterior Walls in Warm-Humid Climates, Building America Solution Center (https://basc.pnnl.gov), August 2013.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code change clarifies when interior vapor retarders are not required, and in fact when they should not be provided. If anything, this code change would reduce the cost of construction if interior vapor retarders are currently being installed where they are not necessary, as well as avoiding the potential cost of mitigating moisture issues down the road.

Proposal # 5033

RB218-19

IRC: R702.7

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com); Gil Rossmiller (gilrossmiller@coloradocode.net)

2018 International Residential Code

SECTION R702 INTERIOR COVERING

Revise as follows:

R702.7 Vapor retarders. Class I or II vapor retarders are required on the interior side of frame walls in Climate Zones 5, 6, 7, 8 and Marine 4. Installation of a Class I vapor retarder shall comply with all of the following:

- 1. <u>Be sealed to framing with construction adhesive or equivalent at the top and bottom plates, around window and door openings, and other areas where needed to create a tight seal.</u>
- 2. <u>Be sealed air tight around utility boxes and other penetrations.</u>
- 3. <u>Seams in the vapor retarder shall be overlapped at least 6 inches (152 mm) and sealed with compatible sealing tape or equivalent.</u>

Exceptions:

- 1. Basement walls.
- 2. Below-grade portion of any wall.
- 3. Construction where moisture or its freezing will not damage the materials.

Reason: I have yet to see manufacture instructions for how to install a class one vapor retarder yet that is what the code relies on. The building science community has studied and reported on the fact that 90 plus percent of the moisture that enters walls or other assemblies is driven there by air leakage not diffusion. If a class one vapor retarder is installed and <u>not</u> sealed to prevent the majority of moisture transport via air leakage then it merely is trapping moisture not fully retarding its ability to enter the cavity. Yes, the barrier can substantially stop vapor diffusion which means that it is not forgiving and will not allow water vapor to diffuse back out of an assembly if it were to get in by other means than diffusion. The requirment to install a vapor retarder is reliant that it is installed correctly not only to stop or reduce vapor diffusion but also moisture that travels with air. Minnesota has realized the reality and dichotomy of this situation and therefore has added some basic installation instruction into their adopted code. The language has been adapted here so as to offer guidance that is needed and missing in the industry.

Cost Impact: The code change proposal will increase the cost of construction

Although this proposal should not increase the cost of construction it is expected that it will slightly since the majority of the country does not enforce proper installation of class one vapor retarders.

Proposal # 4842

RB218-19

RB219-19

IRC: R702.7, R702.7.3

Proponent: Robby Schwarz, EnergyLogic, representing EnergyLogic (robby@nrglogic.com); Joseph Lstiburek, representing self (joe@buildingscience.com)

2018 International Residential Code

Revise as follows:

R702.7 Vapor retarders. Class I, or II or III vapor retarders are required on the interior side of frame walls in Climate Zones 5, 6, 7, 8 and Marine 4.

Exceptions:

- 1. Basement walls.
- 2. Below-grade portion of any wall.
- 3. Construction where moisture or its freezing will not damage the materials.

R702.7.1 Class III vapor retarders. Class III vapor retarders shall be permitted where any one of the conditions in Table R702.7.1 is met.

TABLE R702.7.1 CLASS III VAPOR RETARDERS

Portions of table not shown remain unchanged.

CLIMATEZONE CLASS III VAPOR RETARDERS PERMITTED FOR:^a

R702.7.2 Material vapor retarder class. The *vapor retarder class* shall be based on the manufacturer's certified testing or a tested assembly.

The following shall be deemed to meet the class specified:

- 1. Class I: Sheet polyethylene, on perforated aluminum foil.
- 2. Class II: Kraft-faced fiberglass batts.
- 3. Class III: Latex or enamel paint.

Revise as follows:

R702.7.3 Minimum clear airspaces and vented openings for vented cladding. For the purposes of this section, vented Vented cladding shall include the following minimum clear airspaces. <u>a minimum 3/16-inch (4.8 mm) airspace.</u> Other openings with the equivalent vent area shall be permitted.

- 1. Vinyl polypropylene or horizontal aluminum siding applied over a weather-resistive barrier as specified in Table R703.3(1).
- 2. Brick veneer with a clear airspace as specified in Table R703.8.4.
- 3. Other approved vented claddings.

Reason: First, as written the section title R402.7.3 **Minimum clear airspaces and vented openings for vented cladding** does not match the code language below which is defining vented cladding. It appears that vented cladding is being used as an example of what minimum clear air spaces is but it is very confusing and most are unclear what the section is trying to do. If vented cladding needs to be defined a new section should be create to do so. In my option it does not need to be defined, but the minimum clear airspace certainly does. As we know vapor retarders are designed to stop or limit the amount of moisture that can diffuse into a building assembly. They however do not stop moisture that moves with air and science has determined that 90 plus percent of the moisture that enters our building assemblies gets there via air leakage vs. vapor diffusion. Therefore, our concern regarding trapping moisture in assemblies and the drying potential of the assemblies we build is on the rise. With that in mind this proposal is striving to attain two things. First a realization that the choice of vapor retarder that is used should be based on the structure and the climate that structure is built in. We should dictate that a vapor retarder is installed, but not proclaim that only one type is best for a specific climate zone. Second, specifically when class three vapor retarders are used it has been shown that the vented space does not need to be more than 3/16 of an inch. The structure of the code does not called out the size of the vented opening which is causing builders to be forced to use class one and two vapor retarders when class three retarders would actually be the best choice for their climate and structure. This occurs because jurisdictions do not have better guidance than some random examples of gaps size behind vented cladding that is currently given in the code. This is especially true in dry climate zones but is an issue everywhere.

In Joe Lstiburek's article titled "Wufi – Barking up the Wrong Tree" he demonstrates that wood siding that is installed over a 3/16" gap has air movement behind it that is equivalently to approximately 20 air changes per hour. See table 2 cladding ventilation/sheathing ventilation. Lstiburek continues in his article titled, "Hockey Pucks and Hydrostatic Pressure" to demonstrate the "you need to install wood siding and trim over a small gap to control hydrostatic pressure. This gap can be as small as 1/4" and the spacer can be a strip of thin foam" such as sill seal which is what is pictured in the photographs that accompany the paper.

Bibliography: BSD-106: Understanding Vapor Barriers, by Joseph Lstiburek http://buildingscience.com/documents/digests/bsd-106-understanding-vapor-barriers

BSI-089: Wufi – Barking up the Wrong Tree, by Joseph Lstiburek

https://buildingscience.com/documents/building-science-insights-newsletters/bsi-089-wufi%E2%80%94barking-wrong-tree

BS_-057: Hockey Pucks and Hydrostatic Pressure, by Joseph Lstiburek

https://buildingscience.com/documents/insights/bsi-057-hockey-pucks-and-hydrostatic-pressure

RR-0999: Drainage Planes and Air Spaces, by Joseph Lstiburek

https://buildingscience.com/documents/reports/rr-9909-drainage-planes-and-air-spaces/view

You don't need a Vapor Barrier, By Allison Bailes with the Energy Vanguard

http://www.energyvanguard.com/blog-building-science-HERS-BPI/bid/54110/You-Don-t-Need-a-Vapor-Barrier-Probably

Are Vapor Barriers Required or Recommended?

BY JUAN RODRIGUEZ Updated December 30, 2018

https://www.thebalancesmb.com/what-is-a-vapor-barrier-845075

Cost Impact: The code change proposal will not increase or decrease the cost of construction Cost Statement:

There are no construction cost increases associated with the clarification and flexibility that are achieved through this code change proposal

Proposal # 4838

RB220-19

IRC: R702.7, Table R702.7 (New)

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council; Vladimir Kochkin, Home Innovation Research Labs, representing Home Innovation Research Labs (vkochkin@homeinnovation.com)

2018 International Residential Code

Revise as follows:

R702.7 Vapor retarders. Class I or II vapor retarders are required on the interior side of frame walls in Climate Zones 5, 6, 7, 8 and Marine 4. <u>Where a Class II vapor retarder is used in combination with foam plastic insulating sheathing installed as continuous insulation on the exterior side of frame walls, the continuous insulation shall provide the minimum R values indicated in Table R702.7. The Class II vapor retarder shall have a vapor permeance greater than 1 perm when measured by ASTM E96 water method, Procedure B. Use of a Class I interior vapor retarder in frame walls with a Class I vapor retarder on the exterior side shall require an approved design.</u>

Exceptions:

- 1. Basement walls.
- 2. Below-grade portion of any wall.
- 3. Construction where moisture or its freezing will not damage the materials.
- 4. <u>Conditions where Class III vapor retarders are permitted in Section R702.7.1.</u>

Add new text as follows:

TABLE R702.7 CONTINUOUS INSULATION WITH CLASS II VAPOR RETARDER

CLIMATE ZONE	CLASS II VAPOR RETARDERS PERMITTED FOR ^a
<u>3</u>	Continuous insulation with R-value $>= 2$
	Continuous insulation with R-value>=3 over 2x4 wall.
4, 5, and 6	
	Continuous insualtion with R-value>=5 over 2x6 wall.
	Continuous insulation with R-value>=5 over 2x4 wall.
<u>7</u>	
	Continuous insualtion with R-value>=7.5 over 2x6 wall.
	Continuous insulation with R-value>=7.5 over 2x4 wall.
<u>8</u>	
	Continuous insualtion with R-value>=10 over 2x6 wall.

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

Reason: This proposal is identical to a proposal (FS120-18) approved for the 2021 IBC. It provides needed

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requirements for appropriate use of continuous insulation where a Class II vapor retarder is used and conservatively limits use of Class I vapor retarder. These requirements are based on an extensive review of research and code requirements in the U.S. and Canada and also are consistent with the National Building Code of Canada (ABTG, 2015; ASTM 2017). The effectiveness of these requirements have also been confirmed in recent monitoring of actual homes across northern climates of the U.S. by the Home Innovation Research Lab (Kochkin and Shaw, 2017).

Various associations developed proposals to modify the 2021 Group A vapor retarder section which were subsequently approved by the ICC membership. These proposals act as a package of changes that improve the format and content of this code section. The collaborative group believes this package of code changes will result in regulations that adequately address the moisture management in residential buildings. We have submitted a similar grouping of proposals to make a corresponding change to the IRC. The table below correlates the code proposals between the Group A and B hearings.

CORRELA	TION BETWEEN GROUP	A AND B PROPOSALS	
		Group A Hearing	
Proposal	IBC Code Section	Proponent	Description
FS-117	1404.3, 1404.3(1) (New), 1404.3(2) (New), TABLE 1404.3.2, 1404.3.2, 1404.3.3, 1404.3.4	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Reorganizes and streamlines make requirements more tran
FS-118	1404.3, 1404.3.1	Theresa Weston, DuPont, representing Air Barrier Association	Adds exception describing re Class I and II smart vapor reta than 1 perm per ASTM E96 Pr be allowed in all climate zone
FS-119	1404.3, 1404.3.1, 1404.3.2, 1404.3.3, TABLE 1404.3.3	Kingston Chow, APA - The Engineered Wood Association, representing APA - The Engineered Wood Association; Borjen Yeh (same)	Reorganization (moves vapor classes to first section). Redu changes made in FS-117.
FS-120	1404.3.1, TABLE 1404.3.1 (New), 1404.3.2	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council; Vladimir Kochkin, representing Home Innovation Research Labs	Provides continuous insulation requirements for use with Cla deletes restriction to Class III Requires approved design for barrer (Class I on interior and
FS-121	1404.3.1, 1404.3.2	Mike Fischer, Kellen Company, representing The Polyisocyanurate Insulation Manufacturers Association	Focuses on deleting the Class and restores code to pre-201
FS-122	1404.3.2, 1404.3.2.1 (New), 1404.3.2.2 (New), 1404.3.2.2.1 (New), TABLE 1404.3.2	Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council	The proposal adds charging la clarifies how the combination insulating methods can provi- moisture control so that the t Value can be achieved by cor cavity, or a combination of in strategies.
		Jay Crandell, P.E., ARES Consulting,	Expands Marine 4 to all of CZ
FS-125	TABLE 1404.3.2, 1404.3.2	representing Foam Sheathing Committee of the American Chemistry Council	use of Class III in CZ 1-3.
		Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of	Separate CZ 8 from Climate Z ensure consistent performance

FS-127	[TABLE 1404.3.2	the American Chemistry Council	
		Craig Conner, representing self ; Joseph	Same as FS127
FS-128	TABLE 1404.3.2	Lstiburek, representing Self	
		Mike Fischer, Kellen Company, representing	Adds footnote that prevents a
		The Center for the Polyurethanes Industry of	spray foam and ci R-values fo
FS-130	TABLE 1404.3.2	the American Chemistry Council	0. 10.
		John Woestman, Kellen Co., representing	Improves requirements for va
		Extruded Polystyrene Foam Association	paints to ensure performance
FS-131	1404.3.3	(XPSA)	compliance with manufacture

Bibliography: Assessment of Water Vapor Control Methods for Modern Insulated Light-Frame Wall Assemblies, ABTG Research Report No. 1410-03, 2015, Applied Building Technology Group LLC, https://www.appliedbuilingtech.com/rr/1410-03 Assessment of Hygrothermal Performance and Design Guidance for Modern Light-Frame Wall Assemblies, ASTM STP 1599, Crandell, J.H., 2017,

https://www.astm.org/DIGITAL_LIBRARY/STP/PAGES/STP159920160092.htm

Moisture Performance of High-R Wall Systems, Prepared for the US DOE & NAHB by Home Innovation Research Labs, Kochkin, V. and Shah, N. 2017 (https://www.homeinnovation.com/~/media/Files/Reports/Moisture-Performance-of-High-R-Wall-Systems-2018.pdf)

Cost Impact: The code change proposal will not increase or decrease the cost of construction The use of a Class I or II vapor retarder are options and other options are unchanged. Also, the proposal provides appropriate guidance for use of continuous insulation that, in many cases will allow less insulation to be used than required with use of a Class III vapor retarder. It will also allow conformance with prescriptive energy code R-value requirements without exceeding those requirements for moisture control purposes. Thus, in many cases this proposal may reduce cost.

RB220-19

RB221-19

IRC: R702.7, R702.7.4(New)

Proponent: Theresa Weston, representing Air Barrier Association of America (ABAA) (theresa.a.weston@dupont.com)

2018 International Residential Code

Revise as follows:

R702.7 Vapor retarders. Class I or II vapor retarders are required on the interior side of frame walls in Climate Zones 5, 6, 7, 8 and Marine 4 to protect the exterior wall assembly against condensation. Vapor retarders shall be installed in accordance with Section R702.7.4.

Exceptions:

- 1. Basement walls.
- 2. Below-grade portion of any wall.
- 3. Construction where moisture or its freezing will not damage the materials.

Add new text as follows:

702.7.4 Installation Vapor retarders shall be installed in accordance with the manufacturer's instructions or an approved design. The vapor retarder shall be installed as an air barrier or in conjunction with an air barrier.

Reason: For vapor retarders to perform as intended, they need to be installed as or in conjunction with an air barrier.

Air leakage control is currently dealt with in the I-codes based on energy efficiency considerations, but it is also critical to protection against moisture condensation. Air leakage can move 100x more moisture than vapor diffusion, and vapor retarders will not work properly without air leakage control. As stated in the Whole Building Design Guide:

"Moisture contributed by air leakage is a significant source and should be a serious concern in the design of the wall system. In fact, the design of the building envelope for minimizing air leakage is more critical than the design of the vapor barrier. To illustrate this point, consider that the amount of moisture contributed to a building by the air that flows through a crack 1/16th inch thick by 1 foot long is just over 5 pints per day in a light breeze. In contrast, the amount of moisture contributed by vapor diffusion through a 10 foot by 50-foot painted block wall over the same period equals just under 1/3 of a pint (about 5 ounces)."

It is important to include air leakage control in Section R702.7 as it will highlight its importance to moisture management and facilitate the inclusion of air leakage control in water management details.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal should neither increase nor decrease the cost of construction, as its intention is to ensure that an existing requirement is installed in an effective manner.

Proposal # 4947

RB221-19

RB222-19

IRC: R702.7, TABLE R702.7(1) (New), TABLE R702.7(2) (New), R702.7.1, TABLE R702.7.1, R702.7.2, R702.7.3

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Residential Code

Delete and substitute as follows:

R702.7 Vapor retarders. Class I or II vapor retarders are required on the interior side of frame walls in Climate Zones 5, 6, 7, 8 and Marine 4.

Exceptions:

- 1. Basement walls.
- 2. Below-grade portion of any wall.
- 3. Construction where moisture or its freezing will not damage the materials.

R702.7 Vapor retarders. Vapor retarder materials shall be classified in accordance with Table R702.7(1). A vapor retarder shall be provided on the interior side of frame walls in accordance with Table R702.7(2) including compliance with Table R702.7(3) where applicable. Alternatively, an approved design using accepted engineering practice for hygrothermal analysis shall be used. The appropriate climate zone shall be selected in accordance with Section N1101.7 (R301.1).

Exceptions:

- 1. <u>Basement walls.</u>
- 2. <u>Below-grade portion of any wall.</u>
- 3. <u>Construction where accumulation, condensation, or freezing of moisture will not damage the</u> materials.

Add new text as follows:

TABLE R702.7(1) VAPOR RETARDER MATERIALS AND CLASSES

<u>CLASS</u>	ACCEPTABLE MATERIALS
T	Sheet polyethylene, nonperforated aluminum foil, or other approved materials with a perm rating of less than or equal to 0.1.
Ш	Kraft-faced fiberglass batts, paint, or other approved materials with a perm rating greater than 0.1 and less than or equal to 1.0.
ш	Latex paint, enamel paint, or other approved materials with a perm rating of greater than 1.0 and less than or equal to 10.0.

TABLE R702.7(2) VAPOR RETARDER OPTIONS

VAPOR RETARDER CLASS

	<u>CLASS I</u>	<u>CLASS II</u>	<u>CLASS III</u>
<u>1,2</u>	Not Permitted	Not Permitted	Permitted
3, 4 (except Marine 4)	Not Permitted	Permitted	Permitted
<u> Marine 4, 5, 6, 7, 8</u>	Permitted	Permitted	<u>See Table R702.7(3)</u>

Revise as follows:

TABLE R702.7.1 R702.7(3) CLASS III VAPOR RETARDERS

CLIMATEZONE	CLASS III VAPOR RETARDERS PERMITTED FOR: ^{a, b}
	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
Marine 4	Vented cladding over gypsum.
	Continuous insulation with R-value \geq 2.5 over 2 × 4 wall.
	Continuous insulation with R-value \geq 3.75 over 2 × 6 wall.
	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
5	Vented cladding over gypsum.
	Continuous insulation with R-value \geq 5 over 2 × 4 wall.
	Continuous insulation with R-value \geq 7.5 over 2 × 6 wall.
	Vented cladding over fiberboard.
C	Vented cladding over gypsum.
0	Continuous insulation with R-value \geq 7.5 over 2 × 4 wall.
	Continuous insulation with R-value \geq 11.25 over 2 × 6 wall.
7 and 9	Continuous insulation with R-value \geq 10 over 2 × 4 wall.
/ and 8	Continuous insulation with R-value \geq 15 over 2 × 6 wall.

For SI: 1 pound per cubic foot = 16 kg/m^3 .

- a. Spray foam with a maximum permeance of 1.5 perms at the installed thickness, applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum is deemed to meet the continuous insulation requirement where the spray foam *R*-value meets or exceeds the specified continuous insulation *R*-value.
- b. <u>Vented cladding shall include vinyl, polypropylene, or horizontal aluminum siding, brick veneer</u> with a clear airspace as specified in Table R703.8.4, and other approved vented claddings.

Delete without substitution:

R702.7.1 Class III vapor retarders. Class III vapor retarders shall be permitted where any one of the conditions in Table R702.7.1 is met.

R702.7.2 Material vapor retarder class. The *vapor retarder class* shall be based on the manufacturer's certified testing or a tested assembly.

The following shall be deemed to meet the class specified:

- 1. Class I: Sheet polyethylene, on perforated aluminum foil.
- 2. Class II: Kraft-faced fiberglass batts.
- 3. Class III: Latex or enamel paint.

R702.7.3 Minimum clear airspaces and vented openings for vented cladding. For the purposes of this section, vented cladding shall include the following minimum clear airspaces. Other openings with the equivalent vent area shall be permitted.

- 1. Vinyl polypropylene or horizontal aluminum siding applied over a weather-resistive barrier as specified in Table R703.3(1).
- 2. Brick veneer with a clear airspace as specified in Table R703.8.4.
- 3. Other approved vented claddings.

Reason: This proposal reformats the vapor retarder provisions to coordinate the IRC with an identical proposal (FS117-18) that was approved for the 2021 IBC vapor retarder provisions. All of the requirements are arranged for easy "look-up" in tables rather than in text such that requirements for a given climate zone or locality can be easily identified. Also, it is important that the IBC and IRC provisions are coordinated to avoid confusion or contradiction.

Various associations developed proposals to modify the 2021 Group A vapor retarder section which were subsequently approved by the ICC membership. These proposals act as a package of changes that improve the format and content of this code section. The collaborative group believes this package of code changes will result in regulations that adequately address the moisture management in residential buildings. We have submitted a similar grouping of proposals to make a corresponding change to the IRC. The table below correlates the code proposals between the Group A and B hearings.

CURRELA	TION BETWEEN GROUP	A AND B PROPOSALS	
		Group A Hearing	1
Proposal	IBC Code Section	Proponent	Description
FS-117	1404.3, 1404.3(1) (New), 1404.3(2) (New), TABLE 1404.3.2, 1404.3.2, 1404.3.3, 1404.3.4	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Reorganizes and streamlines make requirements more trar
FS-118	1404.3, 1404.3.1	Theresa Weston, DuPont, representing Air Barrier Association	Adds exception describing re Class I and II smart vapor reta than 1 perm per ASTM E96 Pr be allowed in all climate zone
FS-119	1404.3, 1404.3.1, 1404.3.2, 1404.3.3, TABLE 1404.3.3	Kingston Chow, APA - The Engineered Wood Association, representing APA - The Engineered Wood Association; Borjen Yeh (same)	Reorganization (moves vapor classes to first section). Redu changes made in FS-117.
FS-120	1404.3.1, TABLE 1404.3.1 (New), 1404.3.2	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council; Vladimir Kochkin, representing Home Innovation Research Labs	Provides continuous insulation requirements for use with Cla deletes restriction to Class III Requires approved design for barrer (Class I on interior and
FS-121	1404.3.1, 1404.3.2	Mike Fischer, Kellen Company, representing The Polyisocyanurate Insulation Manufacturers Association	Focuses on deleting the Class and restores code to pre-201

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			The proposal adds charging l clarifies how the combinatior insulating methods can provi
	1404.3.2, 1404.3.2.1		moisture control so that the t
	(New), 1404.3.2.2 (New),	Mike Fischer, Kellen Company, representing	Value can be achieved by cor
	1404.3.2.2.1 (New), TABLE	The Center for the Polyurethanes Industry of	cavity, or a combination of in
FS-122	1404.3.2	the American Chemistry Council	strategies.
		Jay Crandell, P.E., ARES Consulting,	Expands Marine 4 to all of CZ
		representing Foam Sheathing Committee of	use of Class III in CZ 1-3.
FS-125	TABLE 1404.3.2, 1404.3.2	the American Chemistry Council	
	,	Jay Crandell, P.E., ARES Consulting,	Separate CZ 8 from Climate Z
		representing Foam Sheathing Committee of	ensure consistent performance
FS-127	TABLE 1404.3.2	the American Chemistry Council	
		Craig Conner, representing self ; Joseph	Same as FS127
FS-128	TABLE 1404.3.2	Lstiburek, representing Self	
		Mike Fischer, Kellen Company, representing	Adds footnote that prevents a
		The Center for the Polyurethanes Industry of	spray foam and ci R-values fc
FS-130	TABLE 1404.3.2	the American Chemistry Council	
		John Woestman, Kellen Co., representing	Improves requirements for va
		Extruded Polystyrene Foam Association	paints to ensure performance
FS-131	1404.3.3	(XPSA)	compliance with manufacture

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposal is a re-org for clarity, ease of use, and coordination with an identical proposal approved for the 2021 IBC.

Proposal # 4517

RB222-19

RB223-19

IRC: R702.7, TABLE R702.7(1) (New), TABLE R702.7(2) (New), TABLE R702.7(4) (New), R702.7.1, TABLE R702.7.1, R702.7.2, R702.7.3

Proponent: Rob Brooks, representing DowDuPont (rob.brooks.mail@gmail.com); Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council (jcrandell@aresconsulting.biz); Mike Fischer (mfischer@kellencompany.com); John Woestman, representing Extruded Polystyrene Foam Association (jwoestman@kellencompany.com)

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Delete and substitute as follows:

R702.7 Vapor retarders. Class I or II vapor retarders are required on the interior side of frame walls in Climate Zones 5, 6, 7, 8 and Marine 4.

Exceptions:

- 1. Basement walls.
- 2. Below-grade portion of any wall.
- 3. Construction where moisture or its freezing will not damage the materials.

R702.7 Vapor retarders. Vapor retarder materials shall be classified in accordance with Table R702.7(1). A vapor retarder shall be provided on the interior side of frame walls of the class indicated in Table R702.7(2), including compliance with Table R702.7(3) or Table R702.7(4) where applicable. An approved design using accepted engineering practice for hygrothermal analysis shall an alternative. The climate zone shall be determined in accordance with Section N1101.7 (R301.1).

Exceptions:

- 1. <u>Basement walls.</u>
- 2. <u>Below-grade portion of any wall.</u>
- 3. <u>Construction where accumulation, condensation, or freezing of moisture will not damage the</u> <u>materials.</u>

Add new text as follows:

R702.7(1) VAPOR RETARDER MATERIALS AND CLASSES

<u>CLASS</u>	ACCEPTABLE MATERIALS
<u>l</u>	Sheet polyethylene, nonperforated aluminum foil, or other approved materials with a perm rating of less than or equal to 0.1.
<u>11</u>	Kraft-faced fiberglass batts, vapor retarder paint, or other approved materials applied in accordance with the manufacturer's installation instructions for a perm rating greater than 0.1 and less than or equal to 1.0.
<u>III</u>	Latex paint, enamel paint, or other approved materials applied in accordance with the manufacturer's installation instructions for a perm rating of greater than 1.0 and less than or equal to 10.0.

<u>R702.7(2)</u>

VAPOR RETARDER OPTIONS

CLIMATE ZONE	VAPOR RETARDER CLASS		
	<u>CLASS l^a</u>	<u>CLASS II^a</u>	<u>CLASS III</u>
<u>1,2</u>	Not Permitted	Not Permitted	Permitted
<u>3</u>	Not Permitted	<u>Permitted^c</u>	<u>Permitted</u>
4 (except Marine 4)	Not Permitted	<u>Permitted^c</u>	Soo Tabla D702 7(2)
<u>Marine 4, 5, 6, 7, 8</u>	<u>Permitted^b</u>	<u>Permitted^c</u>	<u>See Table R702.7(3)</u>

a. Class I and II vapor retarders with vapor permeance greater than 1 perm when measured by ASTM E96 water method (Procedure B) shall be allowed on the interior side of any frame wall in all climate zones.

b. Use of a Class I interior vapor retarder in frame walls with a Class I vapor retarder on the exterior side shall require an approved design.

c. Where a Class II vapor retarder is used in combination with foam plastic insulating sheathing installed as continuous insulation on the exterior side of frame walls, the continuous insulation shall comply with Table R702.7(4) and the Class II vapor retarder shall have a vapor permeance greater than 1 perm when measured by ASTM E96 water method (Procedure B).

Revise as follows:

TABLE R702.7.1 <u>R702.7(3)</u> CLASS III VAPOR RETARDERS

CLIMATEZONE	CLASS III VAPOR RETARDERS PERMITTED FOR: ^{a, b}
	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
Marine 4	Vented cladding over gypsum.
	Continuous insulation with R-value \geq 2.5 over 2 × 4 wall.
	Continuous insulation with R-value \geq 3.75 over 2 × 6 wall.
	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
5	Vented cladding over gypsum.
	Continuous insulation with R-value \geq 5 over 2 × 4 wall.
	Continuous insulation with R-value \geq 7.5 over 2 × 6 wall.
	Vented cladding over fiberboard.
6	Vented cladding over gypsum.
0	Continuous insulation with R-value \geq 7.5 over 2 × 4 wall.
	Continuous insulation with R-value \geq 11.25 over 2 × 6 wall.
7 and 8	Continuous insulation with R-value \geq 10 over 2 × 4 wall.
	Continuous insulation with R-value \geq 15 over 2 × 6 wall.
8	Continuous insulation with R-value >= 12.5 over 2 x 4 wall.
<u><u>o</u></u>	Continuous insulation with R-value >= 20 over 2 x 6 wall.

For SI: 1 pound per cubic foot = 16 kg/m^3 .

a. Spray foam with a maximum permeance of 1.5 perms at the installed thickness, applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum is deemed to meet the continuous insulation requirement where the spray foam *R*-value meets or exceeds the specified continuous insulation *R*-value.

a. Vented cladding shall include vinyl, polypropylene, or horizontal aluminum siding, brick veneer with a clear airspace as specified in Table R703.8.4, and other approved vented claddings.

b. The requirements in this table apply only to insulation used to control moisture in order to permit the use of Class III vapor retarders. The insulation materials used to satisfy this option also contribute to but do not supersede the thermal envelope requirements of Chapter 11.

Add new text as follows:

CLIMATE ZONE	CLASS II VAPOR RETARDERS PERMITTED FOR ^a
<u>3</u>	Continuous insulation with R-value >= 2
	Continuous insulation with R-value >= 3 over 2x4 wall.
<u>4, 5, and 6</u>	
	Continuous insulation with R-value >= 5 over 2x6 wall.
	Continuous insulation with R-value >= 5 over 2x4 wall.
7	
	Continuous insulation with R-value >= 7.5 over 2x6 wall.
	Continuous insulation with R-value >= 7.5 over 2x4 wall.
<u>8</u>	
	Continuous insulation with R-value >= 10 over 2x6 wall.

R702.7(4) CONTINUOUS INSULATION WITH CLASS II VAPOR RETARDER

a. The requirements in this table apply only to insulation used to control moisture in order to permit the use of Class II vapor retarders. The insulation materials used to satisfy this option also contribute to but do not supersede the thermal envelope requirements of Chapter 11.

Delete and substitute as follows:

R702.7.1 Class III vapor retarders. Class III vapor retarders shall be permitted where any one of the conditions in Table R702.7.1 is met.

R702.7.1 Spray foam plastic insulation for moisture control with Class II and III vapor retarders. For purposes of compliance with Tables R702.7(3) and R702.7(4), spray foam with a maximum permeance of 1.5 perms at the installed thickness applied to the interior side of wood structural panels, fiberboard, insulating sheathing or gypsum shall be deemed to meet the continuous insulation moisture control requirement in accordance with one of the following conditions:

- 1. The spray foam R-value is equal to or greater than the specified continuous insulation R-value.
- 2. <u>The combined R-value of the spray foam and continuous insulation is equal to or greater than the</u> <u>specified continuous insulation R-value.</u>

Delete without substitution:

R702.7.2 Material vapor retarder class. The vapor retarder class shall be based on the manufacturer's

certified testing or a tested assembly.

The following shall be deemed to meet the class specified:

- 1. Class I: Sheet polyethylene, on perforated aluminum foil.
- 2. Class II: Kraft-faced fiberglass batts.
- 3. Class III: Latex or enamel paint.

R702.7.3 Minimum clear airspaces and vented openings for vented cladding. For the purposes of this section, vented cladding shall include the following minimum clear airspaces. Other openings with the equivalent vent area shall be permitted.

- 1. Vinyl polypropylene or horizontal aluminum siding applied over a weather-resistive barrier as specified in Table R703.3(1).
- 2. Brick veneer with a clear airspace as specified in Table R703.8.4.
- 3. Other approved vented claddings.

Reason: This proposal represents a compilation (sum effect) of all vapor retarder proposals approved for the 2021 IBC. This proposal makes no further technical changes to the individual proposals and is intended to demonstrate how all the various individual proposals fit together in a manner consistent with what will appear in the 2021 IBC to ensure consistency between the IBC and the IRC. The justification for the various parts of this "omnibus" proposal are found in the reason statements for the various individual vapor retarder (Section R702.7) proposals which also are submitted here in Group B for the IRC as they were in the prior Group A code development hearing for Chapter 14 of the IBC. However, if this reconciliation proposal is approved, those individual proposals will be moved for disapproval.

Various associations and individuals developed proposals to modify the 2021 Group A vapor retarder section which were subsequently approved by the ICC membership. These proposals act as a package of changes that improve the format and content of this code section. The collaborative group believes this package of code changes will result in regulations that adequately address the moisture management in residential buildings. We have submitted a similar grouping of proposals to make a corresponding change to the IRC. The table below correlates the code proposals between the Group A and B hearings.

CORRELA	TION BETWEEN GROUP	A AND B PROPOSALS	
	Group A Hearing		
Proposal	IBC Code Section	Proponent	Description
FS-117	1404.3, 1404.3(1) (New), 1404.3(2) (New), TABLE 1404.3.2, 1404.3.2, 1404.3.3, 1404.3.4	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Reorganizes and streamlines make requirements more trai
FS-118	1404.3, 1404.3.1	Theresa Weston, DuPont, representing Air Barrier Association	Adds exception describing re Class I and II smart vapor ret than 1 perm per ASTM E96 Pi be allowed in all climate zon
FS-119	1404.3, 1404.3.1, 1404.3.2, 1404.3.3, TABLE 1404.3.3	Kingston Chow, APA - The Engineered Wood Association, representing APA - The Engineered Wood Association; Borjen Yeh (same)	Reorganization (moves vapor classes to first section). Reduction changes made in FS-117.
		Jav Crandell, P.E., ARES Consulting,	Provides continuous insulatio

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FS-120	1404.3.1, TABLE 1404.3.1 (New), 1404.3.2	representing Foam Sheathing Committee of the American Chemistry Council; Vladimir Kochkin, representing Home Innovation Research Labs	requirements for use with Cla deletes restriction to Class III Requires approved design for barrer (Class I on interior and
FS-121	1404 3 1 1404 3 2	Mike Fischer, Kellen Company, representing The Polyisocyanurate Insulation Manufacturers Association	Focuses on deleting the Class
FS-122	1404.3.2, 1404.3.2.1 (New), 1404.3.2.2 (New), 1404.3.2.2.1 (New), TABLE 1404.3.2	Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council	The proposal adds charging la clarifies how the combination insulating methods can provide moisture control so that the t Value can be achieved by con cavity, or a combination of in strategies.
50 (05		Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of	Expands Marine 4 to all of CZ use of Class III in CZ 1-3.
FS-125	TABLE 1404.3.2, 1404.3.2	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Separate CZ 8 from Climate Z ensure consistent performance
FS-128	TABLE 1404.3.2	Craig Conner, representing self ; Joseph Lstiburek, representing Self	Same as FS127
FS-130	TABLE 1404.3.2	Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council	Adds footnote that prevents a spray foam and ci R-values fo
FS-131	1404.3.3	John Woestman, Kellen Co., representing Extruded Polystyrene Foam Association (XPSA)	Improves requirements for va paints to ensure performance compliance with manufacture

Cost Impact: The code change proposal will not increase or decrease the cost of construction The sum effect of the proposal (which represents the compilation of various individual proposals approved for the 2012 IBC in Group A) is to provide a better and more transparent organization of vapor retarder provisions in a table format for easy selection by climate zone. It also provides expanded and improved options. In some specific cases costs may increase or decrease depending on which options are selected to control water vapor in particular climate zones (e.g., Class III vapor retarder in Climate Zone 8), but there are always options that remain in any climate zone that either have no cost impact or which can reduce cost while maintaining water vapor control.

Proposal # 5438

RB223-19

RB224-19

IRC®: R702.7.1, TABLE R702.7.1

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Residential Code

Revise as follows:

R702.7.1 Class III vapor retarders. Class III vapor retarders shall be permitted in Climate Zones 1 through 3 and where any one of the conditions in Table R702.7.1 is met.

CLIMATEZONE	CLASS III VAPOR RETARDERS PERMITTED FOR: ^a
	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
≺Marine> 4	Vented cladding over gypsum.
	Continuous insulation with R-value \geq 2.5 over 2 × 4 wall.
	Continuous insulation with R-value \geq 3.75 over 2 × 6 wall.
	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
5	Vented cladding over gypsum.
	Continuous insulation with R-value \geq 5 over 2 × 4 wall.
	Continuous insulation with R-value \geq 7.5 over 2 × 6 wall.
	Vented cladding over fiberboard.
6	Vented cladding over gypsum.
0	Continuous insulation with R-value \geq 7.5 over 2 × 4 wall.
	Continuous insulation with R-value \geq 11.25 over 2 × 6 wall.
7 and 8	Continuous insulation with R-value \geq 10 over 2 × 4 wall.
7 410 0	Continuous insulation with R-value \geq 15 over 2 × 6 wall.

TABLE R702.7.1 CLASS III VAPOR RETARDERS

For SI: 1 pound per cubic foot = 16 kg/m^3 .

a. Spray foam with a maximum permeance of 1.5 perms at the installed thickness, applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum is deemed to meet the continuous insulation requirement where the spray foam *R*-value meets or exceeds the specified continuous insulation *R*-value.

Reason: This proposal coordinates with an identical Group A proposal (FS125-18) approved for the 2021 IBC. It corrects and clarifies appropriate use of a Class III vapor retarder, applying it to all of Climate Zone 4 and permitting its use in Climate Zones 1-3 (not just those climate zones indicated in the table where additional requirements apply).

Various associations developed proposals to modify the 2021 Group A vapor retarder section which were

subsequently approved by the ICC membership. These proposals act as a package of changes that improve the format and content of this code section. The collaborative group believes this package of code changes will result in regulations that adequately address the moisture management in residential buildings. We have submitted a similar grouping of proposals to make a corresponding change to the IRC. The table below correlates the code proposals between the Group A and B hearings.

CORRELA	TION BETWEEN GROUP	A AND B PROPOSALS		
Group A Hearing				
Proposal	IBC Code Section	Proponent	Description	
FS-117	1404.3, 1404.3(1) (New), 1404.3(2) (New), TABLE 1404.3.2, 1404.3.2, 1404.3.3, 1404.3.4	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Reorganizes and streamlines make requirements more trar	
FS-118	1404.3, 1404.3.1	Theresa Weston, DuPont, representing Air Barrier Association	Adds exception describing re Class I and II smart vapor reta than 1 perm per ASTM E96 Pr be allowed in all climate zone	
FS-119	1404.3, 1404.3.1, 1404.3.2, 1404.3.3, TABLE 1404.3.3	Kingston Chow, APA - The Engineered Wood Association, representing APA - The Engineered Wood Association; Borjen Yeh (same)	Reorganization (moves vapor classes to first section). Redu changes made in FS-117.	
FS-120	1404.3.1, TABLE 1404.3.1 (New), 1404.3.2	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council; Vladimir Kochkin, representing Home Innovation Research Labs	Provides continuous insulation requirements for use with Cla deletes restriction to Class III Requires approved design for barrer (Class I on interior and	
FS-121	1404.3.1, 1404.3.2	Mike Fischer, Kellen Company, representing The Polyisocyanurate Insulation Manufacturers Association	Focuses on deleting the Class and restores code to pre-201	
FS-122	1404.3.2, 1404.3.2.1 (New), 1404.3.2.2 (New), 1404.3.2.2.1 (New), TABLE 1404.3.2	Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council	The proposal adds charging I clarifies how the combination insulating methods can provi moisture control so that the t Value can be achieved by cor cavity, or a combination of in strategies.	
FS-125	TABLE 1404.3.2, 1404.3.2	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Expands Marine 4 to all of CZ use of Class III in CZ 1-3.	
FS-127	TABLE 1404.3.2	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council	Separate CZ 8 from Climate Z ensure consistent performance	
FS-128	TABLE 1404.3.2	Craig Conner, representing self ; Joseph Lstiburek, representing Self Mike Fischer, Kellen Company, representing	Same as FS127	
FS-130	TABLE 1404.3.2	The Center for the Polyurethanes Industry of the American Chemistry Council	spray foam and ci R-values fo	
		John Woestman, Kellen Co., representing Extruded Polystyrene Foam Association	Improves requirements for va paints to ensure performance	

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FS-131	1404 3 3	(XPSA)	compliance with manufacture
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Cost Impact: The code change proposal will not increase or decrease the cost of construction The use of a Class III vapor retarder is optional. However, where it is used, it can reduce cost of construction and this proposal clarifies and extends the applicability.

Proposal # 4524

RB224-19

RB225-19

IRC®: TABLE R702.7.1

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Residential Code

Revise as follows:

CLIMATEZONE	CLASS III VAPOR RETARDERS PERMITTED FOR: ^a
	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
Marine 4	Vented cladding over gypsum.
	Continuous insulation with R-value \geq 2.5 over 2 × 4 wall.
	Continuous insulation with R-value \ge 3.75 over 2 × 6 wall.
	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
5	Vented cladding over gypsum.
	Continuous insulation with R-value \geq 5 over 2 × 4 wall.
	Continuous insulation with R-value \geq 7.5 over 2 × 6 wall.
	Vented cladding over fiberboard.
6	Vented cladding over gypsum.
0	Continuous insulation with R-value \geq 7.5 over 2 × 4 wall.
	Continuous insulation with R-value \geq 11.25 over 2 × 6 wall.
7 <and 8=""></and>	Continuous insulation with R-value \geq 10 over 2 × 4 wall.
	Continuous insulation with R-value \geq 15 over 2 × 6 wall.
8	Continuous insulation with R-value \geq 12.5 over 2 × 4 wall.
	Continuous insulation with R-value \geq 20 over 2 × 6 wall.

TABLE R702.7.1CLASS III VAPOR RETARDERS

For SI: 1 pound per cubic foot = 16 kg/m^3 .

a. Spray foam with a maximum permeance of 1.5 perms at the installed thickness, applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum is deemed to meet the continuous insulation requirement where the spray foam *R*-value meets or exceeds the specified continuous insulation *R*-value.

Reason: This proposal coordinates with an identical proposal (FS127-18) approved for the 2021 IBC. It corrects an inadvertent extension of Climate Zone 7 requirements into Climate Zone 8 when the table was first introduced to the IBC and IRC. It provides consistent requirements and performance for Climate Zone 8 distinct from Climate Zone 7 that accounts for the colder climate in Climate Zone 8.

Various associations developed proposals to modify the 2021 Group A vapor retarder section which were subsequently approved by the ICC membership. These proposals act as a package of changes that improve

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the format and content of this code section. The collaborative group believes this package of code changes will result in regulations that adequately address the moisture management in residential buildings. We have submitted a similar grouping of proposals to make a corresponding change to the IRC. The table below correlates the code proposals between the Group A and B hearings.

CORRELATION BETWEEN GROUP A AND B PROPOSALS				
Group A Hearing				
Proposal	IBC Code Section	Proponent	Description	
	1404.3, 1404.3(1) (New),			
	1404.3(2) (New), TABLE	Jay Crandell, P.E., ARES Consulting,		
	1404.3.2, 1404.3.2,	representing Foam Sheathing Committee of	Reorganizes and streamlines	
FS-117	1404.3.3, 1404.3.4	the American Chemistry Council	make requirements more trai	
FS-118	1404.3, 1404.3.1	Theresa Weston, DuPont, representing Air Barrier Association	Adds exception describing re Class I and II smart vapor ret than 1 perm per ASTM E96 Pr be allowed in all climate zone	
FS-119	1404.3, 1404.3.1, 1404.3.2, 1404.3.3, TABLE 1404.3.3	Kingston Chow, APA - The Engineered Wood Association, representing APA - The Engineered Wood Association; Borjen Yeh (same)	Reorganization (moves vapor classes to first section). Redu changes made in FS-117.	
FS-120	1404.3.1, TABLE 1404.3.1 (New), 1404.3.2	Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council; Vladimir Kochkin, representing Home Innovation Research Labs	Provides continuous insulation requirements for use with Cla deletes restriction to Class III Requires approved design for barrer (Class I on interior and	
	1997 - 1984 1	Mike Fischer, Kellen Company, representing		
FS-121	1404.3.1, 1404.3.2	The Polyisocyanurate Insulation Manufacturers Association	Focuses on deleting the Class and restores code to pre-201	
FS-122	1404.3.2, 1404.3.2.1 (New), 1404.3.2.2 (New), 1404.3.2.2.1 (New), TABLE 1404.3.2	Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council	The proposal adds charging I clarifies how the combination insulating methods can provi moisture control so that the t Value can be achieved by cor cavity, or a combination of in strategies	
	1404.3.2	Jay Crandell, P.E., ARES Consulting,	Expands Marine 4 to all of CZ	
EC 12E	TABLE 1404 2 2 1404 2 2	representing Foam Sheathing Committee of	use of Class III in CZ 1-3.	
F3-125	TABLE 1404.3.2, 1404.3.2	lay Crandell P.E. ARES Consulting	Senarate C7 8 from Climate 7	
		representing Foam Sheathing Committee of	ensure consistent performance	
FS-127	TABLE 1404 3 2	the American Chemistry Council	ensure consistent performant	
		Craig Conner, representing self : Joseph	Same as FS127	
FS-128	TABLE 1404.3.2	Lstiburek, representing Self	nannan mana 1987 - Ale Alar Constanti Carlo C	
	1 (1999) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997) (1997)	Mike Fischer, Kellen Company, representing	Adds footnote that prevents a	
		The Center for the Polyurethanes Industry of	spray foam and ci R-values fo	
FS-130	TABLE 1404.3.2	the American Chemistry Council	204 - 500 1	
50 424	1404.2.2	John Woestman, Kellen Co., representing Extruded Polystyrene Foam Association	Improves requirements for va paints to ensure performance	
FS-131	1404.3.3	(XPSA)	compliance with manufacture	

Cost Impact: The code change proposal will increase the cost of construction The more stringent provisions in Climate Zone 8 are necessary to ensure equivalent vapor/moisture control performance in Climate Zone 8 and will decrease cost in the long run.

Proposal # 4525

RB225-19

RB226-19

IRC: TABLE R702.7.1, R702.7.1.1(New)

Proponent: Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council (mfischer@kellencompany.com)

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R702.7.1 Class III vapor retarders. Class III vapor retarders shall be permitted where any one of the conditions in Table R702.7.1 is met.

Add new text as follows:

R702.7.1.1 Spray foam plastic insulation f or moisture control wit h Class III vapor retarders. For the purposes of compliance with Table R702.7.1, spray foam with a maximum permeance of 1.5 perms at the installed thickness applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum shall be deemed to meet the continuous insulation R-value requirement where the spray foam R-value meets or exceeds the specified continuous insulation R-value.

R702.7.1.2 Hybrid insulation f or moisture control wit h Class III vapor retarders. For the purposes of compliance with Table R702.7.1, the combined R-values of spray foam plastic insulation and continuous insulation shall be permitted to be counted towards the continuous R-value requirement.

Revise as follows:

CLIMATEZONE	CLASS III VAPOR RETARDERS PERMITTED FOR: ^a
	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
Marine 4	Vented cladding over gypsum.
	Continuous insulation with R-value \geq 2.5 over 2 × 4 wall.
	Continuous insulation with R-value \geq 3.75 over 2 × 6 wall.
	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
5	Vented cladding over gypsum.
	Continuous insulation with R-value \geq 5 over 2 × 4 wall.
	Continuous insulation with R-value \geq 7.5 over 2 × 6 wall.
	Vented cladding over fiberboard.
6	Vented cladding over gypsum.
0	Continuous insulation with R-value \geq 7.5 over 2 × 4 wall.
	Continuous insulation with R-value \geq 11.25 over 2 × 6 wall.
7 and 8	Continuous insulation with R-value \geq 10 over 2 × 4 wall.
7 410 0	Continuous insulation with R-value \geq 15 over 2 × 6 wall.

TABLE R702.7.1 CLASS III VAPOR RETARDERS

For SI: 1 pound per cubic foot = 16 kg/m^3 .

a.Spray foam with a maximum permeance of 1.5 perms at the installed thickness, applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum is deemed to meet the continuous insulation requirement where the spray foam *R*-value meets or exceeds the specified continuous insulation *R*-value.

Reason: Table R702.7.1 includes various combinations of continuous insulation used as part of wall assemblies with Class III vapor retarders. Footnote "a" to the table provides an option to use spray foam as an alternative to the continuous insulation requirement. This proposal moves the footnote to the code text and adds an option for hybrid assemblies with a combination of continuous insulation and spray foam. Given that the code permits either option, it is logical that combinations are also acceptable, but that option is not currently included. This proposed requirement is consistent with the provisions for the IBC as approved in proposal FS122-18.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposal is an editorial clarification.

Proposal # 5621

RB226-19

RB227-19

IRC®: TABLE R702.7.1

Proponent: Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council (mfischer@kellencompany.com)

2018 International Residential Code

Revise as follows:

CLIMATEZONE	CLASS III VAPOR RETARDERS PERMITTED FOR: ^{a, b}
	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
Marine 4	Vented cladding over gypsum.
	Continuous insulation with R-value \geq 2.5 over 2 × 4 wall.
	Continuous insulation with R-value \geq 3.75 over 2 × 6 wall.
	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
5	Vented cladding over gypsum.
	Continuous insulation with R-value \geq 5 over 2 × 4 wall.
	Continuous insulation with R-value \geq 7.5 over 2 × 6 wall.
	Vented cladding over fiberboard.
6	Vented cladding over gypsum.
D	Continuous insulation with R-value \geq 7.5 over 2 × 4 wall.
	Continuous insulation with R-value \geq 11.25 over 2 × 6 wall.
7 and 8	Continuous insulation with R-value \geq 10 over 2 × 4 wall.
7 810 0	Continuous insulation with R-value \geq 15 over 2 × 6 wall.

TABLE R702.7.1 CLASS III VAPOR RETARDERS

For SI: 1 pound per cubic foot = 16 kg/m^3 .

a. Spray foam with a maximum permeance of 1.5 perms at the installed thickness, applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum is deemed to meet the continuous insulation <u>moisture control</u> requirement where the spray foam *R*-value meets or exceeds the specified continuous insulation *R*-value.

b. The requirements in this table apply only to insulation used to control moisture in order to permit the use of Class III vapor retarders. The insulation materials used to satisfy this option contribute to but do not supersede the thermal envelope requirements of Chapter 11.

Reason: The proposal clarifies that spray foam used to satisfy the continuous insulation requirements is intended to be used for moisture control. It adds an additional footnote to the table to clarify that the provisions of the IECC are not supplanted by this option. This proposal is identical to FS120-18 that has been approved for inclusion in the 2021 IBC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposal is editorial.

Proposal # 5630

RB227-19

RB228-19

IRC®: R702.7.2

Proponent: John Woestman, representing Extruded Polystyrene Foam Association (jwoestman@kellencompany.com)

2018 International Residential Code

Revise as follows:

R702.7.2 Material vapor retarder class. The *vapor retarder class* shall be based on the manufacturer's certified testing or a tested assembly.

The following shall be deemed to meet the class specified:

- 1. Class I: Sheet polyethylene, on perforated aluminum foil with a perm rating of not more than 0.1.
- 2. Class II: Kraft-faced fiberglass batts <u>or vapor retarder paint applied in accordance with the</u> <u>manufacturer's instructions for a perm rating greater than 0.1 and not more than 1.0</u>.
- 3. Class III: Latex or enamel paint <u>applied in accordance with the manufacturer's instructions for a</u> <u>perm rating of greater than 1.0 and not more than 10.0</u>.

Reason: Recommending revisions in the IRC to be consistent with 2021 IBC, as modified by proposal FS131-18.

This proposal clarifies that where paints are used as vapor retarders they must be applied in accordance with the manufacturer's instructions to achieve the required perm rating for the vapor retarder class. Misuse or misapplication of paints that also may not be specifically recommended for use as vapor retarders has been shown to increase the risk of moisture problems in walls with Class III vapor retarders. Cases have been documented where paint applications have a water vapor permeance of more than three times greater than the maximum limit for Class III vapor retarders. As a result, walls intended to rely on Class III vapor retarders can experience an increased risk of moisture accumulation problems. This proposal will provide the ability to avoid this problem.

Also, consistent with the IBC, this proposal includes the appropriate perm ratings in each Class of vapor retarders.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal clarifies the intent of the code and does not impact cost.

Proposal # 5247

RB228-19

RB229-19

IRC®: R702.7.2

Proponent: Cesar Lujan, representing National Association of Home Builders (clujan@nahb.org); Gary Ehrlich, representing National Association of Home Builders (gehrlich@nahb.org)

2018 International Residential Code

Revise as follows:

R702.7.2 Material vapor retarder class. The *vapor retarder class* shall be based on the manufacturer's certified testing or a tested assembly.

The following shall be deemed to meet the class specified:

- 1. Class I: Sheet polyethylene, on perforated aluminum foil.
- 2. Class II: Kraft-faced fiberglass batts.
- 3. Class III: Latex or enamel paint.

The vapor retarder class of latex or enamel paint shall be determined based on the perm rating provided by the paint manufacturer.

Reason: The purpose of this code change is to remove the automatic assumption that latex paint and enamel paint meets the requirements of a Class III vapor retarder. Depending on the paint thickness, number of coats, and type of primer used, the actual water vapor permeance can far exceed the 1 perm to 10 perm range which defines a Class III vapor retarder. Field studies using test huts or test houses have shown that a coat of primer and 2 coats of standard latex paint can have a perm rating of as much as 50. In one study using test huts in Climate Zone 4A, wall assemblies consisting of un-faced batt insulation and an interior painted wall developed mold within 6 months. In another recent study of 22 houses in a range of climate zones, some wall assemblies meeting the requirements of Table R702.7.1 but relying on gypsum board and paint as a Class III interior vapor retarder showed high cyclic winter moisture contents.

Some paint manufacturers also produce a paint explicitly formulated to act as a Class II vapor retarder, if not Class I. When installed per the manufacturer's instruction to the specified thickness and number of coats, plus any primer coat, these paints can achieve a tested water vapor permeance per ASTM E96 of less than 1.0 perm, qualifying as a Class II vapor retarder or better. The current code language has resulted in difficulty convincing some building officials to accept low-perm paints as a Class II or better vapor retarder. Removing the automatic classification and allowing the manufacturer's specified perm rating and application instructions to be used is intended to help clarify when paints with high vapor-retarding properties (i.e. low perm ratings) can be used.

Example product data sheets for vapor retarder paint include Glidden 1060 Vapor Barrier Interior Primer Sealer: https://www.gliddenprofessional.com/datasheets/tds/gp-1060.aspx and Sherwin-Williams Moisture Vapor Barrier Primer/Finish Interior Latex: http://www.sherwin-williams.com/document/PDS/en/035777633175/.

This change will also align the material specifications in Section R702.7.2 with IBC Section 1404.3 as modified for the 2021 IBC by approved proposal FS117-18.

Bibliography: *Moisture Performance of Walls in Energy-Efficient Homes*, prepared by Home Innovation Research Labs for National Association of Home Builders, August 2015.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code change will not increase the cost of construction. Paint manufacturers already provide information on
Proposal # 4738

RB229-19

RB230-19

IRC®: R702.7.3

Proponent: John Woestman, representing Extruded Polystyrene Foam Association (jwoestman@kellencompany.com)

2018 International Residential Code

Revise as follows:

R702.7.3 Minimum clear airspaces and vented openings for vented cladding. For the purposes of this section, vented cladding shall include the following minimum clear airspaces. Other openings with the equivalent vent area shall be permitted.

- 1. Vinyl polypropylene or horizontal aluminum siding applied over a weather-resistive barrier as specified in Table R703.3(1).
- 2. Brick veneer_, <u>anchored stone or masonry veneer</u> with a clear airspace as specified in Table R703.8.4(1).
- 3. Other approved vented claddings.

Reason: Revising Item 2 to use a term defined in the IRC and to be consistent with the veneer included in Section R703.8 (anchored stone and masonry veneer) and which is required to be installed with an airspace, per Table R703.8.4(1), of between 1" and 4 ½". Retaining "brick veneer" even though redundant with "masonry veneer", for clarity and consistency. It follows that if brick veneer with a (required) airspace per Table R703.8.4(1) is considered vented cladding, then anchored stone or (other) masonry veneer required to be installed with the same airspace requirements should also be considered vented cladding.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal is identifying all the types of (anchored) masonry veneer required by the IRC to be installed with a clear airspace, which results in a vented cladding. This should not increase or decrease the cost of construction.

Proposal # 5226

RB230-19

RB231-19

IRC®: R703.2

Proponent: Paul Coats, representing American Wood Council (pcoats@awc.org)

2018 International Residential Code

Revise as follows:

R703.2 Water-resistive barrier. One layer of No. 15 asphalt felt, free from holes and breaks, complying with ASTM D226 for Type 1 felt or other approved water-resistive barrier shall be applied over studs or sheathing of all exterior walls. No.15 asphalt felt shall be applied horizontally, with the upper layer lapped over the lower layer not less than 2 inches (51 mm). Where joints occur, felt shall be lapped not less than 6 inches (152 mm). Other *approved* materials shall be installed in accordance with the *water-resistive barrier* manufacturer's installation instructions. The No. 15 asphalt felt or other approved *water-resistive barrier* material shall be continuous to the top of walls and terminated at penetrations and building appendages in a manner to meet the requirements of the exterior wall envelope as described in Section R703.1.

Exception: A water-resistive barrier shall not be required in detached accessory structures that are not heated or cooled.

Reason: For many years the code exempted accessory structures from the requirement for a water resistive barrier. The exception was removed from the code in the previous cycle, but the exception that was removed applied to all accessory structures, regardless of their purpose and regardless of whether they were heated or cooled. This proposal will not exempt conditioned (heated or cooled) accessory structures, which are more subject to movement of moisture through the exterior walls than unconditioned ones. Unconditioned detached accessory structures such as sheds and storage structures have a proven record of performance when complying with the normal siding installation requirements without a water resistive barrier as defined in the code. Unconditioned structures are typically used to store yard tools, lawn mowers, tractors, hay, boats, road salts, including certain amounts of fume-producing fuels and lubricants. They often do not have interior wall coverings or insulation, but instead have exposed framing with siding and no wall sheathing. Installing a water resistive barrier directly to framing without wall sheathing is difficult, and the barrier would be easily punctured by yard tools or other objects leaning against the walls. In addition, they could hinder the natural ventilation needed to disperse fumes and heat. Structures that are heated or cooled are more likely to have insulation and therefore the water resistive barrier makes sense, but an exception is needed for unconditioned structures which have been adequately served by the siding provisions in the code.

Cost Impact: The code change proposal will decrease the cost of construction This may decrease the cost of construction for certain unconditioned accessory structures.

Proposal # 4273

RB231-19

RB232-19

IRC®: R703.2, ASTM Chapter 44 (New)

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing self (joe@buildingscience.com)

2018 International Residential Code

Delete and substitute as follows:

R703.2 Water-resistive barrier. One layer of No. 15 asphalt felt, free from holes and breaks, complying with ASTM D226 for Type 1 felt or other approved water-resistive barrier shall be applied over studs or sheathing of all exterior walls. No.15 asphalt felt shall be applied horizontally, with the upper layer lapped over the lower layer not less than 2 inches (51 mm). Where joints occur, felt shall be lapped not less than 6 inches (152 mm). Other *approved* materials shall be installed in accordance with the *water-resistive barrier* manufacturer's installation instructions. The No. 15 asphalt felt or other approved *water-resistive barrier* material shall be continuous to the top of walls and terminated at penetrations and building appendages in a manner to meet the requirements of the exterior wall envelope as described in Section R703.1.

R703.2 Water-resistive barrier. Not fewer than one layer of water-resistive barrier shall be applied over studs or sheathing with flashing as indicated in Section R703.4, in such a manner as to provide a continuous *water-resistive barrier* behind the *exterior wall* veneer. Water-resistive barrier materials shall comply with one of the following:

- 1. No. 15 felt complying with ASTM D226, Type 1
- 2. ASTM E2556, Type 1 or 2
- 3. ASTM E331 in accordance with Section R703.1.1, or
- 4. Other approved materials in accordance with the manufacturer's installation instructions.

Add new text as follows:



ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

E2556/E2556M-10: Standard Specification for Vapor Permeable Flexible Sheet Water-resistive Barriers Intended for Mechanical Attachment

Reason: Objective: Provide more flexible definiton of WRB to account for new innovations that are not sheet applied materials as defined by ASTM D226 or ASTM E2556. Amend IRC R703.2 in Cycle B with same language submitted in cycle A for IBC

The existing code language gives insufficient guidance for other approved materials. The added language addresses this issue and provides a specific performance requirement for water resistance and provides consistency with other sections of the code that relate specifically to water-resistive barriers.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This change gives better guidance for water resistance.

Staff Analysis: The referenced standard, ASTM E2556/E2556M-10, is currently referenced in other 2018 I-codes.

RB232-19

RB233-19

IRC®: R703.2, ASTM Chapter 44 (New)

Proponent: Theresa Weston, representing DuPont Performance Building Solutions (theresa.a.weston@dupont.com)

2018 International Residential Code

Delete and substitute as follows:

R703.2 Water-resistive barrier. One layer of No. 15 asphalt felt, free from holes and breaks, complying with ASTM D226 for Type 1 felt or other approved water-resistive barrier shall be applied over studs or sheathing of all exterior walls. No.15 asphalt felt shall be applied horizontally, with the upper layer lapped over the lower layer not less than 2 inches (51 mm). Where joints occur, felt shall be lapped not less than 6 inches (152 mm). Other *approved* materials shall be installed in accordance with the *water-resistive barrier* manufacturer's installation instructions. The No. 15 asphalt felt or other approved *water-resistive barrier* material shall be continuous to the top of walls and terminated at penetrations and building appendages in a manner to meet the requirements of the exterior wall envelope as described in Section R703.1.

R703.2 Water-resistive barrier. Not fewer than one layer of water-resistive barrier shall be applied over studs or sheathing of all exterior walls with flashing as described in Section R703.4, in such a manner as to provide a continuous *water-resistive barrier* behind the *exterior wall* veneer. The *water-resistive barrier* material shall be continuous to the top of walls and terminated at penetrations and building appendages in a manner to meet the requirements of the exterior wall envelope as described in Section R703.1. Water-resistive barrier materials shall comply with one of the following:

- 1. No. 15 felt complying with ASTM D226, Type 1
- 2. ASTM E2556, Type I or II
- 3. ASTM E331 in accordance with Section R703.1.1
- 4. Other approved materials installed in accordance with the manufacturer's installation instructions.
- 5. <u>No.15 asphalt felt and water-resistive barriers complying with ASTM E2556 shall be applied horizontally,</u> with the upper layer lapped over the lower layer not less than 2 inches (51 mm), and where joints occur, shall be lapped not less than 6 inches (152 mm).

Add new text as follows:



ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

E2556/E2556M—10:: Standard Specification for Vapor Permeable Flexible Sheet Water-resistive Barriers Intended for Mechanical Attachment

Reason: This proposal recognizes the broad range of water-resistive barriers available to the market in addition to the one traditional material currently recognized. This proposal is consistent with a change made to Chapter 14 of the IBC in Group A of this code change cycle, but the change merges that change with more prescriptive language in the IRC

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code change does not add requrements to the code. It explicitly lists the various types of water-resistive barriers which are currently approved through evaluation services reports. Staff Analysis: The referenced standard, E2556/E2556M—10, is currently referenced in other 2018 I-codes.

Proposal # 5451

RB233-19

RB234-19

IRC: R703.3.1, R703.3.1.1, R703.3.1.2, R704(New)

Proponent: T. Eric Stafford, representing Insurance Institute for Business and Home Safety (testafford@charter.net); Glenn Overcash, AECOM, representing Federal Emergency Management Agency (glenn.overcash@aecom.com)

2018 International Residential Code

Revise as follows:

R703.3.1 Soffit installation. Soffits shall comply with Section R703.3.1.1, Section R703.3.1.2 or the manufacturer's installation instructions. <u>R704</u>.

Delete without substitution:

R703.3.1.1 Wood structural panel soffit. The minimum nominal thickness for wood structural panel soffits shall be ³/₈ inch (9.5 mm) and shall be fastened to framing or nailing strips with 2-inch by 0.099-inch (51 mm × 2.5 mm) nails. Fasteners shall be in spaced not less than 6 inches (152 mm) on center at panel edges and 12 inches (305 mm) on center at intermediate supports.

R703.3.1.2 Vinyl soffit panels. Soffit panels shall be fastened at fascia and wall ends and to intermediate nailing strips as necessary to ensure that there is no unsupported span greater than 16 inches (406 mm), or as specified by the manufacturer's instructions.

Add new text as follows:

SECTION R704 SOFFITS

R704.1 General wind limitations. Where the design wind pressure is 30 psf or less, soffits shall comply with Section R704.2. Where the design wind pressure exceeds 30 psf, soffits shall comply with Section R704.3. The design wind pressure on soffits shall be determined using the component and cladding loads specified in Table R301.2(2) for walls using an effective wind area of 10 square feet and adjusted for height and exposure in accordance with Table R301.2(3).

R704.2 Soffit installation where the design wind pressure is 30 psf or less. Where the design wind pressure is 30 psf or less, soffit installation shall comply with Section R704.2.1, Section R704.2.2, Section R704.2.3, or Section R704.2.4.

R704.2.1 Vinyl soffit panels. Vinyl soffit panels shall be installed using fasteners specified by the manufacturer and shall be fastened at both ends to a supporting component such as a nailing strip, fascia or subfascia component. Where the unsupported span of soffit panels is greater than 16 inches, intermediate nailing strips shall be provided in accordance with Figure R704.2.1. Vinyl soffit panels shall be installed in accordance with the manufacturer's installation instructions. Fascia covers shall be installed in accordance with the manufacturer's installation instructions.



Figure R704.2.1 Typical Vinyl Soffit Panel Support

R704.2.2 Fiber-cement soffit panels Fiber-cement soffit panels shall be a minimum of 1/4 inch in thickness and shall comply with the requirements of ASTM C1186, Type A, minimum Grade II or ISO 8336, Category A, minimum Class 2. Panel joints shall occur over framing or over wood structural panel sheathing. Soffit panels shall be installed with spans and fasteners in accordance with the manufacturer's installation instructions.

R704.2.3 Hardboard soffit panels. Hardboard soffit panels shall be a minimum of 7/16 inch in thickness and shall be fastened to framing or nailing strips with 2 ½ " x 0.113" siding nails spaced not more than 6 inches on center at panel edges and 12 inches on center at intermediate supports.

R704.2.4 Wood structural panel soffit. The minimum nominal thickness for wood structural panel soffits shall be 3/8 inch (9.5 mm) and shall be fastened to framing or nailing strips with 2-inch by 0.099-inch (51 mm x 2.5 mm) nails. Fasteners shall be spaced not less than 6 inches (152 mm) on center at panel edges and 12 inches (305 mm) on center at intermediate supports.

R704.3 Soffit installation where the design wind pressure exceeds 30 psf. Where the design wind pressure is greater than 30 psf, soffit installation shall comply with Section R704.3.1, Section R704.3.2, Section R704.3.3, or Section R704.3.4.

R704.3.1 Vinyl soffit panels. Vinyl soffit panels and their attachments shall be capable of resisting wind loads specified in Table R301.2(2) for walls using an effective wind area of 10 square feet and adjusted for height and exposure in accordance with Table R301.2(3). Vinyl soffit panels shall be installed using fasteners specified by the manufacturer and shall be fastened at both ends to a supporting component such as a nailing strip, fascia or subfascia component. Where the unsupported span of soffit panels is greater than 12 inches, intermediate nailing strips shall be provided in accordance with Figure R704.2.1. Vinyl soffit panels shall be installed in

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accordance with the manufacturer's installation instructions. Fascia covers shall be installed in accordance with the manufacturer's installation instructions.

R704.3.2 Fiber-cement soffit panels. Fiber-cement soffit panels shall comply with Section R704.2.2 and shall be capable of resisting wind loads specified in Table R301.2(2) for walls using an effective wind area of 10 square feet and adjusted for height and exposure in accordance with Table R301.2(3).

R704.3.3 Hardboard soffit panels. Hardboard soffit panels shall comply with the manufacturer's installation instructions and shall be capable of resisting wind loads specified in Table R301.2(2) for walls using an effective wind area of 10 square feet and adjusted for height and exposure in accordance with Table R301.2(3).

R704.3.4 Wood structural panel soffit. Wood structural panel soffits shall be capable of resisting wind loads specified in Table R301.2(2) for walls using an effective wind area of 10 square feet and adjusted for height and exposure in accordance with Table R301.2(3). Alternatively, wood structural panel soffits shall be installed in accordance with Table R704.3.4.

<u>Maximum Design</u> Pressure (+ or -	Maximum Design Pressure (+ or - psf)Minimum Panel Span 	<u>Minimum Panel</u> Performance	Nail Type and Size	Fastener ^a Spacing Along Edges and Intermediate Supports	
<u>psf)</u>			Galvanized Steel	Stainless Steel	
30	24/0	3/8	<u>6d box (2 x 0.099 x</u> 0.266 head diameter)	<u>6</u> ^f	4
<u>40</u>	24/0	3/8	<u>6d box (2 x 0.099 x</u> 0.266 head diameter)	<u>6</u>	<u>4</u>
			<u>6d box (2 x 0.099 x</u> 0.266 head diameter)	4	4
50	24/0	<u>3/8</u>	8d common (2½ x 0.131 x 0.281 head diameter)	<u>6</u>	6
60 24	24/0	<u>3/8</u>	<u>6d box (2 x 0.099 x</u> 0.266 head diameter)	4	<u>3</u>
			8d common (2½ x 0.131 x 0.281 head diameter)	<u>6</u>	4
70	24/16	7/16	8d common (2½ x 0.131 x 0.281 head diameter)	<u>4</u>	<u>4</u>
			10d box (3 x 0.128 x 0.312 head diameter)	6	4
80	<u>24/16</u>	7/16	8d common (2½ x 0.131 x 0.281 head diameter)	4	4
			<u>10d box (3 x 0.128 x</u> 0.312 head diameter)	<u>6</u>	4

<u>Table R704.3.4</u> <u>Prescriptive Alternative for Wood Structural Panel Soffit b,c, d, e</u>

<u>90</u>	<u>32/16</u>	<u>15/32</u>	<u>8d common (2½ x</u> 0.131 x 0.281 head diameter)	<u>4</u>	<u>3</u>
			<u>10d box (3 x 0.128 x</u> 0.312 head diameter <u>)</u>	<u>6</u>	<u>4</u>

a. Fasteners shall comply with Sections R703.3.2 and R703.3.3.

b. Maximum spacing of soffit framing members shall not exceed 24 inches.

c. Wood structural panels shall be of an exterior exposure grade.

d. Wood structural panels shall be installed with strength axis perpendicular to supports with a minimum of two continuous spans.

e. Wood structural panels shall be attached to soffit framing members with specific gravity of at least 0.42. Framing members shall be minimum 2x3 nominal with the larger dimension in the cross section aligning with the length of fasteners to provide sufficient embedment depths.

f. Spacing at intermediate supports shall not be greater than 12 inches on center.

Reason: The purpose of this code change proposal is to improve the wind performance of soffits by clarifying International Residential Code (IRC) installation requirements for the most common types of manufactured soffits and by providing a prescriptive alternative for wood structural panel soffits that complies with design wind pressures specified in the IRC and ASCE 7. The proposal's sponsor and co-sponsor developed content in collaboration with representatives from American Wood Council, National Association of Home Builders, Vinyl Siding Institute, and other soffit maunfacturer groups. The code change refines and further clarifies provisions that were adopted into the 2018 IRC and adds new provisions to address soffit installation in high wind regions. The proposal also moves the clarified soffit provisions to the new Section 704 to better distinguish from exterior wall covering provisions that make up nearly all of Section 703. In addition to separating the clarified soffit provisions to prevent them from being overlooked, new soffit provisions can easily be added as needed with this improved organization and simplified format.

As part of the response to Hurricane Harvey in Texas and Hurricane Irma in Florida, the Federal Emergency Management Agency (FEMA) deployed Mitigation Assessment Teams (MATs) composed of national and regional building science experts to assess the damage in both States. The primary purpose of a MAT is to improve the natural hazard resistance of buildings by evaluating the key causes of building damage, failure, and success, and developing strategic recommendations for improving short-term recovery and long-term disaster resilience from future natural hazard events. The following MAT-related information is included in the FEMA MAT Reports: Hurricane Irma in Florida and Hurricane Harvey in Texas. Links to download the free report will be shared with IRC Committee members for reference upon publication.

The FL MAT observed building envelope damage on both older and newer residential construction, and soffits were among the most frequently observed damaged envelope components. Based on estimated wind speeds at the sites visited, failure occurred to soffit components at wind speeds well below design wind speeds for these areas. The FL MAT observed both vinyl and metal soffit loss, but vinyl soffit panels were the most common product observed, particularly in the Florida Keys where vinyl soffit damage was widespread.

In many cases, inadequate support and attachment at the ends of the soffit panel led to failure of the soffit. The Sugarloaf Key house shown below (FL MAT Report Figure 4-19) lost its vinyl soffit in several areas. The red oval shows where the soffit panel was stripped from the assembly's J-channel, which remains attached along the exterior wall (yellow arrows). The soffit appears to have been fastened to only a single nailing strip across the midpoint of the framing above. Section 704.2.1 (including Figure 704.2.1) of the proposal has been included to clarify that vinyl soffit panels are required to be fastened at each end and the unsupported span cannot exceed specified limits (16 or 12 inches) unless permitted by the manufacturer's product approval.



In some cases, vinyl soffit failure appeared to have been associated with fascia cover loss as shown in the image below from Little Torch Key (FL MAT Report Figure 4-18). Loss of the fascia cover likely increases wind pressures on vinyl soffit where the edges of the soffit are exposed.



The TX MAT observed similar wind damage to residential soffits as indicated below. The dwelling in Cape Valero shown on the left (TX MAT Figure 4-44) lost re-covered vinyl soffit panels (green arrow) to high winds, exposing the vent opening (red arrows) to wind driven rain. The photo on the right (TX MAT Figure 4-45) shows a soffit opening that was previously covered by a ventilating fiber-cement board. Red arrows indicate where the attic is exposed to wind driven rain. As with examples shown from Florida, estimated wind speeds for the sites were below design wind speeds.



FL and TX MAT observations described above along with other examples detailed in the MAT Reports, led to the following conclusions and recommendations:

Conclusion FL-10: The MAT observed evidence of inadequate resistance to wind pressures and improper installation of soffits on residential buildings. Widespread loss of soffits was observed in residential construction, and wind-driven rain infiltrated some areas where soffits were displaced or lost. Recommendation FL-10a: Designers, contractors, and inspectors should place more emphasis on proper soffit installation to limit wind-driven rain. Proper soffit installation should be emphasized by designers, contractors,

and inspectors in order to limit wind-driven rain from entering building envelopes and damaging building

ICC COMMITTEE ACTION HEARINGS ::: April, 2019

interiors.

Conclusion TX-18: Many soffits lacked adequate wind resistance, typically because the wrong material was used for the region or it was improperly installed. The MAT observed widespread loss of soffits in residential and non-residential construction, generally due to improper materials, lack of fasteners, and/or inadequate framing, and wind-driven rain infiltrated some areas where soffits were displaced or lost. The loss of soffit vents can allow hurricane winds to drive large amounts of water through the openings and soak insulation, which can lead to mold growth and, in some cases, the collapse of ceilings.

Recommendation TX-18: Designers, contractors, and inspectors should place more emphasis on proper soffit installation in high-wind regions. Wind-driven rain should be limited from entering building envelopes and damaging building interiors through proper soffit installation.

In summary, widespread residential soffit damage observed in the wake of the 2017 Hurricane Season indicates the need for clarified installation provisions in the IRC. The proposed provisions apply to design wind pressures realized across the US, but are clearly differentiated where 30 pounds per square foot (psf) or less or where greater than 30 psf, so that installation requirements are tailored for the site-specific pressures. Regardless the soffit design wind pressure, the new provisions will provide greater clarity for the builder to implement code-compliant soffit installation and for the building official to verify code-compliant soffit installation.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code change proposal will not increase the cost of construction for buildings where design wind pressures are 30 psf or less because it only clarifies the existing requirement for soffit installation. The code change proposal may decrease costs for buildings where the design wind pressure exceeds 30 psf because it provides some prescriptive solutions as an alternative to design.

Proposal # 4373

RB234-19

RB235-19

IRC®: R703.3.1.1

Proponent: Borjen Yeh, APA - The Engineered Wood Association, representing APA - The Engineered Wood Association (borjen.yeh@apawood.org); Ralph Leyva, representing APA- The Engineered Wood Assoc (ralph.leyva@apawood.org)

2018 International Residential Code

Revise as follows:

R703.3.1.1 Wood structural panel soffit. The minimum nominal thickness for wood structural panel soffits shall be ${}^{3}/_{8}$ inch (9.5 mm) and shall be fastened to framing or nailing strips with 2-inch by 0.099-inch (51 mm × 2.5 mm) nails. Fasteners shall be in spaced not less greater than 6 inches (152 mm) on center at panel edges and 12 inches (305 mm) on center at intermediate supports.

Reason: This proposal is intended to correct an oversight on the fastener spacing for wood structural panel soffit from the last code cycle. The fastener spacing should not be greater than 6 inches on center at panel edges. Otherwise, the fastener spacing could be indefinitely larger than 6 inches on center.

Cost Impact: The code change proposal will increase the cost of construction This proposal is a correction to an oversight from the last code cycle.

Proposal # 4623

RB235-19

RB236-19

IRC®: R703.4

Proponent: Mike Fischer, Kellen Company, representing The Polyisocyanurate Insulation Manufacturers Association (mfischer@kellencompany.com); Marcin Pazera, representing The Polyisocyanurate Insulation Manufacturers Association (mpazera@pima.org)

2018 International Residential Code

Revise as follows:

R703.4 Flashing. Approved corrosion-resistant flashing shall be applied shingle-fashion in a manner to prevent entry of water into the wall cavity or penetration of water to the building structural framing components. Self-adhered membranes used as flashing shall comply with AAMA 711. Fluid-applied membranes used as flashing in exterior walls shall comply with AAMA 714. The flashing shall extend to the surface of the exterior wall finish or to a water-resistive barrier that complies with Section R703.2 and is part of a means of drainage complying with Section R703.1.1. Approved corrosion-resistant flashings shall be installed at the following locations:

- Exterior window and door openings. Flashing at exterior window and door openings shall extend to the surface of the exterior wall finish or to the water-resistive barrier complying with Section 703.2 for subsequent drainage. Mechanically attached flexible flashings shall comply with AAMA 712. Flashing at exterior window and door openings shall be installed in accordance with one or more of the following:
 - 1.1. The fenestration manufacturer's installation and flashing instructions, or for applications not addressed in the fenestration manufacturer's instructions, in accordance with the flashing manufacturer's instructions. Where flashing instructions or details are not provided, pan flashing shall be installed at the sill of exterior window and door openings. Pan flashing shall be sealed or sloped in such a manner as to direct water to the surface of the exterior wall finish or to the water-resistive barrier for subsequent drainage. Openings using pan flashing shall incorporate flashing or protection at the head and sides.
 - 1.2. In accordance with the flashing design or method of a registered design professional.
 - 1.3. In accordance with other approved methods.
- 2. At the intersection of chimneys or other masonry construction with frame or stucco walls, with projecting lips on both sides under stucco copings.
- 3. Under and at the ends of masonry, wood or metal copings and sills.
- 4. Continuously above all projecting wood trim.
- 5. Where exterior porches, decks or stairs attach to a wall or floor assembly of wood-frame construction.
- 6. At wall and roof intersections.
- 7. At built-in gutters.

Reason: Item 1 in locations required to be flashed indicates that it is acceptable to direct water to the exterior of the WRB for subsequent drainage to the exterior. That option conflicts with the charging language in R703.4 that does not mention the WRB. This proposal is similar to FS133-18 that was approved as submitted by the ICC FS Committee during the Group A Code Development Cycle in 2018; FS133-18 was Approved as Submitted. This proposal creates consistency between the two codes.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposal is a clarification of common practice.

RB236-19

RB237-19

IRC: R703.4, R703.4.1(New)

Proponent: Theresa Weston, representing DuPont Performance Building Solutions (theresa.a.weston@dupont.com)

2018 International Residential Code

Revise as follows:

R703.4 Flashing. Approved corrosion-resistant flashing shall be applied shingle-fashion in a manner to prevent entry of water into the wall cavity or penetration of water to the building structural framing components. Self-adhered membranes used as flashing shall comply with AAMA 711. Fluid-applied membranes used as flashing in exterior walls shall comply with AAMA 714. The flashing shall extend to the surface of the exterior wall finish. Approved corrosion-resistant flashings shall be installed at the following locations:

- Exterior window and door openings. Flashing at exterior window and door openings shall <u>be</u> <u>installed in accordance with R703.4.1.</u> extend to the surface of the exterior wall finish or to the water-resistive barrier complying with Section 703.2 for subsequent drainage. Mechanically attached flexible flashings shall comply with AAMA 712. Flashing at exterior window and door openings shall be installed in accordance with one or more of the following:
 - 1.1. The fenestration manufacturer's installation and flashing instructions, or for applications not addressed in the fenestration manufacturer's instructions, in accordance with the flashing manufacturer's instructions. Where flashing instructions or details are not provided, pan flashing shall be installed at the sill of exterior window and door openings. Pan flashing shall be sealed or sloped in such a manner as to direct water to the surface of the exterior wall finish or to the water-resistive barrier for subsequent drainage. Openings using pan flashing shall incorporate flashing or protection at the head and sides.
 - 1.2. In accordance with the flashing design or method of a registered design professional.
 - 1.3. In accordance with other approved methods.
- 2. At the intersection of chimneys or other masonry construction with frame or stucco walls, with projecting lips on both sides under stucco copings.
- 3. Under and at the ends of masonry, wood or metal copings and sills.
- 4. Continuously above all projecting wood trim.
- 5. Where exterior porches, decks or stairs attach to a wall or floor assembly of wood-frame construction.
- 6. At wall and roof intersections.
- 7. At built-in gutters.

Add new text as follows:

R703.4.1 Flashing installation at exterior window and door openings. Flashing at exterior window and door openings shall extend to the surface of the exterior wall finish or to the water-resistive barrier complying with Section 703.2 for subsequent drainage. Mechanically attached flexible flashings shall comply with AAMA 712. Flashing at exterior window and door openings shall be installed in accordance with one or more of the following:

 The fenestration manufacturer's installation and flashing instructions, or for applications not addressed in the fenestration manufacturer's instructions, in accordance with the flashing manufacturer's instructions. Where flashing instructions or details are not provided, pan flashing shall be installed at the sill of exterior window and door openings. Pan flashing shall be sealed or sloped in such a manner as to direct water to the surface of the exterior wall finish or to the water resistive barrier for subsequent drainage. Openings using pan flashing shall incorporate flashing or protection at the head and sides.

- 2. In accordance with the flashing design or method of a registered design professional.
- 3. In accordance with other approved methods.

Reason: This proposal rearranges the code text for clarity. Currently the list of places in which flashing is required is "broken up" by details on flashing installation at window and door openings. This proposal moves the installation to a later subsection. Therefore, it make the list of required flashing locations. No technical changes are made to the installation details.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal is a text rearrangement to improve clarity. It does not change any technical requirements.

Proposal # 5285

RB237-19

RB238-19

IRC®: R703.4

Proponent: Donald Sivigny, representing State of MN and Association of Minnesota Building Officials (don.sivigny@state.mn.us)

2018 International Residential Code

Revise as follows:

R703.4 Flashing. Approved corrosion-resistant flashing shall be applied shingle-fashion in a manner to prevent entry of water into the wall cavity or penetration of water to the building structural framing components. Self-adhered membranes used as flashing shall comply with AAMA 711. Fluid-applied membranes used as flashing in exterior walls shall comply with AAMA 714. The flashing shall extend to the surface of the exterior wall finish. Approved corrosion-resistant flashings shall be installed at the following locations:

- 1. Exterior window and door openings. Flashing at exterior window and door openings shall extend to the surface of the exterior wall finish or to the water-resistive barrier complying with Section 703.2 for subsequent drainage. An insulation stop shall be installed around all window and door openings, 1 to 2 inches inward from the face of the exterior sheathing, to allow for drainage of incidental water at the window or door flashing system. Mechanically attached flexible flashings shall comply with AAMA 712. Flashing at exterior window and door openings shall be installed in accordance with one or more of the following:
 - 1.1. The fenestration manufacturer's installation and flashing instructions, or for applications not addressed in the fenestration manufacturer's instructions, in accordance with the flashing manufacturer's instructions. Where flashing instructions or details are not provided, pan flashing shall be installed at the sill of exterior window and door openings. Pan flashing shall be sealed or sloped in such a manner as to direct water to the surface of the exterior wall finish or to the water-resistive barrier for subsequent drainage. Openings using pan flashing shall incorporate flashing or protection at the head and sides.
 - 1.2. In accordance with the flashing design or method of a registered design professional.
 - 1.3. In accordance with other approved methods.
- 2. At the intersection of chimneys or other masonry construction with frame or stucco walls, with projecting lips on both sides under stucco copings.
- 3. Under and at the ends of masonry, wood or metal copings and sills.
- 4. Continuously above all projecting wood trim.
- 5. Where exterior porches, decks or stairs attach to a wall or floor assembly of wood-frame construction.
- 6. At wall and roof intersections.
- 7. At built-in gutters.

Reason: This change will increase the durability of the wall assembly when integrating a fenestration product into the assembly. This code change will enhance the opportunity for water drainage in accordance with the remainder of Section R703.4 to specifically address water drainage at the pan flashing. This proposal provides the opportunity to install fenestration product in compliance with <u>both</u> the Energy Code and the installation instructions of the fenestration manufacturer, by enhancing the drainage of pan flashed fenestration products. The Energy code requires the fenestration products and the framed openings to be insulated and sealed. The installers of these fenestration units almost exclusively use expanding spray foam as a sealant to meet the Energy Codes. When this expanding foam or other sealant flows outward to, or extends to the exterior nailing flange, it actually blocks the free drainage of water to the exterior, allowing water to collect and wick inward

through capillary action toward the interior of the exterior wall assembly where it will cause degradation of the wall assembly. Maintaining an unobstructed and drainable air space around the perimeter of the fenestration product, and especially the pan flashing, will allow for convective air flow that promotes drying and will elevate water infiltration to the wall assembly. This can be accomplished by installing a barrier or stop to prevent the expanding foam or other sealants from reaching the interior side of the nailing flange where it will create degradation issues within the wall assembly. Unobstructed drainage is essential to the draining of water where the fenestration products interface with the wall assemblies. The existing code language does not have any specific, or enforceable language to require an unobstructed drainage plane at all fenestration products. This code change proposal does not interfere with or override the specific installation instruction of fenestration products into walls assemblies by the manufacturer or the code, but instead, it simply enhances the ability of the wall assembly to drain water and maintain a dry and durable assembly for years to come.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code change proposal initially may increase or decrease the cost of construction slightly in material, depending on the manufacturer's installation instructions, however any increase in these cost will more than recovered in the longevity of the assembly and addressing those problems of degradation of wall assemblies at these openings when it is not allowed to drain fully and stay dry. Remember the cost of a Call back to a home is around \$350 or above on average.

Proposal # 5394

RB238-19

RB239-19

IRC®: R703.5

Proponent: Matthew Hunter, representing American Wood Council (mhunter@awc.org)

2018 International Residential Code

Revise as follows:

R703.5 Wood, hardboard and wood structural panel siding. Wood, hardboard, and wood structural panel siding shall be installed in accordance with this section and Table R703.3(1). Hardboard siding shall comply with CPA/ANSI A135.6. Hardboard siding used as architectural trim shall comply with CPA/ANSI A 135.7.

Reason: The Composite Panel Association (CPA) and its trim producing members, view architectural trim as a non-structural decorative accent that should not be required to be certified to voluntary ANSI A135.7-2012 Engineered Wood Trim Standard in the IRC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code change proposal will not increase the cost of construction.

Proposal # 4282

RB239-19

RB240-19

IRC: TABLE R703.6.3(1), TABLE R703.6.3(2), TABLE R905.7.5(2)

Proponent: Rick Allen, International Staple, Nail and Tool Association, representing International Staple, Nail and Tool Association (rallen@isanta.org)

2018 International Residential Code

Revise as follows:

TABLE R703.6.3(1) SINGLE-COURSE SIDEWALL FASTENERS

SINGLE-COURSE SIDEWALL FASTENERS					
Product type	Nail type, and minimum <u>shank</u> <u>diameter and</u> length (inches)	Minimum head diameter(inches)	Minimum shank thickness(inches)		
R & R and sanded	shingles				
16" and 18" shingles	3d box 1 ¹ / ₄ <u>x_0.076</u>	0.19	0.08		
24″ shingles	4d box 1 ¹ / ₂ <u>x_0.076</u>	0.19	0.08		
Grooved shingles					
16" and 18" shingles	3d box 1 ¹ / ₄ <u>x_0.076</u>	0.19	0.08		
24″ shingles	4d box 1 ¹ / ₂ <u>x_0.076</u>	0.19	0.08		
Split and sawn sha	ikes				
18″ straight-split shakes	5d box 1 ³ / ₄ <u>x_0.080</u>	0.19	0.08		
18″ and 24″ handsplit shakes	6d box 2 <u>x 0.099</u>	0.19	0.0915		
24″ tapersplit shakes	5d box 1 ³ / ₄ <u>x 0.080</u>	0.19	0.08		
18″ and 24″ tapersawn shakes	6d box 2 <u>x_0.099</u>	0.19	0.0915		

For SI: 1 inch = 25.4 mm.

TABLE R703.6.3(2) DOUBLE-COURSE SIDEWALL FASTENERS

DOUBLE-COURSE SIDEWALL FASTENERS				
Product type	Nail type and minimum shank diameter and length (inches)	Minimum head diameter (inches)	Minimum (
R & R and sanded shingles				

	5d box $1^{3}/4 \times 0.080$ or same size		
16," & <u>18</u> " and 24" shingles	or box : /4 <u>x 0.000</u> or barro 0/20	0.19	
	<u>5d</u> casing nails <u>1³/₄ x 0.080</u>		
Grooved shingles			
16," 18" and 24" shingles	5d box 1 ³ / ₄ <u>x 0.080</u>	0.19	
Split and sawn shakes			
	7d box 2 ¹ / ₄ <u>x 0.099</u> or		
18" straight-split shakes		0.19	
	8d <u>box</u> 2 ¹ / ₂ <u>x 0.113</u>		
	7d box 2 ¹ / ₄ <u>x 0.099</u> or		
18" and 24" handsplit shakes		0.19	
	8d <u>box</u> 2 ¹ / ₂ <u>x 0.113</u>		
21" taporsplit shakes	7d box 2 ¹ / ₄ <u>x 0.099</u> or	0.10	
	8d <u>box</u> 2 ¹ / ₂ <u>x 0.113</u>	0.10	
18" and 21" tapersown shakes	7d box 2 ¹ / ₄ <u>x 0.099</u> or	0.10	
and 24 lapersawit strakes	8d <u>box</u> 2 ¹ / ₂ <u>x 0.113</u>	0.10	

For SI: 1 inch = 25.4 mm.

TABLE R905.7.5(2)NAIL REQUIREMENTS FOR WOOD SHAKES AND WOOD SHINGLES

SHAKES	NAIL TYPE, AND MINIMUM <u>SHANK DIAMETER</u> <u>AND</u> LENGTH <u>(inches)</u>	MINIMUM HEAD SIZE	MINIMUM SHANK DIAMETER
18" straight-split	5d box 1 ³ /4″ <u>x 0.080</u>	0.19″	.080″
18" and 24" handsplit and resawn	6d box 2″ <u>x 0.099</u>	0.19″	.0915″
24″ taper-split	5d box 1 ³ /4″ <u>x 0.080</u>	0.19″	.080″
18" and 24" tapersawn	6d box 2″ <u>x 0.099</u>	0.19″	.0915″
Shingles	Nail Type, and Minimum <u>Shank Diamater and</u> Length (inches)	Minimum Head Size	Minimum Shank Diameter
16" and 18"	3d box 1 ¹ /4″ <u>x 0.076</u>	0.19″	.080″
24″	4d box 1 ¹ / ₂ ″ <u>x 0.080</u>	0.19″	.080″

For SI: 1 inch = 25.4 mm.

Reason: The box nail dimensions listed in Tables do not match those listed in ASTM F1667. The nominal head diameter of a 3d box, 4d box and 5d box nail is 0.219 inches with a minimum head diameter of 0.197 inches

The nominal head diameter of a 6d and 7d box nail is 0.266 inches. with a minimum head diameter of 0.239 inches

The nominal head diameter of an 8d box nail is 0.297 inches with a minimum head diameter of 0.267 inches

The nominal shank diameter (not shank thickness) of a 3d box nail is 0.076 inches with a minimum of 0.072

inches

The nominal shank diameter (not shank thickness) of a 4d and 5d box nail is 0.080 inches with a minimum of 0.076 inches

The nominal shank diameter (not shank thickness) of a 6d and 7d box nail is 0.099 inches with a minimum of 0.095 inches

The nominal shank diameter (not shank thickness) of an 8d box nail is 0.113 inches with a minimum of 0.109 inches

Listing the nail type (3d box, 4d box, etc.) and then the nominal length and nominal shank diameter provides a correct description of the fastener

The Cedar Shake & Shingle Bureau has listed in their installation manuals the use of box nails for installation these products.

In Table R703.6.3(2) the size of the R&R and sanded shingles should read 16", 18" and 24" not 16", 8" and 24"

Cost Impact: The code change proposal will not increase or decrease the cost of construction These proposed changes do not change the existing requirements but instead clarify the description of the fasteners

Proposal # 3843

RB240-19

RB241-19

IRC®: R703.7, R703.7.1, R703.7.3, 703.7.3.1 (New)

Proponent: Cesar Lujan, representing National Association of Home Builders (clujan@nahb.org); Gary Ehrlich, National Association of Home Builders, representing National Association of Home Builders (gehrlich@nahb.org)

2018 International Residential Code

R703.7 Exterior plaster (stucco). Installation of exterior plaster shall be in compliance with ASTM C926, ASTM C1063 and the provisions of this code.

Revise as follows:

R703.7.1 Lath. Lath and lath attachments shall be of corrosion-resistant materials <u>in accordance with ASTM</u> <u>C1063.</u> expanded meta, welded wire, or woven wire lath shall be attached to wood framing members with $1^{1/2}$ -inch-long (38 mm), 11-gage nails having a $^{7/16}$ -inch (11.1 mm) head, or $^{7/8}$ -inch-long (22.2 mm), 16-gage staples, spaced not more than 6 7 inches (152 178 mm) <u>on center vertically and not more than 24 inches on</u> <u>center horizontally</u>, or as otherwise approved. Additional fastening between wood framing members shall not be prohibited. Lath attachments to cold-formed steel framing or to masonry, stone, or concrete substrates shall be in accordance with ASTM C 1063. Where lath is installed directly over foam sheathing, lath connections shall also be in accordance with Sections R703.15, R703.16, or R703.17. Where lath is attached to furring installed over foam sheathing, the furring connections shall be in accordance with Sections R703.15, R703.16, or R703.17.

Exception: Lath is not required over masonry, cast-in-place concrete, precast concrete or stone substrates prepared in accordance with ASTM C1063.

R703.7.3 Water-resistive barriers. Water-resistive barriers shall be installed as required in Section R703.2 and, where applied over wood-based sheathing, shall include a water-resistive, vapor-permeable barrier with a performance at least equivalent to two layers of Grade D paper. The individual layers shall be installed independently such that each layer provides a separate continuous plane and any flashing, installed in accordance with Section R703.4 and intended to drain to the *water-resistive barrier*, is directed between the layers.

Exception: Where the *water-resistive barrier* that is applied over wood-based sheathing has a water resistance equal to or greater than that of 60-minute Grade D paper and is separated from the stucco by an intervening, substantially nonwater-absorbing layer or designed drainage space.

Add new text as follows:

703.7.3.1 Furring Where provided, furring between lath and vertical supports or solid sheathing shall consist of wood furring strips not less than 1 inch by 2 inches (25 mm by 51 mm), minimum ³/₄ inch (19 mm) metal channels, or self-furring lath, and shall be installed in accordance with ASTM C1063. Furring shall be spaced a maximum of 24 inches (600 mm) on center horizontally and, where installed over wood or cold-formed steel framing, shall be fastened into framing members.

Reason: The purpose of this code change is to correlate the requirements for exterior lath and plaster (stucco) with the requirements of ASTM C 926 and C 1063 and recommended practice. The code requirements in the IRC are not in alignment with the reference standards and lack key details needed to insure a good installation and minimize the risk of moisture intrusion.

In particular, the IRC lath attachment requirements state a 6" nail or staple spacing but do not specify direction

or what nailing substrates are permitted. ASTM C 1063 specifies a 7" vertical spacing along and 16" to 24" horizontal spacing into wood studs. Without this clear direction in the code, some stucco is being installed with fasteners in a 6" grid pattern (both horizontal and vertical), leading to fasteners penetrating sheathing and providing a path for moisture intrusion behind the WRB and exterior sheathing and causing decay and water damage. The code user is referred to C 1063 for lath attachment requirements for other substrates, and is allowed to omit the lath when permitted by C 1063 for concrete substrates which have been properly prepared such that the plaster will bond directly to the concrete.

Also, the IRC does not currently provide any details for furring. Minimum sizes consistent with other wood furring requirements in the IRC and the minimum channel size from C 1063 are supplied along with the maximum horizontal spacing. Again, the proposed language underscores that furring attachment to metal or wood framing must be into studs. Where furring is required between lath and vertical supports or solid surfaces varies depending on the type of lath or plaster base used and the type of vertical support or surface. Designers and stucco installers should defer to C 1063 and stucco manufacturer instructions for guidance on where furring is required.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code change aligns the prescriptive language for exterior lath and plaster in the IRC with the ASTM standards referenced in the section. Since compliance with these standards is already required, this change simply provides clarification for builders, stucco installers and building officials and thus does not increase the cost of construction.

Proposal # 4723

RB242-19

IRC: R703.7.3, R703.7.3.1(New), R703.7.3.2(New)

Proponent: Mike Fischer, representing Self (mfischer@kellencompany.com); Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council (jcrandell@aresconsulting.biz)

2018 International Residential Code

Revise as follows:

R703.7.3 Water-resistive barriers. Water-resistive barriers shall be installed as required in Section R703.2 and, where applied over wood-based sheathing, shall <u>comply with Section R703.7.3.1 or Section</u> <u>R703.7.3.2.include a water-resistive, vapor-permeable barrier with a performance at least equivalent to two layers of Grade D paper. The individual layers shall be installed independently such that each layer provides a separate continuous plane and any flashing, installed in accordance with Section R703.4 and intended to drain to the *water-resistive barrier*, is directed between the layers.</u>

Exception: Where the *water-resistive barrier* that is applied over wood-based sheathing has a water resistance equal to or greater than that of 60-minute Grade D paper and is separated from the stucco by an intervening, substantially nonwater-absorbing layer or designed drainage space.

Add new text as follows:

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

- <u>The water-resistive barrier shall be two layers of 10-minute Grade D paper or have a water resistance</u> equal to or greater than two layers of a *water-resistive barrier* complying with ASTM E2556, Type I. The individual layers shall be installed independently such that each layer provides a separate continuous plane. Flashing installed in accordance with Section R703.4 and intended to drain to the water-resistive barrier, shall be directed between the layers.
- The water-resistive barrier shall be 60-minute Grade D paper or have a water resistance equal to or greater than one layer of a water-resistive barrier complying with ASTM E2556, Type II. The waterresistive barrier shall be separated from the stucco by a layer of foam plastic insulating sheathing or other non-water- absorbing layer.

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

- 1. In addition to complying with Section R703.7.3.1, a space not less than 3/16 inch (5 mm) in depth shall be added to the exterior side of the water-resistive barrier.
- 2. In addition to complying with Section R703.7.3.1 Item 2, a space having a drainage efficiency of not less than 90%, as measured in accordance with ASTM E2273 or Annex A2 of ASTM E2925, shall be added to the exterior side of the *water-resistive barrier*.



ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

ASTM E2925-17: Standard Specification for Manufactured Polymeric Drainage and Ventilation Materials Used to Provide a Rainscreen Function

Reason: The proposal does two things. First, it reorganizes the provisions by deleting an exception (which is really a construction option) and replacing it with subsections that indicate different methods of complying with stucco water-resistive barrier requirements. Second, the proposal properly applies requirements in relation to climate -- something that has been missing in the code and is needed to avoid higher risk of moisture problems in climates that are moist/rainy. The proposal will help resolve problems with stucco performance (e.g., moisture problems over wood-based sheathings) and avoid impacting cost or performance where performance has a long-standing record of good performance (e.g., dry climates such as the southwestern region of the U.S.).

Cost Impact: The code change proposal will increase the cost of construction

The proposal will not increase cost for substrates other than wood-based sheathing. Also, it will not impact cost or change requirements in dry climates where stucco has a long record of successful performance. This also will not impact cost in moist or marine climates where similar actions are already being taken (e.g., a drainage space) to reduce risk of moisture damage.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM E2925-17, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5484

RB242-19

RB243-19

IRC®: R703.7.3, ASTM Chapter 44 (New)

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing self (joe@buildingscience.com)

2018 International Residential Code

Revise as follows:

R703.7.3 Water-resistive barriers. Water-resistive barriers shall be installed as required in Section R703.2 and, where applied over wood-based sheathing, shall include a water-resistive, vapor-permeable barrier with a performance water resistance at least equivalent to two layers of Grade D paper or two layers of water-resistive barrier complying with ASTM E2556. The individual layers shall be installed independently such that each layer provides a separate continuous plane and any flashing, installed in accordance with Section R703.4 and intended to drain to the *water-resistive barrier*, is directed between the layers.

Exception: Where the water-resistive barrier that is applied over wood-based sheathing has a water resistance equal to or greater than that of 60-minute Grade D paper <u>a water-resistive barrier complying with</u> <u>ASTM E2556 Type I</u> and is separated from the stucco by an intervening, substantially nonwater-absorbing layer or designed drainage foam plastic insulating sheathing layer or by a minimum 3/16 inch (5 mm) space.

Add new text as follows:



ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

E2556/E2556M—10: Standard Specification for Vapor Permeable Flexible Sheet Water-resistive Barriers Intended for Mechanical Attachment

Reason: Objective:

- 1. Define water resistance as the primary functional requirement of the WRB and remove reference to vapor permeable.
- 2. Enable a single layer of WRB complying with ASTM E2556 Type I with a drainage space.
- 3. Define depths drainage space

The existing code language gives insufficient guidance for other approved materials. The added language addresses this issue and provides a specific performance requirement for water resistance and provides consistancy with other sections of the code that relate specifically to water-resistive barriers.

The size of the drainage space needs to be specified. Type 1 is the appropriate water-resistive metric for the specified space. This logic is consistant with the body and intent of the text of Section R703.7.3. The specified space and one layer of Type 1 provides equivalent performance to the two layers of Type 1 specified in the body of R703.7.3.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This change gives better guidance for water-resistance.

Staff Analysis: The referenced standard, ASTM E2556/E2556M-10, is currently referenced in other 2018 I-codes.

RB243-19

RB244-19

IRC®: R703.7.3

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing self (joe@buildingscience.com)

2018 International Residential Code

R703.7.3 Water-resistive barriers. Water-resistive barriers shall be installed as required in Section R703.2 and, where applied over wood-based sheathing, shall include a water-resistive, vapor-permeable barrier with a performance at least equivalent to two layers of Grade D paper. The individual layers shall be installed independently such that each layer provides a separate continuous plane and any flashing, installed in accordance with Section R703.4 and intended to drain to the *water-resistive barrier*, is directed between the layers.

Exception Exceptions:

- 1. Where the *water-resistive barrier* that is applied over wood-based sheathing has a water resistance equal to or greater than that of 60-minute Grade D paper and is separated from the stucco by an intervening, substantially nonwater-absorbing layer or designed drainage space.
- Where the water-resistive barrier is applied over wood-based sheathing where the annual mean rainfall as determined by the National Oceanic and Atmospheric Administration (NOAA) exceeds 20 inches, a minimum 3/16 inch space shall be provided between the stucco and the water-resistive barrier.

Reason: There are serious stucco failures occuring with wood frame buildings sheathed with wood based sheathing. The reasons for these failures can be found in the following link: https://buildingscience.com/documents/building-science-insights/bsi-102-coming-stucco-pocalypse

This code change addresses these issues. Annual mean rainfall is the appropriate metric for risk not humidity and temperature.

Cost Impact: The code change proposal will increase the cost of construction The code change proposal reduces the cost of damage, repair and associated litigation. This change gives better guidance for water resistance.

Proposal # 5424

RB244-19

RB245-19

IRC®: R703.7.3, ASTM Chapter 44 (New)

Proponent: Gary Ehrlich, National Association of Home Builders, representing National Association of Home Builders (gehrlich@nahb.org)

2018 International Residential Code

Revise as follows:

R703.7.3 Water-resistive barriers. Water-resistive barriers shall be installed as required in Section R703.2 and, where applied over wood-based sheathing, shall include a water-resistive, vapor-permeable barrier with a performance have a water resistance at least equivalent to 60-minute Grade D paper or other material complying with ASTM E2556, Type II and be separated from the stucco by an intervening, substantially nonwater-absorbing layer or by a designed drainage space not less than 3/16 inch in depth.

Exception: In <u>climate zones</u> designated as Dry (B) in accordance with Section 1101.7, the <u>water-resistive</u> <u>barrier</u> shall have a water resistance at least equivalent to <u>that of</u> two layers of <u>10-minute</u> Grade D <u>paper or</u> <u>other material complying with ASTM E2556, Type I</u>. The individual layers shall be installed independently such that each layer provides a separate continuous plane and any flashing, installed in accordance with Section R703.4 and intended to drain to the <u>water-resistive barrier</u>, is directed between the layers. <u>The</u> <u>designed drainage space or additional substantially non water-absorbing layer shall not be required.</u>

Exception: Where the *water-resistive barrier* that is applied over wood-based sheathing has a water resistance equal to or greater than that of 60-minute Grade D paper and is separated from the stucco by an intervening, substantially nonwater-absorbing layer or designed drainage space.

Add new text as follows:



ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

E2556-10: Standard Specification for Vapor Permeable Flexible Sheet Water-resistive Barriers Intended for MechanicalAttachment

Reason: The purpose of this code change is to revise the requirements for water resistive barriers and drainage behind exterior lath and plaster (stucco)

Significant water damage has occurred in stucco walls due to improper provisions for drainage and drying behind the lath and plaster. If sufficient amounts of moisture accumulate, especially around penetrations and rough openings, it may be able to wick through the traditional 10-minute layers of Grade D paper or equivalent material. The current exception for one layer of minimum 60-minute Grade D paper or equivalent with an additional layer of non-water-absorbing material or drainage space is a good recommended practice and is elevated to the base requirement. The traditional requirement for two 10-minute layers of Grade D paper or equivalent for equivalent material is limited to dry climate zones where bulk moisture is not expected to be present for extended periods of time.

Materials considered as "substantially non-water-absorbing material" include an additional layer of 10-minute Grade D paper, an additional layer of housewrap, or foam plastic insulating sheathing.

Cost Impact: The code change proposal will increase the cost of construction Depending on the products selected to meet the water-resistant barrier requirements, the cost to provide a

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single 60-minute layer may be greater than the cost to provide two separate 10-minute layers. In warm-humid climates, the requirement for an additional 10-minute layer over the 60-minute layer would be an increase in cost if not already being provided as the "substantially non-water absorbing layer".

Staff Analysis: The referenced standard, ASTM E2556-10, is currently referenced in other 2018 I-codes.

Proposal # 5076

RB245-19

RB246-19

IRC: 202 (New), R703.7.3, TABLE R703.7.3 (New), ASTM Chapter 44 (New)

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council (jcrandell@aresconsulting.biz)

2018 International Residential Code

Revise as follows:

R703.7.3 Water-resistive barriers. Water-resistive barriers shall be installed as required in Section R703.2 and, where applied over wood-based sheathing, shall include a water-resistive, vapor-permeable barrier with a performance at least equivalent to two layers of Grade D paper. The individual shall be installed as required in Table R703.7.3. The individual water-resistive barrier and bond break material layers shall be installed independently such that each layer provides a separate continuous plane and any flashing, installed in accordance with Section R703.4 and intended to drain to the water-resistive barrier, is directed between the layers.

Exception: Where the *water-resistive barrier* that is applied over wood-based sheathing has a water resistance equal to or greater than that of 60-minute Grade D paper and is separated from the stucco by an intervening, substantially nonwater-absorbing layer or designed drainage space.

Add new text as follows:

TABLE R703.7.3

WATER-RESISTIVE BARRIER, BOND BREAK, DRAINAGE, AND VENTILATION REQUIREMENTS FOR EXTERIOR PLASTER (STUCCO)

CLIMATE ZONE	<u>WATER-</u> RESISTIVE BARRER	<u>BOND BREAK</u> MATERIAL LAYER	<u>DRAINAGE</u> SPACE	<u>VENTILATED</u> DRAINAGE SPACE	
APPLICATION: Stucco over a	any substrate other	than wood-based she	eathing		
All Climate Zones	Required	Not Required	<u>Not</u> Required	Not Required	
APPLICATION: Stucco over wood-based sheathing					
<u>Dry (B)</u>	<u>Required^a</u>	<u>Required</u>	<u>Not</u> Required	Not Required	
Moist (A) and Marine (C), Except Warm-Humid	<u>Required^b</u>	Required	<u>Required^c</u>	Not Required	
Warm-Humid	<u>Required^b</u>	Required	<u>Required</u> d,e		

<u>a. Water-resistive barrier complying with Section R703.2 shall be 10-minute Grade D paper or have a water-resistance equal to or greater than one layer of water-resistive barrier complying with ADTM E2556, Type I.</u>

b. Water-resistive barrier complying with Section R703.2 shall be 60-min Grade D paper or have a waterresistance equal to or greater than one layer of water-resistive barrier complying with ADTM E2556, Type II.

<u>c. A minimum 1/8-inch (3.2 mm) draining space or have a minimum drainage efficiency of 90% as measured in accordance with ASTM E2273 or Annex A2 of ASTM E2925.</u>
d. A minimum 3/16-inch (4.8 mm) ventilated drainage space and, where not a clear airspace, have a minimum drainage efficiency of 90% as measured in accordance with ASTM E2273 or Annex A2 of ASTM E2925.

e. Where foam plastic insulating sheathing complying with ASTM C578 or ASTM C1289 is located between the stucco and wood-based sheathing with a drainage space in accordance with footnote 'c', a ventilated drainage space is not required.

Add new definition as follows:

BOND BREAK. A substantially nonwater-absorbing layer placed directly behind stucco to prevent adhesion of the stucco to the surface of the water-resistive barrier, to serve as a protective layer over the water-resistive barrier, to provide a capillary break, and to promote drainage.

DRAINAGE SPACE. A separation between cladding and the surface of a water-resistive barrier created by a furred gap, channels, a porous material or matrix, or by other means to provide drainage of water downward to an outlet.

VENTILATED DRAINAGE SPACE. A drainage space that further incorporates the capability to allow outdoor air flow into and back out of the space behind cladding, usually by way of high and low vent inlets and outlets or by way of an air permeable, vented, cladding.

Add new text as follows:

ASTM

ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

ASTM E2925-17: Standard Specification for Manufactured Polymeric Drainage and Ventilation Materials Used to Provide a Rainscreen Function

ASTM

ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

<u>E2556/E2556M—10: Standard Specification for Vapor Permeable Flexible Sheet Water-resistive Barriers</u> Intended for Mechanical Attachment

Reason: The current minimum requirements for stucco installation over wood-based sheathing are confusing and also problematic in that they are predominantly aimed at practices that have been successful mainly in drying climates. In more moist climates, these minimum stucco installation requirements, particularly in regard to the WRB layer and lack of sufficient drainage or ventilation, has resulted in or contributed to numerous moisture-related problems.

Given the above concerns, this proposal achieves the following:

1) First, it **re-formats** the provisions into an easy-to-use tabulated ("look up table) format as shown in proposed Table R703.7.3. This will make it much easier to identify the various installation practices (including those also currently permitted in the code).

2) Second, it **clarifes** much of the confusion or ambiguity in this section of code. This is done through definitions and terminology that reflect the primary purpose of various features or materials that are important to an overall

stucco installation and proper functioning of the WRB layer. This has also allowed the exception to be deleted since it is now incorporated more appropriately within the requirements of Table R703.7.3 (and footnote 'b') and the added definition of a "bond break" (replacing currently use of "nonwater absorbing layer" is consistent with the intent of the exception as explained in the reason statement to proposal S93-03/04 which brought the exception into the 2006 code).

3) Third, it provides **enhanced moisture control practices only where needed** for the moist (rainy) and hot/humid climates where rainwater management (drainage) and also ventilation (drying) or hygric redistribution become more important, particularly when used over wood-based sheathing. Thus, these provisions add the enhancements only where needed and only where stucco is used over wood sheathing which is susceptible to moisture (following the current approach to single-out special requirements for application over wood-based sheathing). It does not change requirements where stucco has been performing successfully for decades.

4) Finally, this proposal provides for **flexibility** in meeting the requirements, including both prescriptive and performance requirements for drainage and ventilation in the footnotes. And, these requirements are consistent with a wide selection of suitable materials currently being used and relies on available (and widely used) consensus standards for measuring performance of those materials or alternatives.

Cost Impact: The code change proposal will increase the cost of construction

This proposal will not increase cost for stucco installation over substrates other than wood-based sheathing. Also, it will not impact cost or change requirements in dry climates where the minimum stucco installation over wood-based sheathing has a very successful performance record. Even where enhanced practices (drainage or ventilation) are required, this will impact cost only where they are not already being used to control risk of moisture damage. For those installations not already using these enhanced provisions in moist/rainy/humid climates, this proposal will likely reduce long term costs to builders and home owners because it will reduce risk of moisture problems and improve durability.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM E2925-17, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

The referenced standard, ASTM E2556-10, is currently referenced in other 2018 I-codes.

Proposal # 4526

RB246-19

RB247-19

IRC®: R703.8.4

Proponent: Ralph Leyva, APA- The Engineered Wood Assoc, representing APA- The Engineered Wood Assoc (ralph.leyva@apawood.org); Borjen Yeh, representing APA - The Engineered Wood Association (borjen.yeh@apawood.org)

2018 International Residential Code

Revise as follows:

R703.8.4 Anchorage. Masonry veneer shall be anchored <u>directly</u> to the supporting wall studs with corrosion-resistant metal ties embedded in mortar or grout and extending into the veneer a minimum of $1^{1/2}$ inches (38 mm), with not less than 5_{8} -inch (15.9 mm) mortar or grout cover to outside face. Masonry veneer shall conform to Table R703.8.4(1). For Where the masonry veneer tie attachment is fastened directly to wood structural panel not less than 7/16 performance category through insulating sheathing not greater than 2 inches (51 mm) in thickness to not less than 7/16 performance category wood structural panel, see Table R703.8.4(2). Where Table R703.8.4(2) is used, attachment to the wood studs behind the sheathing is not required.

Reason: This is a non-technical change. It clarifies the code making it easier to use and enforce, and making it more clearly conveys the two separate anchorage requirements -- one directly to the studs and one directly to wood structural panel sheathing.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal calrifies the code and will not increase the cost of construction.

Proposal # 4695

RB247-19

RB248-19

IRC®: TABLE R703.8.4(1)

Proponent: Charles Clark Jr, Brick Industry Association, representing Brick Industry Association (cclark@bia.org)

2018 International Residential Code

Revise as follows:

BACKING AND TIE	MINIMUM TIE	MINIMUM TIE FASTENER ^a	AIRSP	ACE ^{e_b}
Wood stud backing with corrugated sheet metal	22 U.S. gage(0.0299 in.) × ⁷ / ₈ in. wide	8d common nail ⁺ _c (2 ¹ / ₂ in. × 0.131 in.)	Nominal 1 in. be and v	tween sheathing eneer
Wood stud backing with <u>adjustable</u> metal strand wire	W1.7 (No. 9 U.S. gage; 0.148 in. <u>dia</u>) with hook embedded in mortar joint_ ^d	8d common nail ⁺ <u>c</u> (2 ¹ / ₂ in. × 0.131 in.)	Minimum nominal 1 in. between backing and veneer	Maximum 4¹/<u>2</u>4⁵ /<u>8</u> in. between backing and veneer
<u>Wood stud backing</u> with adjustable metal strand wire	<u>W2.8 (0.187 in. dia.)</u> with hook embedded in mortar joint ^{e.f}	<u>8d common nail ^c (2¹/₂ in. x 0.131 in.)</u>	<u>Greater than 4⁵/8</u> in. between backing and veneer	<u>Maximum 6⁵/8</u> 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.) 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 sheathingand veneer	Maximum $4^{4}/_{2}$ $4^{5}/_{8}$ in. between backing and veneer
<u>Cold-formed steel</u> <u>stud backing with</u> <u>adjustable meta</u> l <u>strand wire</u>	<u>W2.8 (0.187 in. dia.)</u> with hook embedded in mortar joint ^{e.f}	No. 10 screw extending through the steel framing a minimum of three exposed threads	<u>Greater than 4⁵/₈ in. between backing and veneer</u>	<u>Maximum 6⁵/₈ in. between backing and veneer</u>

TABLE R703.8.4(1)TIE ATTACHMENT AND AIRSPACE REQUIREMENTS

b. <u>a.</u> 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.

e. <u>b.</u> 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.

a. <u>c</u>. In Seismic Design Category D0, D_1 or D_2 , the minimum tie fastener shall be an 8d ring-shank nail (2 $\frac{1}{2}$ in. x 0.131 in.) or a No. 10 screw extending through the steel framing a minimum of three exposed threads.

d. Adjustable tie pintle shall include a minimum of 1 pintle leg of wire size W2.8 (MW18) with a maximum offset of 1-1/4 in.

e. Adjustable tie pintle shall include a minimum of 2 pintle legs with a maximum offset of 1-1/4 in. Distance between inside face of brick and end of pintle shall be a maximum of 2 in.

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f. Adjustable tie backing attachment components shall consist of one of the following: eyes with minimum wire W2.8 (MW18), barrel with minimum 1/4 in. outside dia., or plate with minimum thickness of 0.074 in. and minimum width of 1-1/4 in.

Reason: This code change proposal allows larger airspaces to be constructed between masonry veneer and backing. Larger airspaces are necessary in order to accommodate thicker continuous insulation which may be needed in colder climate zones.

If adopted, the tie and airspace provisions of the IRC would match those required by the IBC through reference to the anchored masonry veneer provisions of TMS 402 Building Code Requirements for Masonry Structures. As such, they would allow masonry veneer with airspaces up to a maximum of 4-5/8 in. to be constructed using the traditional tie configurations already in the existing IRC table. They would also allow masonry veneer with airspaces greater than 4-5/8 in. up to a maximum of 6-5/8 in. to be constructed using stiffer tie configurations.

This code change proposal also adjusts the existing footnotes in the table (Footnotes a, b and c). For the footnote addressing Seismic Design Category D0, D1 or D2, there is no need to include No. 10 screws as they are already required for all cold-formed steel framing. Footnotes addressing rust-inhibitive coating and construction mortar are moved to more appropriate locations.

Cost Impact: The code change proposal will increase the cost of construction

This code change proposal WILL NOT increase the cost of constructing masonry veneer with an airspace of 4-1/2 in. or smaller as currently allowed by the exsiting code provision. Rather, it allows the construction of masonry veneer with an airspace larger than 4-1/2 in. to a maximum of 6-5/8 in. However, masonry veneer with an airpace greater than 4-5/8 in. will be more expensive than veneer with an airspace of 4-5/8 in. or less because stiffer ties are required to span the larger airspace.

Proposal # 5503

RB248-19

RB249-19

IRC®: R703.11.2, TABLE R703.11.2

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Residential Code

Revise as follows:

R703.11.2 Installation over foam plastic sheathing. Where vinyl siding or insulated vinyl siding is installed over foam plastic sheathing, the vinyl siding shall comply with Section R703.11 and shall have a <u>wind load</u> design wind pressure resistance rating in accordance with Table R703.11.2.

Exceptions:

- 1. Where the foam plastic sheathing is applied directly over wood structural panels, fiberboard, gypsum sheathing or other *approved* backing capable of independently resisting the design wind pressure, the vinyl siding shall be installed in accordance with Sections R703.3.3 and R703.11.1.
- 2. Where the vinyl siding manufacturer's product specifications provide an approved <u>wind load</u> design wind pressure rating for installation over foam plastic sheathing, use of this <u>wind load</u> design wind pressure rating shall be permitted and the siding shall be installed in accordance with the *manufacturer's installation 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.

TABLE R703.11.2

ADJUSTED REQUIRED MINIMUM WIND LOAD DESIGN WIND PRESSURE REQUIREMENT RATING FOR VINYL SIDING INSTALLED OVER FOAM PLASTIC SHEATHING ALONE

	ADJUSTED MINIMUM DESIGN WIND PRESSURE (ASD) (PSF) ^{a, b}												
	Case 1:	With interi wallboard	or gypsum J ^c	Case 2:	Without inter wallboard ^o	ior gypsum :							
		Exposur	e		Exposure								
	В	С	D	В	С	D							
<u><=95</u>	-30.0	<u>-33.2</u>	-39.4	<u>-33.9</u>	-47.4	<u>-56.2</u>							
100	-30.0	<u>-36.8</u>	<u>-43.6</u>	<u>-37.2</u>	<u>-52.5</u>	<u>-62.2</u>							
105	-30.0	<u>-40.5</u>	-48.1	-41.4	<u>-57.9</u>	<u>-68.6</u>							
	-44.0	-61.6	-73.1	-62.9	-88.1	-104.4							
110													
	<u>-31.8</u>	<u>-44.5</u>	<u>-52.8</u>	<u>-45.4</u>	<u>-63.5</u>	<u>-75.3</u>							
	-49.2	-68.9	-81.7	-70.3	-98.4	-116.7							
115													
	<u>-35.5</u>	<u>-49.7</u>	<u>-59.0</u>	<u>-50.7</u>	<u>-71.0</u>	<u>-84.2</u>							

	-51.8	-72.5	-86.0	-74.0	-103.6	-122.8						
120	<u>-37.4</u> <u>-52.4</u> <u>-62.1</u>		<u>-62.1</u>	<u>-53.4</u>	<u>-74.8</u>	<u>-88.6</u>						
	-62.2	-87.0	-103.2	-88.8	-124.3	<u>-147.4</u>						
130												
	<u>-44.9</u>	<u>-62.8</u>	<u>-74.5</u>	<u>-64.1</u>	<u>-89.7</u>	<u>-106</u>						
> 130	Not Allowed ^d											

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 square foot = 0.0929 m^2 , 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa.

a. Linear interpolation is permitted.

b. 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 <u>component and cladding</u> wind pressure from Table R301.2(2), <u>adjusted for exposure in accordance with Table R301.2(3)</u>, multiplied by the following adjustment factors: 2.6 <u>1.87</u> (Case 1) and 3.7 <u>2.67</u> (Case 2) for wind speeds less than 130 mph and 3.7 (Case 2) for wind speeds greater than 130 mph.

c. Gypsum wallboard, gypsum panel product or equivalent.

d. For the indicated wind speed condition,<u>vinyl siding over</u> foam sheathing, only 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 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.

Reason: The main purpose of this proposal is to update Table R70311.2 to ensure that the adjusted vinyl siding design wind pressure ratings are based on updated standard for vinyl siding (ASTM D3679) which has changed the pressure equalization factor from 0.36 to 0.5 for design wind pressure rating of vinyl siding. Because the pressure equalization factor in ASTM D3679 is now more conservative (changed to 0.5 from 0.36), the adjustment for applications over foam sheathing are adjusted downward accordingly by multiplying existing table values by 0.36/0.5 = 0.72. This will ensure that the intended level of performance is maintained with use of newer vinyl siding products complying with ASTM D3679 as required by the code. Also, the design components and cladding wind pressures for walls (which the adjusted values in Table R703.11.2 are based) remain consistent with the newer ASCE 7-16 standard. The proposal also coordinates "wind load design pressure rating" with terminology as used in ASTM D3679.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposal only updates to correlate with the newer ASTM D3679 standard. Because the adjustments are relative to that standard, there is no difference in cost of vinyl siding specified for use over foam sheathing.

Proposal # 4527

RB249-19

RB250-19

IRC®: R703.14, R703.14.2, R703.14.3

Proponent: Matthew Dobson, Vinyl Siding Institute, representing Vinyl Siding Institue (mdobson@vinylsiding.org)

2018 International Residential Code

Revise as follows:

R703.14 Polypropylene siding. Polypropylene siding shall be certified and labeled as conforming to the requirements of ASTM D7254 , and those of Section R703.14.2 or Section R703.14.3, by an approved quality control agency._.

Delete without substitution:

R703.14.2 Fire separation. Polypropylene siding shall not be installed on walls with a fire separation distance of less than 5 feet (1524 mm) and walls closer than 10 feet (3048 mm) to a building on another lot.

Exception: Walls perpendicular to the line used to determine the fire separation distance.

R703.14.3 Flame spread index. The certification of the *flame spread index* shall be accompanied by a test report stating that all portions of the test specimen ahead of the flame front remained in position during the test in accordance with ASTM E84 or UL 723.

Reason: The requirements in sections R703.14.2 & 3, are unnecessary and unfair. Section R302 of the code deals with fire separation, specifically for high density settings. We feel these sections are erroneous for the following reasons:

- 1. 703.14.2 bans the use of polypropylene siding high density settings, yet the product can pass an ASTM E119 test which is the requirement in high density settings. The requirement also applies a 10 foot fire separation to buildings on another lot which may or may not be enforceable as there may be two property owners involved.
- 2. 703.14.3 provides that if you change how you conduct the flame spread test prescribed in the ASTM standard for polypropylene siding, it can be used in high density settings. Having changes to standard testing methods in the code is inappropriate. This issue has been ongoing in the ASTM realm for years, it not the place of the code to get in the middle of this issue. Further, there has been no shown direct correlation of how this specific change to the flame spread test impacts allowing the product's use in high density settings, especially when the long standing requirement has been the rated assembly test.

We have included as evidence a report which approves polypropylene siding use with an ASTM E119 rated assembly as required by the code and therefore could and should be allowed in high density settings.

The code should be fair in its approach and not single out one particular product without clear substantiated evidence. We ask these erroneous restrictions be removed and let the code regulate safely as it has done through section R302.

Cost Impact: The code change proposal will decrease the cost of construction This change could potentially reduce the cost by removing an additional unnecessary testing requirement.

Proposal # 5461

RB251-19

IRC®: TABLE R703.15.1

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Residential Code

Revise as follows:

TABLE R703.15.1

CLADDING MINIMUM FASTENING REQUIREMENTS FOR DIRECT ATTACHMENT OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT^a

Portions of table not shown remain unchanged.

			M FC	ЛА.) АГ
CLADDING FASTENERTHROUGHFOAMSHEATHING ^b	CLADDING FASTENERTYPE ANDMINIMUMSIZE	CLADDING FASTENERVERTICALSPACING(inches)	F	16 Fa: Ior Sp
	٦đ		(Cla Wo
			3	1.
			psf	p٩

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

DR = Design Required.

o.c. = On Center.

a. Wood framing shall be Spruce-pine-fir or any wood species with a specific gravity of 0.42 or greater in accordance with AWC NDS.

b. Where wood structural panels complying with the specific gravity requirement of Note 'a' are used, the fastener penetration depth into framing plus the thickness of the such panel shall be considered as satisfying the minimum penetration into framing. For cladding connections to wood structural panels, see Table R703.3.3.

b.c. Nail fasteners shall comply with ASTM F1667, except nail length shall be permitted to exceed ASTM F1667 standard lengths.

c. <u>d.</u> Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM C578 or ASTM C1289.

Reason: This footnote added to Table R703.15.1 is needed to coordinate with provisions in other parts of the code related to fastening through wood structural panels which addresses a very common "oversheathing" application of foam plastic insulating sheathing (continuous insulation).

Cost Impact: The code change proposal will decrease the cost of construction

The proposal will allow for slightly reduced fastener lengths while still satisfying minimum fastener penetration. It will also help reduce cost by referring to Table R703.3.3 which permits fastening directly to wood-structural panels of minimum required thickness to serve as a nail base. This will also simplify installation which can reduce cost.

Proposal # 4528

RB251-19

RB252-19

IRC: TABLE R703.15.1, TABLE R703.15.2, TABLE R703.16.1, TABLE R703.16.2

Proponent: Charles Clark Jr, representing Brick Industry Association (cclark@bia.org)

2018 International Residential Code

R703.15.1 Direct attachment. Where cladding is installed directly over foam sheathing without the use of furring, cladding minimum fastening requirements to support the cladding weight shall be as specified in Table R703.15.1.

Revise as follows:

TABLE R703.15.1

CLADDING MINIMUM FASTENING REQUIREMENTS FOR DIRECT ATTACHMENT OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT^a

CLADDING	CLADDING		MAXIMUM THICKNESS OF FOAM SHEATHING ^c (inches)												
CLADDING FASTENER THROUGH FOAM	CLADDING FASTENER TYPE AND MINIMUM	FASTENER VERTICAL SPACING	1 Ho	6″ o. orizor	c. Fa ntal S	stene paci	er ng	24" o.c. Fastener Horizontal Spacing							
SHEATHING	SIZE ^b		C	laddi	ng W	/eigh	t:	C	laddi	ing W	/eigh	t:			
		(incres)	3	11	<u>15</u>	18	25	3	11	<u>15</u>	18	25			
			psf	psf	<u>psf</u>	psf	psf	psf	psf	<u>psf</u>	psf	psf			
	0.113″	6	2.00	1.45	<u>1.00</u>	0.75	DR	2.00	0.85	<u>0.55</u>	DR	DR			
	0.113" diameternail	8	2.00	1.00	<u>0.65</u>	DR	DR	2.00	0.55	DR	DR	DR			
		12	2.00	0.55	DR	DR	DR	1.85	DR	DR	DR	DR			
	0.120″ -	6	3.00	1.70	<u>1.15</u>	0.90	0.55	3.00	1.05	<u>0.65</u>	0.50	DR			
		8	3.00	1.20	<u>0.80</u>	0.60	DR	3.00	0.70	<u>DR</u>	DR	DR			
Wood framing	diamotornali	12	3.00	0.70	<u>DR</u>	DR	DR	2.15	DR	<u>DR</u>	DR	DR			
penetration)	0.404″	6	4.00	2.15	1.50	1.20	0.75	4.00	1.35	0.90	0.70	DR			
, , , , , , , , , , , , , ,	0.131 diameternail	8	4.00	1.55	<u>1.05</u>	0.80	DR	4.00	0.90	<u>0.55</u>	DR	DR			
	diamotornali	12	4.00	0.90	<u>0.55</u>	DR	DR	2.70	0.50	<u>DR</u>	DR	DR			
	0.400″	6	4.00	3.55	<u>2.50</u>	2.05	1.40	4.00	2.25	<u>1.55</u>	1.25	0.80			
	0.162 diameternail	8	4.00	2.55	1.80	1.45	0.95	4.00	1.60	1.10	0.85	0.50			
	diameternail	12	4.00	1.60	<u>1.10</u>	0.85	0.50	4.00	0.95	0.60	DR	DR			

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

DR = Design Required.

- a. Wood framing shall be Spruce-pine-fir or any wood species with a specific gravity of 0.42 or greater in accordance with AWC NDS.
- b. Nail fasteners shall comply with ASTM F1667, except nail length shall be permitted to exceed

ASTM F1667 standard lengths.

c. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM C578 or ASTM C1289.

R703.15.2 Furred cladding attachment. Where wood furring is used to attach cladding over foam sheathing, furring minimum fastening requirements to support the cladding weight shall be as specified in Table R703.15.2. Where placed horizontally, wood furring shall be preservative-treated wood in accordance with Section R317.1 or naturally durable wood and fasteners shall be corrosion resistant in accordance Section R317.3.

Revise as follows:

TABLE R703.15.2

FURRING MINIMUM FASTENING REQUIREMENTS FOR APPLICATION OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT^{a, b}

		FASTENER	MINIMUM	FASTENER	MAXIMUM THICKNESS OF FOAM SHEATHING ^d (inches)											
FURRING	FRAMING	TYPE AND	PENETRATION		16″ o.c. Furring ^e					24″ o.c. Furring ^e						
MATERIAL	MEMBER	MINIMUM	FRAMING	FURRING	Siding Weight:					Siding Weight:						
		SIZE	(inches)	(inches)	3	11	<u>15</u>	18	25	3	11	<u>15</u>	18			
					psf	psf	<u>psf</u>	psf	psf	psf	psf	<u>psf</u>	psf	Ķ		
		0 101″		8	4.00	2.45	1.75	1.45	0.95	4.00	1.60	1.10	0.85]		
		diameternail	1 ¹ /4	12	4.00	1.60	<u>1.10</u>	0.85	DR	4.00	0.95	<u>0.55</u>	DR	I		
				16	4.00	1.10	<u>0.70</u>	DR	DR	3.05	0.60	<u>DR</u>	DR]		
	-	0.162″ diameternail	1 ¹ / ₄	8	4.00	4.00	<u>3.05</u>	2.45	1.60	4.00	2.75	<u>1.85</u>	1.45	0		
				12	4.00	2.75	1.85	1.45	0.85	4.00	1.65	1.05	0.75	Ι		
Minimum 1 v wood	Minimum			16	4.00	1.90	<u>1.25</u>	0.95	DR	4.00	1.05	<u>0.60</u>	DR	I		
furring ^c	∠× woodstud	No. 10		12	4.00	2.30	<u>1.60</u>	1.20	0.70	4.00	1.40	<u>0.85</u>	0.60	1		
5		woodscrew	1	16	4.00	1.65	<u>1.05</u>	0.75	DR	4.00	0.90	<u>DR</u>	DR	Ι		
		noodooron		24	4.00	0.90	<u>DR</u>	DR	DR	2.85	DR	DF	DR	Ι		
		1/ // 10 0		12	4.00	2.65	<u>1.90</u>	1.50	0.90	4.00	1.65	<u>1.05</u>	0.80	1		
		¹ / ₄ ″ lag screw	1 ¹ /2	16	4.00	1.95	<u>1.25</u>	0.95	0.50	4.00	1.10	<u>0.65</u>	DR	Ī		
		screw		24	4.00	1.10	<u>0.65</u>	DR	DR	3.25	0.50	<u>DR</u>	DR]		

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

DR = Design Required.

- a. Wood framing and furring shall be Spruce-pine-fir or any wood species with a specific gravity of 0.42 or greater in accordance with AWC NDS.
- b. Nail fasteners shall comply with ASTM F1667, except nail length shall be permitted to exceed ASTM F1667 standard lengths.
- c. Where the required cladding fastener penetration into wood material exceeds 3/4 inch and is not more than $1^{1}/2$ inches, a minimum 2× wood furring or an approved design shall be used.
- d. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM

C578 or ASTM C1289.

e. Furring shall be spaced not more than 24 inches on center, in a vertical or horizontal orientation. In a vertical orientation, furring shall be located over wall studs and attached with the required fastener spacing. In a horizontal orientation, the indicated 8-inch and 12-inch fastener spacing in furring shall be achieved by use of two fasteners into studs at 16 inches and 24 inches on center, respectively.

R703.16.1 Direct attachment. Where cladding is installed directly over foam sheathing without the use of furring, cladding minimum fastening requirements to support the cladding weight shall be as specified in Table R703.16.1.

Revise as follows:

TABLE R703.16.1CLADDING MINIMUM FASTENING REQUIREMENTS FOR DIRECT ATTACHMENT OVER FOAM PLASTICSHEATHING TO SUPPORT CLADDING WEIGHT^a

CLADDING		CLADDING	MAXIMUM THICKNESS OF FOAM SHEATHING ^c (inches)												
CLADDING FASTENER	FASTENER TYPE AND	FASTENER VERTICAL SPACING	1 Ho	6″ o. orizor	c. Fa ntal S	stene paci	er ng	24" o.c. Fastener Horizontal Spacing							
SHEATHING INTO:			Cladding Weight:					С	laddi	ng W	/eigh	t:			
		(inches)	3	11	<u>15</u>	18	25	3	11	<u>15</u>	18	25			
			psf	psf	<u>psf</u>	psf	psf	psf	psf	<u>psf</u>	psf	psf			
	No. 8 screw into	6	3.00	2.95	<u>2.50</u>	2.20	1.45	3.00	2.35	<u>1.75</u>	1.25	DR			
	33-mil steelor thicker	8	3.00	2.55	2.00	1.60	0.60	3.00	1.80	<u>0.90</u>	DR	DR			
Steel framing		12	3.00	1.80	<u>0.95</u>	DR	DR	3.00	0.65	DR	DR	DR			
(minimum		6	4.00	3.50	<u>3.05</u>	2.70	1.95	4.00	2.90	<u>2.20</u>	1.70	0.55			
penetrationof steel	into-33 mil steel	8	4.00	3.10	<u>2.50</u>	2.05	1.00	4.00	2.25	<u>1.35</u>	0.70	DR			
thickness + 3threads)		12	4.00	2.25	1.35	0.70	DR	3.70	1.05	DR	DR	DR			
	No. 10 screw into	6	4.00	4.00	4.00	4.00	3.60	4.00	4.00	<u>3.80</u>	3.45	2.70			
	43-mil steelor	8	4.00	4.00	4.00	3.70	3.00	4.00	3.85	<u>3.25</u>	2.80	1.80			
	thicker	12	4.00	3.85	<u>3.25</u>	2.80	1.80	4.00	3.05	<u>2.15</u>	1.50	DR			

For SI: 1 inch = 25.4 mm, 1 mil = 0.0254 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

DR = Design Required.

- a. Steel framing shall be minimum 33 ksi steel for 33 mil and 43 mil steel, and 50 ksi steel for 54 mil steel or thicker.
- b. Screws shall comply with the requirements of ASTM C1513.
- c. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM C578 or ASTM C1289.

R703.16.2 Furred cladding attachment. Where steel or wood furring is used to attach cladding over foam sheathing, furring minimum fastening requirements to support the cladding weight shall be as specified in Table R703.16.2. Where placed horizontally, wood furring shall be preservative-treated wood in accordance with Section R317.1 or naturally durable wood and fasteners shall be corrosion resistant in accordance with Section R317.3. Steel furring shall have a minimum G60 galvanized coating.

Revise as follows:

TABLE R703.16.2

FURRING MINIMUM FASTENING REQUIREMENTS FOR APPLICATION OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT^a

		FASTENER	MINIMUM	FASTENER		M	AXIM S	UM T HEA1	HICK THING	(NES G ^d (in	S OF ches	FOAI)	М		
FURRING	FRAMING	TYPE AND	PENETRATION	SPACING	1	6″ o.	c. Fu	rring	е	24″ o.c. Furring ^e					
MATERIAL	MEMBER	MINIMUM	FRAMING	FURRING	C	Cladding Weight:					Cladding Weight:				
		SIZE	(inches)	(inches)	3	11	<u>15</u>	18	25	3	11	<u>15</u>	18	;	
					psf	psf	<u>psf</u>	psf	psf	psf	psf	<u>psf</u>	psf	Ķ	
			Staal thickness	12	3.00	1.80	<u>0.95</u>	DR	DR	3.00	0.65	<u>DR</u>	DR	I	
		No. 8 screw	+ 3threads	16	3.00	1.00	<u>DR</u>	DR	DR	2.85	DR	<u>DR</u>	DR	I	
Minimum	33-milsteel stud			24	2.85	DR	DR	DR	DR	2.20	DR	DR	DR	I	
		No. 10	Steel thickness	12	4.00	2.25	1.35	0.70	DR	3.70	1.05	<u>DR</u>	DR	I	
33-mil steel				16	3.85	1.45	<u>DR</u>	DR	DR	3.40	DR	<u>DR</u>	DR	I	
furring or		001011	1 othioddo	24	3.40	DR	<u>DR</u>	DR	DR	2.70	DR	<u>DR</u>	DR	I	
minimum		N ₂ 0		12	3.00	1.80	<u>2.00</u>	DR	DR	3.00	0.65	<u>DR</u>	DR	I	
1× WOOd		NO. 8 Screw	+ 3threads	16	3.00	1.00	1.30	DR	DR	2.85	DR	<u>DR</u>	DR	I	
lunnig	43-milor	001011	1 othioddo	24	2.85	DR	<u>DR</u>	DR	DR	2.20	DR	<u>DR</u>	DR	I	
	stud			12	4.00	3.85	<u>3.25</u>	2.80	1.80	4.00	3.05	<u>2.15</u>	1.50	I	
	stud	No. 10 S	Steel thickness	16	4.00	3.30	<u>2.55</u>	1.95	0.60	4.00	2.25	1.05	DR	I	
		screw		24	4.00	2.25	1.05	DR	DR	4.00	0.65	<u>DR</u>	DR	1	

For SI: 1 inch = 25.4 mm, 1 mil = 0.0254 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

DR = Design Required.

- a. Wood furring shall be Spruce-pine-fir or any softwood species with a specific gravity of 0.42 or greater. Steel furring shall be minimum 33-ksi steel. Steel studs shall be minimum 33-ksi steel for 33-mil and 43-mil thickness, and 50-ksi steel for 54-mil steel or thicker.
- b. Screws shall comply with the requirements of ASTM C1513.
- c. Where the required cladding fastener penetration into wood material exceeds $^{3}/_{4}$ inch and is not more than $1^{1}/_{2}$ inches, a minimum 2-inch nominal wood furring or an approved design shall be used.
- d. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM C578 or ASTM C1289.

e. Furring shall be spaced not more than 24 inches (610 mm) on center, in a vertical or horizontal orientation. In a vertical orientation, furring shall be located over wall studs and attached with the required fastener spacing. In a horizontal orientation, the indicated 8-inch and 12-inch fastener spacing in furring shall be achieved by use of two fasteners into studs at 16 inches and 24 inches on center, respectively.

Reason: This code change proposal adds a 15 psf column option to the cladding over foam plastic sheathing tables. This is the weight usually associated with adhered masonry veneer applied using a traditional lath and scratch coat. The thicknesses in the proposed 15 psf columns were developed using the same analysis that was used for developing the original tables.

Cost Impact: The code change proposal will decrease the cost of construction This code change proposal decreases the cost of hiring an engineer to determine the size and spacing of fasteners for a 15 psf cladding directly attached over foam sheathing.

Proposal # 5609

RB252-19

RB253-19

IRC®: TABLE R703.15.2

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Residential Code

Revise as follows:

TABLE R703.15.2FURRING MINIMUM FASTENING REQUIREMENTS FOR APPLICATION OVER FOAM PLASTIC SHEATHING
TO SUPPORT CLADDING WEIGHT^{a, b}

					М	AXIM S	UM 1 HEAT	THICK THINC		
FURRING MATERIAL	FRAMING FASTENER TYPE MEMBER ANDMINIMUMSIZE WALLFRAMING(inches			FASTENER SPACING INFURRING(inches)	16″ o.c. Furring e1					
					Siding Weig			ght:		
					3 psf	11 psf	18 psf	25 psf		
				8	4.00	2.45	1.45	0.95		
		0.131″ diameternail	1 ¹ /4	12	4.00	1.60	0.85	DR		
	_			16	4.00	1.10	DR	DR		
				8	4.00	4.00	2.45	1.60		
		0.162″ diameternail	1 ¹ /4	12	4.00	2.75	1.45	0.85		
Minimum	Minimum			16	4.00	1.90	0.95	DR		
furring ^{e_d}	woodstud			12	4.00	2.30	1.20	0.70		
5		No.10 woodscrew	1	16	4.00	1.65	0.75	DR		
				24	4.00	0.90	DR	DR		
				12	4.00	2.65	1.50	0.90		
		¹ /4" lag screw	1 ¹ /2	16	4.00	1.95	0.95	0.50		
				24	4.00	1.10	DR	DR		

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

DR = Design Required.

- a. Wood framing and furring shall be Spruce-pine-fir or any wood species with a specific gravity of 0.42 or greater in accordance with AWC NDS.
- b. Nail fasteners shall comply with ASTM F1667, except nail length shall be permitted to exceed ASTM F1667 standard lengths.
- c. Where wood structural panels complying with the specific gravity requirement of Note 'a' are

used, the fastener penetration depth into framing plus the thickness of the such panel shall be considered as satisfying the minimum penetration into framing.

- d. Where the required cladding fastener penetration into wood material exceeds $^{3}/_{4}$ inch and is not more than $1^{1}/_{2}$ inches, a minimum 2× wood furring or an approved design shall be used.
- e. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM C578 or ASTM C1289.
- f. Furring shall be spaced not more than 24 inches on center, in a vertical or horizontal orientation. In a vertical orientation, furring shall be located over wall studs and attached with the required fastener spacing. In a horizontal orientation, the indicated 8-inch and 12-inch fastener spacing in furring shall be achieved by use of two fasteners into studs at 16 inches and 24 inches on center, respectively.

Reason: This footnote added to Table R703.15.2 is needed to allow for thickness of wood structural panels to count toward the required fastener penetration into framing.

Cost Impact: The code change proposal will decrease the cost of construction The proposal will allow for slightly reduced fastener lengths while still satisfying minimum fastener penetration.

Proposal # 4529

RB253-19

RB254-19

IRC®: TABLE R703.16.1

Proponent: Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council

2018 International Residential Code

Revise as follows:

TABLE R703.16.1

CLADDING MINIMUM FASTENING REQUIREMENTS FOR DIRECT ATTACHMENT OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT^{a, b}

			MAXIMUM THICKNESS OF FOAM SHEATHING ^{e_d} (inches)										
CLADDING FASTENER THROUGH FOAMSHEATHING	CLADDING FASTENER TYPE AND	CLADDING FASTENER VERTICAL	16″	o.c. Horiz Spa	Faste ontal cing	ener I	24" o.c. Fastener Horizontal Spacing						
INTO:	MINIMUMSIZE ^b <u>c</u>	SPACING(inches)		dding	y Wei	ght:	Clac	dding	Wei	ght:			
			3	11	18	25	3	11	18	25			
			psf	psf	psf	psf	psf	psf	psf	psf			
		6	3.00	2.95	2.20	1.45	3.00	2.35	1.25	DR			
	no. 8 screw into 33- mil steelor thicker	8	3.00	2.55	1.60	0.60	3.00	1.80	DR	DR			
		12	3.00	1.80	DR	DR	3.00	0.65	DR	DR			
Steel framing (minimum		6	4.00	3.50	2.70	1.95	4.00	2.90	1.70	0.55			
penetrationof steel	No. 10 screw into-33 mil steel	8	4.00	3.10	2.05	1.00	4.00	2.25	0.70	DR			
thickness + 3threads)		12	4.00	2.25	0.70	DR	3.70	1.05	DR	DR			
	No. 10 screw into 43-mil steelor	6	4.00	4.00	4.00	3.60	4.00	4.00	3.45	2.70			
		8	4.00	4.00	3.70	3.00	4.00	3.85	2.80	1.80			
	thicker	12	4.00	3.85	2.80	1.80	4.00	3.05	1.50	DR			

For SI: 1 inch = 25.4 mm, 1 mil = 0.0254 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

DR = Design Required.

o.c. = On Center.

a. Steel framing shall be minimum 33 ksi steel for 33 mil and 43 mil steel, and 50 ksi steel for 54 mil steel or thicker.

b. Where cladding is attached to wood structural panel sheathing only, fastening requirements shall be in accordance with Table R703.3.3.

b. c. Screws shall comply with the requirements of ASTM C1513.

e.<u>d.</u> Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM C578 or ASTM C1289.

Reason: This footnote added to Table R703.16.1 is needed to coordinate with provisions in other parts of the code related to fastening through wood structural panels which addresses a very common "oversheathing" application of foam plastic insulating sheathing (continuous insulation).

Cost Impact: The code change proposal will decrease the cost of construction

The proposal will help reduce cost by referring to Table R703.3.3 which permits fastening directly to woodstructural panels of minimum required thickness to serve as a nail base. This will also simplify installation which can reduce cost.

Proposal # 4530

RB255-19

IRC®: R802.1.5

Proponent: Marcelo Hirschler, GBH International, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Revise as follows:

R802.1.5 Fire-retardant-treated wood. Fire-retardant-treated wood (FRTW) is any wood product that, when impregnated with chemicals by a pressure process or other means during manufacture, shall have, when tested in accordance with ASTM E84 or UL 723, a listed flame spread index of 25 or less and does not show evidence of significant progressive combustion where the test is. <u>In addition, the ASTM E84 or UL 723 test shall be</u> continued for an additional 20-minutes . In addition, and the flame front shall not progress more than 10.5 feet (3200 mm) beyond the center line of the burners at any time during the <u>extended 30-minute</u> test.

Reason: This proposal addresses the incorrect double requirement for testing to both flame front progress and no significant progressive combustion in the extended ASTM E84 test.

This issue has been under discussion for many years at the ICC codes, as well as at ASTM and at NFPA, but can now be resolved in the IRC code. The ASTM E5 committee, responsible for ASTM E84, has now, for the first time, accepted incorporating requirements for conducting a 30 minute test. Until this change ASTM E84 did not contain any information other than that it is a 10 minute test. Consequently, until this change ASTM E84 did not provide any details on how to assess either "no evidence of significant progressive combustion" or "the flame front shall not progress more than 101/2 feet (3200 mm) beyond the centerline of the burners". The information for how to determine both of those characteristics is contained in ASTM E2768. The committee agreed that the next edition of ASTM E84 will state that a 30 minute test is to be conducted per ASTM E2768. In turn, ASTM E2768 explains that "no significant progressive combustion" is evidenced by lack of flame front progress beyond 10 1/2 feet. In fact ASTM E2768 states: "The flame front shall not progress more than 10.5 ft (3.2 m) beyond the centerline of the burners at any time during the 30 min test period. This is considered evidence of no significant progressive combustion in this test method." This IBC proposal incorporates the requirements from the ASTM E84 test into the IBC and ensures that the code does not require a duplicate (and confusing) measurement.

It is likely that information will be presented stating that "no significant progressive combustion" has been in the code since the legacy codes and that the flame front progress requirement was added later. That is exactly the reason that ASTM E2768 was developed to ensure that everyone understands what is to be measured, and that is what the testing laboratories have been doing for many years now.

This change appears to alter requirements but in fact simply recognizes what the ASTM E84 standard states and what the labs are doing (and have been doing for years) and, therefore, is really clarification.

The ASTM E05 committee agreed on actions at the December 2018 meeting so that the language in ASTM E84 reads:

1. Scope

1.1 This fire-test-response standard for the comparative surface burning behavior of building materials is applicable to exposed surfaces such as walls and ceilings. The test is conducted with the specimen in the ceiling position with the surface to be evaluated exposed face down to the ignition source. The material, product, or assembly shall be capable of being mounted in the test position during the test. Thus, the specimen shall either be self-supporting by its own structural quality, held in place by added supports along the test surface, or

secured from the back side.

1.2 Test Method E84 is a 10-minute fire-test response method. The following standards address testing of materials in accordance with test methods that are applications or variations of the test method or apparatus used for Test Method E84:

1.2.1 Materials required by the user to meet an extended 30-min duration tunnel test shall be tested per Test Method E2768.

1.2.2 Wires and cables for use in air-handling spaces shall be tested per NFPA 262.

1.2.3 Pneumatic tubing for control systems shall be tested per UL 1820.

1.2.4 Combustible sprinkler piping shall be tested per UL 1887.

1.2.5 Optical fiber and communications raceways for use in air handling spaces shall be tested per UL 2024.

1.3 The purpose of this test method is to determine the relative burning behavior of the material by observing the flame spread along the specimen. Flame spread and smoke developed index are reported. However, there is not necessarily a relationship between these two measurements.

1.4 The use of supporting materials on the underside of the test specimen has the ability to lower the flame spread index from those which might be obtained if the specimen could be tested without such support. These test results do not necessarily relate to indices obtained by testing materials without such support.

1.5 Testing of materials that melt, drip, or delaminate to such a degree that the continuity of the flame front is destroyed, results in low flame spread indices that do not relate directly to indices obtained by testing materials that remain in place.

1.6 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.7 The text of this standard references notes and footnotes that provide explanatory information. These notes and footnotes, excluding those in tables and figures, shall not be considered as requirements of the standard.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This simply recognizes what the fire test labs have ben doing for many years. When they conduct the "extended ASTM E84 test" they assess two criteria: a flame spread index of 25 and a flame front that does not progress more than 10.5 ft (3.2 m) beyond the centerline of the burners.

Proposal # 5094

RB255-19

RB256-19

IRC®: R802.1.5.2

Proponent: Marcelo Hirschler, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Revise as follows:

R802.1.5.2 Other means during manufacture. For wood products produced impregnated with chemicals by other means during manufacture, the treatment shall be an integral part of the manufacturing process of the wood product. The treatment shall provide permanent protection to all surfaces of the wood product. The use of paints, coatings, stains or other surface treatments is not an approved method of protection as required in this section.

Reason: This proposal corrects the language of the section by making it identical to the language of the corresponding section of the IBC. The proposal makes two changes:

1. It incorporates the words "impregnated with chemicals" into the first sentence, which makes it consistent with the code section above that says that the pressure treatment process must provide impregnation with chemicals.

2. It adds a sentence pointing out that coatings are not permitted as a way of generating fire retardant treated wood.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This is clarification, consistent with the IBC and with the section above.

Proposal # 5096

RB256-19

RB257-19

IRC®: R802.1.5.2

Proponent: Manny Muniz, representing Representing self (Mannymuniz.mm@gmail.com)

2018 International Residential Code

Revise as follows:

R802.1.5.2 Other means during manufacture. For wood products produced impregnated with chemicals by other means during manufacture, the treatment shall be an integral part of the manufacturing process of the wood product. The treatment shall provide permanent protection to all surfaces of the wood product. The use of paints, coating, stains or other surface treatments is not an approved method of protection as required by this section.

Reason: The proposed code language has already been approved in the IBC and appears in the 2018 International Building Code, Section 2303.2.2. Clarification is made that regardless of the other means used during manufacture, fire-retardant-treated wood must be impregnated with chemicals per the definition of fireretardant-treated wood in Chapter 2. During the IBC committee hearings, the State Fire Marshal of California, a committee member, identified this code change as being a necessary clarification as California had experienced numerous problems with coated wood products pretending to be fire-retardant-treated wood. The language in the last sentence was derived from the California codes.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code change proposal will not increase or decrease the cost of construction.

Proposal # 5590

RB257-19

RB258-19

IRC: R802.1.5.3, 802.1.5.3.1 (New)

Proponent: Marcelo Hirschler, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Revise as follows:

R802.1.5.3 Testing. For wood products produced by other means during manufacture, other than a pressure process, all sides fire retardant treated wood products the front and back faces of the wood product shall be tested in accordance with and produce the results required in Section R802.1.5. Testing of only the front and back faces of wood structural panels shall be permitted.

Add new text as follows:

R802.1.5.3.1 Fire testing of wood structural panels. Wood structural panels shall be tested with a ripped or cut longitudinal gap of 1/8 inch (3.2 mm).

Reason: Note that the sections above require that fire retardant treated wood be "impregnated with chemicals" and provide permanent protection. That requirement applies to all FRTW products, whether produced by a pressure process or produced by other means during manufacture. IBC Section 2303.2.2 (and the proposed revision to R802.1.5.2, for consistency) is also explicit in stating that the use of paints or coatings is not an approved method to comply with this section. This proposal thus eliminates the requirement to test a particular type of fire retardant treated wood on "all sides", since the testing is never actually conducted on all sides (as pointed out often by multiple testifiers in previous code cycles) because all sides really means front and back (you literally cannot test the edges in the ASTM E84 other than by putting multiple edge pieces into the tunnel to make up the 24 feet by 2 feet specimen). In order to test "all sides" of a lumber product it would be necessary to fasten 864 small pieces together to make one specimen, which is not realistic.

The proposed new subsection will add fire safety because it recognizes an issue that was highlighted in the previous code cycle, and was also brought up in committee ASTM E05 and at the IWUIC: wood structural panels are typically installed in the field following industry practice. Industry recommendations for wood structural panels require a gap to accommodate dimensional changes caused by swelling due to changing moisture conditions. Therefore, installation in the field requires cutting and ripping of the panels and this results in the creation of "non-factory edges". Therefore, it is important to test wood structural panels with a rip or gap to ensure that the required fire test results from the charging paragraph are achieved when the interior of the panel is exposed.

Note that the IWUIC requires such a rip or gap for ignition resistant structural panels, and it sends FRTW products to IBC section 2303.2, which is equivalent to section R802.1.5.

Cost Impact: The code change proposal will increase the cost of construction

This proposal will add fire safety and will require more testing for wood structural panels. The proposal will also require more testing for other FRTW products manufactured by a pressure process but apparently less testing for FRTW products that are manufactured by other means, except that typically just the front and back faces are tested anyway.

Proposal # 4823

RB258-19

RB259-19

IRC®: R801.2, ASSE Chapter 44 (New)

Proponent: nella davis-ray, Michigan Department of Licensing and Regulatory Affairs, MIOSHA, representing MIOSHA (davis-rayn@michigan.gov)

2018 International Residential Code

Revise as follows:

R801.2 Requirements. Roof and ceiling construction shall be capable of accommodating all loads imposed in accordance with Section R301 and of transmitting the resulting loads to the supporting structural elements. Permanent anchorage connectors shall be installed to fixed structural members to provide a secure connecting point for personal fall arrest systems. The anchorage connecting devices shall comply with ANSI/ASSE Z359.1.

Add new text as follows:



ASSE International 18927 Hickory Creek Drive, Suite 220 Mokena IL 60448

ANSI/ASSE Z359.1—2016: Requirements for the ANSI/ASSE Z359 Fall Protection Code

Reason: Falls are the leading cause of death in the construction industry. Falls from roofs account for a third of the fall deaths. Contractors are required to use fall protection by OSHA. 1926.502 - Fall Protection, addresses minimum requirements and criteria for fall protection at construction workplaces. Personal fall arrest systems (PFAs) require a secure point of attachment, anchorage and components for coupling PFAs to anchorage, anchorage connectors. A significant challenge contractors report is finding or creating suitable anchoring for PFAs. A logical time to install anchorage connectors is during the construction process. OSHA cannot mandate permanent anchorage connectors for PFAs fabricated or designed into fixed structural members although we know the protective and functional anchoring role they play.

A variety of permanent anchorage connectors are commercially available. ANSI/ASSE Z359 establishes safety requirements for personal fall arrest systems, subsystems and components. Verification that permanent anchorage connectors are installed in accordance with applicable requirements of ANSI/ASSE Z359.1 will be an additional element of a building plan review.

Requiring permanent anchorage connectors has many advantages:

a. Level playing field: Currently, installing and removing temporary anchor points costs the "safe" contractors time and money. If the building code required the installation permanent anchorage connectors it would help ensure compliance with fall protection requirements.

b. Benefits to the building owner. The building owners becomes the beneficiary of a safer building which is a primary goal of construction codes. Permanent anchorage connections came be used for building maintenance such as cleaning windows, cleaning gutters, minor repairs, hanging holiday lights, etc. These anchor points would be available for maintenance/repair contractors eliminating the need for these contractors to make new penetrations in the roof.

c. Reduced labor costs: The labor cost of installing and removing temporary anchors is eliminated, helping offset the cost of the permanent anchors.

d. Efficiencies in construction: For other contractors working at the site, the work and costs of installing temporary anchor points is removed. This added efficiency would likely help offset the cost of the permanent anchorage connectors.

e. Workers Comp Reductions: Workers compensation costs for the building industry is very high. Availability of anchor points, and their use, may lead to lower premium costs for many businesses.

f. General Liability: Reduced likelihood of accidents by contractors, and due diligence for providing safety, reduces property and personal injury risk thus reducing the contractor and building owner liability.

g. Aligning requirements: Aligning building code requirements with national safety requirements helps contractors more clearly understand what is required and how it all fits together.

h. Increased use of fall protection: If the anchorage connectors are there, people are more likely to use them. Creating buildings and job sites with less risk, less citations, and more cost savings.

Cost Impact: The code change proposal will increase the cost of construction The increased advantage of having anchorage will encourage use of fall protection which will lower fall accidents and fatalities. In turn, increased safety may lower worker compensition costs.

Staff Analysis: The referenced standard, ANSI/ASSE Z359.1—2016, is currently referenced in other 2018 I-codes.

Proposal # 4867

RB259-19

RB260-19

IRC: R802.4.2, R802.4.6, TABLE R602.3(1)

Proponent: Robert Rice C.B.O., Northwest Code Professionals, representing Southern Oregon Chapter-ICC (RobertR@nwcodepros.com)

2018 International Residential Code

Revise as follows:

R802.4.2 Framing details. Rafters shall be framed <u>opposite from each other to a ridge board, shall not be</u> <u>offset more than $1^{1}/_{2}$ inches (38 mm) offset from each other to a ridge board or directly opposite from each other <u>and shall be connected</u> with a collar tie , gusset plate or ridge strap <u>in accordance with Section R802.4.6</u> <u>or a gusset plate in accordance with Table R602.3(1)</u>. Rafters shall be nailed to the top wall plates in accordance with Table R602.3(1) unless the roof assembly is required to comply with the uplift requirements of Section R802.11.</u>

R802.4.6 Collar ties. Where collar ties are used to connect opposing rafters, they shall be located in the upper third of the *attic* space and fastened in accordance with Table R602.3(1). Collar ties shall be not less than 1 inch by 4 inches (25 mm × 102 mm) nominal, spaced not more than 4 feet (1220 mm) on center. Ridge straps in accordance with Table R602.3(1) shall be permitted to replace collar ties. Ridge straps shall be not less than 1 1/4 inch (32 mm) x 20 gage and shall extend a minimum of 12 inches (305 mm) onto rafters and shall be nailed in accordance with manufacturers installation instructions.

TABLE R602.3(1) FASTENING SCHEDULE

Portions of table not shown remain unchanged.

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING AND LOCATION
		Roof	
5	Collar tie to rafter, face nail or 1¹/4″ × 20 ga. ridge strap to rafter	4-10d box (3" × 0.128"); or3-10d common (3" × 0.148"); or4-3" × 0.131" nails	Face nail each rafter

Reason: Prior to the 2012 code, this section (R802.3.1 in the previous code) simply called out a "ridge strap" with no further information. It was not known to most code users that Table R602.3(1) showed a "1 1/4" x 20 ga ridge strap". A proposal was submitted and approved to modify this section to include "..in accordance with Table R602.3(1)." and Figure R802.4.5 was also revised to call out the ridge strap which tied those sections together.

However, upon further examination, I realized that the ridge strap noted in the Table only defines the width and gauge of the strap. It does not specify the length that the strap has to extend onto the rafter or the nailing requirements for the strap. It also does not specify the spacing requirements for the straps. Without this information, the strap reference is incomplete and, effectively, impossible to accomplish.

This proposal is to address the missing information. Rather than adding the information to the strap noted in the table, it would be much more clear to add the information to the text of Sections R802.4.2 and R802.4.6 as shown in this proposal.

The requirement for a minimum of 12 inches onto each rafter is based on typical manufactured straps.

The spacing requirement is consistent with the collar tie requirement of 48 inches on center.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal clarifies an existing provision for ridge straps to replace collar ties and does not add or remove any code requirements. The use of ridge straps is and remains an option. Therefore, there is no cost impact.

Proposal # 4090

RB260-19

RB261-19

IRC: R802.5.2, TABLE R802.5.2, R802.5.2.1, R802.5.2.2, R802.5.2.3

Proponent: Randy Shackelford, P.E., Simpson Strong-Tie Co., representing Simpson Strong-Tie Co. (rshackelford@strongtie.com)

2018 International Residential Code

Add new text as follows:

R802.5.2 Ceiling joist and rafter connections. Ceiling joists, rafter ties and ridge beams shall be in accordance with Sections R802.5.2.1 and R802.5.2.2.

Revise as follows:

R802.5.2 <u>R802.5.2.1</u> Ceiling joist and rafter connections. joists parallel to rafters.</u> Where ceiling joists run parallel to rafters <u>and are located at the top wall plate</u>, they shall be connected to rafters <u>at and</u> the top wall plate in accordance with Table R802.5.2 <u>R802.5.2.1</u>. Where ceiling joists are not connected to the rafters at the top wall plate, they shall be installed in the bottom third of the rafter height in accordance with Figure R802.4.5 and Table R802.5.2 <u>R802.5.2.1</u>. Where the ceiling joists are installed above the bottom third of the rafter height, the ridge shall be <u>supported by a wall or ridge beam</u> designed <u>in accordance with accepted engineering</u> <u>practice.as a beam.Where ceiling joists do not run parallel to rafters, the ceiling joists shall be connected to top plates in accordance with Table R602.3(1). Each rafter shall be tied across the structure with a rafter tie or a 2-inch by 4-inch (51 mm × 102 mm) kicker connected to the ceiling diaphragm with nails equivalent in capacity to Table R802.5.2.</u>

TABLE R802.5.2 R802.5.2.1

RAFTER/CEILING JOIST HEEL JOINT CONNECTIONS^{a, b, c, d, e, g}

Portions of table not shown remain unchanged.

		GROUND SNOW LOAD (psf)															
		20 ^f			30			50				70					
RAFTER SLOPE	RAFTER SPACING (inches)	Roof span (feet)															
		12	20	28	36	12	20	28	36	12	20	28	36	12	20	28	36
			Req	uire	ed n	umb	er o	f 16 s	d co plice	omm es ^{c,}	on n d,e	ails	^{a, b} f	oer h	neel	join	t

Add new text as follows:

R802.5.2.2 Ceiling joists not parallel to rafters or not provided. Where ceiling joists do not run parallel to rafters, the ceiling joists shall be connected to top plates in accordance with Table R602.3(1). Each rafter shall be tied across the structure with a rafter tie not less than 2 inches by 4 inches (51 mm × 102 mm) fastened to rafters in accordance with Table R802.2.5.1 and with joints in accordance with Section R802.5.3. Where ceiling joists or rafter ties are not provided, the ridge shall be supported by a wall or ridge beam designed in accordance with accepted engineering practice.

Revise as follows:

R802.5.2.1 <u>R802.5.3</u> **Ceiling joists lapped.** Ends of ceiling joists shall be lapped not less than 3 inches (76 mm) or butted over bearing partitions or beams and toenailed to the bearing member. Where ceiling joists are used to provide resistance to rafter thrust, lapped joists shall be nailed together in accordance with Table

R802.5.2 and butted joists shall be tied together with a connection of equivalent capacity in a manner to resist such thrust. Joists that do not resist thrust shall be permitted to be nailed in accordance with Table R602.3(1). Wood structural panel roof sheathing, in accordance with Table R503.2.1.1(1), shall not cantilever more than 9 inches (229 mm) beyond the gable endwall unless supported by gable overhang framing.

Delete without substitution:

R802.5.2.2 Rafter ties. Wood rafter ties shall be not less than 2 inches by 4 inches (51 mm × 102 mm) installed in accordance with <u>Table R802.5.2</u> at each rafter. Other approved rafter tie methods shall be permitted.

Revise as follows:

R802.5.2.3 R802.5.4 Blocking. Lumber. Blocking Lumber used to transfer loads shall be not less than utility grade lumber.

Reason: The purpose of this code change is to clarify the requirements for connections of rafters and ceiling joists. This seciton is the most important section in establishing the concept of the continuous tie across the lower portion of the rafters, using either ceiling joists or rafter ties, which will prevent the rafters from sliding off the walls or pushing the walls out when the rafters are loaded, which is referred to as rafter thrust. The concept is that the ceiling joists have to be installed in the lower portion of the attic, and fastened in a specific manner as required in Table R802.5.2. However, sometimes the ceiling joists are installed higher in the attic where they are ineffective as a tie, sometimes the ceiling joists are installed perpendicular to the rafters, and sometimes there may not be any ceiling joists at all, such as in a cathedral ceiling.

So the first revision is to break out these possibilities into two separate sections to clarify what needs to happen in each case to ensure the rafters do not slide off the walls or push them outward.

In each case, either a tie can be provided, or a "wall or ridge beam designed in accordance with accepted engineering practice" can be provided. This language is close to what was required in this section prior to the 2018 edition.

In new R802.5.2.2, the requirements for rafter ties are moved back into this section, and the description of the rafter tie is provided. Since it is in this section now, the subsequent section on Rafter Ties can be deleted. The language about the kicker connected to the ceiling diaphragm is deleted because I don't know what a kicker really is in regard to ceiling joists, and because a prescriptive requirement is not provided. Any alternate method could be accepted if proven equivalent.

In new R802.5.3, Ceiling Joists Lapped, the last sentence talking about wood structural panel roof sheathing is deleted because this is out of place. The exact same wording is repeated in Section R803.2.3, which is the appropriate location.

In the last section, the term "blocking" was replaced by "lumber". It does not appear that the term "blocking" is used anywhere in this section, but it is possible that scabs of wood could be used to transfer tension loads across butt joints in ceiling joists or rafter ties, so it is proposed to be left in this way.

Cost Impact: The code change proposal will not increase or decrease the cost of construction There is no intent to cause any change in requirements, just a clarification.

Proposal # 5688

RB262-19

IRC®: TABLE R802.5.2

Proponent: Dennis Richardson, American Wood Council, representing American Wood Council (drichardson@awc.org)

2018 International Residential Code

Delete and substitute as follows:

TABLE R802.5.2 RAFTER/CEILING JOIST HEEL JOINT CONNECTIONS^{a, b, c, d, c, g}

		GROUND SNOW LOAD (psf)															
		20 [‡]			30			50			70						
RAFTER	RAFTER SPACING (inches)	Roof span (feet)															
SLOPE		12	20	28	36	12	20	28	36	12	20	28	36	12	20	-28	36
		Required number of 16d common nails ^{a, b} per heel joint splices ^{c, d, e}												ŧ			
	12	4	6	8	10	4	6	8	11	5	8	12	15	6	11	15	20
3:12	-16	5	8	10	13	5	8	11	14	6	11	15	20	8	14	20	26
	2 4	7	11	15	19	7	11	16	21	9	16	23	30	12	21	30	39
4:12	12	3	5	6	8	ტ	5	6	8	4	6	9	11	5	8	12	15
	16	4	6	8	10	4	6	8	11	5	8	12	15	φ	11	15	20
	24	5	용	12	15	5	9	12	16	7	12	17	22	ф	16	23	29
5:12	12	3	4	5	€	ф	4	5	7	3	5	7	9	4	7	9	12
	-16	3	5	6	8	3	5	7	9	4	7	9	12	5	9	12	-16
	24	4	7	9	12	4	7	10	13	6	10	14	18	7	13	18	23
	12	ઝ	4	4	5	ф	3	4	5	3	4	5	7	ф	5	7	9
7:12	-16	ઝ	4	5	6	3	4	5	6	3	5	7	9	4	6	9	11
	2 4	ર	5	7	9	3	5	7	9	4	7	10	13	5	9	13	1 7
9:12	12	ર	સ	4	4	3	3	3	4	3	3	4	5	3	4	5	7
	16	ર	4	4	5	3	3	4	5	3	4	5	7	3	5	7	9
	24	ઝ	4	6	7	ф	4	6	7	3	6	8	10	4	7	10	13
12:12	12	3	3	3	3	3	3	3	3	3	3	3	4	3	3	4	5
	16	3	3	4	4	3	3	3	4	3	3	4	5	3	4	5	7
	24	3	4	4	5	3	3	4	6	3	4	6	8	3	6	8	10

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

a. 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

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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 following factors:

H _C /H _R	Heel Joint Connection Adjustment Factor
1/3	1.5
1/4	1.33
1/5	1.25
1/6	1.2
1/10 or less	1.11

where:

 H_G – Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.

 H_R – Height of roof ridge measured vertically above the top of the rafter support walls.

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

TABLE R802.5.2 RAFTER/CEILING JOIST HEEL JOINT CONNECTIONS ^g

	<u>19.2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>3</u>	<u>4</u>	<u>6</u>	<u>3</u>	<u>6</u>	<u>9</u>	<u>4</u>	<u>8</u>	<u>12</u>
	<u>24</u>	<u>3</u>	<u>5</u>	<u>7</u>	<u>3</u>	<u>5</u>	<u>8</u>	<u>4</u>	<u>8</u>	<u>11</u>	<u>5</u>	<u>10</u>	<u>15</u>
<u>9:12</u>	<u>12</u>	<u>3</u>	<u>5</u>	<u>3</u>	<u>4</u>	<u>6</u>							
	<u>16</u>	<u>3</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>4</u>	<u>6</u>	<u>3</u>	<u>5</u>	<u>8</u>
	<u>19.2</u>	<u>3</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>3</u>	<u>5</u>	<u>7</u>	<u>3</u>	<u>6</u>	<u>9</u>
	<u>24</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>3</u>	<u>4</u>	<u>6</u>	<u>3</u>	<u>6</u>	<u>9</u>	<u>4</u>	<u>8</u>	<u>12</u>
<u>12:12</u>	<u>12</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>3</u>	<u>5</u>							
	<u>16</u>	<u>3</u>	<u>5</u>	<u>3</u>	<u>4</u>	<u>6</u>							
	<u>19.2</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>4</u>	<u>6</u>	<u>3</u>	<u>5</u>	<u>7</u>
	24	<u>3</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>3</u>	<u>5</u>	<u>3</u>	<u>5</u>	7	<u>3</u>	<u>6</u>	<u>9</u>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

<u>a. 10d common ($3^{"} \times 0.148^{"}$) 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.</u>

b. Heel joint connections are not required where the ridge is supported by a load-bearing wall, header or ridge beam.

c. 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.

d. Equivalent nailing patterns are required for ceiling joist to ceiling joist lap splices.

e. Applies to roof live load of 20 psf or less.

<u>f. Tabulated heel joint connection requirements assume that ceiling joists or rafter ties are located at the bottom</u> 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 following factors:

H _C /H _R	Heel Joint Connection Adjustment Factor
1/3	1.5
1/4	1.33
1/5	1.25
1/6	1.2
1/10 or less	1.11

where:

 H_{C} = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.

 H_{R} = Height of roof ridge measured vertically above the top of the rafter support walls.

g. Tabulated requirements are based on 10 psf roof dead load in combination with the specified roof snow load

ICC COMMITTEE ACTION HEARINGS ::: April, 2019

and roof live load.

Reason: Replace Table R802.5.2 to be consistent with calculation basis of 2018 Wood Frame Construction Manual (WFCM) heel joint nailing requirements based on the 2018 National Design Specification for Wood Construction (NDS) provisions for nailed connections. The reduced number of 16d common nails required in rafter tie connections, by approximately 15%, are due to changes in penetration factor and load duration assumptions from those used to develop the existing table. The existing table used a 0.77 penetration factor (based on 1991 and 1997 NDS) for 16d common nails with less than 12d penetration in the main member and a load duration factor of 1.25 for all tabulated cells. The proposed revised nailing requirements are based on use of a 1.15 load duration factor for snow cases, 1.25 load duration factor for roof live load cases, and an effective penetration factor equal to 1.0 per 2001 NDS and later editions when nail lateral value calculations are based on the actual penetration in the wood member. The ratio of nail design values for snow cases originally used to develop nailing requirements to the current nail design values for snow cases is $(Z \times 0.77 \times 1.25)/(Z \times 1.0 \times 1.15) = 0.84$ and explains the reduced number of nails required by this proposal. Due to revised nail design provisions in the NDS, the benefit of a longer nail that is clinched is no longer recognized for this application and existing footnote b is removed. A 10d common nail option is added in new footnote "a." based on NDS lateral nail calculations. The table heading clarifies the 10psf dead load basis of the tabulated nailing requirements.

Bibliography: 1) 2018 Wood Frame Construction Manual (WFCM) for One- and Two-Family Dwellings. American Wood Council, Leesburg, VA. 2018. https://awc.org/pdf/codes-standards/publications/wfcm/AWC-WFCM2018-ViewOnly-1711.pdf

2) 2018 National Design Specification (NDS) for Wood Construction. American Wood Council, Leesburg, VA. 2018. https://awc.org/pdf/codes-standards/publications/nds/AWC-NDS2018-ViewOnly-171117.pdf

Cost Impact: The code change proposal will decrease the cost of construction This code change utilizes fewer nails from the WFCM at less cost.

Proposal # 4258

RB262-19

RB263-19

IRC®: R802.5.2.1

Proponent: Randy Shackelford, Simpson Strong-Tie Co., representing Simpson Strong-Tie Co. (rshackelford@strongtie.com)

2018 International Residential Code

Revise as follows:

R802.5.2.1 Ceiling joists lapped. Ends of ceiling joists shall be lapped not less than 3 inches (76 mm) or butted over bearing partitions or beams and toenailed to the bearing member. Where ceiling joists are used to provide resistance to rafter thrust, lapped joists shall be nailed together in accordance with Table R802.5.2 and butted joists shall be tied together in a manner to resist such thrust. Joists that do not resist thrust shall be permitted to be nailed in accordance with Table R602.3(1). Wood structural panel roof sheathing, in accordance with Table R503.2.1.1(1), shall not cantilever more than 9 inches (229 mm) beyond the gable endwall unless supported by gable overhang framing.

Reason: This wording does not appear to belong here. This section deals with lapping of ceiling joists to provide a continuous tie across the building. The exact same text on roof sheathing cantilever over gable end walls is contained in Section R803.2.3.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This is just deleting an unrelated and duplicate code requirement so no cost impact

Proposal # 5195

RB263-19

RB264-19

IRC®: R802.6

Proponent: Randy Shackelford, Simpson Strong-Tie Co., representing Simpson Strong-Tie Co. (rshackelford@strongtie.com)

2018 International Residential Code

Revise as follows:

R802.6 Bearing. The ends of each rafter or ceiling joist shall have not less than 1¹/₂ inches (38 mm) of bearing on wood or metal and not less than 3 inches (76 mm) on masonry or concrete. The bearing on masonry or concrete shall be direct, or a sill plate of 2-inch (51 mm) minimum nominal thickness shall be provided under the rafter or ceiling joist. The sill plate shall provide a minimum nominal bearing area of 48 square inches (30 865 mm²). Where the roof pitch is greater than or equal to 3:12 (25% 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.

Reason: The reason for this code change is to clarify what types of bearing are acceptable for rafters, specifically at the top ends of rafters.

Section R802.6 requires that "The ends of each rafter or ceiling joist shall have not less than 1-1/2 inches of bearing on wood or metal......".

Bearing is typically thought of as bearing on a horizontal surface, such as a top plate, beam, or hanger for resisting vertical loads. However, for a rafter system that has the continuous tension tie at the bottom provided by ceiling joists or rafter ties, and collar ties at the top, it is considered that the downward force is all transferred to the lower ends of the rafters, and the force at the top is a horizontal force toward the ridge board, bearing on it. So horizontal bearing here is fine.



On the other hand, when the roof slope gets shallow, a structural ridge beam is required to be provided. (See Section R802.4.4). In that case, the ridge beam is providing vertical support for the "top" end of the rafters, and a connection with vertical capacity is required (horizontal bearing).


Another case is when the horizontal tie is not provided at the bottom of the rafters. In that case, a load-bearing ridge beam is required to be provided (See Section R802.5.2). Again, here the ridge beam is providing vertical support for the top end of the rafter, so a support against vertical forces is required (horizontal bearing).



Cost Impact: The code change proposal will not increase or decrease the cost of construction This code change is meant as a clarification, and will not result in an increase in cose for a normal rafter/ceiling joist system.

RB264-19

RB265-19

IRC: R802.11.1

Proponent: Randy Shackelford, Simpson Strong-Tie Co., representing Simpson Strong-Tie Co. (rshackelford@strongtie.com)

2018 International Residential Code

Revise as follows:

R802.11 Roof tie-down.

R802.11.1 Uplift resistance. Roof assemblies shall have uplift resistance in accordance with Sections R802.11.1.1 and R802.11.1.2.

Exception: Where the uplift force does not exceed 200 pounds (90.8 kg), rafters and trusses spaced not more than 24 inches (610 mm) on center <u>Rafters or trusses</u> shall be permitted to be attached to their supporting wall assemblies in accordance with Table R602.3(1) where either of the following occur:

- 1. Where the uplift force per rafter or truss does not exceed 200 pounds (90.8 kg) as determined by Table R802.11.
- 2. Where the basic wind speed does not exceed 115 mph, the wind exposure category is B, the roof pitch is 5:12 (42-percent slope) or greater, and the roof span is 32 feet (9754 mm) or less, and rafters and trusses are spaced not more than 24 inches (610 mm) on center shall be permitted to be attached to their supporting wall assemblies in accordance with Table R602.3(1).

R802.11.1.1 Truss uplift resistance. Trusses shall be attached to supporting wall assemblies by connections capable of resisting uplift forces as specified on the truss design drawings for the ultimate design wind speed as determined by Figure R301.2(5)A and listed in Table R301.2(1) or as shown on the construction documents. Uplift forces shall be permitted to be determined as specified by Table R802.11, if applicable, or as determined by accepted engineering practice.

R802.11.1.2 Rafter uplift resistance. Individual rafters shall be attached to supporting wall assemblies by connections capable of resisting uplift forces as determined by Table R802.11 or as determined by accepted engineering practice. Connections for beams used in a roof system shall be designed in accordance with accepted engineering practice.

Reason: The purpose of this proposal is to clarify the roof tiedown requirements. Section R802.11.1 states that roof tiedown shall be in accordance with either the truss tiedown section (R802.11.1.1) or the rafter tiedown section (R802.11.1.2). Then it has some more text that are actually exceptions for when the standard roof to wall fastening can be used. This seems to be more appropriate as an exception, so this code change is written as such. There is no intent to make technical changes. Exception 1 does not need the language about limiting to 24" o.c. since the uplift is being read directly form Table R802.11 anyway, and that only goes up to 24" o.c.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal is just a clarification of this section.

Proposal # 5638

RB266-19

IRC®: TABLE R804.3, TABLE R804.3.2.1(2), R804.3.2.1.2, FIGURE R804.3.2.1.2, R804.3.2.5

Proponent: Jon-Paul Cardin, American Iron and Steel Institute, representing American Iron and Steel Institute (JCardin@steel.org)

2018 International Residential Code

Revise as follows:

TABLE R804.3ROOF FRAMING FASTENING SCHEDULE^{a, b}

DESCRIPTION OF BUILDING ELEMENTS			NUMBER AND SIZE OF FASTENERS ^a			OF	SPACING OF FASTENERS
Roof sheathing (oriented strand board or plywood) to rafter			No. 8 screws				6" o.c. on edges and 12" o.c. at interior supports. 6" o.c. at gable end truss
Gypsum board to ceiling	<u>g joists</u>			<u>No. 6 s</u>	crews		<u>12" o.c.</u>
Gable end truss to endv	vall top track			No. 10 s	screws		12″ o.c.
Rafter to ceiling joist and to ridge member			Minimum No. 10 screws, in accordance with Table R804.3.1.1(3)			vs, in ole	Evenly spaced, not less than ¹ /2" from all edges.
	Coiling loist or	Doof	Ultimate Design Wind Speed (mph) and Exposure Category			Speed e	
	<u>Truss</u> Spacing (in.)	Span (ft)	126 <u>130</u> В 110	<139 B 115	126 <u>130 </u> C	<139 C	
			<u>115</u> C	<u>120 </u> C			
Ceiling joist or roof		24	2 <u>3</u>	2 <u>3</u>	2 <u>4</u>	3 5	
truss to top track of		28	2 <u>3</u>	2 <u>3</u>	3 <u>4</u>	3 5	Each ceiling joist or roof truss
bearing wall ^b	16	32	2 3	2 <u>4</u>	3 5	<u>46</u>	
		36	2 4	2 4	육 <u>5</u>	4 <u>6</u>	
		40	2 4	2 <u>4</u>	3 <u>6</u>	<u>4 7</u>	
		24	2 4	2 5	3 <u>6</u>	<u>4 7</u>	
		28	2 4	2 5	<u>4 6</u>	5 8	
	24	32	2 4	3 6	4 <u>7</u>	5 8	
		36	2 4	<u> ३ 6</u>	4 <u>8</u>	6 9	
		40	2 6	3 6	5 8	6 <u>10</u>	

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 mil = 0.0254 mm.

a. Screws are a minimum No. 10 unless noted otherwise.

b. Indicated number of screws shall be applied through the flanges of the truss or ceiling joist or

through each leg of a 54 mil clip angle. See Section R804.3.8 for additional requirements to resist uplift forces.

ULTIMATE WIND SPEEDAND EXPOSURE		EQUIVALENT GROUND SNOW LOAD (psf)									
		Roof slope									
Exposure	xposure Wind speed(mph)			5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12
	115	20	20	20	20	30 <u>20</u>	20	30 20	30 20	30 20	50 20
в	120	20	20	20	20	30 <u>20</u>	30 <u>20</u>	30 20	30 <u>20</u>	30 <u>20</u>	50 <u>20</u>
В	130	20	20	20	20	30 20	30 20	30 20	50 20	50 20	50 20
	<140	20	20	20	20	30 20	50 20	50 20	50 <u>30</u>	50 <u>30</u>	50 <u>30</u>
С	115	20	20	20	20	30	30 <u>20</u>	30 20	50 20	50 <u>30</u>	50 <u>30</u>
	120	20	20	20	20	30 20	30 20	50 20	50 <u>30</u>	50 <u>30</u>	50
	130	20	20	20 30	30	30	50 <u>30</u>	50 30	50 <u>30</u>	50	70 <u>50</u>
	<140	30	30	30 50	50	50 <u>30</u>	50 <u>30</u>	70 50	70 <u>50</u>	70 <u>50</u>	— <u>50</u>

TABLE R804.3.2.1(2)ULTIMATE DESIGN WIND SPEED TO EQUIVALENT SNOW LOAD CONVERSION

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

R804.3.2.1.2 Rake overhangs. Rake overhangs shall not exceed 12 inches (305 mm) measured horizontally. the limitations provided for Option #1 or Option #2 in Figure R804.3.2.1.2. Outlookers at gable endwalls shall be installed in accordance with Figure R804.3.2.1.2. The required strength for uplift connectors required for Option #1 shall be determined in accordance with AISI S230 Table F3-4.

Delete and substitute as follows:



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

FIGURE R804.3.2.1.2 GABLE ENDWALL OVERHANG DETAILS





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

FIGURE R804.3.2.1.2 GABLE ENDWALL OVERHANG DETAILS

Revise as follows:

R804.3.2.5 Roof rafter bottom flange bracing. The bottom flanges of roof rafters shall be continuously braced, at a maximum spacing of 8 of 4 feet (2440 mm) as measured parallel to the roof rafters, with one of the following members:

- 1. Minimum 33-mil (0.84 mm) C-shaped member.
- 2. Minimum 33-mil (0.84 mm) track section.
- 3. Minimum $1^{1/2}$ -inch by 33-mil (38 mm by 0.84 mm) steel strap.

The bracing element shall be fastened to the bottom flange of each roof rafter with one No. 8 screw and shall be fastened to blocking with two No. 8 screws. Blocking shall be installed between roof rafters in-line with the continuous bracing at a maximum spacing of 12 feet (3658 mm) measured perpendicular to the roof rafters.

The ends of continuous bracing shall be fastened to blocking or anchored to a stable building component with two No. 8 screws.

Reason: The purpose of this code change proposal is to update the cold-formed steel framing provisions of the International Residential Code to correspond to the latest edition of AISI S230 - *Standard for Cold-Formed Steel Framing - Prescriptive Method for One- and Two-Family Dwellings (AISI S230-18).* The 2018 edition of AISI S230 has updated the prescriptive provisions to conform to the loading criteria of the 2016 edition of ASCE 7-*Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7-16).* The cold-formed steel provisions affected by the update to ASCE 7-16 are exclusively located in IRC Section 804 – *Roof Framing.* The affected provisions are isolated in Section 804 due to the increase in wind pressure coefficients on roof surfaces from the 2010 to 2016 editions of ASCE 7. AISI S230-18 reduced the required bottom flange bracing spacing from 8-feet to 4-feet in order to minimize changes in the allowable roof span tables due to the increased wind loading.

There is a concurrent code change proposal to update Chapter 44 to AISI S230-18. A draft version of AISI S230-18 is currently available for review at www.aisistandards.org. AISI anticipates the final published edition of AISI S230-18 will be available free of charge at the same website by March 1, 2019.

Bibliography: AISI (2018), *Standard for Cold-Formed Steel Framing - Prescriptive Method for One- and Two-Family*

Dwellings, ANSI/AISI S230-18, American Iron and Steel Institute, Washington D.C.

Cost Impact: The code change proposal will increase the cost of construction

This proposal reduces the required bottom flange bracing of roof members to account for increase wind uplift forces. Also, in some conditions this code change proposal will require additional tie-downs at roof overhangs to resist wind uplift forces.

Proposal # 4002

RB266-19

RB267-19

IRC®: R805.1

Proponent: Robert DeVries, representing Self (rdevries@nuwool.com)

2018 International Residential Code

Revise as follows:

R805.1 Ceiling installation. Ceilings shall be installed in accordance with the requirements for interior wall finishes as provided in Section R702. Sections R702.1 through R702.6

Reason: Removing section R702.7 from section R805 Ceiling Finishes clears up the confusion of vapor retarders being required in the ceiling assembly. Section R702.7 specifcally requires vapor retarers for frame walls but since the ceiling finishes section referes to this section it may be interpreted to mean a vapor retarder is required in the ceiling assembly as well.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The code change proposal will not increase or decrease the cost of construction due to the fact the code is not changing but rather clarifying the scope as to how it is applied.

Proposal # 5000

RB267-19

RB268-19

IRC: R806.5

Proponent: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing self (joe@buildingscience.com)

2018 International Residential Code

SECTION R806 ROOF VENTILATION

R806.1 Ventilation required. Enclosed attics and enclosed rafter spaces formed where ceilings are applied directly to the underside of roof rafters shall have cross ventilation for each separate space by ventilating openings protected against the entrance of rain or snow. Ventilation openings shall have a least dimension of 1/16 inch (1.6 mm) minimum and 1/4 inch (6.4 mm) maximum. Ventilation openings having a least dimension larger than 1/4 inch (6.4 mm) shall be provided with corrosion-resistant wire cloth screening, hardware cloth, perforated vinyl or similar material with openings having a least dimension of 1/16 inch (1.6 mm) minimum and 1/4 inch (6.4 mm) members shall conform to the requirements of Section R802.7. Required ventilation openings shall open directly to the outside air and shall be protected to prevent the entry of birds, rodents, snakes and other similar creatures.

Revise as follows:

R806.5 Unvented attic and unvented enclosed rafter assemblies. Unvented *attics* and unvented enclosed roof framing assemblies created by ceilings that are applied directly to the underside of the roof framing members and structural roof sheathing applied directly to the top of the roof framing members/rafters, shall be permitted where all the following conditions are met:

- 1. The unvented *attic* space is completely within the *building thermal envelope*.
- 2. Interior Class I vapor retarders are not installed on the ceiling side (*attic* floor) of the unvented *attic* assembly or on the ceiling side of the unvented enclosed roof framing assembly.
- 3. Where wood shingles or shakes are used, a minimum 1/4-inch (6.4 mm) vented airspace separates the shingles or shakes and the roofing underlayment above the structural sheathing.
- 4. In Climate Zones 5, 6, 7 and 8, any *air-impermeable insulation* shall be a Class II vapor retarder, or shall have a Class II vapor retarder coating or covering in direct contact with the underside of the insulation.
- 5. Insulation shall comply with Item 5.3 and either Item 5.1 or 5.2:
 - 5.1. Item 5.1.1, 5.1.2, 5.1.3 or 5.1.4 shall be met, depending on the air permeability of the insulation directly under the structural roof sheathing.
 - 5.1.1. Where only *air-impermeable insulation* is provided, it shall be applied in direct contact with the underside of the structural roof sheathing.
 - 5.1.2. Where *air-permeable insulation* is installed directly below the structural sheathing, rigid board or sheet insulation shall be installed directly above the structural roof sheathing in accordance with the *R*-values in Table R806.5 for condensation control.
 - 5.1.3. Where both *air-impermeable* and *air-permeable insulation* are provided, the *air-impermeable insulation* shall be applied in direct contact with the underside of the structural roof sheathing in accordance with Item 5.1.1 and shall be in accordance with the *R*-values in Table R806.5 for condensation control. The *air-permeable insulation* shall be installed directly under the *air-impermeable insulation*.

- 5.1.4. Alternatively, sufficient rigid board or sheet insulation shall be installed directly above the structural roof sheathing to maintain the monthly average temperature of the underside of the structural roof sheathing above 45°F (7°C). For calculation purposes, an interior air temperature of 68°F (20°C) is assumed and the exterior air temperature is assumed to be the monthly average outside air temperature of the three coldest months.
- 5.2. In Climate Zones 1, 2 and 3, air-permeable insulation installed in unvented *attics* shall meet the following requirements:
 - 5.2.1. An approved *vapor diffusion port* shall be installed not more than 12 inches (305 mm) from the highest point of the roof, measured vertically from the highest point of the roof to the lower edge of the port.
 - 5.2.2. The port area shall be greater than or equal to 1:600 of the ceiling area. Where there are multiple ports in the attic, the sum of the port areas shall be greater than or equal to the area requirement.
 - 5.2.3. The vapor-permeable membrane in the *vapor diffusion port* shall have a vapor permeance rating of greater than or equal to 20 perms when tested in accordance with Procedure A of ASTM E96.
 - 5.2.4. The *vapor diffusion port* shall serve as an air barrier between the *attic* and the exterior of the building.
 - 5.2.5. The *vapor diffusion port* shall protect the *attic* against the entrance of rain and snow.
 - 5.2.6. Framing members and blocking shall not block the free flow of water vapor to the port. Not less than a 2-inch (51 mm) space shall be provided between any blocking and the roof sheathing. Air-permeable insulation shall be permitted within that space.
 - 5.2.7. The roof slope shall be greater than or equal to 3:12 (vertical/horizontal).
 - 5.2.8. Where only air-permeable insulation is used, it shall be installed directly below the structural roof <u>sheathing</u>, on top of the attic floor, or on top of the ceiling.
 - 5.2.9. *Air-impermeable insulation*, if any where used in conjunction with airpermeable insulation, shall be directly above or below the structural roof sheathing and is not required to meet the *R*-value in Table 806.5. Where directly below the structural roof sheathing, there shall be no space between the *air-impermeable insulation* and air-permeable insulation.
 - 5.2.10. The Where air-permeable insulation is used and is installed directly below the roof structural sheathing, air shall be supplied at a flow rate greater than or equal to 50 CFM (23.6 L/s) per 1,000 square feet (93 m²) of ceiling. The air shall be supplied from ductwork providing supply air to the occupiable space when the conditioning system is operating. Alternatively, the air shall be supplied by a supply fan when the conditioning system is operating. **Exceptions:**
 - 1. Where both air-impermeable and air-permeable insulation are used, and the R-value in Table 806.5 is met, air supply to the attic is not required.
 - 2. Where only air-permeable insulation is used and is installed on top of the attic floor, or on top of the ceiling, air supply to the attic is not required.
- 5.3. Where preformed insulation board is used as the air-impermeable insulation layer, it shall be sealed at the perimeter of each individual sheet interior surface to form a continuous layer.

Reason: Objective: Provide consistency with IBC and provide additional options

This code change provides consistency with the IBC and provides additional options. The building science related to this change can be found in the following link:

https://buildingscience.com/documents/building-science-insights-newsletters/bsi-094-no-sweat

Cost Impact: The code change proposal will decrease the cost of construction For some types of insulation and construction this will be a lower cost option.

Proposal # 5433

RB268-19

RB269-19

IRC: R807.1.1(New)

Proponent: Vincent Anderson Jr, Self, representing Self (Vincent.Anderson@denvergov.org)

2018 International Residential Code

R807.1 Attic access. Buildings with combustible ceiling or roof construction shall have an *attic* access opening to *attic* areas that have a vertical height of 30 inches (762 mm) or greater over an area of not less than 30 square feet (2.8 m²). The vertical height shall be measured from the top of the ceiling framing members to the underside of the roof framing members.

The rough-framed opening shall be not less than 22 inches by 30 inches (559 mm by 762 mm) and shall be located in a hallway or other location with *ready access*. Where located in a wall, the opening shall be not less than 22 inches wide by 30 inches high (559 mm wide by 762 mm high). Where the access is located in a ceiling, minimum unobstructed headroom in the *attic* space shall be 30 inches (762 mm) at some point above the access measured vertically from the bottom of ceiling framing members. See Section M1305.1.3 for access requirements where mechanical *equipment* is located in *attics*.

Add new text as follows:

807.1.1 Attic access platform. A standing platform having an area not less than 32 square foot (2.98 m²) shall be constructed adjacent to the attic access opening. The platform shall be constructed of plywood or oriented stand board (OSB) sheathing of 5/8-inch (16 mm) minimum thickness and fastened to the ceiling joists or bottom truss chord with nails or screws, and elevated to create a nominal 10 inch (254 mm) deep cavity space for installing insulation beneath the sheathing. Framing materials shall be provided to support the platform sheathing.

Reason: The attic access opening is usually accessed by use of a ladder or similar device to gain entry into the attic space. Once inside the attic, there is little to no place to stand or maneuver once in the attic space. It is a life-safety issue everytime a person enters the attic regarding the location and placement of their feet once inside the attic. Some attics have limited insulation and the bottom chords of trusses or ceiling joists can be easily seen, however with the advent of blown-in insulation and added energy conservation measures the attic ceiling joists disappear below the insulation surface. This lack of a "platform" could lead to persons stepping onto the ceiling gypsum board and potentially falling between or through the attic joists/rafters, resulting in serious injury from a fall to the floor level below. A building occupant, owner, tenant, or repairman could sustain serious injury from a fall especially in an unlighted attic space. A second code change to add an electrical outlet receptacle has been proposed to IRC Sec. E3901.9 to provide a light source and power source during the performance of work or maintenance within an attic space.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The cost impact of adding this 32-sqft "platform" adjacent to the attic access opening is negligible to less than \$100.00.

Proposal # 4818

RB269-19

RB270-19

IRC®: R902.2

Proponent: Marcelo Hirschler, representing GBH International (mmh@gbhint.com)

2018 International Residential Code

Revise as follows:

R902.2 Fire-retardant-treated shingles and shakes. Fire-retardant-treated wood shakes and shingles shall be treated by impregnation with chemicals by the full-cell vacuum-pressure process, in accordance with AWPA C1. a pressure process or other means during manufacture. The fire-retardant-treated wood shakes and shingles shall be tested in accordance with and produce the results required in Section R802.1.5. Each bundle shall be marked to identify the manufactured unit and the manufacturer, and shall be *labeled* to identify the classification of the material in accordance with the testing required in Section R902.1, the treating company and the quality control agency.

Reason: Section 802.1.5 explains that fire retardant treated wood needs to be manufactured by impregnation "with chemicals by a pressure process or other means during manufacture" and this section should state the same and not address a specific manufacturing process. The same words are also in the IBC and in the IWUIC. The added sentence ensures that the fire retardant treated wood products meet the requirements for fire-retardant treated wood products, now in chapter 8.

The other change being introduced is the elimination of AWPA C1, which is a standard that has been withdrawn by AWPA (since being issued in 2003). Moreover, AWPA C1 (entitled "All Timber Products - Preservative Treatment by Pressure Processes") does not address impregnation with fire retardant chemicals for improved flame spread but addresses preservative treatment.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This is clarification since the requirements for fire retardant treated wood are already in the IRC code.

Proposal # 4824

RB270-19

RB271-19

IRC®: R902.4

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Revise as follows:

R902.4 Rooftop-mounted photovoltaic panel systems. Rooftop-mounted *photovoltaic panel systems* installed on or above the roof covering shall be tested, listed and identified with a fire classification in accordance with UL 1703 and UL 2703. Class A, B or C *photovoltaic panel systems* and modules shall be installed in jurisdictions designated by law as requiring their use or where the edge of the roof is less than 3 feet (914 mm) from a lot line.

Reason: This correlates with the action taken in Group A for Section 1505.9 of the IBC, Proposal FS152-18. Fire classification for rooftop rack-mounted photovoltaic panel systems are determined in accordance with UL 2703.UL 1703 includes partial fire testing of the photovoltaic panel, which is one of the components of the photovoltaic panel system. UL 2703 uses the results of that component testing, and includes further evaluation and testing of the photovoltaic panel system (i.e. the photovoltaic panel and the rack support system) to establish the Fire Classification for the system. UL 1703 is referenced within UL 2703.

Cost Impact: The code change proposal will not increase or decrease the cost of construction Fire classification of these systems are determined in accordance with UL 2703 currently.

Proposal # 4266

RB271-19

RB272-19

IRC: R904 (New), R905.2.4.1, TABLE R905.2.4.1, R905.1, R905.16.6, R905.17.7, ASTM, FM, ICC, UL Chapter 44 (New)

Proponent: T. Eric Stafford, representing Insurance Institute for Business and Home Safety (testafford@charter.net)

2018 International Residential Code

Add new text as follows:

SECTION R904 WIND REQUIREMENTS FOR ROOF COVERINGS

R904.1 Wind resistance for roof coverings. Roof coverings shall comply with the wind provisions and limitations of this section.

Revise as follows:

R905.2.4.1 <u>R904.1.1</u> Wind resistance of asphalt shingles. Asphalt shingles shall be tested in accordance with ASTM D7158. Asphalt shingles shall meet the classification requirements of Table R905.2.4.1 <u>R904.1.1</u> for the appropriate ultimate design wind speed. Asphalt shingle packaging shall bear a label to indicate compliance with ASTM D7158 and the required classification in Table R905.2.4.1. <u>R904.1.1</u>.

Exception: Asphalt shingles not included in the scope of ASTM D7158 shall be tested and labeled in accordance with ASTM D3161. Asphalt shingle packaging shall bear a label to indicate compliance with ASTM D3161 and the required classification in Table R905.2.4.1.<u>R904.1.1.</u>

MAXIMUM ULTIMATE DESIGN WIND SPEED, V _{ult} FROM FIGURE R301.2(5)A (mph)	MAXIMUM BASIC WIND SPEED,V _{ASD} FROM TABLE R301.2.1.3(mph)	ASTM D7158 ^a SHINGLE CLASSIFICATION	ASTM D3161SHINGLE CLASSIFICATION
110	85	D, G or H	A, D or F
116	90	D, G or H	A, D or F
129	100	G or H	A, D or F
142	110	G or H	F
155	120	G or H	F
168	130	Н	F
181	140	Н	F
194	150	Н	F

TABLE R905.2.4.1 R904.1.1CLASSIFICATION OF ASPHALT ROOF SHINGLES

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

a. The standard calculations contained in ASTM D7158 assume Exposure Category B or C and a building height of 60 feet or less. Additional calculations are required for conditions outside of these assumptions.

Add new text as follows:

R904.1.2 Concrete and clay tile. In regions where wind design is required in accordance with Figure R301.2(5)B, wind loads on concrete and clay tile shall be determined in accordance with Section 1609.5 of the *International Building Code.* Concrete and clay tile shall be tested to determine their resistance to overturning due to wind loads in accordance with SBCCI SSTD 11 or ASTM C1568. Where concrete and clay roof tiles do not satisfy the limitations in Chapter 16 of the *International Building Code* for rigid tile, a wind tunnel test shall be used to determine the wind characteristics of the concrete or clay tile roof covering in accordance with SBCCI <u>SSTD 11.</u>

In regions where wind design is not required in accordance with Figure R301.2(5)B, concrete and clay tiles shall be attached in accordance with this section or Section R905.3

R904.1.3 Metal roof shingles. Metal roof shingles shall be installed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3). Metal roof shingles shall be tested in accordance with FM 4474, UL 580 or UL 1897.

R904.1.4 Mineral-surfaced roll roofing. Mineral-surfaced roll roofing shall be installed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3).

R904.1.5 Slate shingles. Slate shingles shall be installed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3).

R904.1.6 Wood shingles. In regions where wind design is required in accordance with Figure R301.2(5)B, Wood shingles shall be installed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3). In regions where wind design is not required in accordance with Figure R301.2(5)B, wood shingles are permitted to be attached in accordance with Section R905.7.

R904.1.7 Wood shakes. In regions where wind design is required in accordance with Figure R301.2(5)B, Wood shakes shall be installed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3). In regions where wind design is not required in accordance with Figure R301.2(5)B, wood shakes are permitted to be attached in accordance with Section R905.8.

R904.1.8 Metal roof panels. Metal roof panels shall be installed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3). Metal roof panels shall be tested for wind resistance in accordance with FM 4474, UL 580, or UL 1897.

R904.1.9 Photovoltaic shingles. Photovoltaic shingles shall be tested in accordance with procedures and acceptance criteria in ASTM D 3161. Photovoltaic shingles shall comply with the classification requirements of Table R904.1.1 for the appropriate maximum basic wind speed. Photovoltaic shingle packaging shall bear a label to indicate compliance with the procedures in ASTM D 3161 and the required classification from Table R904.1.1.

R904.1.10 Building-integrated Photovoltaic roof panels. *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.

R904.1.11 Other roof systems. Built-up, modified bitumen, fully adhered or mechanically attached single ply systems, sprayed polyurethane foam, and liquid applied roof coverings shall be tested in accordance with FM 4474, UL1897 or UL 580 and installed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3).

Revise as follows:

R905.1 Roof covering application. Roof coverings shall be applied in accordance with the applicable provisions of this section and the manufacturer's installation instructions. Unless otherwise specified in this section, roof <u>Roof</u> coverings shall be installed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3). comply with the wind requirements specified in Section R904.

R905.16.6 Wind resistance. Photovoltaic <u>Wind resistance of photovoltaic shingles</u> shall be tested in accordance with procedures and acceptance criteria in ASTM D3161. Photovoltaic shingles shall comply with the classification requirements of Table R905.2.4.1 for the appropriate maximum basic wind speed. Photovoltaic shingle packaging shall bear a label to indicate compliance with the procedures in ASTM D3161 and the required classification from Table R905.2.4.1. Section R904.

R905.17.7 Wind resistance. Wind resistance of *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. Section R904.

Add new standard(s) as follows:

ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

<u>C1568-08(2013): Standard Test Method for Wind Resistance of Concrete and Clay Roof Tiles</u> (Mechanical Uplift Resistance Method) R904.1.2

FM

ASTM

FM Approvals Headquarters Office Norwood MA 02062

4474-2011: American National Standard for Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures R904.1.3, R904.1.8

ICC

UL

International Code Council, Inc. 500 New Jersey Avenue NW Washington DC 20001

SBCCI SSTD 11-97: Test Standard for Determining Wind Resistance of Concrete or Clay Roof Tiles R904.1.2

> UL LLC 333 Pfingsten Road Northbrook IL 60062

580-2006: Test for Uplift Resistance of Roof Assemblies-with Revisions through October 2013 R904.1.3, R904.1.8

Reason: This proposal is one of two proposals intended to clarify the wind limitations in the IRC. Section R301.2.1.1 intends to limit the applicability of the IRC to areas where wind design is not required in accordance with Figure R301.2(5)B. However, Chapter 9 contains high wind requirements for asphalt shingles and for underlayment in wind design required regions, but for no other roof coverings. While Section R905.1 states that unless otherwise specified, roof coverings have to resist the component and cladding loads specified in Table

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R302(2), that requirement is not necessarily correct for all roof coverings. Prescriptive attachment methods are provided for concrete and clay tile but the code does not specify any wind limitations on the use of this prescriptive method.

Therefore, a new section is proposed for Chapter 9 on roof coverings that specifically addresses the wind limitations in the IRC for roof covering attachment and specifies the performance requirements for roof coverings in wind design required regions. It is similar to and was patterned after Section 1504 in the IBC.

This proposal is not intended to change any technical requirements in the IRC related to wind design. It is intended to simply clarify the wind requirements for roof coverings in the IRC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This code change proposal will not increase the cost of construction as it is primarily a clarification.

Staff Analysis: The referenced standard, ASTM C1568-08(2013), FM 4474-2011, ICC SBCCI SSTD 11-97 and UL 580-2006 are currently referenced in other 2018 I-codes.

Proposal # 4660

RB272-19

RB273-19

IRC®: R905.1.1, ASTM Chapter 44 (New)

Proponent: Gregory Keeler, Owens Corning, representing Owens Corning (greg.keeler@owenscorning.com)

2018 International Residential Code

Revise as follows:

R905.1.1 Underlayment. Underlayment for asphalt shingles, clay and concrete tile, metal roof shingles, mineral-surfaced roll roofing, slate and slate-type shingles, wood shingles, wood shakes, metal roof panels and *photovoltaic shingles* shall conform to the applicable standards listed in this chapter. Underlayment materials required to comply with ASTM D226, D1970, D4869, and D6757 and ASTM WK51913 shall bear a label indicating compliance to the standard designation and, if applicable, type classification indicated in Table R905.1.1(1). Underlayment shall be applied in accordance with Table R905.1.1(2). Underlayment shall be attached in accordance with Table R905.1.1(3).

Exceptions:

- 1. As an alternative, self-adhering polymer-modified bitumen *underlayment* complying with ASTM D1970 installed in accordance with both the *underlayment* manufacturer's and roof covering manufacturer's instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed, shall be permitted.
- 2. As an alternative, a minimum 4-inch-wide (102 mm) strip of self-adhering polymer-modified bitumen membrane complying with ASTM D1970, installed in accordance with the *manufacturer's installation instructions* for the deck material, shall be applied over all joints in the roof decking. An *approved underlayment* for the applicable roof covering for maximum ultimate design wind speeds, *Vult*, less than 140 miles per hour shall be applied over the entire roof over the 4-inch-wide (102 mm) membrane strips.
- As an alternative, two layers of *underlayment* complying with ASTM D226 Type II; or ASTM D4869 Type III or Type IV; or ASTM WK51913 shall be permitted to be installed as follows in 3.1 through 3.4:
 - 3.1. Apply a 19-inch-wide (483 mm) strip of *underlayment* parallel with the eave. Starting at the eave, apply 36-inch-wide (914 mm) strips of *underlayment* felt, overlapping successive sheets 19 inches (483 mm). End laps shall be 4 inches (102 mm) and shall be offset by 6 feet (1829 mm).
 - 3.2. The *underlayment* shall be attached with corrosion-resistant fasteners in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at side and end laps.
 - 3.3. Underlayment shall be attached using metal or plastic cap nails with a nominal cap diameter of not less than 1 inch (25 mm). Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a thickness of not less than 0.010 inch (0.25 mm). Minimum thickness of the outside edge of plastic caps shall be 0.035 inch (0.89 mm).
 - 3.4. The cap nail shank shall be not less than 0.083 inch (2.11 mm) for ring shank cap nails and 0.091 inch (2.31 mm) for smooth shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than 3/4 inch (19 mm) into the roof sheathing.

Add new text as follows:



ASTM WK51913 - ????:: New Specification for Mechanically Attached Polymeric Roof Underlayment Used in Steep Slope Roofing

Reason: This is a placeholder for the ASTM Work Item to develop a standard related to synthetic underlayments. This will be the first ASTM Standard that applies specifically to synthetic underlayments and includes requirements that are related directly to synthetic underlayments. These requirements are much more appropriate for synthetic underlayment products than testing in accordance with the current standards which are specifically for asphalt impregnated products.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal simply adds requirements for products that are already in widespread use.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM WK51913, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5310

RB273-19

RB274-19

IRC®: R905.1.1, TABLE R905.1.1(1)

Proponent: Mike Fischer, Kellen Company, representing The Asphalt Roofing Manufacturers Association (mfischer@kellencompany.com)

2018 International Residential Code

Revise as follows:

R905.1.1 Underlayment. Underlayment for asphalt shingles, clay and concrete tile, metal roof shingles, mineral-surfaced roll roofing, slate and slate-type shingles, wood shingles, wood shakes, metal roof panels and *photovoltaic shingles* shall conform to the applicable standards listed in this chapter. Underlayment materials required to comply with ASTM D226, D1970, D4869 and D6757 shall bear a label indicating compliance to the standard designation and, if applicable, type classification indicated in Table R905.1.1(1). Underlayment shall be applied in accordance with Table R905.1.1(2). Underlayment shall be attached in accordance with Table R905.1.1(3).

Exceptions:

- 1. As an alternative, self-adhering polymer-modified bitumen *underlayment* complying with ASTM D1970 installed in accordance with both the *underlayment* manufacturer's and roof covering manufacturer's instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed, shall be permitted.
- 2. As an alternative, a minimum 4-inch-wide (102 mm) strip of self-adhering polymer-modified bitumen membrane complying with ASTM D1970, installed in accordance with the *manufacturer's installation instructions* for the deck material, shall be applied over all joints in the roof decking. An *approved underlayment* for the applicable roof covering for maximum ultimate design wind speeds, *Vult*, less than 140 miles per hour shall be applied over the entire roof over the 4-inch-wide (102 mm) membrane strips.
- 3. As an alternative, two layers of *underlayment* complying with ASTM D226 Type II or ASTM D4869 Type III or Type IV shall be permitted to be installed as follows in 3.1–3.4:
 - 3.1. Apply a 19-inch-wide (483 mm) strip of *underlayment* parallel with the eave. Starting at the eave, apply 36-inch-wide (914 mm) strips of *underlayment* felt, overlapping successive sheets 19 inches (483 mm). End laps shall be 4 inches (102 mm) and shall be offset by 6 feet (1829 mm).
 - 3.2. The *underlayment* shall be attached with corrosion-resistant fasteners in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at side and end laps.
 - 3.3. Underlayment shall be attached using metal or plastic cap nails with a nominal cap diameter of not less than 1 inch (25 mm). Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a thickness of not less than 0.010 inch (0.25 mm). Minimum thickness of the outside edge of plastic caps shall be 0.035 inch (0.89 mm).
 - 3.4. The cap nail shank shall be not less than 0.083 inch (2.11 mm) for ring shank cap nails and 0.091 inch (2.31 mm) for smooth shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than 3/4 inch (19 mm) into the roof sheathing.

TABLE R905.1.1(1) UNDERLAYMENT TYPES

Portions of table not shown remain unchanged.

ROOF COVERING	SECTION	MAXIMUM ULTIMATE DESIGN WIND SPEED, V _{ult} < 140 MPH	MAXIMUM ULTIMATE DESIGN WIND SPEED, $V_{ult} \ge 140$ MPH
Asphalt	R005 2	ASTM D226 Type I <u>or Type II</u> ASTM D4869	ASTM D226 Type II ASTM D4869 Type
shingles	11303.2	Type I, II, III or IVASTM D6757	III or Type IVASTM D6757

For SI: 1 mile per hour = 0.447 m/s.

Reason: The proposal makes two editorial changes. The alternate for ASTM D 1970 is redundant as that standard is listed in Section R905.1.1. Table R905.1.1 (1) includes ASTM D226 Type II for high wind areas; that material is also appropriate for lower wind zone areas.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposal is editorial.

Proposal # 5672

RB274-19

RB275-19

IRC®: R905.1.1, TABLE R905.1.1(1), TABLE R905.1.1(2), TABLE R905.1.1(3)

Proponent: T. Eric Stafford, representing Insurance Institute for Business and Home Safety (testafford@charter.net)

2018 International Residential Code

Revise as follows:

R905.1.1 Underlayment. *Underlayment* for asphalt shingles, clay and concrete tile, metal roof shingles, mineral-surfaced roll roofing, slate and slate-type shingles, wood shingles, wood shakes, metal roof panels and *photovoltaic shingles* shall conform to the applicable standards listed in this chapter. *Underlayment* materials required to comply with ASTM D226, D1970, D4869 and D6757 shall bear a label indicating compliance to the standard designation and, if applicable, type classification indicated in Table R905.1.1(1). *Underlayment* shall be applied in accordance with Table R905.1.1(2). *Underlayment* shall be attached in accordance with Table R905.1.1(3).

Exceptions:

- 1. As an alternative, self-adhering polymer-modified bitumen *underlayment* complying with ASTM D1970 installed in accordance with both the *underlayment* manufacturer's and roof covering manufacturer's instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed, shall be permitted.
- 2. As an alternative, a minimum 4-inch-wide (102 mm) strip of self-adhering polymer-modified bitumen membrane complying with ASTM D1970, installed in accordance with the *manufacturer's installation instructions* for the deck material, shall be applied over all joints in the roof decking. An *approved underlayment* for the applicable roof covering for maximum ultimate design wind speeds, *V_{ult}*, less than 140 miles per hour <u>areas where wind design is not required in accordance with Figure R301.2(4)B</u> shall be applied over the entire roof over the 4-inch-wide (102 mm) membrane strips.
- 3. As an alternative, two layers of *underlayment* complying with ASTM D226 Type II or ASTM D4869 Type III or Type IV shall be permitted to be installed as follows in 3.1–3.4:
 - 3.1. Apply a 19-inch-wide (483 mm) strip of *underlayment* parallel with the eave. Starting at the eave, apply 36-inch-wide (914 mm) strips of *underlayment* felt, overlapping successive sheets 19 inches (483 mm). End laps shall be 4 inches (102 mm) and shall be offset by 6 feet (1829 mm).
 - 3.2. The *underlayment* shall be attached with corrosion-resistant fasteners in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at side and end laps.
 - 3.3. Underlayment shall be attached using metal or plastic cap nails with a nominal cap diameter of not less than 1 inch (25 mm). Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a thickness of not less than 0.010 inch (0.25 mm). Minimum thickness of the outside edge of plastic caps shall be 0.035 inch (0.89 mm).
 - 3.4. The cap nail shank shall be not less than 0.083 inch (2.11 mm) for ring shank cap nails and 0.091 inch (2.31 mm) for smooth shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than $\frac{3}{4}$ inch (19 mm) into the roof sheathing.

TABLE R905.1.1(1) UNDERLAYMENT TYPES

ROOF COVERING	SECTION	AREAS WHERE WIND DESIGN IS NOT <u>REQUIRED IN ACCORDANCE WITH</u> <u>FIGURE R301.2(4)B</u> <u>MAXIMUM</u> ULTIMATE DESIGN WIND SPEED, V_{ult} < <u>140 MPH</u>	AREAS WHERE WIND DESIGN IS <u>REQUIRED IN ACCORDANCE WITH</u> <u>FIGURE R301.2(4)B</u> MAXIMUM ULTIMATE DESIGN WIND SPEED, V _{ult} ≥ <u>140 MPH</u>
Asphalt shingles	R905.2	ASTM D226 Type I ASTM D4869 Type I, II, III or IVASTM D6757	ASTM D226 Type II ASTM D4869 Type III or Type IV ASTM D6757
Clay and concrete tile	R905.3	ASTM D226 Type II ASTM D2626 Type IASTM D6380 Class M mineral- surfaced roll roofing	ASTM D226 Type II ASTM D2626 Type IASTM D6380 Class M mineral- surfaced roll roofing
Metal roof shingles	R905.4	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type III or Type IV
Mineral- surfaced roll roofing	R905.5	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type III or Type IV
Slate and slate-type shingles	R905.6	ASTM D226 Type I ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type III or Type IV
Wood shingles	R905.7	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type III or Type IV
Wood shakes	R905.8	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type III or Type IV
Metal panels	R905.10	Manufacturer's instructions	ASTM D226 Type II ASTM D4869 Type III or Type IV
Photovoltaic shingles	R905.16	ASTM D4869 Type I, II, III or IV ASTM D6757	ASTM D4869 Type III or Type IV ASTM D6757

For SI: 1 mile per hour = 0.447 m/s.

TABLE R905.1.1(2) UNDERLAYMENT APPLICATION

ROOF COVERING	SECTION	AREAS WHERE WIND DESIGN IS NOT REQUIRED IN ACCORDANCE WITH FIGURE R301.2(4)B MAXIMUM ULTIMATE DESIGN WIND SPEED, vuit < 140 MPH	AREAS WHERE WIND DESIGN IS REQUIRED IN ACCORDANCE WITH FIGURE R301.2(4)B MAXIMUM ULTIMATE DESIGN WIND SPEED, Vult ≥ 140 MPH
			V_{ult} ≥ 140 MPH

Asphalt shingles	R905.2	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 followingmanner: apply a 19-inch strip of underlayment felt parallel toand starting at the eaves. Starting at the eave, apply 36-inch- widesheets of underlayment, overlapping successive sheets19 inches. Distortions in the underlayment shall not interferewith the ability of the shingles to seal. End laps shall be 4 inchesand shall be offset by 6 feet.For roof slopes of four units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied inthe following manner: underlayment shall be applied shinglefashion, parallel to and starting from the eave and lapped 2 inches,Distortions in the underlayment shall not interfere withthe ability of the shingles to seal. End laps shall be 4 inchesand shall be offset by 6 feet.	Same as Maximum Ultimate Design Wind Speed, V _{ult} < 140 mph except all laps shall be not less than 4 inches. Underlayment shall be two layers applied in the followingmanner: 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.
Clay and concrete tile	R905.3	For roof slopes from two and one-half units vertical in 12 units horizontal $(2^{1}/_{2}:12)$, up to four unitsvertical in 12 units horizontal (4:12), underlaymentshall be not fewer than two layers applied asfollows: starting at the eave, apply a 19-inch stripof underlayment parallel with the eave. Starting atthe eave, apply 36-inch-wide strips of underlaymentfelt, overlapping successive sheets 19 inches.End laps shall be 4 inches and shall be offset by 6 feet.For roof slopes of four units vertical in 12 unitshorizontal (4:12) or greater, underlayment shall benot fewer than one layer of underlayment feltapplied shingle fashion, parallel to and startingfrom the eaves and lapped 2 inches. End laps shallbe 4 inches and shall be offset by 6 feet.	Same as Maximum Ultimate Design Wind Speed, V _{ult} < 140 mph, except all laps shall be not less than 4 inches. Underlayment shall be two layers applied in the followingmanner: 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.

Metal roof shingles	R905.4		For roof slopes from two units vertical in 12 units horizontal (2:12), up to four
Mineral- surfaced roll roofing	R905.5		units vertical in 12 unitshorizontal (4:12), u_Underlayment shall be twolayers applied in the following
Slate and slate-type shingles	R905.6		manner: apply a19-inch strip of underlayment felt parallel to andstarting at the eaves. Starting at the eave, apply36-inch-wide sheets of
Wood shingles	R905.7	Apply in accordance with the manufacturer's	underlayment, overlapping successive sheets 19 inches. End laps shall be
Wood shakes	R905.8		4inches and shall be offset by 6 feet. For roof slopes of four units
Metal panels	R905.10		vertical in 12 units horizontal (4:12) or greater, underlayment shall beone layer applied in the following manner: underlaymentshall be applied shingle fashion, parallelto and starting from the eave and lapped 4 inches.End laps shall be 4 inches and shall be offset by 6 feet.
Photovoltaic shingles	R905.16	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. 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.	Same as Maximum Ultimate Design Wind Speed, V _{ult} < 140 mph, except all laps shall be not less than 4 inches. Underlayment shall be two layers applied in the followingmanner: 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.

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

TABLE R905.1.1(3) UNDERLAYMENT APPLICATION

ROOF COVERING	SECTION	AREAS WHERE WIND DESIGN IS NOT REQUIRED IN ACCORDANCE WITH FIGURE R301.2(4)B MAXIMUM ULTIMATE DESIGN WIND SPEED, Vuit « 140 MPH	AREAS WHERE WIND DESIGN IS REQUIRED IN ACCORDANCE <u>WITH FIGURE R301.2(4)B</u> MAXIMUM ULTIMATE DESIGN WIND SPEED, V_{ult} ≥ 140 MPH
Asphalt shingles	R905.2		The underlayment shall be attached with corrosion-resistant fasteners in a grid pattern of 12 inches between side laps witha 6-inch spacing at
Clay and concrete tile	R905.3		side and end laps. Underlayment shall be attached using <u>annular ring</u> or deformed shank nails with 1 inch diameter metal or plastic cap <u>s</u>
Photovoltaic	R905.16	Fastened sufficiently to hold in place	inch. Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nailsand 0.091 inch for smooth shank cap nails. Staples shall benot less than 21 gage. The C cap nail shank and cap staple legs shall have a length sufficient to penetrate through the roof sheathing or not less than $3/4$ inch into the roof sheathing.
Metal roof shingles	R905.4		The underlayment shall be attached with corrosion-resistant fasteners
Mineral- surfaced roll roofing	R905.5		in a grid pattern of 12 inches between side laps witha 6-inch spacing at side and end laps. Underlayment shall be attached using <u>annular ring</u> <u>or deformed shank nails with 1 inch diameter</u> metal or plastic cap <u>s</u>
Slate and slate-type shingles	R905.6	Manufacturer's installation	nails or cap staples with a nominal cap diameter of not lessthan 1 inch. Metal caps shall have a thickness of not less than32-gage sheet metal. Power-driven metal caps shall have aminimum thickness of 0.010 inch.
Wood shingles	R905.7		inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nailsand 0.091 inch for smooth shank cap nails. Staples
Wood shakes	R905.8		shall benot less than 21 gage. <u>The C c</u> ap nail shank and cap staple legs shall have a length sufficient to penetrate through the roof
Metal panels	R905.10		sheathing or not less than $^{3}/_{4}$ inch into the roof sheathing.

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

Reason: This code change simply requires an extra layer of 30# roofing felt (ASTM D 226 Type II, or ASTM D 4869 Types III or IV) for areas vulnerable to roof covering loss and subsequent water intrusion in the hurricaneprone regions. The fastening of the underlayment remains the same as required in the 2018 IRC except the use of staples as a fastening method has been removed. The effectiveness of staples in keeping the underlayment in place when subjected to hurricane-level wind loads has not been tested. Additionally, the trigger for the enhanced underlayment has been changed to where wind design is required in accordance with Figure R301.2(4)B. The wind design required trigger is consistent with other limitations in the IRC and would also capture areas impacted by Hurricane Michael where design wind speeds currently range from 130 mph to 140 mph. However, for the northeastern U.S. and Alaska, where the wind design required region is based on the 140 mph wind speed contour, the trigger remains the same. This proposal would also remove the enhanced underlayment requirements from the Special Wind Regions.

Water infiltration due to wind driven rain has been well documented from post-hurricane damage assessments where hurricane winds were strong enough to blow off the primary roof covering, but not strong enough to blow off roof sheathing. In such instances, significant property damage and extended occupant displacement routinely occur due to water intrusion. In many cases, the building will appear relatively undamaged from the exterior except for roof covering loss. However, a closer inspection would reveal significant interior and contents damage.

Water entry can occur where it is able to infiltrate through the roof, walls, vents, windows, and/or doors, or at interfaces between these items. Water intrusion can cause extensive damage to interior finishes, furnishings, and other contents, and can lead to ceiling collapse when attic insulation is saturated. When power is lost and/or a building cannot otherwise be dried out within 24–48 hours, additional issues such as mold can develop, potentially extending the period during which the property may not be available for use. An insurance closed claims study for residential properties conducted following Hurricane Charley in 2004 indicated interior losses and additional living expesses were 27% of the total loss costs.

Recent hurricanes have not been an exception. The following photographs show buildings damaged due to Hurricane Michael which impacted Mexico Beach and the Panama City area of Florida (other areas as well). While structurally, the buildings performed well, each had extensive interior damage likely due to wind driven rain and roof covering loss. Also, parts of North Carolina that were hit by Hurricane Florence in 2018 are in areas where the design wind speed is around 145 mph. However, these arease suffered substantial residential roof damage at winds which measured only at around 100 mph.

Tests performed by IBHS at the Research Center have consistently shown that the secondary roof underlayment strategies recommened by the IBHS Fortified HomeTM - Hurricane program consistently show significantly reduced water intrusion rates when one of these strategies was employed. Two of these strategies are already recognized by the code in Exceptions 1 and 2 to Section R905.1.1. A 2011 hurricane demonstration clearly showed the benefit of sealing the seams of the roof deck sheathing which is one of the strategies recognized in Exception 2 to Section R905.1.1.

A summary of the results of the demonstration can be viewed at the following link: http://ibhstest.wpengine.com/ibhs-news-releases/ibhs-hurricane-demonstration-illustrates-importance-ofsealed-roof-deck-3/.

The wind driven rain demonstration can be viewed at the following link: https://disastersafety.org/thunderstorms/wind-driven-rain-demo/.

A more recent study included an assessment of a new approach where the roof is covered with two layers of high-quality underlayment attached with cap nails. Based on the performance achieved with this system, it has now been added to the FORTIFIED Home–Hurricane program as a fifth option for achieving a sealed roof deck. This report is identified in the bibliography and has been included as an attachment to this code change. All of the mitigation strategies, including the two layers of felt underlayment reduced water entry into the attic space by 70% or more.





Bibliography: Brown, T.M., Quarles, S.L., Giammanco, I.M., Brown, R., Insurance Institute for Business and Home Safety, "Building Vulnerability to Wind-Driven Rain Entry and Effectiveness of Mitigation Techniques." 14th International Conference on Wind Engineering (ICWE).

Cost Impact: The code change proposal will increase the cost of construction

If one of the methods in Exceptions 1 or 2 of Section R905.1.1 are used, this proposal will not increase the cost of construction.

If the double layer of underlayment option is used, for areas where wind design is required, the cost of the additional layer of underlayment will vary by region. However, for a 2000 square foot roof, the cost increase for the additional layer of underlayment will be between \$100 to \$200. For areas where the design wind speed is less than 140 mph but equal to or greater than 130 mph in the wind design required region, additional fasteners will be reqired in addition to the additionaly layer of underlayment.

Proposal # 4669

RB275-19

RB276-19

IRC®: TABLE R905.1.1(1), ASTM Chapter 44 (New)

Proponent: Gregory Keeler, representing Owens Corning (greg.keeler@owenscorning.com)

2018 International Residential Code

Revise as follows:

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} ≥ 140 MPH
		ASTM D226 Type I	ASTM D226 Type II
Asphalt shingles	B905 2	ASTM D4869 Type I, II, III or IV	ASTM D4869 Type III or Type IV
noprial eningiee	1000.2	ASTM D6757	ASTM D6757
		<u>ASTM WK51913</u>	<u>ASTM WK51913</u>
		ASTM D226 Type II	ASTM D226 Type II
Clay and concrete		<u>ASTM WK51913</u>	<u>ASTM WK51913</u>
tile	R905.3	ASTM D2626 Type I	ASTM D2626 Type I
		ASTM D6380 Class M mineral- surfaced roll roofing	ASTM D6380 Class M mineral- surfaced roll roofing
		ASTM D226 Type I or II	ASTM D226 Type II
Metal roof shingles	R905.4	ASTM D4869 Type I, II, III or IV	ASTM D4869 Type III or Type IV
		ASTM WK51913	ASTM WK51913
		ASTM D226 Type I or II	ASTM D226 Type II
Mineral-surfaced roll roofing	R905.5	ASTM D4869 Type I, II, III or IV	ASTM D4869 Type III or Type IV
		ASTM WK51913	ASTM WK51913
		ASTM D226 Type I	ASTM D226 Type II
Slate and slate- type shingles	R905.6	ASTM D4869 Type I, II, III or IV	ASTM D4869 Type III or Type IV
		ASTM WK51913	ASTM WK51913

		ASTM D226 Type I or II	ASTM D226 Type II
Wood shingles	R905.7	ASTM D4869 Type I, II, III or IV	ASTM D4869 Type III or Type IV
		<u>ASTM WK51913</u>	<u>ASTM WK51913</u>
		ASTM D226 Type I or II	ASTM D226 Type II
Wood shakes	R905.8	ASTM D4869 Type I, II, III or IV	ASTM D4869 Type III or Type IV
		ASTM WK51913	ASTM WK51913
			ASTM D226 Type II
Metal panels	R905.10	Manufacturer's instructions	ASTM D4869 Type III or Type IV
			ASTM WK51913
		ASTM D4869 Type I, II, III or IV	ASTM D4869 Type III or Type IV
Photovoltaic shingles	R905.16	ASTM D6757	ASTM D6757
		ASTM WK51913	ASTM WK51913

For SI: 1 mile per hour = 0.447 m/s.

Add new text as follows:



ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

ASTM WK51913 - ????: New Specification for Mechanically Attached Polymeric Roof Underlayment Used in Steep Slope Roofing

Reason: This proposal references an ASTM Work Item for a new ASTM Standard that will appply exclusively to synthetic underlayments. The proposal simply stipulates new performance requirements for products that are already in widespread use.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal references a proposed ASTM Standard that will, for the first time, apply specific performance requirements to synthetic underlayment products that are already in widespread use and will therefore not affect the cost of construction.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM WK51913-????, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5319

RB277-19

IRC®: R905.3.1

Proponent: Shahen Akelyan (shahen.akelyan@lacity.org)

2018 International Residential Code

Revise as follows:

R905.3.1 Deck requirements. Concrete and clay tile shall be installed only over solid sheathing or spaced structural sheathing boards.

Reason: This section is amended to require concrete and clay tiles to be installed **only** over solid structural sheathing boards. The change is necessary because there were numerous observations of tile roofs pulling away from wood framed buildings following the 1994 Northridge Earthquake. The SEAOSC/LA City Post Northridge Earthquake committee findings indicated significant problems with tile roofs was due to inadequate design and/or construction. Therefore, the amendment is needed to minimize such occurrences in the event of future significant earthquakes. This amendment will reduce the failure of concrete and clay tile roofs during a significant earthquake and is in accordance with the scope and objectives of the Internation Building Code.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposal limits the "spaces sheating", therefore it does not increase any cost.

Proposal # 4876

RB277-19

RB278-19

IRC®: R905.3.6 (New)

Proponent: Rick Allen, International Staple, Nail and Tool Association, representing International Staple, Nail and Tool Association (rallen@isanta.org)

2018 International Residential Code

Revise as follows:

R905.3.6 Fasteners. Nails shall be corrosion resistant and not less than 11-gage, $[0.120 \text{ inch } (3 \text{ mm})]^{5/16}$ -inch (11 mm) head, and of sufficient length to penetrate the deck not less than $^{3/4}$ inch (19 mm) or through the thickness of the deck, whichever is less. Attaching wire for clay or concrete tile shall not be smaller than 0.083 inch (2 mm). Perimeter fastening areas include three tile courses but not less than 36 inches (914 mm) from either side of hips or ridges and edges of eaves and gable rakes.

Reason: ASTM F1667-18 requires that when gage is used as a diameter for nails, a decimal equivalent must also be shown. This requirement was put in place because of the multiple and conflicting wire gage tables that are used in the manufacturing of nails.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal will not change the cost of production. It only provides clarification required by ASTM F01667-18

Proposal # 4085

RB278-19

RB279-19

IRC: R301.2.1, R905.4.4.1(New), TABLE R905.4.4.1 (New), FM Chapter 44 (New), UL Chapter 44 (New)

Proponent: Andy Williams, Metal Construction Association, representing Metal Construction Association (afwilliams@Connect2amc.com)

2018 International Residential Code

Add new text as follows:

R905.4.4.1 Wind Resistance of metal roof shingles. 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

TABLE R905.4.4.1

CLASSIFICATION OF STEEP SLOPE ROOF SHINGLES TESTED IN ACCORDANCE WITH ASTM D3161 OR D7158

MAXIMUM ULTIMATE DESIGN WIND SPEED, V _{ult} FROM FIGURE R301.2(5)A (mph)	<u>MAXIMUM BASIC WIND</u> SPEED,V _{ASD} FROM TABLE R301.2.1.3 (mph)	<u>ASTM</u> D7158 ^a SHINGLE CLASSIFICATION	<u>ASTM</u> D3161SHINGLE CLASSIFICATION
110	85	<u>D, G or H</u>	A, D or F
116	<u>90</u>	<u>D, G or H</u>	<u>A, D or F</u>
<u>129</u>	<u>100</u>	<u>G or H</u>	<u>A, D or F</u>
142	<u>110</u>	<u>G or H</u>	E
155	<u>120</u>	<u>G or H</u>	E
<u>168</u>	<u>130</u>	Н	E
<u>181</u>	<u>140</u>	H	Ē
<u>194</u>	150	Н	E

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

a. <u>The standard calculations contained in ASTM D7158 assume Exposure Category B or C and a</u> building height of 60 feet or less. Additional calculations are required for conditions outside of these assumptions.

Revise as follows:

R301.2.1 Wind design criteria. Buildings and portions thereof shall be constructed in accordance with the wind provisions of this code using the ultimate design wind speed in Table R301.2(1) as determined from Figure R301.2(5)A. <u>A.</u> The structural provisions of this code for wind loads are not permitted where wind design is required as specified in Section R301.2.1.1. Where different construction methods and structural materials are used for various portions of a building, the applicable requirements of this section for each portion shall apply. Where not otherwise specified, the wind loads listed in Table R301.2(2) adjusted for height and exposure using Table R301.2(3) shall be used to determine design load performance requirements for wall coverings, curtain walls, roof coverings, exterior windows, skylights, garage doors and exterior doors. Asphalt shingles shall be designed for wind speeds in accordance with Section R905.2.4. <u>Metal roof shingles shall be designed for wind</u>

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<u>speeds in accordance with Section R905.4.4.</u> A continuous load path shall be provided to transmit the applicable uplift forces in Section R802.11.1 from the roof assembly to the foundation.

Add new text as follows:

FM

FM Approvals Headquarters Office Norwood MA 02062

<u>4474—2011: American National Standard for Evaluating the Simulated Wind Uplift Resistance of Roof</u> <u>Assemblies Using Static Positive and/or Negative Differential Pressures</u>

UL

UL LLC 333 Pfingsten Road Northbrook IL 60062

580—2006: Test for Uplift Resistance of Roof Assemblies—with Revisions through October 2013

Reason: This proposal recognizes wind resistance of "metal roof shingles" as a separate item in Section R905.4.4.1. This product is not the same in all respects as asphalt shingles (Section R905.2.4.1) which is the reason for addition of this section.

Table R905.2.4.1 is appropriate to metal roof shingles. The title is changed to reflect modifications that were made to ASTM D3161 dating back to 2013.

The major issue is that the wind uplift testing is currently addressed by multiple standards that determine compliance through uplift ratings. Metal shingle performance is not correctly represented by these current tests due to the air permeability inherent in the design of the shingle units, so a fan-induced method was developed through ASTM, with UL as a major proponent, as an alternative to the required uplift resistance testing. Manufacturers use one or more of the standards listed to determine this performance and feel they should choose the correct and most representative method to show compliance.

ASTM D3161 (Fan Induced) was originally created for asphalt shingles however the standard was expanded in 2013 to evaluate wind resistance of discontinuous, air permeable, steep slope roofing products with or without contribution from adhesives or mechanical interlocking to hold down the leading tab edge and is not limited to asphalt shingles. This clearly includes metal shingles (specifically identified in Scope Section 1.3).

ASTM D3161 removes difficulties for metal shingle manufacturers currently required to run UL 1897 or UL 580 in a non-air-permeable manner that does not fairly represent the product. UL has provided metal shingle wind classifications for many years and currently has D3161-related listings in the Online Classification Directory. UL was also a proponent of the D3161 scope change showing acceptance of D3161 as a means to demonstrate metal shingle wind resistance. The scope is clear. "This test method was formerly titled "Wind Resistance of Asphalt Shingles (Fan-Induced Method)" but was revised to acknowledge that the method is applicable to many other steep slope roofing products and has been used to evaluate the wind resistance of those products for many years by several testing and certification laboratories."

The modification to Section R301.2.1 is placed to point the reader to Section R905.4.4.1.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal introduces alternate wind resistance testing that is more appropriate to metal shingles.

Staff Analysis: The referenced standard, FM 4474-2011 and UL 580-2006/13, is currently referenced in other 2018 I-codes.

RB279-19

RB280-19

IRC®: R905.7.1

Proponent: David Roodvoets (davelee@ix.netcom.com)

2018 International Residential Code

Revise as follows:

R905.7.1 Deck requirements. Wood shingles shall be installed on solid or spaced sheathing. Where spaced sheathing is used, sheathing boards shall be not less than 1-inch by 4-inch (25 mm by 102 mm) nominal dimensions and shall be spaced on centers equal to the weather exposure to coincide with the placement of fasteners. Spaced sheathing shall be open to the building interior and shall not be backed with spray foam or other moisture impermeable material.

Reason: Moisture is driven into the shingles by the heating of the sun. When the back or interior side of the shingles are open to air the moisture and heat has two ways to excape the shingle, toward the inside and toward the outdoors. When foam insulation is added to the back side of the shingles, there is only one escape path. The foam also stops heat transfer and builds up the temperature of the shingle, resulting in more rapid deterioration from both moisture and heat.

Bibliography: Fisette, P. Housewraps, Felt Paper and Weather Penetration Barriers:Building Materials and Wood Technology, University of Massachusetts Amherst, 2001

Cost Impact: The code change proposal will not increase or decrease the cost of construction This change is primarily to stop a practice that often occurs as a retrofit. It is not a normal part of any construction process or system, but can sometimes is added to a building interior during modifications. No costs are involved when following standard construction practices.

Proposal # 4728

RB280-19

RB281-19

IRC®: R905.8.1

Proponent: David Roodvoets (davelee@ix.netcom.com)

2018 International Residential Code

Revise as follows:

R905.8.1 Deck requirements. Wood shakes shall be used only on solid or spaced sheathing. Where spaced sheathing is used, sheathing boards shall be not less than 1-inch by 4-inch (25 mm by 102 mm) nominal dimensions and shall be spaced on centers equal to the weather exposure to coincide with the placement of fasteners. Where 1-inch by 4-inch (25 mm by 102 mm) spaced sheathing is installed at 10 inches (254 mm) on center, additional 1-inch by 4-inch (25 mm by 102 mm) boards shall be installed between the sheathing boards. Spaced sheathing shall not be backed with spray foam or other moisture impermeable material.

Reason: Moisture is driven into the shakes by the heating of the sun. When the back or interior sie of teh shakes are open to air the moisture has two ways to excape the shake, toward the inside and toward the outdoors. When foam insulation is added to the back side of the shakes there is only one escape path. The foam also stops heat transfer and builds up the temperature in the shake resulting in more rapid deterioration from both moisture and heat.

Bibliography: Fisette P.; Housewarps, Felt Paper and Weather Penetration Barriers: Building Materials and Wood Technology. University of Massachusetts, Amherst 2001

Cost Impact: The code change proposal will not increase or decrease the cost of construction This change is primarily to stop a practice that often occurs as a retrofit. It is not a normal part of any construction process or system, but can sometimes is added to a building interior during modifications. No costs are involved when following standard construction practices.

Proposal # 4730

RB281-19

RB282-19

IRC®: TABLE R905.9.2, ASTM Chapter 44 (New)

Proponent: Chadwick Collins, Kellen Company, representing Asphalt Roofing Manufacturers Association (Ccollins@kellencompany.com)

2018 International Residential Code

Revise as follows:

TABLE R905.9.2 BUILT-UP ROOFING MATERIAL STANDARDS

MATERIAL STANDARD	STANDARD
Acrylic coatings used in roofing	ASTM D6083
Aggregate surfacing	ASTM D1863 <u>: D7655</u>
Asphalt adhesive used in roofing	ASTM D3747
Asphalt cements used in roofing	ASTM D2822; D3019; D4586
Asphalt-coated glass fiber base sheet	ASTM D4601
Asphalt coatings used in roofing	ASTM D1227; D2823; D2824; D4479
Asphalt glass felt	ASTM D2178
Asphalt primer used in roofing	ASTM D41
Asphalt-saturated and asphalt-coated organic felt base sheet	ASTM D2626
Asphalt-saturated organic felt (perforated)	ASTM D226
Asphalt used in roofing	ASTM D312
Coal-tar cements used in roofing	ASTM D4022; D5643
Coal-tar primer used in roofing, dampproofing and waterproofing	ASTM D43
Coal-tar saturated organic felt	ASTM D227
Coal-tar used in roofing	ASTM D450, Type I or II
Glass mat, coal tar	ASTM D4990
Glass mat, venting type	ASTM D4897
Mineral-surfaced inorganic cap sheet	ASTM D3909
Thermoplastic fabrics used in roofing	ASTM D5665; D5726

Add new text as follows:



ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

D7655/D7655M—12: Standard Classification for Size of Aggregate Used as Ballast for Roof Membrane Systems

Reason: This proposal adds an accepted ASTM standard for specification of aggregate for built-up roofs. It also coordinates with a separate proposal providing improved provisions for parapet height and aggregate size

to control aggregate blow-off in extreme wind events.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal adds an already listed aggregate standard from the referenced standard list to the table.

Staff Analysis: The referenced standard, ASTM D7655/D7655M-12, is currently referenced in other 2018 I-codes.

Proposal # 5457

RB282-19

RB283-19

IRC®: R906.1, NFPA Chapter 44 (New)

Proponent: Mike Fischer, Kellen Company, representing The Center for the Polyurethanes Industry of the American Chemistry Council (mfischer@kellencompany.com)

2018 International Residential Code

Revise as follows:

R906.1 General. The use of <u>Where</u> above-deck thermal insulation <u>is installed</u>, <u>such insulation</u> shall be permitted provided that such insulation is covered with an *approved* roof covering and complies with FM 4450 shall <u>comply with NFPA 276</u> or UL 1256.

Add new standard(s) as follows:

NFPA

National Fire Protection Association 1 Batterymarch Park Quincy MA 02169-7471

276-15: Standard Method of Fire Tests for Determining the Heat Release Rate of Roofing Assemblies with Combustible Above-deck Roofing Components

Reason: During the development of the 2012 IBC, FM 4450 was removed from the IBC requirements for roof insulation and replaced with NFPA 276. This proposal will make the code consistent with IBC Section 1508.1. FM 4450 is no longer applicable for this use. NFPA 276 is referenced in the IBC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposal is editorial in nature to align with IBC requirements.

Staff Analysis: The referenced standard, NFPA 276-15, is currently referenced in other 2018 I-codes.

Proposal # 5615

RB283-19

RB284-19

IRC: R1001.13(New), UL Chapter 44 (New)

Proponent: Jonathan Roberts, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Add new text as follows:

R1001.13 Fireplace accessories. *Listed* and *labeled* fireplace accessories shall be installed in accordance with the conditions of the listing and the manufacturer's instructions. Fireplace accessories shall comply with UL 907.

Add new standard(s) as follows:

UL

UL LLC 333 Pfingsten Road Northbrook IL 60062

UL 907-94: Fireplace Accessories - with revisions through November 2014

Reason: This proposal aligns the masonry fireplace requirements in the IRC with the masonry fireplace requirements in the IMC, Section 902.2.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This proposal only requires that if listed and labeled fireplace accessories are used, they shall be installed in accordance with the manufacturer's installation instructions and be listed in accordance with UL 907.

Staff Analysis: The referenced standard, UL 907-94, is currently referenced in other 2018 I-codes.

Proposal # 4843

RB284-19

RB285-19

IRC: R101.2.1 (New), Chapter 44 HUD (New), Appendix E, AJ101.4.1 (New), AJ701

Proponent: Brian Tollisen, representing Division of Building Standards and Codes, New York State Department of State (Brian.Tollisen@dos.ny.gov)

2018 International Residential Code

Add new text as follows:

R101.2.1 Manufactured Home Installation. The installation of a new manufactured home shall be in accordance with HUD 24 CFR 3285 and the manufacturer's installation instructions.

Add new standard(s) as follows:

HUD

United States Department of Housing and Urban Development 451 7th Street S.W., Washington D.C. 20410 US

HUD

United States Department of Housing and Urban Development 451 7th Street S.W., Washington D.C. 20410 US

24 CFR 3285: Model Manufactured Home Installation Standards

Delete without substitution:

E-MANUFACTURED HOUSING USED AS DWELLINGS

SECTION AJ101 PURPOSE AND INTENT

Add new text as follows:

AJ101.4 Relocated Manufactured Home A manufactured home that is being relocated to a new foundation system shall comply with one of the following standards:

- 1. The manufacturer's installation instructions for that specific model.
- 2. <u>The latest installation instructions provided by the manufacturer of the manufactured home.</u>
- 3. <u>NFPA 225</u>

AJ101.4.1 Repair, renovation, alteration and reconstruction of a manufactured home The repair, renovation, alteration and reconstruction of a manufactured home shall comply with Appendix J.

Revise as follows:

SECTION AJ701 REFERENCED STANDARDS ASTM

F2090-17Specification for Window Fall Prevention Devices with Emergency Escape (Egress) Release Mechanisms ...AJ102.4.3, AJ102.4.4

ICC

IEBC-18 International Existing Building Code ® ...AJ102.6

<u>NFPA</u>

225-2017: Model Manufactured Home Installation Standard, 2017 Edition....AJ101.4

Reason: This proposal will delete all of Appendix E.

All manufactured home installations are required to conform to 24 CFR 3285 - Model Manufactured Home Installation Standards. In accordance with 24 CFR 3285.2, a manufacturer of manufactured homes must provide installation instructions. Federal standards regulate the installation of a manufactured home. This proposal directly references 24 CFR 3285 within the scope of the IRC for new installations and addresses the repair, renovation, renovation and addition of manufactured homes in Appendix J.

Cost Impact: The code change proposal will increase the cost of construction The proposal will increase the cost of construction in places that Appendix E is less restrictive than 24 CFR 3285.

Staff Analysis: A review of the standard proposed for inclusion in the code, HUD 24 CFR CFR 3285 and NFPA 225-17, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

This proposal will delete the entirity of Appendix E.

Proposal # 1367

RB285-19

RB286-19

IRC®: AF103.7 (New), AF103.7.1 (New), AF103.7.2 (New), AF103.7.3 (New), AF103.7.4 (New)

Proponent: Dan Buuck, National Association of Home Builders, representing National Association of Home Builders (dbuuck@nahb.org)

2018 International Residential Code

Add new text as follows:

AF103.7 Sidewall Vent Termination. The vent pipe shall be permitted to be routed out the side of the building and terminated at the sidewall provided the requirements of this section are met.

AF103.7.1 Vent Location. The vent termination shall be located:

- 1. Not less than 3 feet (914 mm) above any forced-air inlet located within 10 feet (3048 mm).
- 2. Not less than 4 feet (1219 mm) below, 4 feet (1219 mm) horizontally from or 1 foot (305 mm) above any door, operable window or gravity air inlet into any building. The bottom of the vent terminal shall be located not less than 12 inches (305 mm) above finished ground level.
- 3. Not over public walkways or over an area where condensate or vapor could create a nuisance or hazard or could be detrimental to the operation of regulators, relief valves or other equipment.
- 4. Not less than 12 inches (305 mm) above finished ground level.

AF103.7.2 Vent Pipe. Vent pipe joints shall be solvent welded.

AF103.7.3 Fan. A radon fan shall be installed to activate the system and shall meet the following conditions:

- 1. <u>The fan shall be a listed in-line fan designed for radon mitigation and be installed in accordance with</u> <u>NFPA 70 and the manufacturer's installation instructions.</u>
- 2. <u>The fan shall be airtight and installed within 4 feet (1219 mm) from the point the vent passes through the wall.</u>
- 3. The fan shall have ready access for repair or replacement.
- 4. The fan shall be connected to a system failure alarm.

AF103.7.4 Testing. The radon system shall be tested as follows:

- 1. <u>Testing shall be performed after the dwelling passes its air tightness test and after the radon control</u> <u>system and HVAC installations are complete.</u>
- 2. The radon fan and HVAC system shall be operating during the test.
- 3. Testing shall be performed with the windows closed.
- 4. Testing shall be performed with the exterior doors closed, except when being used for entrance or exit.
- 5. If the test result is 4 pCi/L or greater, then the system shall be modified and retested until the test result is less than 4 pCi/L.
- 6. The final test results shall be included with the construction documents.

Reason: The intent of this proposal is to allow sidewall venting of radon reduction systems without changing the other provisions of Appendix F. An active system is required if the sidewall venting option is chosen, but builders and owners still have the option of constructing a passive through-the-roof system. The sidewall termination option can provide advantages for those who have already decided to install a radon fan and want the benefits of simple vent routing or want to have better access to the fan for monitoring and maintenance. The side-vent option reduces ice formation on the roof vent. In cold climates ice forms on the roof vent as warm moist air meets cold outdoor air.



venting (Henschel, 1995) showed a negligible re-entrainment level of 0.07 pCi/L when a concentration of 25 times the EPA action level was being exhausted at grade level. At the action level of 4 pCi/L the calculated re-entrainment level would be a negligible 0.003 pCi/L. This same research has been used as substantiation to <u>allow</u> sidewall radon vent termination in Canada (see Health Canada, *Reducing Radon Levels in Existing Homes: A Canadian Guide for Professional Contractors*). Recent additional testing summarized below supports this view.

The following is from *Summary Report on Active Soil Depressurization (ASD) Field Study* (Health Canada, 2016), emphasis added. The 200 Bq/m³ in the quoted text below is the Canadian action level for radon.

"The second part of the study investigated how quickly radon levels dissipate with distance away from the side-wall discharge point. To do this, real-time radon dispersion measurements were conducted at 5 homes. At each home, arrays of approximately 10-15 continuous radon monitors were set up at fixed heights and distances away from where the exhaust is expelled, and measurements were conducted for a continuous period of roughly 6 hours. <u>Generally speaking, radon levels fell from thousands of Bq/m² to less than the 200 Bq/m² quideline value within 1-2 metres, indicating a rapid decrease with distance.</u>

"The long-term indoor post-mitigation results indicate that radon levels can be successfully lowered, and maintained, to levels well below the Canadian guideline value using an ASD mitigation system with an indoor mounted fan and side-wall discharge. This further implies that indoor leakage of radon from the system, and re-entry of radon into the home from the exhaust stream, were not issues of concern for the systems tested. As predicted, extreme cold climatic conditions did not cause freeze-up issues or impact the function of the ASD fan or system, as system components were not directly exposed to harsh conditions in the way they may be with the traditional geometry. The alternative, and conveniently less expensive, ASD geometry has been shown to be quite viable."







A sidewall termination can also be beneficial in cold climates where water vapor can freeze at the termination of tall, uninsulated systems, closing off the vent.

"Condensation problems can be reduced if the exhaust is discharged from a short pipe near ground level at right angles to the wall; similar to the exhausts from fan powered combustion appliances. ... A major advantage in cold weather areas is that the exposed discharge pipe is short and horizontal, reducing condensation and frost problems." (Health Canada, *Reducing Radon Levels in Existing Homes: A Canadian Guide for Professional Contractors*).

When considering how big of an issue freezing can be, it's important to note that most of the Canadian population lives near the U.S. border in climate zone 6, which is the same climate zone that covers a significant portion of the northern U.S. This is demonstrated in the figure to the left which shows IECC climate zones extended into Canada. Coincidentally, the same region covers much of radon zone 1.



(Map credit: www.greenbuildingadvisor.com/article/climate-zone-map-including-canada)

The proposed language for the vent termination clearances was taken from IRC Section G2427.8 where it applies to a mechanical draft venting system. The power source for a future fan is adequately addressed in AF103.12.

The Canadian – National Radon Proficiency Program (C-NRPP) also recognizes sidewall terminations for radon reduction systems and shows the following image on its website (<u>https://c-nrpp.ca/radonreduction/</u>). The C-NRPP was established in 2014 as an agreement between the Canadian Association of Radon Scientists and Technologists and Health Canada.



Bibliography: Henschel, D. (1995). Re-Entrainment and Dispersion of Exhausts from Indoor Radon Reductions Systems: Analysis of Tracer Gas Data. Indoor Air 5(4):270-284.

https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NRMRL&dirEntryId=128594. Health Canada. (2010). Reducing Radon Levels in Existing Homes: A Canadian Guide for Professional Contractors. www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radon contractors-entrepreneurs/index-eng.php.

Health Canada. (2014). Radon Reduction Guide for Canadians. www.canada.ca/en/healthcanada/services/environmental-workplace-health/reportspublications/radiation/radonreduction-guide-canadianshealth-canada-2013.html.

Health Canada. (2016). Summary Report on Active Soil Depressurization (ASD) Field Study. www.canada.ca/en/healthcanada/services/environmental-workplace-health/radiation/radon/summary-report-activesoil-depressurization-fieldstudy.html.

"Understanding a Radon Mitigation System." Canadian – National Radon Proficiency Program, https://cnrpp.ca/radonreduction/.

Cost Impact: The code change proposal will not increase or decrease the cost of construction Installing an active radon system with a sidewall termination is an option, and the passive, through-the-roof option is still available.

Proposal # 4478

RB286-19

RB287-19

IRC®: AF103.13 (New), AF103.14 (New)

Proponent: David Kapturowski, American Association of Radon Scientists and Technicians and Spruce Environmental Technologies, Inc., representing AARST & Spruce Environmental Technologies, Inc.; Jane Malone (janemalonedc@gmail.com)

2018 International Residential Code

Add new text as follows:

AF103.13 Testing. The building or dwelling unit shall be tested and verified as having an indoor radon level less than the USEPA Action level of 4 picocuries per liter (pCi/L). Testing shall be conducted in accordance with ANSI/AARST MAH. Where required by the *code official* testing shall be provided 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 conducted at any time after the completion of the building thermal envelope, with all doors and windows in place, and after the building heating and cooling systems are installed.

AF103.14 Mitigation. Where testing results indicate the radon level is 4 pCi/L or greater steps shall be taken to mitigate radon levels, including the installation of a radon fan in the anticipated location prescribed in Section AF103.12. Where required by the *code official* mitigation shall be provided by an approved third party. Testing as prescribed in Section AF103.13 shall be repeated until results are below 4 pCi/L.

Reason: This proposal updates Appendix F Radon Control Methods by adding new requirements for Radon Testing and Mitigation. Radon is an odorless, colorless radioactive that can only be detected through a radon test. Various inexpensive test methods are available. If the test results exceed the USEPA Action Level of 4 picocurries per liter (pCi/L) then the excess gas can be removed by adding a radon fan to the preliminary system properly installed per Appendix F. An active radon mitigation system can be uo to 99% effective in removing radon gas from a home.

Bibliography: Add Referenced Standards:

AARST/ANSI MAH - Protocol For Conducting Measurements Of Radon And Radon Decay Products In Homes

Cost Impact: The code change proposal will increase the cost of construction Radon testing can cost between \$20 and \$125 depending on the type of test and who performs the test. Only if excess levels of radon are detected will a radon fan will need to be added which will incease the cost between \$100 and \$300.

Staff Analysis: A review of the standard proposed for inclusion in the code, ANSI/AARST MAH, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5515

RB287-19

RB288-19

IRC®: SECTION AF101, AF101.1, SECTION AF102, AF102.1, , (New), SECTION AF103, AF103.1, AF103.2, FIGURE AF103, AF103.6, AF103.3.1 (New), AF103.3.2 (New), AF103.3, AF103.5, AF103.5.3, AF103.5.2, AF103.6.1, AF103.5.1, AF103.7, AF103.9, AF103.10, AF103.6.2, AF103.5.6 (New), AF103.8, AF103.5.6.2 (New), AF103.12, AF103.4, AF103.4.1, AF103.4.2, AF103.4.4, AF103.4.5, AF103.4.10, AF103.4.3, AF103.4.6, AF103.4.7, AF103.4.8, AF103.4.9, AF103.11, FIGURE AF101, TABLE AF101(1), ASTM Chapter 44 (New)

Proponent: Jane Malone, American Association of Radon Scientists and Technologists, representing American Association of Radon Scientists and Technologists (jmalone@aarst.org); David Kapturowski, representing AARST & Spruce Environmental Technologies, Inc. (dave@spruce.com)

2018 International Residential Code

SECTION AF101 SCOPE

Revise as follows:

AF101.1 General. This appendix contains requirements for <u>radon control methods in new construction</u>.new construction in *jurisdictions* where radon-resistant construction is required. Inclusion of this appendix by jurisdictions shall be determined through the use of locally available data or determination of Zone 1 designation in Figure AF101 and Table AF101(1)

Add new definition as follows:

SECTION AF102 DEFINITIONS

AF102.1 General. For the purpose of these requirements, the terms used shall be defined as follows:

Delete without substitution:

DRAIN TILE LOOP. A continuous length of drain tile or perforated pipe extending around all or part of the internal or external perimeter of a *basement* or crawl space footing.

Revise as follows:

RADON GAS. A naturally occurring, chemically inert, radioactive gas that is not detectable by human senses. As a gas, it can move readily through particles of soil and rock, and can accumulate under the slabs and foundations of homes where it can easily enter into the living space through construction cracks and openings. The element Rn, which is a radioactive colorless, odorless, tasteless, cancer-causing gas that occurs naturally as a decay product of radium.

Add new definition as follows:

RADON ROUGH-IN. The installation of all parts and materials of sub-membrane or sub-slab depressurization system including gas permeable layers, soil gas retarders, membranes, piping, connectors, terminations, and power sources.

SOIL-GAS-RETARDER. A continuous membrane of 6-mil (0.15 mm) polyethylene or other equivalent material used to retard the flow of soil gases into a building.

Revise as follows:

SUBMEMBRANE DEPRESSURIZATION SYSTEM. A system designed to achieve lower submembrane air pressure relative to crawl space air pressure by use of a <u>fan-powered</u> vent drawing air from beneath the soil-gas-retarder membrane.

SUBSLAB DEPRESSURIZATION SYSTEM (Active). A system designed to achieve lower subslab air pressure relative to indoor sub-slab air pressure by use of a fan-powered vent drawing air from beneath the slab.

Delete without substitution:

SUBSLAB DEPRESSURIZATION SYSTEM (Passive). A system designed to achieve lower subslab air pressure relative to indoor air pressure by use of a vent pipe routed through the *conditioned space* of a building and connecting the subslab area with outdoor air, thereby relying on the convective flow of air upward in the vent to draw air from beneath the slab.

SECTION AF103 REQUIREMENTS

Revise as follows:

AF103.1 General. The following construction techniques are intended to resist radon entry and prepare the building for post-construction radon mitigation, if necessary (see Figure AF103). These techniques are required in areas where designated by the *jurisdiction*.

AF103.2 Subfloor preparation. Radon Rough-In A radon rough-in is required for all foundation types. including crawlspace, basement, slab on grade, and slab on grade garage located below a living area as shown in Figure AF103.2. The rough-in shall be installed prior to pouring of concrete slabs, closure of building cavities, and installation of finish materials. layer of gas-permeable material shall be placed under all concrete slabs and other floor systems that directly contact the ground and are within the walls of the living spaces of the building, to facilitate future installation of a subslab depressurization system, if needed. The gas-permeable layer shall consist of one of the following:

- 1. A uniform layer of clean aggregate, not less than 4 inches (102 mm) thick. The aggregate shall consist of material that will pass through a 2-inch (51 mm) sieve and be retained by a ⁻¹/₄-inch (6.4 mm) sieve.
- 2. A uniform layer of sand (native or fill), not less than 4 inches (102 mm) thick, overlain by a layer or strips of geotextile drainage matting designed to allow the lateral flow of soil gases.
- 3. Other materials, systems or floor designs with demonstrated capability to permit depressurization across the entire subfloor area.

Delete and substitute as follows:



FIGURE AF103 RADON-RESISTANT CONSTRUCTION DETAILS FOR FOUR FOUNDATION TYPES



FIGURE AF103.2 FOUNDATION TYPES

Revise as follows:

AF103.6 <u>AF103.3</u> Passive subslab <u>Sub-slab</u> depressurization system. system rough-in. In *basement* or slab-on-grade buildings, the following components of a passive subslab <u>sub-slab</u> depressurization system shall be installed during construction. construction in accordance with Sections AF103.3.1 through AF103.3 and AF103.5 through AF103.6.5.

Add new text as follows:

AF103.3.1 Gas Permeable Layer A gas-permeable layer shall be constructed under all concrete slabs and other floor systems that directly contact the ground and are within the walls of the living spaces of the building. The gas-permeable layer shall consist of one of the following:

- 1. <u>A uniform layer of clean aggregate, not less than 4 inches [102 mm] in depth, shall be placed over the soil. The aggregate shall have a void ratio of not less than 35 percent or a Size Number 4, 5, 56, or 6 as classified by ASTM C33.</u>
- A uniform layer of native or fill sand, a minimum of 4 inches [102 mm] in depth, overlain by a layer or strips of geotextile drainage matting. The geotextile drainage matting shall have a cross-sectional area of at least 12 square inches [774 sq mm]. The closest edge of the geotextile matting shall be placed no closer than 12 inches [305 mm] to the foundation wall around the interior of the foundation perimeter.
- 3. A loop of 4 inch [102 mm] nominal or larger size perforated pipe placed in a trench along the perimeter of the foundation, with the trench backfilled with clean aggregate having a void ratio of not less than 35 percent or a Size Number 4, 5, 56, or 6 as classified by ASTM C33 such that the pipe is surrounded by aggregate for at least 1/3 of the outside pipe circumference. The pipe shall be placed no closer than 12 inches [305 mm] to the foundation wall around the interior of the foundation perimeter.
- 4. <u>A loop of interconnected stay-in-place forms used to cast the foundation footing in accordance with</u> 404.1.3.3.6 that is left in place to provide ground water control and provide a separate channel above the ground water channel for soil gas ventilation, with a cross sectional area no less than 12 square inches [77 sq. cm].
- 5. <u>Other materials, systems or floor designs with demonstrated capability to allow the lateral flow of soil gases from across the entire sub-floor area.</u>

AF103.3.2 Vent pipe connector. A 4 inch [102 mm] nominal diameter tee fitting or equivalent method shall be used to secure the vent pipe opening within the gas permeable layer. Not less than 4 feet [1219 mm] of perforated pipe or geotextile matting shall be connected to each of the two horizontal openings of the tee fitting or the two horizontal openings shall be connected to the interior drain tile system. Alternatively, a sealed sump

cover where the sump communicates directly with the sub-slab aggregate or communicates with it through a drainage system, shall secure the vent pipe opening. A flexible rubber coupling connector shall be provided at the sump cover connection to facilitate servicing the sump.

Revise as follows:

AF103.3 AF103.3.3 Soil-gas-retarder. A minimum 6-mil (0.15 mm) [or 3-mil (0.075 mm) cross-laminated] polyethylene or equivalent flexible sheeting material shall be placed on top of the gas-permeable layer prior to casting the slab or placing the floor assembly to serve as a soil-gas-retarder by bridging any cracks that develop in the slab or floor assembly, and to prevent concrete from entering the void spaces in the aggregate base material. The sheeting shall cover the entire floor area with separate sections of sheeting lapped not less than 12 inches (305 mm) - The sheeting shall fit closely around any and extend up the surrounding foundation walls not less than 4 inches [101 mm]. Openings in the sheeting caused by pipe, wire or and other penetrations of the material. shall be sealed. Punctures or tears in the material shall be sealed or covered with additional sheeting.

AF103.5 <u>AF103.4</u> Passive submembrane <u>Sub-membrane</u> depressurization <u>system.</u> <u>system rough-in.</u> In buildings with <u>a</u> crawl space foundations foundation, the following components of a passive submembrane <u>sub-membrane</u> depressurization system shall be installed during <u>construction.</u> <u>construction in accordance with</u> <u>Sections AF103.4.1 through AF103.6.5.</u>

Exceptions: Exception:

- 1. Buildings in which an *approved* mechanical crawl space ventilation system or other equivalent system is installed. is installed.
- 2. Where the soil gas retarder will be covered with concrete, the requirements of Section AF103.3.2 shall apply.

AF103.5.3 <u>AF103.4.1</u> Vent pipe. pipe connector. A plumbing tee or other *approved* connection <u>fitting</u> shall be inserted horizontally beneath the sheeting and connected to a 3- or 4-inch-diameter (76 or 102 mm) fitting with a vertical vent pipe installed through the sheeting. The vent pipe shall be extended up through the building floors, and terminate not less than 12 inches (305 mm) above the roof in a location not less than 10 feet (3048 mm) away from any window or other opening into the *conditioned spaces* of the building that is less than 2 feet (610 mm) below the exhaust point, and 10 feet (3048 mm) from any window or other opening in adjoining or adjacent buildings. soil gas membrane with not less than 10 feet of perforated pipe connected to each of the two horizontal openings of such fitting or the two horizontal openings of the tee fitting shall connect to the interior drain tile system. The branch opening of the tee fitting shall be connected to the vent pipe in accordance with Section AF103.5.

AF103.5.2 AF103.4.2 Soil-gas-retarder. Soil gas membrane. The soil in crawl spaces shall be covered with a continuous layer of minimum 6-mil (0.15 mm) polyethylene soil-gas-retarder. The ground cover soil gas membrane complying with ASTM E1745 Class A, B or C. The membrane shall be lapped not less than 12-6 inches (305-152 mm) at joints, and shall extend upwards 12 inches (305 mm) and be sealed to all foundation walls enclosing the crawl space area. Seams shall be sealed with polyurethane caulk complying with ASTM C920 class 25 or higher, or taped or equivalent method, installed in accordance with the manufacturer's recommendations.

AF103.6.1 <u>AF103.5</u> Vent pipe. A minimum 3-inch-diameter (76 mm) ABS, PVC or equivalent 3 inch [76 mm] nominal size or larger gas-tight pipe shall be embedded vertically into the subslab aggregate or other permeable material before the slab is cast. A "T" fitting or equivalent method shall be used to ensure that the pipe opening remains within the subslab permeable material. Alternatively, the 3-inch (76 mm) pipe shall be inserted directly into an interior perimeter drain tile loop or through a sealed sump cover where the sump is exposed to the subslab aggregate or connected to it through a drainage system.

The pipe shall be extended <u>extended from the tee fitting</u> up through the building floors, <u>in accordance with</u> <u>Sections AF103.5.1 through AF103.5.6. Materials used shall comply with Section P3002.1.</u> and terminate not less than 12 inches (305 mm) above the surface of the roof in a location not less than 10 feet (3048 mm) away from any window or other opening into the *conditioned spaces* of the building that is less than 2 feet (610 mm) below the exhaust point, and 10 feet (3048 mm) from any window or other opening in adjoining or adjacent buildings.

AF103.5.1 <u>Ventilation.</u> <u>Vent pipe termination.</u> Crawl spaces shall be provided with vents to the exterior of the building. The minimum net area of ventilation openings shall comply with Section R408.1. The vent pipe shall terminate vertically upward not less than 12 inches [305 mm] above the roof and in a location not less than two feet [51 mm] vertically above, or not less than 10 feet [3048 mm] measured in any other direction, from openings in the building and adjacent buildings including windows, doors and other gravity air intake openings, exclusive of attic ventilation openings. Where a screen is installed on the terminus of radon exhaust pipe to prevent the entry of animals, such screen shall have a mesh size with a dimension of not less than 0.5 inch (12.7mm).

AF103.7 <u>AF103.5.2</u> Vent pipe drainage. Components of the <u>The</u> radon vent pipe system shall be installed to provide <u>positive condensate</u> drainage to the ground beneath the slab or <u>soil-gas-retarder</u>. <u>membrane</u>. The pipe shall not be trapped and shall have a minimum slope of one-eighth inch per foot (1 percent slope).

AF103.9 AF103.5.3 Vent pipe identification. Exposed and visible interior radon vent pipes shall be identified with not less than one label on each floor and in accessible *attics*. attics. The label shall read : "Radon Reduction System." "This pipe is a component of a radon control system. A radon test is necessary to verify that the radon level is below the level recommended by the US EPA." The height of the label lettering shall be not less than 0.25 inch [6.35 mm].

AF103.10 <u>AF103.5.4</u> Combination foundations. Combination *basement*/crawl space or slab-on-grade/crawl space foundations shall have separate radon vent pipes installed in each type of foundation area. Each radon vent pipe shall terminate above the roof or shall be connected Where more than one type of foundation is present, each foundation area shall have a separate radon vent pipe and soil gas collector. Vent pipes shall connect to a single vent that terminates above the roof or each individual vent pipe shall terminate separately above the roof.

AF103.6.2 AF103.5.5 Multiple vent pipes. Separate foundation areas In buildings where interior footings or other barriers separate the subslab aggregate or other gas-permeable material foundation areas, each area shall be fitted with an individual vent pipe. pipe or a pipe loop or equivalent method shall connect such areas below the slab. Vent pipes shall connect to a single vent that terminates above the roof or each individual vent pipe shall terminate separately above the roof.

Add new text as follows:

AF103.5.6 Provisions for radon fan. To facilitate possible installation of a radon fan. compliance with Sections AF103.5.6.1 through AF103.5.6.3 shall be required.

Revise as follows:

AF103.8 <u>AF103.5.6.1</u> Vent pipe accessibility. Radon vent pipes shall be accessible for future fan installation through provided with access in an *attic* or other area outside the *habitable space*. for the purpose of installing a fan. The pipe shall be centered in an an unobstructed cylindrical space having a vertical height of not less than 48 inches [122 cm] and a diameter of not less than 21 inches [53 cm] in the location where a fan would be installed.

Exception: Where an *approved* electrical supply is installed on the roof **Exception:** The radon vent pipe

need not be accessible in an *attic* space where an *approved* roof-top electrical supply is provided for future use.

Add new text as follows:

AF103.5.6.2 Radon fan location. Fans shall be located outdoors, in attics or in garages that are not beneath conditioned spaces. Fans shall not be installed below ground, in conditioned spaces, in occupiable spaces of a building or in any basement, crawlspace or other interior location that is directly beneath a conditioned or occupiable space of a building. Fans shall not be installed in any location where pipe positively pressured by the fan would be located inside conditioned or occupiable space.

Revise as follows:

AF103.12 <u>AF103.5.6.3</u> **Power source.** To provide for future installation of <u>an active submembrane or subslab</u> depressurization system <u>a radon fan</u>, an electrical circuit terminated that terminates in an *approved* junction box shall be installed during construction in the *attic* or other anticipated location of vent pipe fans. An electrical supply shall be accessible in anticipated locations of system failure alarms. <u>of a fan.</u>

AF103.4 AF103.6 Entry routes. Potential radon entry routes shall be closed in accordance with Sections AF103.4.1 AF103.6.1 through AF103.4.10. AF103.6.5.

AF103.4.1 <u>AF103.6.1</u> Floor openings. Openings around bathtubs, showers, water closets, pipes, wires or and other objects that penetrate concrete slabs , or other floor assemblies , shall be filled with a polyurethane caulk or equivalent sealant applied in accordance with the manufacturer's recommendations. sealed in a permanent manner.Exception: Sealing is not required for floors above conditioned spaces.

AF103.4.2 <u>AF103.6.2</u> Concrete joints. Control <u>Isolation joints</u>, isolation joints, construction joints, and any other joints in concrete slabs or between slabs and foundation walls shall be sealed with a caulk or sealant. Gaps and joints shall be cleared of loose material and filled with polyurethane caulk or other elastomeric sealant applied complying with ASTM C920 class 25 or higher or equivalent method installed in accordance with the manufacturer's recommendations.

AF103.4.4 AF103.6.3 Sumps. Sump pits open to soil or serving as the termination point for subslab or exterior drain tile loops shall be covered with a gasketed or otherwise sealed lid. Sumps used as the suction point in a subslab depressurization system shall have a lid designed to accommodate the vent pipe. Sumps used as a floor drain shall have a lid equipped with a trapped inlet.

AF103.4.5 AF103.6.4 Foundation walls. Hollow block masonry foundation walls shall be constructed with either a continuous course of *solid masonry*, one course of masonry grouted solid, or a solid concrete beam at or above finished ground surface to prevent the passage of air from the interior of the wall into the living space. Where a brick veneer or other masonry ledge is installed, the course immediately below that ledge shall be sealed. Joints, cracks <u>or and</u> other openings around all penetrations of both exterior and interior surfaces of masonry block or wood foundation walls below the ground surface shall be filled with polyurethane caulk or equivalent sealant. complying with ASTM C920 class 25 or higher, or equivalent method installed in accordance with the manufacturer's recommendations. Penetrations of concrete walls shall be filled.

AF103.4.10 AF103.6.5 Crawl space access. Access doors and other openings or penetrations between *basements* and adjoining crawl spaces shall be closed, gasketed or otherwise filled to prevent air leakage. <u>leakage.Exception: Air sealing is not required for conditioned crawl spaces.</u>

Delete without substitution:

AF103.4.3 Condensate drains. Condensate drains shall be trapped or routed through nonperforated pipe to daylight.

AF103.4.6 Dampproofing. The exterior surfaces of portions of concrete and masonry block walls below the ground surface shall be dampproofed in accordance with Section R406.

AF103.4.7 Air-handling units. Air-handling units in crawl spaces shall be sealed to prevent air from being drawn into the unit.

Exception: Units with gasketed seams or units that are otherwise sealed by the manufacturer to prevent leakage.

AF103.4.8 Ducts. Ductwork passing through or beneath a slab shall be of seamless material unless the airhandling system is designed to maintain continuous positive pressure within such ducting. Joints in such ductwork shall be sealed to prevent air leakage.

Ductwork located in crawl spaces shall have seams and joints sealed by closure systems in accordance with Section M1601.4.1.

AF103.4.9 Crawl space floors. Openings around all penetrations through floors above crawl spaces shall be caulked or otherwise filled to prevent air leakage.

AF103.11 Building depressurization. Joints in air ducts and plenums in un*conditioned spaces* shall meet the requirements of Section M1601. Thermal envelope air infiltration requirements shall comply with the energy conservation provisions in Chapter 11. Fireblocking shall meet the requirements contained in Section R302.11.



pCi/L standard for picocuries per liter of radon gas. The U.S. Environmental Protection Agency (EPA) recommends that homes that measure 4 pCi/L and greater be mitigated.

The EPA and the U.S. Geological Survey have evaluated the radon potential in the United States and have developed a map of radon zones designed to assist *building officials* in deciding whether radonresistant features are applicable in new construction.

The map assigns each of the 3,141 counties in the United States to one of three zones based on radon potential. Each zone designation reflects the average short-term radon measurement that can be expected to be measured in a building without the implementation of radon-control methods. The radon zone designation of highest priority is Zone 1. Table AF101 lists the Zone 1 counties illustrated on the map. More detailed information can be obtained from state-specific booklets (EPA-402-R-93-021 through 070) available through State Radon Offices or from EPA Regional Offices.

FIGURE AF101 EPA MAP OF RADON ZONES

a.

TABLE AF101(1) HIGH RADON-POTENTIAL (ZONE 1) COUNTIES*

Delete table in its entirety

Add new standard(s) as follows:

E1745: Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

Reason: This code change proposal improves Appendix F by clarifying some construction details, resolving longstanding editorial issues and addressing a few significant installation problems that impact the effectiveness of radon control in new construction.

The requirement subsections are renumbered to facilitate deletions of redundant material and reorganization. The narrative statement below refers to the subsection numbers in the *proposed* text.

- Additional detail has been provided on the vent pipe connector in Section AF103.3.3, the connection between the vertical radon vent pipe and the gas permeable layer below the crawl space or slab. This connection has suffered from consistent clogging with soil, concrete and/or gravel. A requirement for a couple of short lengths of perforated piping in the gas permeable layer and clarification that the tee fitting shall secure the vent pipe will largely prevent this clogging.
- Another latent problem which occurs often in the field is that the vent piping is routed through the attic space without allowing access to the vent pipe and leaving insufficient headroom for a fan if system activation is required. Space considerations are provided to address this problem in Section AF103.5.6. Fan installation remains outside of the scope of AF103.5.6.
- Section AF103.4.1, the required 12-inch lapping of joints is reduced to 6 inches, and extension of the soil gas retarder upward on foundation walls for subslabs is added to match the extension on walls for crawl spaces.
- Clearances to prevent radon entry from the exhaust pipe are clarified, and prevention of pipe obstruction by screening material is added, both within Section AF03.5.1.
- In Section AF103.5.3, the vent pipe identification is expanded to clarify the limit of Appendix F radon control.
- Lack of sealing of the submembrane soil gas retarder creates problems in systems installed in homes with crawl spaces. In this proposal, sealing is added (except for where the crawl space will be covered by concrete and where crawl space ventilation exists) to

Several editorial changes clarify and simplify the Appendix without expanding requirements. Along with some fairly self-explanatory edits, these changes include:

- Section AF101 specifies that the scope of the appendix is "radon control methods in new construction."
- Section AF101 would no longer include references to EPA radon zone 1, zone 1 county lists, or the EPA radon map. Voluntary use of the Appendix by builders and adoptions in jurisdictions beyond Zone 1 reduce the applicability of these materials. According to the Home Innovations Research Lab report "Radon-Resistant Construction Practices in New U.S. Homes 2016" [see bibliography] 24% of 2016 homes in Zone 2 were built with radon control. In 2016 the State of Connecticut adopted radon control for all counties; previously Minnesota and Illinois did the same. Local jurisdictions are adopting the Appendix.
- In AF102, the definition of radon gas is simplified, a universal term, radon rough-in, is added to clarify the type of system allowed by Appendix F, and duplicative references to active and passive subslab methods are deleted in favor of a single definition for subslab systems.

- In Section AF103.3.1 Gas Permeable Layer, an option for using stay-in-place forms per 404.1.3.3.6 is added to the choices, and the specification allowing for "the lateral flow of gases" is moved from the initial sentence to the fifth and final option.
- The description of materials for vent pipes in Section AF103.5 was changed from "ABS, PVC or equivalent" to "comply with P3002.1."
- Redundancies with other code requirements for ventilation, foundation and condensate drains, damp proofing, and air handler sealing have been removed.
- An exception for sealing for floors above conditioned spaces is added in AF 103.6.1.
- Sealing requirements for control joints were eliminated in AF 103.6.2.

Most of the changes in this proposal were presented by the proponent in code change proposal or public comment in 2016.

Below for ease of review is the text that would result from the proposed revisions:

APPENDIX F

RADON CONTROL METHODS

AF101.1 General. This appendix contains requirements for radon control methods in new construction.

SECTION AF102 DEFINITIONS

AF102.1 General. For the purpose of these requirements, the terms used shall be defined as follows: RADON GAS. The element Rn-222, which is a radioactive, colorless, odorless, tasteless, cancer-causing gas that occurs naturally as a decay product of radium.

RADON ROUGH-IN. The installation of all parts and materials of submembrane or subslab depressurization system including gas permeable layers, soil gas retarders, membranes, piping, connectors, terminations, and power sources.

SOIL-GAS-RETARDER. A continuous membrane of 6-mil [0.15 mm] polyethylene or other equivalent material used to retard the flow of soil gases into a building.

SUBMEMBRANE DEPRESSURIZATION SYSTEM. System designed to achieve lower sub-membrane air pressure relative to crawl space air pressure by use of a fan powered vent drawing air from beneath the soil gas retarder membrane.

SUBSLAB DEPRESSURIZATION SYSTEM. System designed to achieve lower sub-slab air pressure by use of a fan-powered vent drawing air from beneath the floor slab.

SECTION AF103 REQUIREMENTS

AF103.1 General. AF103 is intended to reduce radon entry and prepare the building for post-construction radon mitigation if necessary.

AF103.2 Radon Rough-in. A rough-in is required for all foundation types, including crawlspace, basement, slab on grade, and slab on grade garage located below a living area as shown in Figure AF103.2. The rough-in shall be installed prior to pouring of concrete slabs, closure of building cavities, and installation of finish materials. Figure AF103.2 Foundation Types

AF103.3 Sub-slab depressurization system rough-in. In basement or slab-on-grade buildings, the components of a sub-slab depressurization system shall be installed during construction in accordance with AF103.3.1 through AF103.3 and AF103.5 through AF103.6.5.

AF103.3.1 Gas permeable layer. A gas-permeable layer shall be constructed under all concrete slabs and other floor systems that directly contact the ground and are within the walls of the living spaces of the building. The gas-permeable layer shall consist of one of the following:

A uniform layer of clean aggregate, not less than 4 inches [102 mm] in depth, shall be placed over the soil. The aggregate shall have a void ratio of not less than 35 percent or a Size Number 4, 5, 56, or 6 as classified by

ASTM C33.

A uniform layer of native or fill sand, a minimum of 4 inches [102 mm] in depth, overlain by a layer or strips of geotextile drainage matting. The geotextile drainage matting shall have a cross-sectional area of at least 12 square inches [774 sq mm]. The closest edge of the geotextile matting shall be placed no closer than 12 inches [305 mm] to the foundation wall around the interior of the foundation perimeter.

A loop of 4 inch [102 mm] nominal or larger size perforated pipe placed in a trench along the perimeter of the foundation, with the trench backfilled with clean aggregate having a void ratio of not less than 35 percent or a Size Number 4, 5, 56, or 6 as classified by ASTM C33 such that the pipe is surrounded by aggregate for at least 1/3 of the outside pipe circumference. The pipe shall be placed no closer than 12 inches [305 mm] to the foundation wall around the interior of the foundation perimeter.

A loop of interconnected stay-in-place forms used to cast the foundation footing in accordance with 404.1.3.3.6 that is left in place to provide ground water control and provide a separate channel above the ground water channel for soil gas ventilation, with a cross sectional area no less than 12 square inches [77 sq. cm]. Other materials, systems or floor designs with demonstrated capability to allow the lateral flow of soil gases from across the entire sub-floor area.

AF103.3.2 Vent pipe connector. A 4 inch [102 mm] nominal diameter tee fitting or equivalent method shall be used to secure the vent pipe opening within the gas permeable layer. Not less than 4 feet [1219 mm] of perforated pipe or geotextile matting shall be connected to each of the two horizontal openings of the tee fitting or the two horizontal openings shall be connected to the interior drain tile system. Alternatively, a sealed sump cover where the sump communicates directly with the sub-slab aggregate or communicates with it through a drainage system, shall secure the vent pipe opening. A flexible rubber coupling connector shall be provided at the sump cover connection to facilitate servicing the sump.

AF103.3.3 Soil gas retarder. A minimum 6-mil [[.006 in; 0.15 mm] (or 3-mil [[.003 in; 0.075 mm] crosslaminated) polyethylene or equivalent flexible sheeting material shall be placed on top of the gas permeable layer prior to casting the slab or placing the floor assembly. The sheeting shall cover the entire floor area with separate sections of sheeting lapped not less than 12 inches [305 mm] and extend up the surrounding foundation walls not less than 4 inches [101 mm]. Openings in the sheeting caused by pipe, wire and other penetrations shall be sealed. Punctures or tears in the material shall be sealed or covered with additional sheeting. AF103.4 Sub-membrane depressurization system rough-in. In buildings with a crawl space foundation, the components of a sub-membrane depressurization system shall be installed during construction in accordance with AF103.4.1 through AF103.6.5.

Exceptions:

Buildings in which an approved mechanical crawl space ventilation system is installed.

Where the soil gas retarder will be covered with concrete, the requirements of 103.3.2 shall apply.

AF103.4.1 Vent pipe connector. A tee fitting shall be installed beneath the soil gas membrane with not less than 10 feet of perforated pipe connected to each of the two horizontal openings of such fitting or the two horizontal openings of the tee fitting shall connect to the interior drain tile system. The branch opening of the tee fitting shall be connected to the vent pipe in accordance with section AF103.5.

AF103.4.2 Soil gas membrane. The soil in crawl spaces shall be covered with a continuous layer of soil gas membrane complying with ASTM E1745 Class A, B or C. The membrane shall be lapped not less than 6 inches [152 mm] at joints and shall extend upwards 12 inches [305 mm] and be sealed to all foundation walls enclosing the crawl space area. Seams shall be sealed with polyurethane caulk complying with ASTM C920 class 25 or higher, or taped or equivalent method, installed in accordance with the manufacturer's recommendations. AF103.5 Vent pipe. A 3 inch [76 mm] nominal size or larger gas-tight pipe shall be extended from the tee fitting up through the building floors and in accordance with Sections AF103.5.1 through AF103.5.6. Materials used shall comply with P3002.1.

AF103.5.1 Vent pipe termination. The vent pipe shall terminate vertically upward not less than 12 inches [305 mm] above the roof and in a location not less than two feet [51 mm] vertically above, or not less than 10 feet [3048 mm] measured in any other direction from, openings in the building and adjacent buildings including windows, doors and other gravity air intake openings, exclusive of attic ventilation openings. Where a screen is installed on the terminus of radon exhaust pipe to prevent the entry of animals, such screen shall have a mesh

size with a dimension of not less than 0.5 inch (12.7mm).

AF103.5.2 Vent pipe drainage. The radon vent pipe shall be installed to provide condensate drainage to the ground beneath the slab or membrane. The pipe shall not be trapped and shall have a minimum slope of one-eighth inch per foot (1 percent slope).

AF103.5.3 Vent pipe identification. Exposed and visible interior radon vent pipes shall be identified with not less than one label on each floor and in accessible attics. The label shall read "This pipe is a component of a radon control system. A radon test is necessary to verify that the radon level is below the level recommended by the US EPA.." The height of the label lettering shall be not less than 0.25 inch [6.35 mm].

AF103.5.4 Combination foundations. Where more than one type of foundation is present, each foundation area shall have a separate radon vent pipe and soil gas collector. Vent pipes shall connect to a single vent that terminates above the roof or each individual vent pipe shall terminate separately above the roof.

AF103.5.5 Separate foundation areas. In buildings where interior footings or other barriers separate foundation areas, each area shall be fitted with an individual vent pipe or a pipe loop or equivalent method shall connect such areas below the slab. Vent pipes shall connect to a single vent that terminates above the roof or each individual vent pipe shall terminate separately above the roof.

AF103.5.6 Provisions for radon fan. To facilitate possible installation of a radon fan, the following shall be provided:

AF103.5.6.1 Vent pipe accessibility. The radon vent pipes shall be provided with access in an attic or other area outside the habitable space for the purpose of installing a fan. The pipe shall be centered in an unobstructed cylindrical space having a vertical height of not less than 48 inches [122 cm] and a diameter of not less than 21 inches [53 cm] in the location where a fan would be installed.

Exception: Where an approved electrical supply is installed on the roof for future use.

AF103.5.6.2 Radon fan location. Fans shall be located outdoors, in attics or in garages that are not beneath conditioned spaces. Fans shall not be installed below ground, in conditioned spaces, in occupiable spaces of a building or in any basement, crawlspace or other interior location that is directly beneath a conditioned or occupiable space of a building. Fans shall not be installed in any location where pipe positively pressured by the fan would be located inside conditioned or occupiable space.

AF103.5.6.3 Power source. To provide for future installation of a radon fan, an electrical circuit that terminates in an approved junction box shall be installed in the attic or other anticipated location of a fan.

AF103.6 Entry routes. Potential radon entry routes shall be closed in accordance with Sections AF103.6.1 through AF103.6.5.

AF103.6.1 Floor openings. Openings around bathtubs, showers, water closets, pipes, wires and other objects that penetrate concrete slabs or floor assemblies shall be sealed in a permanent manner.

Exception: Sealing is not required for floors above conditioned spaces.

AF103.6.2 Concrete joints. Isolation joints, construction joints and other joints in concrete slabs and between slabs and foundation walls shall be sealed with a caulk or sealant. Gaps and joints shall be cleared of loose material and filled with polyurethane caulk complying with ASTM C920 class 25 or higher or equivalent method installed in accordance with the manufacturer's recommendations.

AF103.6.3 Sumps. Sump pits open to soil or serving as the termination point for subslab or exterior drain tile loops shall be covered with a gasketed or otherwise sealed lid. Sumps used as a suction point in a subslab depressurization system shall have a lid designed to accommodate the vent pipe. Sumps used as a floor drain shall have a lid equipped with a trapped inlet.

AF103.6.4 Foundation walls. Hollow block masonry foundation walls shall be constructed with a continuous course of solid masonry, one course of masonry grouted solid, or a solid concrete beam at or above finished grade to prevent passage of air from the interior of the wall into the living space. Where a brick veneer or other masonry ledge is installed, the course immediately below that ledge shall be sealed. Joints, cracks and other openings around penetrations of both exterior and interior surfaces of masonry block and wood foundation walls below the ground surface shall be filled with polyurethane caulk complying with ASTM C920 class 25 or higher, or equivalent method installed in accordance with the manufacturer's recommendations. Penetrations of concrete walls shall be sealed.

AF103.6.5 Crawl space access. Access doors and other openings or penetrations between basements and

adjoining crawl spaces shall be closed, gasketed or otherwise filled to prevent air leakage. Exception: Air sealing is not required for conditioned crawl spaces.

Bibliography: "Radon-Resistant Construction Practices in New U.S. Homes 2016," prepared by Home Innovations Research Lab, Annual Builder Practices Survey, 5960-17, for USEPA. ASTM E1745

Cost Impact: The code change proposal will increase the cost of construction

The additional cost of the code change in materials is \$25: \$10 for 10 feet of 4" perforated pipe; \$10 for caulk to seal the soil gas retarder and \$5 in additional cost for soil retarder material on walls (offset by the reduction in soil retarder material need to overlap seams). There is also a labor cost component which is minimal for the perforated pipe and varable for the sealing depending on the area of the crawl space.

Installation of the existing Appendix F in a single family home is documented in the Home Innovation Research Labs' 2016 report on radon-resistant construction practices [see bibliography]: "In 2016, the average installation cost for a passive system in a single-family detached home was approximately \$374, up slightly from the \$358 reported for 2015 and \$332 reported for 2014."

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM E1745, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4315

RB288-19

RB289-19

IRC®: AF104 (New)

Proponent: Craig Conner, representing self (craig.conner@mac.com)

2018 International Residential Code

Add new text as follows:

AF104 Testing. Where radon-resistant construction is required, radon testing shall be as specified in Items 1 through 11:

- 1. Testing shall be performed after the dwelling passes its air tightness test
- 2. <u>Testing shall be performed after the radon control system and HVAC installations are complete. The HVAC system shall be operating during the test. Where the radon system has an installed fan, the dwelling shall be tested with the radon fan operating</u>
- 3. <u>Testing shall be performed at the lowest occupied floor level, whether or not that space is finished.</u> <u>Spaces that are physically separated and served by different HVAC systems shall be tested separately</u>
- 4. <u>Testing shall not be performed in a closet, hallway, stairway, laundry room, furnace room, bathroom or kitchen</u>
- 5. <u>Testing shall be performed with a commercially available radon test kit or with a continuous radon monitor</u> <u>that can be calibrated. Testing with test kits shall include two tests, and the test results shall be averaged.</u> <u>Testing shall be in accordance with this section and the testing device manufacturer's instructions</u>
- 6. <u>Testing shall be performed with the windows closed</u>. <u>Testing shall be performed with the exterior doors</u> <u>closed</u>, <u>except when being used for entrance or exit</u>. <u>Windows and doors shall be closed for at least 12</u> <u>hours prior to the testing</u>
- 7. <u>.Testing shall be performed by the builder, a registered design professional, or an approved third party.</u>
- 8. <u>Testing shall be conducted over a period of not less than 48 hours or not less that the period specified by</u> <u>the testing device manufacturer, whichever is longer</u>
- 9. <u>Written radon test results shall be provided by the test lab or testing party. The final written test results shall be included with construction documents.</u>
- 10. Where the radon test result is 4 pCi/L or greater, the fan for the radon vent pipe shall be installed as specified in Sections AF103.8 and AF103.12
- 11. Where the radon test result is 4 pCi/L or greater, the system shall be modified and retested until the test result is less than 4 pCi/L.

Exception: Testing is not required where the occupied space is located above an unenclosed open space.

Reason: Testing is the only way to know if radon levels are below the safety level. Radon is a tasteless colorless gas that can cause lung cancer. Radon tests are relatively simple and inexpensive. The jurisdiction decides if radon-resistant construction applies in the jurisdiction by adopting (or not adopting) Appendix F, most commonly adopting the Appendix F in radon zone 1. Both the occupants and the builder want to know that the radon mitigation system works.

Where radon systems are required, consider this test commissioning for the radon system. Typically the inexpensive radon test kits are mailed off to a testing lab. The testing lab responds fairly quickly with written results. The "safety" level or range is a test below 4 pCi/L. Besides confirming compliance, written test results provide the owner with confirmation the home's radon level is at or below the safety level. For unsold homes, written test results with the construction documents allow the future owner to know that the home passed its safety test.

Often homes will pass without installing the fan described in Appendix F, with is sometimes called a "passive" radon system. Where a passive system does not meet the safety level, adding a fan usually lowers the radon level to the safety range.

Bibliography: The American Cancer Society states that "The leading cause of lung cancer in non-smokers is exposure to radon gas." (ref 1) The link between radon and lung cancer has been firmly established for about 20 years (ref 2). Radon is estimated to cause about 20,000 deaths per year from lung cancer (ref 2). Children exposed to high levels of radon are more likely to develop lung cancer later in life. (ref 3). Deaths from radon significantly exceed deaths from other building-related risks; such as fires, falls, electrocution, tornadoes, hurricanes, winds, fires, etc. In part this is because the codes have reduced these other risks, but have not addressed radon as well.

1) Lung Cancer Risks for Non-Smokers. American Cancer Society. Nov 6, 2017 <u>https://www.cancer.org/latest-news/why-lung-cancer-strikes-nonsmokers.html</u>

Radon "accounts for about 21,000 deaths from lung cancer each year."

2) U.S. National Research Council Committee on the Biological Effects of Ionizing Radiation. 1999.

https://www.nap.edu/read/5499/chapter/1#viii https://www.nap.edu/read/5499/chapter/5#97

Historically the link between radon and lung cancer was not understood. Radon is an invisible, tasteless and odorless gas. There is a long period between exposure to radon and the symptoms of lung cancer. Recognition that radon increased lung cancers came from early studies of uranium miners, and was later confirmed more broadly.

https://www.nap.edu/read/5499/chapter/5#97

In 1999 it was concluded that residential radon, as well as smoking, were the most important contributors to the lung cancer. Note table 3-10, summed "total male" and "total female" for both "ever-smokers" and "never-smokers" Actual value in table is 21,800, but is rounded to 21,000.

3) "Canadian Lung Cancer Relative Risk from Radon Exposure for Short Periods in Childhood Compared to a Lifetime" International Journal of Environmental Research and Public Health. 2013 May; 10(5): 1916–1926.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3709356/

The study concluded: "... exposure to radon during childhood increases the lifetime risk of developing lung cancer ... if a child lived in a home with very high radon concentration for only a few years, the risk of developing lung cancer later in the life could be equivalent to a lifetime exposure to moderate radon concentration."

Cost Impact: The code change proposal will increase the cost of construction Radon test kits are inexpensive, less than \$50 for the two tests including laboratory determination of results. Tests by radon professionals will likely be more expensive.

Proposal # 5548

RB290-19

IRC®: AJ102.4.4

Proponent: Jeff Inks, representing Window and Door Manufacturers Association (jinks@wdma.com); Jennifer Hatfield, representing American Architectural Manufacturers Association (jen@jhatfieldandassociates.com)

2018 International Residential Code

Revise as follows:

AJ102.4.4 Window control devices. Where window fall prevention devices complying with ASTM F2090 are not provided, window opening control devices complying with ASTM F2090 shall be installed where an existing window, including the sash and glazed portion, is replaced and where all of the following apply to the replacement window:

- 1. The window is operable.
- 2. The window replacement includes replacement of the sash and the frame.
- 3. The top of the sill of the window opening is at a height less than 24 inches (610 mm) above the finished floor.
- 4. The window will permit openings that will allow passage of a 4-inch-diameter (102 mm) sphere where the window is in its largest opened position.
- 5. The vertical distance from the top of the sill of the window opening to the finished grade or other surface below, on the exterior of the building, is greater than 72 inches (1829 mm).

The window opening control device, after operation to release the control device allowing the window to fully open, shall not reduce the minimum net clear opening area of the window unit.

Reason: This revision makes it clear that regardless of whether replacing the entire existing window (sash and frame), or the sash and glazed portion with an insert window where the existing frame remains, the window fall prevention requirements apply in both applications which is consistent with how the code treats these replacements for energy efficiency.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The intent of this proposal is to ensure window fall prevention requirements are met as intended by the code. It does not have a direct impact on cost.

Proposal # 5398

RB290-19

RB291-19

IRC®: AK102.1, AK103.1, ASTM Chapter 44 (New)

Proponent: Tim Earl, representing The Gypsum Association (tearl@gbhinternational.com)

2018 International Residential Code

Revise as follows:

AK102.1 General. Airborne sound insulation for wall and floor-ceiling assemblies shall meet a sound transmission class (STC) rating of 45 where tested in accordance with ASTM E90 or an apparent STC (ASTC). of 42 when tested in accordance with ASTM E90. E336. Penetrations or openings in construction assemblies for piping; electrical devices; recessed cabinets; bathtubs; soffits; or heating, ventilating or exhaust ducts shall be sealed, lined, insulated or otherwise treated to maintain the required ratings. *Dwelling unit* entrance doors, which share a common space, shall be tight fitting to the frame and sill.

AK103.1 General. Floor/ceiling assemblies between *dwelling units*, or between a *dwelling unit* and a public or service area within a structure, shall have an impact insulation class (IIC) rating of not less than 45 when tested in accordance with ASTM E492. E492 or an apparent IIC (AIIC) of 42 where tested in accordance with ASTM E1007.

Add new standard(s) as follows:

ASTM

ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

E336-17a: Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings



ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428

E1007-16: Standard Test Method for Field Measurement of Tapping Machine Impact Sound Transmission Through Floor-Ceiling Assemblies and Associated Support Structures

Reason: This creates the addition of the option for field testing for ASTC and AIIC – actual field measures versus laboratory measures - with slightly lower requirements for these versus the lab tested assemblies as they are actual numbers of in place systems. This begins to migrate the code to the more preferred field verified apparent measures as reflected in ICC G2-2010 guidance, in the IBC and in ASTM standards on sound, but still leaves it as just an option in an optional appendix.

Cost Impact: The code change proposal will not increase or decrease the cost of construction This adds an optional method of testing, so it will not increase the cost of construction unless users choose this option, which would add approximately \$1,500 to the cost of a home.

Proposal # 5049

RB292-19

IRC®: AQ (New), AQ106.1 (New), AQ106.1.1 (New), AQ107.1 (New)

Proponent: Hope Medina, representing Self (hmedina@coloradocode.net)

2018 International Residential Code

Add new text as follows:

<u>AQ</u> Energy Conservation

<u>AQ106.1 Testing for tiny houses.</u> The air leakage rate for tiny houses shall not exceed 0.30 cfm at 50 pascals of pressure per ft² of the dwelling unit enclosure area.

Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E 779 or ASTM E 1827 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*.

During testing:

- 1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weather stripping or other infiltration control measures.
- 2. <u>Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not</u> sealed beyond intended infiltration control measures.
- 3. Interior doors, if installed at the time of the test, shall be open.
- 4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed.
- 5. <u>Heating and cooling systems, if installed at the time of the test, shall be turned off.</u>
- 6. <u>Supply and return registers, if installed at the time of the test, shall be fully open.</u>

<u>AQ106.1.1 Whole house mechanical ventilation.</u> Where an air leakage rate not exceeding 0.30 cfm per ft² of the dwelling unit enclosure area in accordance with Section AQ106.1 is provided, the tiny house shall be provided with whole house mechanical ventilation in accordance with Section M1505.4.

AQ107.1 Tiny House. Tiny houses shall be deemed to be in compliance with Chapter 11 of this code and Chapter R4 of the *International Energy Conservation Code* provided that the following conditions are met:

- 1. The insulation and fenestration meet the requirements of Table N1102.1.2
- 2. <u>The thermal envelope meets the requirements of Section N1102.4.1.1 and Table N1102.4.1.1</u>.
- 3. <u>Solar, wind, or other renewable energy source supplies not less than 90 percent of the energy use for the structure.</u>
- 4. <u>Solar, wind, or other renewable energy source supplies not less than 90 percent of the energy for service</u> water heating.
- 5. <u>Permanently installed lighting is in accordance with Section R404.</u>
- 6. <u>Mechanical ventilation is provided in accordance with Section M1505 of this code. Operable fenestration</u> is not used for ventilation.

Reason: The appendix currently states that tiny houses must comply with the code except for the following. There are some energy requirements that need to be adjusted for the unique construction of tiny houses. The current test parameters for air tightness are not conducive for houses with smaller volumes. The new testing
parameters and metrics will provide the ability for air leakage of the smaller structures and allowing for them to demonstrate compliance.

When testing to the new metrics there needs to be an understanding that when meeting the testing one must provide a whole house mechanical ventilation system.

This proposal addresses those tiny houses that build to be self-sufficient with their energy consumption. If they meet those requirements they should be considered to comply with the intent of the energy requirements.

Cost Impact: The code change proposal will not increase or decrease the cost of construction These requirements while are already required would not increase the cost of construction. This proposal provide options for the type of construction that happens for tiny houses to obtain energy compliance.

Staff Analysis: A review of the standards proposed for inclusion in the code, RESNE/ICC 380, ASTM E779 and ASTM E1827, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 5539

RB292-19

RB293-19

IRC®: AQ104.1.2, AQ104.1.3, AQ104.2, AQ104.2.1, AQ104.2.1.2, AQ104.2.1.4 (New), AQ104.2.1.4, AQ104.2.1.5, AQ104.2.1.6, AQ104.2.5, Figure AQ104.1.3 (New)

Proponent: Martin Hammer, representing Martin Hammer, Architect (mfhammer@pacbell.net); Thom Stanton, Tiny Home Industry Association, representing Tiny Home Industry Association (THIA) (gotiny.com@gmail.com); David Eisenberg, representing DCAT (strawnet@gmail.com); Brad Wiseman, Garmin USA, representing Tiny Home Industry Association (chairman@tinyhomeindustryassociation.org); Charles Ballard, PWA, representing PWA; Zachariah Giffin, A+E Network, representing Tiny House Nation (zackgiffin@gmail.com)

2018 International Residential Code

Revise as follows:

AQ104.1.2 Minimum <u>horizontal</u> dimensions. *Lofts* shall be not less than 5 feet (1524 mm) in any horizontal dimension.

AQ104.1.3 Height effect on loft area. Portions of a *loft* with a sloped ceiling measuring less than 3 feet (914 mm) from the finished floor to the finished ceiling shall not be considered as contributing to the minimum required area for the loft. <u>See Figure AQ104.1.3</u>.

Exception: Under gable roofs with a minimum slope of 6 units vertical in 12 units horizontal (50-percent slope), portions of a *loft* with a sloped ceiling measuring less than 16 inches (406 mm) from the finished floor to the finished ceiling shall not be considered as contributing to the minimum required area for the *loft*.

AQ104.2 Loft <u>access</u><u>access</u> and <u>egress</u>. The access to and primary egress from *lofts* shall be of any type described in Sections AQ104.2.1 through AQ104.2.4. <u>The loft access and egress element along its required</u> <u>minimum width, shall meet the loft where its ceiling height is not less than 3 feet (914 mm).</u>

AQ104.2.1 Stairways. Stairways accessing *lofts* shall comply with this code or with Sections AQ104.2.1.1 through AQ104.2.1.5. AQ104.2.1.7.

Revise as follows:

AQ104.2.1.2 Headroom. The headroom in <u>above</u> stairways accessing a *loft* shall be not less than 6 feet 2 inches (1880 mm), as measured vertically, from a sloped line connecting the tread <u>, landing</u> or landing platform nosings in the <u>middle center</u> of their <u>width</u>. <u>width</u>, and vertically from the landing platform along the center of its width</u>

Add new text as follows:

AQ104.2.1.4 Landings. Intermediate landings and landings at the bottom of stairways shall comply with Section R311.7.6, except that the depth in the direction of travel shall be not less than 24 inches (610 mm).

Revise as follows:

AQ104.2.1.4 <u>AQ104.2.1.5</u> Landing platforms. The top tread and riser of stairways accessing *lofts* shall be constructed as a *landing platform* where the *loft* ceiling height is less than 6 feet 2 inches (1880 mm) where the stairway meets the *loft*. The landing platform shall be <u>18 inches to 22 inches (457 to 559 not less than 20 inches (508 mm)</u> in <u>width and in depth measured horizontally</u> from <u>and perpendicular to</u> the nosing of the landing platform. The landing platform riser height to the edge of the loft , and <u>16 to floor shall be not less than 16 inches (406 mm) and not greater than</u> <u>18 inches (406 to 457 mm) in height measured from the *landing platform* to the *loft* floor...</u>

AQ104.2.1.5 AQ104.2.1.6 Handrails. Handrails shall comply with Section R311.7.8.

AQ104.2.1.6 AQ104.2.1.7 Stairway guards. Guards at open sides of stairways, landings, and landing platforms shall comply with Section R312.1.

AQ104.2.5 Loft Guards. Loft guards shall be located along the open side (s) of *lofts*. Loft guards shall be not less than 36 inches (914 mm) in height or one-half of the clear height to the ceiling, whichever is less. Loft guards shall comply with Section R312.1.3 and Table R301.5 for their components.

Add new text as follows:



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm

Figure AQ104.1.3 Loft Ceiling Height

Reason: This proposal improves Appendix Q by 1) modifying the language in some sections to provide clarity, 2) adding Figure AQ104.1.3 from the Commentary to illustrate the meaning of "height effect, and 3) making other changes to the following sections:

AQ104.2: The added sentence requires the ceiling height of the loft to be a minimum of 3 feet where access and egress element meets the loft. This was previously unaddressed.

AQ104.2.1.2: The change at the end clarifies that the required ceiling height above a landing platform is measured from the landing platform itself, as opposed to a sloping line connecting the landing platform nosing and the loft nosing. This is because a person goes from a standing to a kneeling position when entering a loft from a landing platform.

AQ104.2.1.4: A new section on intermediate and bottom landings for stairways sets their minimum dimensions, which was previously unaddressed. The 24" dimension in the direction of travel is greater than that required for a landing platform (20") because the nature of their use differs. A person goes from standing to kneeling at a landing platform to a loft (or vice versa), whereas a short, standing stride may be needed at an intermediate or bottom landing. The 24" dimension provides for that.

AQ104.2.5: The added sentence refers to related sections in the IRC to clarify that loft guard components must comply with those sections.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposed changes clarify dimensional requirements and language and do not affect cost.

Proposal # 4769

RB294-19

IRC®: AQ104.2.2.1 (New)

Proponent: Jay Hyde, representing Sacramento Valley Association of Building Officials (jhyde@mogaveroarchitects.com)

2018 International Residential Code

Revise as follows:

AQ104.2.2.1 Size and capacity. Ladders accessing *lofts* shall have a rung width of not less than 12 inches (305 mm), and 10-inch (254 mm) to 14-inch (356 mm) spacing between rungs. Ladders shall be capable of supporting a $\frac{200\ 300}{300}$ -pound ($\frac{75\ 136}{136}$ kg) load on any rung. Rung spacing shall be uniform within $\frac{3}{8}$ inch (9.5 mm).

Reason: The proposed 300 pond ladder capacity coordinates with IMC Section 306.5. According to the Centers for Disease Control, the average American male over 30 years of age is 180 pounds. The margin of safety at 200 pounds capacity is inadequate to protect the public.

Cost Impact: The code change proposal will increase the cost of construction The code change proposal MAY increase the cost of construction.

Proposal # 1427

RB294-19

RB295-19

IRC®: , TABLE AR103.2.3

Proponent: Martin Hammer, representing Martin Hammer, Architect (mfhammer@pacbell.net); Paula Baker-Laporte, representing Econest Architecture Inc. (paula@econest.com); Lou Host-Jablonski, representing self (lou@designcoalition.org); David Eisenberg, representing DCAT (strawnet@gmail.com)

2018 International Residential Code

Revise as follows:

CLAY SLIP. A suspension of clay or clay subsoil particles in water.

CLAY SUBSOIL. Subsoil sourced directly from the earth or refined, containing clay and free from not more than trace amounts of organic matter.

Revise as follows:

Density(pcf)	Straw(pcf)	Subsoil(pcf)	Water(gal/cf) ^b	Min.% clayin subsoil	Minimumclay: siltratio	Subsoil testingmethod ^{c,} d	Max. wallthickness, inches
10	6.7	3.3	1.55	70	3.5:1	А	15
12	6.7	5.3	1.63	46	1.7:1	A	15
13	6.7	6.3	1.67	40	1.33:1	A	15
15	6.7	8.3	1.74	35	0.95:1	A	15
20	6.7	13.3	1.93	30	0.60:1	А	12
30	6.7	23.3	2.31	NA	NA	В	12
40	6.7	33.3	2.70	NA	NA	В	12
50	6.7	43.3	3.08	NA	NA	В	12

TABLE AR103.2.3 REQUIREMENTS AND PROPERTIES OF LIGHT STRAW-CLAY MIXTURES^a

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- a. Interpolation permitted. Extrapolation not permitted.
- b. Water mixed with subsoil equals clay slip.
- c. Subsoil Testing Methods:
 - A. Lab test for percent of clay, silt and sand via hydrometer method.
 - B. <u>The Figure 2 Ribbon Test or and the Figure 3 Ball Test in the Appendix of ASTM</u> E2392/E2392M.
- d. Trace amounts of organic materials are acceptable.

Reason: The proposed changes to definitions improve clarity and provide consistency with language in footnote 'd' in Table AR103.2.3 and with definitions in Appendix S. The proposed changes to footnote 'c' in Table AR103.2.3 clarifies the referenced test's location, and corrects for the intention that both tests are required to determine subsoil suitability.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposed changes for clarity and consistency do not affect cost.

Proposal # 5109

RB296-19

IRC®: SECTION AS102, (New), , 202, 202, 202, 202, AS103.1, AS103.3, AS103.7, AS103.8, AS104.1, AS104.2, AS104.3, AS104.4.3.1, AS104.4.3.2, AS104.4.6.1, AS104.4.6.3, AS104.4.7 (New), AS104.4.7, AS104.4.8, AS105.3, AS105.4.1, TABLE AS105.4, AS105.6.8, AS106.2, AS106.4, AS106.5, AS106.8, AS106.9, AS106.9, I, TABLE AS106.12, AS106.12.3.1, AS106.13, TABLE AS106.13(1), TABLE AS106.13(3), AS106.15

Proponent: Martin Hammer, representing Martin Hammer, Architect (mfhammer@pacbell.net); David Eisenberg, DCAT, representing DCAT (strawnet@gmail.com); David Arkin, representing California Straw Building Association (info@strawbuilding.org); Ian Smith, representing Colorado Straw Bale Association (ian@lopezsmolensengineers.com); Anthony Dente, representing Verdant Structural Engineers (anthony@verdantstructural.com)

2018 International Residential Code

SECTION AS102 DEFINITIONS

Add new text as follows:

BRACED WALL PANEL, STRAWBALE. A strawbale wall designed and constructed to resist in-plane shear loads through the interaction of the stacked straw bales, the reinforced plaster and its connections to the top plate, sill plates and foundation. The panel's length meets the requirements for the particular wall type and contributes toward the total amount of bracing required along its braced wall line in accordance with Sections AS106.13 and R602.10.1.

CLAY. Inorganic soil with particle sizes less than 0.00008 inch (0.002 mm) having the characteristics of high to very high dry strength and medium to high plasticity. plasticity, used as the binder of other component materials in *clay* plaster and *straw-clay*.

Revise as follows:

CLAY SLIP. A suspension of *clay or <u>clay</u> subsoil particles* in water.

CLAY SUBSOIL. Subsoil sourced directly from the earth-or refined, containing *clay*-and free, sand and silt, and not more than trace amounts of organic matter.

FINISH. Completed <u>compilation combination</u> of materials on the interior or exterior faces of stacked *bales*.

PLASTER. Gypsum plaster, cement plaster, *clay* plaster, soil-cement plaster, lime plaster or cement-lime plaster-<u>Clay</u>, soil-cement, gypsum, lime, clay-lime, lime-cement, or cement plaster, as described in Section AS104.

Revise as follows:

PRECOMPRESSION. Vertical Permanent vertical compression of stacked *bales* before the application of finish.

Add new text as follows:

ROOF BEARING ASSEMBLY In load-bearing *strawbale* walls, a structural assembly at the top of the wall that bears and distributes roof loads to the wall.

ICC COMMITTEE ACTION HEARINGS ::: April, 2019

Revise as follows:

SHEAR WALL. A *strawbale* wall designed and constructed to resist <u>in-plane</u> lateral seismic and wind forces parallel to the plane of the wall in accordance with Section AS106.13. <u>Synonymous with braced wall panel.</u>

AS103.1 Shape. *Bales* shall be rectangular in shape. shape. except for partial bales made to fill non-rectangular spaces in accordance with AS103.6.

AS103.3 Ties. *Bales* shall be confined by synthetic fiber, natural fiber or metal *ties* sufficient to maintain required *bale* density. *Ties* shall be not less than 3 inches (76 mm) and not more than 6 inches (152 mm) from the two <u>untied</u> faces without *ties* and shall be spaced not more than 12 inches (305 mm) apart. *Bales* with broken *ties* shall be retied with sufficient tension to maintain required bale density.

AS103.7 Types of straw. *Bales* shall be composed of *straw* from wheat, rice, rye, barley or oat. <u>The dry stems</u> of other cereal grains or similar crops shall be acceptable where *approved* by the building official. Bales shall not be composed of hay.

AS103.8 Other baled material. Orientation of bales. The dry stems of other cereal grains shall be acceptable where *approved* by the building official. Straw bales shall be placed *laid flat*, *on-edge*, or *on-end* in accordance with this appendix.

AS104.1 General. Finishes applied to *strawbale* walls shall be any type permitted by this code, and shall comply with this section and with Chapters 3 and 7 unless stated otherwise in this section. <u>plasters in accordance with Section AS104.4</u>, or non-plaster exterior wall coverings in accordance with Section R703 and other finish systems complying with all of the following:

- 1. <u>With approved specifications and details showing the finish system's means of attachment to the wall or</u> its independent support, and a means of draining or evaporating water that penetrates the exterior finish to the exterior.
- 2. The vapor permeance of the combination of finish materials shall be 5 perms or greater to allow the transpiration of water vapor through the wall.
- 3. Finish systems with weights >10 and \leq 20 pounds per square foot (> 48.9 and \leq 97.8 kg/m²) of wall area require a factor of 1.2 for minimum total length of braced wall panels in Table AS106.13(3).
- Einish systems with weights > 20 pounds per square foot (97.8 kg/m²) of wall area require an engineered design.

Revise as follows:

AS104.2 Purpose, and where required. *Strawbale* walls shall be finished so as to provide mechanical protection, fire resistance and protection from weather and to restrict the passage of air through the *bales*, in accordance with this appendix and this code. Vertical *strawbale* wall surfaces shall receive a coat of *plaster* not less than 3 /₈ inch (10 mm) thick, or greater where required elsewhere in this appendix, or shall fit tightly against a solid wall panel or dense-packed cellulose insulation with a density of not less than 3.5 pounds per cubic foot (56 kg/m³) blown into an adjacent framed wall. The tops of *strawbale* walls shall receive a coat of *plaster* not less than 3 /₈ inch (10 mm) thick where *straw* would otherwise be exposed. or be tightly covered by gypsum board or a *roof bearing assembly*.

Exception: *Truth windows* shall be permitted where a fire-resistance rating is not required. Weatherexposed *truth windows* shall be fitted with a weather-tight cover. Interior truth windows in Climate Zones 5, 6, 7, 8 and Marine 4 shall be fitted with an air-tight cover.

AS104.3 Vapor retarders. Class I and II vapor retarders shall not be used on a *strawbale wall*, nor shall any other material be used that has a vapor permeance rating of less than <u>3-5</u> perms, except as permitted or required elsewhere in this appendix.

AS104.4.3.1 General. *Clay plaster* shall be any plaster having a clay or *clay subsoil* binder. Such plaster shall contain sufficient clay to fully bind the plaster, sand or other inert granular material aggregate, and shall be permitted to contain reinforcing fibers. Acceptable reinforcing fibers include chopped straw, sisal and animal hair.

AS104.4.3.2 Clay subsoil requirements. The suitability of *clay subsoil* shall be determined in accordance with the Figure 2 Ribbon Test or and the Figure 3 Ball Test in the appendix of ASTM E2392/E2392M.

AS104.4.6.1 General. Lime *plaster* is any *plaster* with a binder that is composed of calcium hydroxide (CaOH) including Type N or S hydrated lime, hydraulic lime, natural hydraulic lime or <u>slaked</u> quicklime. Hydrated lime shall comply with ASTM C206. <u>C206</u>. <u>Hydraulic lime</u> shall comply with ASTM C1707. Natural hydraulic lime shall comply with ASTM C141 and EN 459. Quicklime shall comply with ASTM C5.

Revise as follows:

AS104.4.6.3 On structural walls. Lime *plaster* on *strawbale* structural walls in accordance with Table AS106.12 or Table AS106.13(1) shall use a binder of hydraulic or natural hydraulic lime.

Add new text as follows:

AS104.4.7 Clay-lime plaster. Clay-lime plaster shall be composed of refined *clay* or *clay subsoil*, sand, and lime, and shall be permitted to contain reinforcing fibers.

AS104.4.7 <u>AS104.4.8</u> Cement-lime plaster. Cement-lime plaster shall be *plaster* mixes CL, F or FL, as described in ASTM C926.

AS104.4.8 <u>AS104.4.9</u> Cement plaster. Cement *plaster* shall conform to ASTM/C926 and shall comply with Sections R703.7.4 and R703.7.5, except that the amount of lime in plaster coats shall be not less than 1 part lime to 6-4 parts cement to allow a minimum acceptable vapor permeability. The combined thickness of *plaster* coats shall be not more than $1^{1}/_{2}$ inches (38 mm) thick.

Revise as follows:

AS105.3 Sill plates. Sill plates shall be installed in accordance with Figure AS105.1(1) or AS105.1(2). Sill plates shall support and be flush with each face of the *straw bales* above and shall be of naturally durable or preservative-treated wood where required by this code. Sill plates shall be not less than nominal 2 inches by 4 inches (51 mm by 102 mm) with anchoring complying with Section R403.1.6 and the additional requirements of Tables Table AS105.4 and AS106.6(1), where applicable. where applicable and Sections AS106.13.2 and AS106.13.3 for strawbale braced wall panels.

AS105.4.1 Determination of out-of-plane loading. Out-of-plane loading for the use of Table AS105.4 shall be in terms of the ultimate design wind speed and seismic design category as determined in accordance with Sections R301.2.1 and R301.2.2. An engineered design in accordance with Section R301.2.1 shall be required where the building is located in a Special Wind Region or a Wind Design Required location in accordance with Figure R301.2(5).

Revise as follows:

TABLE AS105.4 OUT-OF-PLANE RESISTANCE METHODS AND UNRESTRAINED WALL DIMENSION LIMITS

METHOD	505		UNREST	RAINED WALL NSIONS, H ^b	MEOLIOTAL
OFOUT-OF- PLANE LOAD RESISTANCE ^a	FOR ULTIMATEDESIGN WINDSPEEDS(mph)	FOR SEISMICDESIGNCATEGORIES	Absolute limitin feet	Limit based on balethickness T ^c in feet (mm)	BOUNDARYRES
Nonplaster finish or unreinforced plaster	≤ 130	A, B, C, D ₀	H ≤ 8	H ≤ 5T	None requi
Pins per Section AS105.4.2	≤ 130	A, B, C, D ₀	H ≤ 12	H ≤ 8T	None requi
Pins per Section AS105.4.2	≤ 140	A, B, C,D ₀ , D ₁ , D ₂	H ≤ 10	H ≤ 7T	None requi
Reinforced ^d clay plaster	≤ 140	A, B, C,D ₀ , D ₁ , D ₂	H ≤ 10	H ≤ 8T ^{0.5} (H ≤ 140T ^{0.5})	≤ 6 inche
Reinforced ^d clay plaster	≤ 140	A, B, C,D ₀ , D ₁ , D ₂	10 < H ≤ 12	H ≤ 8T ^{0.5} (H ≤ 140T ^{0.5})	≤ 4 inche:
Reinforced ^d cement, cement-lime, limeor soil- cement plaster	≤ 140	A, B, C,D ₀ , D ₁ , D ₂	H ≤ 10	H ≤ 9T ^{0.5} (H ≤ 157T ^{0.5})	≤ 6 inche
Reinforced ^d cement, cement-lime, limeor soil- cement plaster	≤ 155	A, B, C,D ₀ , D ₁ , D ₂	H ≤ 12	H ≤ 9T ^{0.5} (H ≤ 157T ^{0.5})	≤ 4 inche։
2×6 load- bearing <u>wood</u> studs ^f at max. 6′ o.c.	≤ 140	A, B, C,D ₀ , D ₁ , D ₂	H ^g ≤ 9	N/A	None requi
2×6 load- bearing <u>wood</u> studs ^f at max. 4′ o.c.	≤ 140	A, B, C,D ₀ , D ₁ , D ₂	H ^g ≤ 10	N/A	None requi
2×6 load- bearing <u>wood</u> studs ^f at max. 2′ o.c.	≤ 140	A, B, C,D ₀ , D ₁ , D ₂	H ^g ≤ 12	N/A	None requi
2×4 load- bearing <u>wood</u> studs ^f at max. 2′ o.c.	≤ 140	A, B, C,D ₀ , D ₁ , D ₂	H ^g ≤ 10	N/A	None requi

2×6 nonload- bearing <u>wood</u> studs ^f at max.	≤ 140	A, B, C,D ₀ , D ₁ , D ₂	H ^g ≤ 12	N/A	None requi
6′ o.c.					

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

N/A = Not Applicable

- a. Finishes applied to both sides of stacked bales. Where different finishes are used on opposite sides of a wall, the more restrictive requirements shall apply.
- b. *H* = Stacked bale height in feet (mm) between sill plate and top plate or other approved horizontal restraint, or the horizontal distance in feet (mm) between *approved* vertical restraints. For load-bearing walls, *H* refers to vertical height only.
- c. T = Bale thickness in feet (mm).
- d. Plaster reinforcement shall be any mesh allowed in Table AS106.16 for the matching plaster type, and with staple spacing in accordance with this table. Mesh shall be installed in accordance with Section AS106.9.
- e. Sill plate attachment shall be with $\frac{5}{8}$ -inch anchor bolts or *approved* equivalent at not more than 48 inches on center where staple spacing is required to be ≤ 4 inches.
- f. Bales shall be attached to the studs by an approved method. Horizontal framing and attachment at top and bottom of studs shall be in accordance with Section R602 or an *approved* alternative. Table R602.7(1) shall be used to determine the top framing member where load-bearing stud spacing exceeds 24 inches o.c.
- g. H is vertical height only.

AS105.6.8 Separation of wood and plaster. Where wood framing or wood sheathing occurs at the exterior face of *strawbale* walls, such wood surfaces shall be separated from exterior plaster with two layers of Grade D paper, No. 15 asphalt felt or other *approved* material in accordance with Section R703.7.3. <u>R703.7.3</u>, <u>extending</u> not less than 1 inch (25 mm) past the edges of the framing member.

Exceptions:

- 1. Where the wood is preservative treated or *naturally durable* and is not greater than $1^{1}/_{2}$ inches (38 mm) in width.
- 2. Clay plaster shall not be required to be separated from untreated wood that is not greater than $1^{1}/_{2}$ inches (38 mm) in width.

AS106.2 Building limitations and requirements for use of strawbale structural walls. *Buildings* using strawbale *structural* walls shall be subject to the following limitations and requirements:

- 1. Number of stories: Not more than one. <u>one, except that two stories shall be allowed with an</u> <u>approved engineered design.</u>
- 2. *Building* height: Not more than 25 feet (7620 mm)-, except that greater heights shall be allowed with an *approved* engineered design.
- 3. Wall height: In accordance with Table AS105.4, AS106.13(2) or AS106.13(3) as applicable, whichever is most restrictive.
- 4. Braced wall panel lengths: The greater of the values determined in accordance with Tables AS106.13(2) and AS106.13(3) for *buildings* using strawbale braced wall panels, or in accordance with Item 4 of Section AS105.2 for *buildings* with *load-bearing strawbale walls* that do not use *strawbale* braced wall panels.

AS106.4 Foundations. Foundations for plastered *strawbale* walls shall be in accordance with Chapter 4, <u>and</u> Figure AS105.1(1) or Figure AS105.1(2) - <u>or an *approved* engineered design.</u>

AS106.5 Configuration Orientation and configuration of bales. Bales in strawbale structural walls shall be laid flat or on-edge and in a running bond or stack bond, except that bales in structural walls with unreinforced plasters shall be laid in a running bond only.

AS106.8 Plaster and membranes. membranes on structural walls. *Strawbale* structural walls shall not have a membrane between straw and plaster, or shall have attachment through the *bale* wall from one plaster skin to the other in accordance with an *approved* engineered design.

AS106.9 Mesh. Mesh in plasters on *strawbale* structural walls, and where required by Table AS105.4, <u>and</u> where used to resist wind uplift in accordance with Section AS106.14, shall be installed in accordance with Sections AS106.9.1 through AS106.9.4.

AS106.9.1 Mesh laps. Mesh required by Table AS105.4 or AS106.12 shall be installed with not less than 4-inch (102 mm) laps. Mesh required by Table AS106.13(1) or in walls designed to resist wind uplift of more than 100 plf (1459 N/m) in accordance with Section AS106.14, shall run continuous vertically from sill plate to the top plate or roof-bearing element, or shall lap not less than 8 inches (203 mm). Horizontal laps in such mesh shall be not less than 4 inches (102 mm).

TABLE AS106.12 ALLOWABLE SUPERIMPOSED VERTICAL LOADS (LBS/FOOT) FOR PLASTERED LOAD-BEARING STRAWBALE WALLS

WALL DESIGNATION	PLASTER ^a (both sides) Minimumthickness in inches each side	MESH ^b	STAPLES ^c	ALLOWABLEBEARING CAPACITY ^d (plf)
А	Clay 1 ¹ / ₂	None required	None required	400
В	Soil-cement 1	Required	Required	800
С	Lime ^{e 7} /8	Required	Required	500
D	Cement-lime ⁷ /8	Required	Required	800
E	Cement ⁷ /8	Required	Required	800

For SI: 1 inch = 25.4mm, 1 pound per foot = 14.5939 N/m.

- a. Plasters shall conform to Sections AS104.4.3 through AS104.4.8, AS106.7 and AS106.10.
- b. Any metal mesh allowed by this appendix and installed in accordance with Section AS106.9.
- c. In accordance with Section AS106.9.2, except as required to transfer roof loads to the plaster skins in accordance with Section AS106.11.
- d. For walls with a different plaster on each side, the lower value shall be used. For walls with plaster on only one side, half of the tabular value shall be used.
- e. Shall use hydraulic or natural hydraulic lime.

AS106.12.3.1 Roof-bearing assembly spanning openings. Roof-bearing assemblies that span openings in *strawbale* walls shall comply with the following at each opening:

- 1. Lumber on each side of the assembly shall be of the dimensions and quantity required to span each opening in accordance with Table R602.7(1).
- 2. The required lumber in the assembly shall be supported at each side of the opening by the

number of jack studs required by Table R602.7(1), or shall shall extend beyond the opening on both sides a distance, D, using the following formula equation: $D = S \times R/2 / (1-R)$ (Equation AS-1) where:

D = Minimum distance (in feet) for required spanning lumber to extend beyond the opening

S = Span (in feet)

 $R = B_L/B_C$

 B_L = Design load on the wall (in pounds per lineal foot) in accordance with Sections R301.4 and R301.6

 B_C = Allowable bearing capacity of the wall in accordance with Table AS106.12

AS106.13 Braced wall panels. Plastered *strawbale* walls used as braced wall panels for one-story *buildings* shall be in accordance with Section R602.10 and Tables AS106.13(1), AS106.13(2) and AS106.13(3). Wind design criteria shall be in accordance with Section R301.2.1. Seismic design criteria shall be in accordance with Section R301.2.2. <u>An *approved* engineered design in accordance with Section R301.2.1 shall be required where the building is located in a Special Wind Region or Wind Design Required location in accordance with Figure R301.2(5)B.</u>

Revise as follows:

	PLASTER ^a (both sides)		SILL	ANCHOR			
WALLDESIGNATION	Туре	Thickness(minimum in incheseach side)	PLATE S ^b (nominal size ininches)	BOLT ^c SPACING(inches on center)	MESH ^d (inches)	STAPLESPACING ^e (inches on center)	
A1	Clay	1.5	2 × 4	32	None	None	
A2	Clay	1.5	2 × 4	32	2 × 2 high- density polypropylene	2	
A3	Clay	1.5	2 × 4	32	2 × 2 × 14 gage	4	
В	Soil- cement	1	4 × 4	24	2 × 2 × 14 gage	2	
C1	Lime	7/8	2 × 4	32	17-gage woven wire	3	
C2	Lime	7/8	4 × 4	24	2 × 2 × 14 gage	2	
D1	Cement- lime	7/8	4 × 4	32	17-gage woven wire	2	
D2	Cement- lime	7/8	4 × 4	24	2 × 2 × 14 gage	2	
E1	Cement	7/8	4 × 4	32	2 × 2 × 14 gage	2	
E2	Cement	1.5	4 × 4	24	2 × 2 × 14 gage	2	

TABLE AS106.13(1) PLASTERED STRAWBALE BRACED WALL PANEL TYPES

SI: 1 inch = 25.4 mm.

a. Plasters shall comply with Sections AS104.4.3 through AS104.4.8, AS106.7, AS106.8 and AS106.12.

b. Sill plates shall be Douglas fir-larch or southern pine and shall be preservative treated where required by the International Residential Code.

c. Anchor bolts shall be in accordance with Section AS106.13.3 at the spacing shown in this table.

d. Installed in accordance with Section AS106.9.

e. Staples shall be in accordance with Section AS106.9.2 at the spacing shown in this table.

f. Shall use hydraulic or natural hydraulic lime

TABLE AS106.13(3) BRACING REQUIREMENTS FOR STRAWBALE-BRACED WALL PANELS BASED ON SEISMIC DESIGN

CATEGORY

• SOIL CLASS D ^f PSF ROOF-CEI WALL LI	• WALL HEIG ILING DEAD I NE SPACING	GHT = 10 FEET ^d • 15 LOAD ^d • BRACED ≤ 25 FEET ^d	MINIMUM TOTAL LENGTH (FEET) OF STRAWBALE- BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE ^{a, b, c, d}				
Seismic Design Category	Story location	Braced wall line length(feet)	Strawbale-braced wall panel ^e A2, <u>A3^g,</u> C1, C2, D1	Strawbale-braced wallpanel ^e B, D2, E1, E2			
		10	5.7	4.6			
	One stary	20	8.0	6.5			
С	One-story building	30	9.8	7.9			
	bunung	40	12.9	9.1			
		50	16.1	10.4			
D ₀		10	6.0	4.8			
	One-story building	20	8.5	6.8			
		30	10.9	8.4			
		40	14.5	9.7			
		50	18.1	11.7			
		10	6.3	5.1			
		20	9.0	7.2			
D ₁	One-story	30	12.1	8.8			
	building	40	16.1	10.4			
		50	20.1	13.0			
		10	7.1	5.7			
		20	10.1	8.1			
D ₂	Une-story	30	15.1	9.9			
	building	40	20.1	13.0			
		50	25.1	16.3			

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 pound per square foot = 0.0479 kPa.

- a. Linear interpolation shall be permitted.
- b. Braced wall panels shall be without openings and shall have an aspect ratio $(H:L) \le 2:1$.
- c. Tabulated minimum total lengths are for braced wall lines using single braced wall panels with an aspect ratio (H:L) ≤ 2:1, or using multiple braced wall panels with aspect ratios (H:L) ≤ 1:1. For braced wall lines using two or more braced wall panels with an aspect ratio (H:L) > 1:1, the minimum total length shall be multiplied by the largest aspect ratio (H:L) of braced wall panels in that line.
- d. Subject to applicable seismic adjustment factors associated with "All methods" in Table R602.10.3(4), except "Wall dead load."
- e. Strawbale braced wall panel types indicated shall comply with Sections AS106.13.1 through AS106.13.3 and Table AS106.13(1).
- f. Wall bracing lengths are based on a soil site class "D." Interpolation of bracing lengths between S_{ds} values associated with the seismic design categories is allowable where a site-specific S_{ds} value is determined in accordance with Section 1613.3 of the International Building Code.
- g. Where using wall type A3, the minimum total length of braced wall panels in this column shall be

AS106.15 Post-and-beam with strawbale infill. Post-and-beam with *strawbale* infill systems shall be in accordance with Figure AS105.1(4) and Items 1 through 6, or be of an *approved* engineered design.

- 1. Beams shall be of the dimensions and number of members in accordance with Table R602.7(1), where the space between posts equals the span in the table.
- 2. Beam ends shall bear over posts not less than $1^{1/2}$ inches (38 mm) or be supported by a framing anchor in accordance with Table R602.7(1).
- 3. Discontinuous beam ends shall be spliced with a metal strap with not less than 1,000-pound (454 kg) wind or seismic load tension capacity. Where the wall line includes a braced wall pane,I the strap shall have not less than a 4,000-pound (1814 kg) capacity.
- 4. Each post shall equal NJ + 1 in accordance with Table R602.7(1), where the space between posts equals the span in the table.
- 5. Posts shall be connected to the beam by an *approved* means.
- 6. Roof and ceiling framing shall be attached to the beam in accordance with Table R602.3(1), Items 2 and 6.
- 7. <u>Posts shall be supported by the sill plate of the bale wall in accordance with Sections AS105.3 or</u> <u>AS106.13.2, with fastening in accordance with Table R602.3(1), Item 16, or shall be supported</u> <u>and fastened at their base by an *approved* means.</u>

Reason: This proposal does the following:

1) Removes ambiguous language and corrects errors in the 2018 Appendix S.

2) Corrects for internal constistency.

3) Adds a definition for Braced Wall Panel specific to strawbale construction, and adds a definition for Roof Bearing Assembly.

4) Expands the acceptable types of straw at the discretion of the building official, and prohibits the use of hay which is well known as inappropriate for strawbale construction.

5) Greatly clarifies which wall finishes are acceptable on strawbale walls and adds requirements for non-plaster finishes.

6) Adds clay-lime plaster as a plaster choice, which has a successful history of use on strawbale buildings.

7) Clarifies that the studs in Table AS105.4 used for out-of-plane resistance were intended to be wood studs.

8) Adds wall type A3 to the seismic braced wall panel table with an adjustment factor of 1.25, which was previously mentioned only in the Commentary.

9) Adds language regarding wind design based on input from an engineer practicing in a high wind zone. Thus the proposed explicit requirement for an approved engineered design in Special Wind Regions or Wind Design Required locations per Figure R301.2(5) of the IRC. This clarifies that strawbale construction is subject to these same requirements as other methods of construction in the IRC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposal makes corrections, improves clarity and internal consistency, but does not affect cost.

RB296-19

RB297-19

IRC®: FIGURE AS105.1(3), FIGURE AS105.1(4)

Proponent: Martin Hammer, representing Martin Hammer, Architect (mfhammer@pacbell.net); David Eisenberg, representing DCAT (strawnet@gmail.com); Anthony Dente, representing Verdant Structural Engineers (anthony@verdantstructural.com); David Arkin, representing California Straw Building Association (info@strawbuilding.org)

2018 International Residential Code

Revise as follows:





For SI: 1 inch = 25.4 mm

FIGURE AS105.1(3) TYPICAL TOP OF LOAD-BEARING STRAWBALE WALL

For SI: 1 inch = 25.4 mm, 1 pound = 2.2 kg.

FIGURE AS105.1(3) TYPICAL TOP OF LOAD-BEARING STRAWBALE WALL





FIGURE AS105.1(4) TYPICAL TOP OF POST-AND-BEAM WALL WITH PLASTERED STRAW BALE INFILL

For SI: 1 inch = 25.4 mm.

FIGURE AS105.1(4) TYPICAL TOP OF POST-AND-BEAM WALL WITH PLASTERED STRAWBALE INFILL

Reason: The revision and substitution of these two Figures: 1) removes ambiguous language, 2) adds

references to a section on wind uplift that was added to the 2018 Appendix S, 3) addresses comments made by a representative of the Structural Engineeers Association of California (SEAOC) at the IRC hearings in 2016

Cost Impact: The code change proposal will not increase or decrease the cost of construction The revised and substituted Figures clarify meaning and add references to existing sections, but do not change code requirements. Therefore there is no cost impact.

Proposal # 5286

RB297-19

RB298-19

IRC®: AS107.1.1, AS107.1.2

Proponent: Martin Hammer, representing Martin Hammer, Architect (mfhammer@pacbell.net); David Eisenberg, DCAT, representing DCAT (strawnet@gmail.com); David Arkin, representing California Straw Building Association (info@strawbuilding.org)

2018 International Residential Code

Revise as follows:

AS107.1.1 One-hour-rated clay-plastered wall. One-hour fire-resistance-rated nonload-bearing clay plastered *strawbale* walls shall comply with all of the following:

- 1. *Bales* shall be laid flat or on-edge in a running bond.
- 2. Bales shall maintain thickness of not less than 18 inches (457 mm).
- 3. *Bales* shall have a minimum <u>dry</u> density of 7.5 <u>7.25</u> pounds per cubic foot (120 kg/m³).
- 4. Gaps shall be stuffed with *straw-clay*.
- 5. *Clay* plaster on each side of the wall shall be not less than 1 inch (25 mm) thick and shall be composed of a mixture of 3 parts clay, 2 parts chopped straw and 6 parts sand, or an alternative approved *clay* plaster.
- 6. Plaster application shall be in accordance with Section AS104.4.3.3 for the number and thickness of coats.

AS107.1.2 Two-hour-rated cement-plastered wall. Two-hour fire-resistance-rated nonload-bearing cement-plastered strawbale walls shall comply with all of the following:

- 1. Bales shall be laid flat or on-edge in a running bond.
- 2. Bales shall maintain a thickness of not less than 14 inches (356 mm).
- 3. *Bales* shall have a minimum <u>dry</u> density of 7.5 <u>7.25</u> pounds per cubic foot (120 kg/m³).
- 4. Gaps shall be stuffed with *straw-clay*.
- 5. A single section of 1/2-inch (38 mm) by 17-gage galvanized woven wire mesh shall be attached to wood members with $1^{1}/2$ -inch (38 mm) staples at 6 inches (152 mm) on center. 9 gage U-pins with not less than 8-inch (203 mm) legs shall be installed at 18 inches (457 mm) on center to fasten the mesh to the *bales*.
- 6. Cement plaster on each side of the wall shall be not less than 1 inch (25 mm) thick.
- 7. Plaster application shall be in accordance with Section AS104.4.8 for the number and thickness of coats.

Reason: This proposed change clarifies that the density of the straw bales in the two fire-resistance rated wall assemblies as tested was not dry density and therefore the density number was adjusted accordingly. The change to the minimum density numbers for both the tested wall assemblies are based on our research revisiting some inconsistencies between our notes and information when the test panels were constructed at the ETL Semko Laboratory in Elmendorf, Texas and the descriptions of the bales and density in the test reports for the two walls. The two wall panels were constructed using the same batch of straw bales, which were all made by the same baler, thus they were all the same dimensions in height and width, though varying slightly in length. The bales all measured 18" x 14" x approximately 36."

The test reports however indicated that two different bale dimensions – 18"x14"x36" for the earth plastered wall panel and 18"x15"x36" for the cement/lime plastered wall panel. Two string bales are typically 18"x14"x36" and our notes and drawings indicated the bales were 14" high. We know that bales are not easy to accurately

measure because some straw tends to stick up above the solidly compressed mass of straw within the strings. We had requested that the test reports be corrected but that ultimately was not done.

The procedure at the lab, which took place once the bales were delivered but before our crew was on site at the lab was that the workers measured and weighed a sample of the bales and calculated the density from those measurements. They did not, however measure the moisture content of the bales at that time. Their notes indicated that the average bale density was 7.5 pounds per cubic foot. They noted the average weight of the bales was 42.3 pounds. We know that though the bales were very dry, they still contained some moisture. Having worked with straw bales for many years for construction purposes, and having measured the moisture content of the bales after the wall panels were built and plastered, we estimate that the bales conservatively contained about 10% moisture by weight. This would result in a calculated dry density of approximately 6.75 pounds per cubic foot if the bales had been 15" high and 7.25 pounds per cubic feet if the bales were 14" high.

Because there is no reasonable way to use wet density as a constant without stating exact moisture content, we have converted the density in this section to dry density and have based it on our evidence that the bales were 14" high.

The calculations for this dry density were determined using an average of 10% moisture content, an average 42.3 pounds per bale, and the average bale dimension of 18"x14"x36". Thus 42.3 pounds per bale divided by 5.25 cu.ft. (36x14x18 = 5.25 cu.ft.) = 8.05 pcf wet density minus 10% moisture content = 7.245 pounds per cubic foot, rounded up to 7.25.



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Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposed change is a clarification that does not affect cost.

Proposal # 5661

RB298-19

RB299-19

IRC®: Appendix (New), SECTION AU101 (New), AU101.1 (New), AU101.2 (New), AU101.3 (New), AU101.4 (New), FIGURE AU101.4 (New), SECTION AU102 (New), AU102.1 (New), SECTION AU103 (New), AU103.1 (New), AU103.2 (New), AU103.3 (New), AU103.4 (New), AU103.4.1 (New), AU103.5 (New), AU103.6 (New), AU103.7 (New), AU103.8 (New), AU103.9 (New), SECTION AU104 (New), AU104.1 (New), AU104.2 (New), AU104.3 (New), AU104.4 (New), AU104.4.1 (New), AU104.4.2 (New), AU104.4.3 (New), AU104.4.3.1 (New), AU104.4.3.2 (New), AU104.4.4 (New), AU104.4.5 (New), AU104.4.6 (New), AU104.4.7 (New), AU104.4.8 (New), AU104.4.9 (New), SECTION AU105 (New), AU105.1 (New), AU105.2 (New), AU105.3 (New), AU105.3.1 (New), TABLE AU105.3 (New), AU105.3.2 (New), AU105.3.3 (New), AU105.3.4 (New), AU105.3.4.1 (New), AU105.3.4.2 (New), AU105.3.4.3 (New), AU105.3.5 (New), AU105.4 (New), AU105.4.1 (New), AU105.4.2 (New), AU105.4.3 (New), AU105.4.4 (New), AU105.4.5 (New), AU105.5 (New), SECTION AU106 (New), AU106.1 (New), AU106.2 (New), AU106.3 (New), AU106.4 (New), AU106.5 (New), AU106.6 (New), AU106.6.1 (New), AU106.7 (New), AU106.7.1 (New), AU106.8 (New), AU106.8.1 (New), AU106.8.2 (New), AU106.9 (New), AU106.9.1 (New), AU106.9.1.1 (New), AU106.9.1.2 (New), AU106.9.1.3 (New), AU106.9.2 (New), AU106.9.3 (New), AU106.9.4 (New), AU106.9.5 (New), AU106.9.6 (New), AU106.10 (New), TABLE AU106.10 (New), AU106.11 (New), AU106.11.1 (New), AU106.11.2 (New), AU106.11.3 (New), FIGURE AU106.11.3 (New), TABLE AU106.11(1) (New), TABLE AU106.11(2) (New), TABLE AU106.11(3A) (New), AU106.11(3B) (New), AU106.11(3C) (New), AU106.12 (New), TABLE AU106.12 (New), AU106.13 (New), AU106.14 (New), SECTION AU107 (New), AU107.1 (New), SECTION AU108 (New), AU108.1 (New), AU108.2 (New), SECTION AU109 (New), AU109.1 (New), AU109.2 (New), AU109.3 (New), SECTION AU110 (New)

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2018 International Residential Code

Add new text as follows:

APPENDIX U Cob Construction (Monolithic Adobe)

SECTION AU101 GENERAL

AU101.1 Scope. This appendix provides prescriptive and performance-based requirements for the use of *natural cob* as a building material. *Buildings* using *cob* walls shall comply with this code except as otherwise stated in this appendix.

AU101.2 Intent. In addition to the intent described in Section R101.3, the purpose of this appendix is to establish minimum requirements for cob structures that provide flexibility in the application of certain provisions of the code, to permit the use of site-sourced and local materials, and innovative combinations of proven historical and modern techniques that are safe, reduce life-cycle impacts, and increase affordability.

AU101.3 Tests and empirical evidence. Tests for an alternative material, design or method of construction shall be in accordance with Section R104.11.1, and the *building official* shall have the authority to consider

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evidence of a history of successful use in lieu of testing.

AU101.4 Cob wall systems. *Cob* wall systems include those shown in Figure AU101.4 and *approved* variations.

FIGURE AU101.4 TYPICAL COB WALL



SECTION AU102 DEFINITIONS

AU102.1 Definitions. The following words and terms shall, for the purposes of this appendix, have the meanings shown herein. Refer to Chapter 2 of the *International Residential Code* for general definitions. BRACED WALL PANEL. A *cob* wall designed and constructed to resist in-plane shear loads through the interaction of the cob material, its reinforcing and its connections to its bond beam and foundation. The panel's length meets the requirements for the particular wall type and contributes toward the total amount of bracing required along its braced wall line in accordance with Sections AU106.11 and R602.10.1.

BUTTRESS. A mass set at an angle to, or bonded to a wall that it strengthens or supports.

CLAY. Inorganic soil with particle sizes less than 0.00008 inch (0.002 mm) having the characteristics of high to very high dry strength and medium to high plasticity, used as the binder of other component materials in a mix of *cob* or of *clay* plaster.

CLAY SUBSOIL. Subsoil sourced directly from the earth, containing *clay*, sand, and silt, and not more than trace amounts of organic matter.

COB. A composite building material consisting of refined clay or clay subsoil wet-mixed with loose straw and sometimes sand. Also known as *monolithic adobe*.

COB CONSTRUCTION. A wall system of layers or *lifts* of moist *cob* placed to create monolithic walls, typically without formwork.

DRY JOINT. The boundary between a layer of moist cob and a previously laid and significantly drier, nonmalleable layer of cob that requires wetting to achieve bonding between the layers.

FINISH. Completed combination of materials on the face of a cob wall.

LIFT. A layer of installed cob.

LOAD-BEARING WALL.	A cob wal	I that sup	ports	more t	than	100	pounds	per	linear	foot (1459	N/m)	of v	vertical
load in addition to its own	weight.	•					•							

MONOLITHIC ADOBE. Synonymous with cob.

NATURAL COB. Cob not containing admixtures such as Portland cement, lime, asphalt emulsion, or oil. Synonymous with *unstabilized* cob.

NONSTRUCTURAL WALL. Walls other than load-bearing walls or shear walls.

PLASTER. Clay, soil-cement, gypsum, lime, clay-lime, cement-lime, or cement plaster as described in Section AU104.

SHEAR WALL. A *cob* wall designed and constructed to resist in-plane lateral seismic and wind forces in accordance with Section AU106.11. Synonymous with *braced wall panel*.

STABILIZED. Cob or other earthen material containing admixtures such as Portland cement, lime, asphalt

emulsion, or oil, that are intended to help limit water absorption, stabilize volume, increase strength, and increase durability.

STRUCTURAL WALL. A wall that meets the definition for a load-bearing wall or shear wall.

STRAW. The dry stems of cereal grains after the seed heads have been removed.

UNSTABILIZED. A *Cob* or other earthen material that does not contain admixtures such as Portland cement, lime, asphalt emulsion, or oil.

SECTION AU103 MATERIALS, MIXING, AND INSTALLATION

AU103.1 Clay subsoil. Clay subsoil for a *cob* mix shall be acceptable if the mix it produces meets the requirements of Section AU103.4.

AU103.2 Sand. Sand or other aggregates such as, but not limited to, gravel, pumice and lava rock, when added to *cob* mixes, shall yield a mix that meets the requirements of Section AU103.4.

AU103.3 Straw. *Straw* for *cob* mixes shall be from wheat, rice, rye, barley or oat, or similar reinforcing fibers with similar performance. Before mixing, the straw or other reinforcing fibers shall be dry to the touch and free of visible decay.

AU103.4 Mix proportions. *Cob* mixes shall be of any proportion of refined *clay* or *clay subsoil*, added sand (if any) and straw that produces a dried mix that passes the shrinkage test in accordance with Section AU103.4.1, complies with the compressive strength requirements of Section AU106.6 and complies with the modulus of rupture requirements of Section AU106.7.

AU103.4.1 Shrinkage test for cob mixes. Each proposed *cob* mix of different mix proportions shall be placed moist to completely fill a 24-inch by 3 1/2-inch by 3 1/2-inch (610 mm by 89 mm by 89 mm) wooden form on a plastic or paper slip sheet and dried to ambient moisture conditions, or oven dried. The total shrinkage of the length shall not exceed 1 inch (25 mm), as measured from the dried edges of the material to the insides of the form. Cracks in the sample > 1/16 inch (1.5 mm) shall first be closed manually. The shrinkage test shall be shown to the building official for approval before placement of the cob mix onto walls.

AU103.5 Mixing. The clay subsoil, sand and straw for *cob* shall be thoroughly mixed by manual or mechanical means with water sufficient to produce a mix of a plastic consistency capable of bonding of successively placed layers or *lifts*.

AU103.6 Installation. *Cob* shall be installed on the wall in *lifts* of a height that supports itself with minimal slumping.

AU103.7 Dry joints. Each layer of cob shall be prevented from drying until the next layer is installed, to ensure bonding of successive layers. The top of each layer shall be kept moist and malleable with one or more of the following methods:

- 1. Covering with a material that prevents loss of or holds moisture,
- 2. Covering with a material that shades it from direct sun, or
- 3. <u>Wetting.</u>

When dry joints are unavoidable, the previous layer shall be wetted prior to application of the next layer.

AU103.8 Drying holes. Where holes to facilitate drying are used, such holes shall be of any depth and not

exceeding 3/4-inch (19 mm) in diameter on the face of *cob* walls. Drying holes shall not be spaced closer than ten hole-diameters. Drying holes shall not be placed in *braced wall panels*. The design load on load-bearing walls with drying holes shall not exceed 90% of the allowable bearing capacity as determined in accordance with Section AU106.8. Drying holes shall be filled with cob before final inspection.

AU103.9 Adding roof loads to walls. Roof and ceiling loads shall not be added until walls are sufficiently dry to support them without compressing.

SECTION AU104 FINISHES

AU104.1 General. *Cob* walls shall not require a *finish*, except as required by Section AU104.2. Finishes applied to *cob* walls shall be plasters in accordance with Section AU104.4, non-plaster exterior wall coverings in accordance with Section R703 or other finish systems in accordance with the following:

- 1. <u>Specifications and details of the finish system's means of attachment to the wall or its independent</u> support and means of draining or evaporating water that penetrates the exterior finish shall be provided.
- 2. The vapor permeance of the combination of finish materials shall be 5 perms or greater to allow the transpiration of water vapor from the wall.
- Finish systems with weights >10 and ≤ 20 pounds per square foot (> 48.9 and ≤ 97.8 kg/m²) of wall shall require that the minimum total length of braced wall panels in Table AU106.11(3) be multiplied by a factor of 1.2.
- 4. Finish systems with weights > 20 pounds per square foot (> 97.8 kg/m²) of wall area shall require an engineered design.

AU104.2 Where required. Cob walls exposed to rain due to local climate, building design and wall orientation shall be finished or clad to provide protection from excessive erosion.

AU104.3 Vapor retarders. Class I and II vapor retarders shall not be used on *cob* walls, except at cob walls surrounding showers or as required or addressed elsewhere in this appendix.

AU104.4 Plaster. *Plaster* applied to *cob* walls shall be any type described in this section. *Plaster* thickness shall not exceed 3 inches (76 mm) on each face except where an approved engineered design is provided.

AU104.4.1 Plaster and membranes. *Plaster* shall be applied directly to *cob* walls to facilitate transpiration of moisture from the walls and to secure a mechanical bond between the *plaster* and the *cob*. A membrane shall not be located between the cob wall and the plaster.

AU104.4.2 Plaster lath. The surface of *cob* walls shall be permitted to function as lath for plaster, with no other lath required. Metal, plastic, and natural fiber lath shall be permitted to be used to limit plaster cracking or increase the plaster bond to the wall, or to bridge dissimilar materials.

AU104.4.3 Clay plaster. Clay plaster shall comply with Sections AU104.4.3.1 and AU104.4.3.2.

AU104.4.3.1 General. *Clay* plaster shall be any plaster having a *clay* or *clay subsoil* binder. Such plaster shall contain sufficient clay to fully bind the sand or other aggregate and any reinforcing fibers. Reinforcing fibers shall be chopped straw, sisal, hemp, animal hair or other similar *approved* fibers.

AU104.4.3.2 Clay subsoil requirements. The suitability of *clay subsoil* shall be determined in accordance with the Figure 2 Ribbon Test and the Figure 3 Ball Test in the appendix of ASTM E2392/E2392M.

AU104.4.4 Soil-cement plaster. Soil-cement plaster shall be composed of *clay subsoil*, sand, not more than 7 percent Portland cement by volume and, where provided, reinforcing fibers.

AU104.4.5 Gypsum plaster. Gypsum plaster shall comply with Section R702.2.1 and shall be limited to interior use.

AU104.4.6 Lime plaster. Lime plaster is any plaster with a binder composed of calcium hydroxide including Type N or S hydrated lime, hydraulic lime, natural hydraulic lime or slaked quicklime. Hydrated lime shall comply with ASTM C206. Hydraulic lime shall comply with ASTM C1707. Natural hydraulic lime shall comply with ASTM C141 and EN 459. Quicklime shall comply with ASTM C5.

AU104.4.7 Clay-lime plaster. Clay-lime plaster shall be composed of refined *clay* or *clay subsoil*, sand, lime and, where provided, reinforcing fibers.

AU104.4.8 Cement-lime plaster. Cement-lime plaster shall be plaster mix types CL, F or FL, as described in ASTM C926.

AU104.4.9 Cement plaster. Cement plaster shall have not less than 1 part lime to 4 parts cement and be not thicker than 1-1/2 inches (38 mm), to ensure minimum acceptable vapor permeability

SECTION AU105 COB WALLS—GENERAL

AU105.1 General. *Cob walls* shall be designed and constructed in accordance with this section and Figure AU101.4 or an *approved* alternative design. In addition to the general requirements for *cob* walls in this section, *cob structural walls* shall comply with Section AU106.

AU105.2 Building limitations and requirements for cob wall construction. *Cob* walls shall be subject to the following limitations and requirements:

- 1. Number of stories: not more than one.
- 2. Building height: not more than 25 feet (7620 mm).
- 3. <u>Seismic design categories: limited to use in Seismic Design Categories A, B and C, except where an approved engineered design is provided.</u>
- 4. Wall height: in accordance with Table AU105.4, and with Table AU106.11(1) for braced wall panels.
- 5. <u>Wall thickness, excluding finish, shall be not less than 10 inches, not greater than 24 inches at the top</u> <u>two-thirds, not limited at the bottom third and, for structural walls, shall comply with Section AU106.2(2).</u> <u>Wall taper is permitted in accordance with Section AU106.5(1).</u>
- 6. Interior *cob* walls shall require an *approved* engineered design that accounts for the seismic load of the interior *cob* walls, except in Seismic Design Category A for walls with a height to thickness ratio ≤ to 6.

AU105.3 Out-of-plane resistance methods and unrestrained wall height limits. *Cob* walls shall employ a method of out-of-plane load resistance in accordance with Table AU105.3, and comply with its associated height limits and requirements.

AU105.3.1 Determination of out-of-plane loading. Out-of-plane loading for the use of Table AU105.3 shall be in accordance with the ultimate design wind speed and seismic design category requirements of Sections R301.2.1 and R301.2.2 respectively. An *approved* engineered design shall be required where the building is located in a Special Wind Region or a Wind Design Required location in accordance with Figure R301.2(5)B.

TABLE AU105.3 OUT-OF-PLANE RESISTANCE METHODS AND UNRESTRAINED WALL HEIGHT LIMITS

WALL TYPE ^{a, g, h}	FOR	FOR SEISMIC	UNRESTR	AINED	ТОР	TENSION
	ULTIMATE	DESIGN	COB WAL	L HEIGHT	ANCHOR ^e	TIE ^f
and	DESIGN	CATEGORIES	H ^{b, c}		SPACING	SPACING
	WIND		Absolute	Limit		
METHOD OF	SPEEDS		limit in	based on	(inches)	(inches)

OUT-OF-PLANE LOAD RESISTANCE	(mph)		feet	wall thickness T ^d		
				in feet		
Wall 1 ⁱ : no anchors, no steel wall reinforcing	≤ 110	A	<i>H</i> ≤ 8	<i>H</i> ≤6 <i>T</i>	none	48
Wall 2: top anchors ^j , continuous vertical 6"x6"x6 gage steel mesh in center of wall embedded in foundation 12"	≤ 140	A, B, C	<i>H</i> ≤ 8	H≤8T	12	24
Wall A ⁱ : top anchors, no vertical steel reinforcing	≤ 120	А, В	<i>H</i> ≤ 8	<i>H</i> ≤6 <i>T</i>	12	48
Wall B ⁱ : top & bottom anchors, no vertical steel reinforcing	≤ 130	А, В	<i>H</i> ≤ 8	<i>H</i> ≤6 <i>T</i>	12	48
Wall C: top and bottom anchors, continuous vertical threaded rod at 4' oc embedded in foundation and connected to bond beam	≤ 140	A, B, C	<i>H</i> ≤ 8	H≤8T	12	24
Wall D: continuous vertical threaded rod at 1' oc embedded in foundation and connected to bond beam	≤ 140	A, B, C	<i>H</i> ≤ 8	H≤8T	NA	24
Wall E: top anchors, continuous vertical 6"x6"x6 gage steel mesh 2" from each face of wall embedded in foundation	≤ 140	A, B, C	<i>H</i> ≤ 8	H≤8T	12	24

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

N/A = Not Applicable

a. See Table AU106.11(1) for reinforcing and anchorage specifications for wall types A, B, C, D and E.

<u>b.</u> H = height of the cob portion of the wall only. See Figure AU101.4. The maximum H is the absolute limit or the limit based on wall thickness, whichever is more restrictive.

c. Bond beams or other horizontal restraints are capable of separating a wall into more than one unrestrained wall height with an *approved* engineered design.

d. T = Cob wall thickness (in feet) at its minimum, without plaster.

e. 5/8-inch threaded rod anchors at prescribed spacing with 12" embedment in cob, full embedment in concrete bond beams or full penetration in wood bond beam with a nut and washer.

<u>f. Attach rafters to bond beam with 4-inch by 3-inch by 3-inch by 18 gage tension tie angles at prescribed</u> <u>spacing. See Figure R608.9(9). Where rafters are attached to tension ties shall, roof sheathing shall be edge</u> <u>nailed.</u> g. All walls shall be tested for compressive strength in accordance with Section AU106.6.

h. For curved walls with an arc length:radius ratio of 1.5:1 or greater, the H/T factor shall be increased by 1, and the absolute height limit by 1 foot.

i. Wall type requires a modulus of rupture test in accordance with Section AU106.7.

j. See wall type A in Table AU106.11(1) for top anchor requirements.

AU105.3.2 Bond beams for nonstructural walls. Nonstructural *cob* walls shall be provided with a bond beam at the top of the wall that complies with Section AU106.9, except for requirements relating to roof and/or ceiling loads or *braced wall panels*.

AU105.3.3 Lintels in nonstructural walls. Door, window, and other openings in nonstructural *cob* walls shall require a lintel in accordance with Section AU106.10, except for requirements relating to roof and/or ceiling loads or *braced wall panels*.

<u>AU105.3.4 Reinforcing at wall openings.</u> Reinforcing shall be installed at window, door, and similar wall openings and penetrations greater than 2 feet (610 mm) in width in accordance with this section. Surface voids deeper than 25 percent of the wall thickness shall be considered an opening.

AU105.3.4.1 Opening size limit. Openings shall not exceed 6 feet (1829 mm) in width, and the height of the cob wall below openings shall not exceed 6 feet (1829 mm) above the top of the foundation.

AU105.3.4.2 Horizontal reinforcing. 2-inch by 2-inch (51 mm by 51 mm) 14 gage galvanized steel mesh shall be embedded 4 inches (102 mm) in the cob above the rough opening and below the rough opening for windows, and shall extend 12 inches (305 mm) beyond the sides of the opening. Walls below rough window openings greater than 4 foot 6 inches (1372 mm) in height shall be provided with additional horizontal reinforcing at mid-height.

AU105.3.4.3 Vertical reinforcing. Full-height 5/8-inch (16 mm) threaded rod shall be installed 4 inches (102 mm) from each side of the opening, centered in the thickness of the cob wall. The threaded rods shall be embedded 7 inches (178 mm) in the foundation, and 4 inches (102 mm) in concrete bond beams or shall penetrate through wood bond beams and be secured with a nut and washer. The threaded rods shall be embedded in concrete lintels, or pass through a drilled hole in wood lintels.

AU105.3.5 Minimum length of cob walls. Sections of *cob* walls between openings shall be not less than 2 foot 6 inches (762 mm) in length. Wall sections less than 4 feet (1219 mm) and not less than 2 foot 6 inches (762 mm) in length shall contain vertical reinforcing in accordance with Section AU105.3.4.3

AU105.4 Moisture control. *Cob* walls shall be protected from moisture intrusion and damage in accordance with Sections AU105.4.1 through AU105.4.5.

AU105.4.1 Water-resistant barriers and vapor permeance. *Cob* walls shall be constructed without a membrane barrier between the *cob* wall and *plaster* to facilitate transpiration of water vapor from the wall, and to secure a mechanical bond between the cob and plaster, except as otherwise required elsewhere in this appendix. Where a water-resistant barrier is placed behind an exterior finish, it shall be considered part of the finish system and shall comply with Section AU104.1(2) for the combined vapor permeance rating.

AU105.4.2 Horizontal surfaces. *Cob* walls and other *cob* elements shall be provided with a water-resistant barrier at weather-exposed horizontal surfaces. The water-resistant barrier shall be of a material and installation that will prevent erosion and prevent water from entering the wall system. Horizontal surfaces, including exterior window sills, sills at exterior niches, and exterior buttresses, shall be sloped not less than 1 unit vertical in 12 units horizontal to drain away from cob walls or other cob elements.

AU105.4.3 Separation of cob and foundation. A liquid-applied or bituminous Class II *vapor retarder* shall be installed between *cob* and supporting concrete or masonry

Exception: Where local climate, site conditions and foundation design limit ground moisture migration into the base of the *cob* wall, including but not limited to the use of a moisture barrier or capillary break between the supporting concrete or masonry and the earth.

AU105.4.4 Separation of cob and finished grade. *Cob* shall be not less than 8 inches (203 mm) above finished grade.

Exception: The minimum separation shall be 4 inches (102 mm) in Dry climate zones as defined in Table N1101.7.2(1) [R302.3(1)], and shall be 2 inches (51mm) on walls that are not weather-exposed.

AU105.4.5 Installation of windows and doors. Windows and doors shall be installed in accordance with the manufacturer's instructions to a wooden frame of not less than nominal 2x4 (51 mm by 102 mm) wood members anchored into the cob wall with 16d galvanized nails half-driven at a maximum 6-inch (152 mm). spacing, with the protruding half embedded in the cob. The wood frame shall be embedded not less than 1-1/2 inches (38 mm) in the cob and shall be set in from each face of the wall not less than 3 inches (76 mm). Alternative window and door installation methods shall be capable of resisting the wind loads in Table R301.2(2). Windows and doors in cob walls shall be installed so as to mitigate the passage of air or moisture into or through the wall system. Window sills shall comply with Section AU105.4.2.

AU105.5 Inspections. The *building official* shall inspect the following aspects of *cob construction* in addition to the required tests of, and accordance with Section R109.1:

- 1. Anchors and vertical and horizontal reinforcing in *cob* walls, where required in accordance with Tables AU105.2 and AU106.11(1) and Sections AU105.3.4 and AU105.3.5.
- 2. Reinforcing in any concrete bond beams or lintels, in accordance with Sections AU106.9.2 and Table AU106.10.

SECTION AU106 COB WALLS—STRUCTURAL

AU106.1 General. *Cob structural walls* shall be in accordance with the prescriptive provisions of this section. Designs or portions of designs not complying with this section shall require an *approved* engineered design.

AU106.2 Requirements for cob structural walls. In addition to the requirements of Section AU105.2, *cob structural walls* shall be subject to the following:

- 1. <u>Wall height: shall be in accordance with Table AU105.3 for load-bearing cob walls or AU106.11(1) for cob</u> braced wall panels, as applicable and most restrictive.
- 2. <u>Wall thickness: shall be in accordance with Section AU105.2(5) and Section AU106.8.1 for load-bearing</u> cob walls or AU106.11(1) for cob braced wall panels, as applicable and most restrictive.
- 3. *Braced wall panel* lengths: for *buildings* using *cob braced wall panels*, the greater of the values determined in accordance with Tables AU106.11(2) for wind loads and AU106.11(3) for seismic loads shall be used.

AU106.3 Loads and other limitations. Live and dead loads and other limitations shall be in accordance with Section R301, except that the dead load for *cob* walls shall be determined with the following equation: $CW_{DL} = (H \times T_{avg} \times D)$ (Equation AU-1)

where:

<u>CW_{DL} = Cob wall dead load (in pounds per lineal foot of wall)</u>

Tavg= Average thickness of wall (in feet)

<u>*D*</u> = Density of cob = 110 (in pcf), unless a lesser value at equilibrium moisture content is demonstrated to the *building official*

AU106.4 Foundations. Foundations for *cob* walls shall be in accordance with Chapter 4. The width of foundations for cob walls shall be not less than the width of the cob at its base, excluding *finish.*

<u>AU106.5 Wall taper, straightness and surface voids for cob walls.</u> *Cob* walls shall be in accordance with the following:

- 1. <u>Cob structural and nonstructural walls shall be vertical, or shall taper from bottom to top with the wall thickness in accordance with Section AU105.2(5) and the wall height in accordance with AU105.2(4).</u>
- 2. <u>Cob structural and nonstructural walls shall be straight or curved. Curved braced wall panels shall be in</u> <u>accordance with Sections AU106.11.2 and AU106.11.3.</u>
- Niches and other surface voids in *load-bearing walls* are limited to 12 inches (305 mm) in width and height and 25 percent of the wall thickness, and shall be located in the top two-thirds of the wall. Surface voids that exceed these limits shall be considered wall openings, and shall receive a lintel in accordance with Section AU106.10 and be reinforced in accordance with Section AU105.3.4. Surface voids are prohibited in *braced wall panels*.

AU106.6 Compressive strength of cob structural and nonstructural walls. All *cob* walls shall have a minimum compressive strength of 60 psi (414 kPa). *Cob* in walls used as *braced wall panels* shall have a minimum compressive strength of 85 psi (586 kPa).

AU106.6.1 Demonstration of compressive strength. The compressive strength of the *cob* mix to be used in *structural walls* and *nonstructural walls* as required in Section AU106.6 shall be demonstrated to the *building official* before the placement of cob onto walls, with compressive strength tests and an associated report by an *approved* laboratory or with an *approved* on-site test as follows:

Five samples of the proposed *cob* mix shall be placed moist to completely fill a 4-inch by 4-inch by 4-inch (102 mm by 102 mm) form and dried to ambient moisture conditions. Samples shall not be oven dried. Any opposite faces shall be faced with plaster of Paris if needed to achieve smooth, parallel faces, after which the sample shall reach ambient moisture conditions before testing. The horizontal cross-section of the dried sample as tested, and the maximum applied load at failure shall be used to calculate the sample's compressive strength. The fourth lowest value shall be used to determine the mix's compressive strength.

AU106.7 Modulus of rupture of cob structural walls. *Cob* in walls used as *braced wall panels* shall have a minimum modulus of rupture of 50 psi (345 kPa).

AU106.7.1 Demonstration of modulus of rupture. The modulus of rupture of *cob* used in structural walls as required in Section AU106.7 shall be demonstrated to the *building official* before the placement of cob onto walls, with modulus of rupture tests and an associated report by an *approved* laboratory or with an *approved* on-site test as follows:

 Five samples of the proposed *cob* mix shall be placed moist to completely fill a 6-inch by 6-inch by 12inch (152 mm by 152 mm by 305 mm) form and dried to indoor ambient moisture conditions. Samples shall not be oven dried. Each sample shall be tested with the 12-inch (305 mm) dimension horizontal. The fourth lowest value shall be used to determine if the mix's meets the minimum required modulus of rupture.

AU106.8 Bearing capacity. The allowable bearing capacity for cob load-bearing walls supporting vertical roof

and/or ceiling loads imposed in accordance with Section R301 shall be determined with the following equation: $\underline{BC} = (C \times T_{min})/3 - (H \times T_{avg} \times D)$ (Equation AU-2)

where:

BC = Allowable bearing capacity of wall (in pounds per lineal foot of wall)

<u>C = Compressive strength (in psi) as determined in accordance with Section AU106.6</u>

Tmin= Thickness of wall (in feet) at its minimum

<u>*H*</u> = Height of cob portion of wall (in feet)

<u>*T_{avg}*= Average thickness of wall (in feet)</u>

<u>D = Density of cob = 110 (in pcf), unless a lesser value at equilibrium moisture content is demonstrated</u>

AU106.8.1 Support of uniform loads. Uniform roof and/or ceiling loads shall be supported by *cob* load-bearing walls not exceeding their allowable bearing capacity, as demonstrated in accordance with the following equation: $BL \leq BC$ (Equation AU-3)

where:

<u>BL</u> = Design load on the wall (in pounds per lineal foot) determined in accordance with Sections R301.4 and R301.6

<u>BC</u> = Allowable bearing capacity of wall (in pounds per lineal foot of wall) determined in accordance with Section <u>AU106.8</u>

AU106.8.2 Support of concentrated loads. Concentrated roof and/or ceiling loads shall be distributed by structural elements capable of distributing the loads to the *cob load-bearing wall* and within its allowable bearing capacity as determined in accordance with Section AU106.8. Concentrated loads over lintels or over bond beams spanning openings shall require an *approved* engineered design.

AU106.9 Bond beams. *Cob structural walls* shall require a bond beam at the top of the wall in accordance with Sections AU106.9.1, AU106.9.2 or AU106.9.3, and shall be anchored to the *cob* below in accordance with Tables AU105.3, AU106.11(1) and AU106.12 as applicable and most restrictive. Bond beams spanning openings shall be in accordance with Section AU106.9.4.

AU106.9.1 Wood bond beams. Wood bond beams shall be not less than nominal 4 inches high by 8 inches wide and shall comply with Sections AU106.9.1.1 through AU106.9.1.3.

AU106.9.1.1 Wood species and grade. Wood bond beams shall be of a species with an extreme fiber in bending (F_b) of not less than 850 psi (5.9 MPa), a modulus of elasticity (E) of not less than 1,300,000 psi (8964 MPa), and of No. 2 grade or better. Composite lumber bond beams shall have an extreme fiber in bending (F_b) of not less than 850 psi (5.9 MPa), and a modulus of elasticity (E) of not less than 1,300,000 psi (8964 MPa).

AU106.9.1.2 Discontinuity. Discontinuous wood bond beams shall be spliced on top with a metal strap with not less than the allowable wind or seismic load tension capacity in accordance with the following, whichever is more restrictive:
- 1. For seismic design categories: A: 2500 pounds (11 kN). B: 4500 pounds (20 kN). C: 6000 pounds (26.7 kN).
- 2. For braced wall line lengths, when wind governs: 10 feet: 2500 pounds (11 kN). 20 feet: 3400 pounds (15.1 kN). 30 feet: 5000 pounds (22.2 kN).

AU106.9.1.3 Corners and curved walls. Wood bond beams at corners and discontinuities atop curved walls shall be connected across their exterior faces with a metal strap with a capacity of not less than that determined in in accordance Section AU106.9.2.

AU106.9.2 Concrete bond beams. Concrete bond beams shall be not less than 6 inches (152 mm) high by 8 inches (305 mm) wide. Concrete bond beams shall be reinforced with two # 4 bars, 2 inches (51 mm) clear from the bottom and 2 inches (51 mm) clear from the sides. Lap splices shall comply with Table R608.5.4(1). Reinforcing at corners shall be in accordance with the horizontal reinforcing requirements in Section R608.6.4. The concrete shall have a compressive strength of not less than 2500 psi (17.2 MPa) at 28 days.

AU106.9.3 Other bond beams. Bond beams of other materials, including earthen materials, require an *approved* engineered design.

AU106.9.4 Bond beams spanning openings. Bond beams that support uniform roof and/or ceiling loads and span openings in *cob* walls shall be in accordance with Table AU106.10. Bond beams shall be continuous across the opening and not less than 1 foot (305 mm) beyond each side of the opening.

AU106.9.5 Connection of roof framing to bond beams. Roof and ceiling framing shall be attached to bond beams in accordance with Table R602.3(1), Items 2, 6, 30, 31, and 32. Tension ties shall be provided in accordance with Figure R608.9(9) and Footnote f of Table AU105.3. 10d toe nails at 6 inches (152 mm) on center shall be provided from the rim blocking to top plate for the entirety of braced wall lines, instead of the 43 mil strap shown in Figure R608.9(9). A nominal 2-inch by 6-inch (51 mm by 152 mm) wood plate shall be installed on concrete bond beams with 5/8-inch (16 mm) diameter anchor bolts with 5-inch (127 mm) embedment at 2 feet (610 mm) on center to allow the required fastening of roof and ceiling framing, including tension ties and toe nailing of rim blocking.

AU106.9.6 Bond beams at gable and shed roof end walls. Bond beams at end walls of buildings with gable or shed roofs shall comply with the following:

- 1. End walls shall not exceed 20 feet (6096 mm) in length.
- 2. Shall be continuous and straight for the entire wall line.
- 3. Wood bond beams when used shall comply with the following:
 - 3.1. Not less than nominal 4x8 (102 mm by 203 mm) when wind design governs in accordance with Tables AU106.11(2) and AU106.11(3), and for wall lengths \leq 20 feet (6096 mm) in Seismic Design Category A, and for wall lengths \leq 10 feet (3048 mm) in Seismic Design Categories B and C.
 - 3.2. Not less than nominal 4x10 (102 mm by 254 mm) for wall lengths ≤ 20 feet (6096 mm) in Seismic Design Category B.
 - 3.3. Not less than nominal 6x12 (152 mm by 305 mm) or 4x16 (102 mm by 406 mm) for wall lengths \leq 20 feet (6096 mm) in Seismic Design Category C.
- 4. <u>Concrete bond beams when used shall be in accordance with Section AU106.9.2 in Seismic</u> Design Categories A, B, and C and for ultimate design wind speeds ≤ 140 mph (63.6 m/s).
- 5. Walls between the bond beam and roof shall be of wood-framed construction in accordance with Section R602.

AU106.10 Lintels. Door, window, and other openings in load-bearing cob walls shall be provided with a lintel of

TABLE AU106.10 LINTELS AND BOND BEAMS SPANNING OPENINGS

• GROUND S	NOW LOAD ≤ 3	30 PSF	WOOD:		CONCRETE:	:	
			F _b ≥ 850 PS	I	2500 PSI CO STRENGTH	MPRESSIVE	
			E ≥ 1,300,00	0 PSI		_	
					HEIGHT = 6'	2	
			BETTER	E OR	EXTEND 1 FT BEYOND OPENING SIDES		
				=LAT			
			1 PIECE OR 2 EQUAL- WIDTH PIECES EXTEND 1 FT BEYOND		REINFORCEMENT: 2 - #4 BARS ^a 2" CLEAR FROM BOTTOM		
				DEG	2" CLEAR F	ROM SIDES ^a	
Building width (feet)	Cob above lintel (feet)	Total cob wall and plaster thickness	SIZE OF WOOD LINTEL		WIDTH OF C	ONCRETE	
			OR BOND B	EAM			
		(inches)		in al in ab a a)	OR BOND B	EAM	
				inal incres)	(inches)		
			For Span ≤	For Span ≤	, For Span ≤	For Span ≤	
			4'	6'	6'	8'	
10	0	≤ 27	4 ' 4x8	6 ' 4x8	6 ' 8	8 '	
10 10	0	≤ 27 15	4' 4x8 4x12	6 ' 4x8 4x12	6' 8 12	8 ['] 8 12	
10 10 10	0 1 1	≤ 27 15 19	4 ' 4x8 4x12 4x16	6 ' 4x8 4x12 4x16	6' 8 12 16	8' 8 12 16	
10 10 10 10	0 1 1 1	≤ 27 15 19 27	4' 4x8 4x12 4x16 4x24	6' 4x8 4x12 4x16 4x24	6' 8 12 16 24	8' 8 12 16 24	
10 10 10 10 10	0 1 1 1 2	 ≤ 27 15 19 27 15 	4' 4x8 4x12 4x16 4x24 4x12	6' 4x8 4x12 4x16 4x24 6x12	6' 8 12 16 24 12	8' 8 12 16 24 12	
10 10 10 10 10 10	0 1 1 1 2 2 2	 ≤ 27 15 19 27 15 19 19 	4' 4x8 4x12 4x16 4x24 4x12 4x16	6' 4x8 4x12 4x16 4x24 6x12 6x16	6' 8 12 16 24 12 16	8 ' 8 12 16 24 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 12 16 16	
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10 10 10 10 10 10 10 20	0 1 1 1 2 2 2 2 0	 ≤ 27 15 19 27 15 19 27 27 ≤ 27 	4' 4x8 4x12 4x16 4x24 4x12 4x16 4x24 4x16 4x24 4x16 4x24 4x16 4x24 4x8	6' 4x8 4x12 4x16 4x24 6x12 6x16 4x24 6x8	6' 8 12 16 24 12 16 24 24 8	8' 8 12 16 24 12 16 24 12 16 24 8	
10 10 10 10 10 10 10 20 20	0 1 1 2 2 2 2 0 1	 ≤ 27 15 19 27 15 19 27 ≤ 27 ≤ 27 ≤ 27 15 	4' 4x8 4x12 4x16 4x24 4x12 4x16 4x24 4x16 4x24 4x16 4x24 4x16 4x24 4x16 4x24 4x24 4x24 4x24 4x8 4x12	6' 4x8 4x12 4x16 4x24 6x12 6x16 4x24 6x8 6x12	6' 8 12 16 24 12 16 24 16 24 8 12 12	8' 8 12 16 24 12 16 24 12 16 24 12 16 24 12 16 24 12 12 13 14	
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30	1	27	4x24	6x24	24	NP
30	2	15	4x12	6x12	12	NP
30	2	19	4x16	6x16	16	NP
30	2	27	4x24	6x24	24	NP

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm

<u>NP = Not Permitted</u>

a. Concrete bond beams spanning openings, and lintels greater than 16 inches in width, shall have an additional #4 bar in the center of their width.

AU106.11 Cob braced wall panels. *Cob braced wall panels* shall be in accordance with Section R602.10 and Tables AU106.11(1), AU106.11(2) and AU106.11(3A), AU106.11(3B) and AU106.11(3C). Wind design criteria shall be in accordance with Section R301.2.1. Seismic design criteria shall be in accordance with Section R301.2.1. Seismic design criteria shall be in accordance with Section R301.2.1 where the building is located in a Special Wind Region or a Wind Design Required location in accordance with Figure R301.2(5)B.

AU106.11.1 Non-orthogonal braced wall panels. Braced wall panels at an angle to the orthogonal braced wall lines shall be considered to contribute to the minimum total braced wall lengths in Tables AU106.11(2) and AU106.11(3) as follows:

- 1. <u>A braced wall panel not more than 45 degrees and greater than 30 degrees to an adjacent orthogonal</u> braced wall line shall contribute 50% of its length to that line.
- 2. <u>A braced wall panel not more than 30 degrees to an orthogonal braced wall line shall contribute 65</u> percent of its length to that line.
- 3. <u>A braced wall panel greater than 45 degrees and not more than 60 degrees to an orthogonal braced wall</u> <u>line shall contribute 35 percent of its length to that line.</u>
- 4. <u>The angle of a curved braced wall panel to a braced wall line shall be determined with the chord of that</u> section of wall, connecting the end points of the arc at the center of the wall.

AU106.11.2 Braced wall lines for buildings with curved walls. Buildings with curved *cob* walls shall contain two braced wall lines in two orthogonal directions. The spacing of the braced wall lines for wind design in Table AU106.11(2) and the spacing and length of the braced wall lines for seismic design in Table AU106.11(3), shall be the maximum widths of the building in the two orthogonal directions.

AU106.11.3 Radius, thickness and length of curved braced wall panels. Cob curved braced wall panels shall have an inside radius of not less than 5 feet (1524 mm), shall be of the thickness required in Table AU106.11(1) and of the length determined in accordance with Section AU106.11. The curved wall's length shall be considered to be the length of the arc at the center of the wall, in accordance with Figure AU106.11.3 and determined with the following equation: $ARC_{C} = .0175 R_{C} \times A$ (Equation AU-4)

where:

 ARC_{C} = Length of arc at center of wall (in feet)

 R_{C} = Radius at center of wall = R_{l+} .5T (in feet)

<u>*R_l* = Inside radius of wall (in feet)</u>

<u>A = Angle of extent of braced wall panel from the center of the arc (in degrees)</u>

FIGURE AU106.11.3 CURVED BRACED WALL PANEL



TABLE AU106.11(1) COB BRACED WALL PANEL TYPES

WALL TYPE ^a DESIGNATION	ANCHORS TO FOUNDATION ^b	ANCHORS TO	VERTICAL STEEL REINFORCING ^{b, c}	HORIZONTAL STEEL REINFORCING	MAXIMUM HEIGHT H ^d	MAXIMUM ASPECT RATIO
		BOND BEAM ^c			(in feet)	(H:L)
A	none	5/8" threaded rod @12"	none	none	7 ^e	1:1
		4" from wall ends				
		12" embedment in cob				
В	#5 bar @ 12"	5/8" threaded rod @12"	none	2"x2"x14 gage welded wire	7 ^e	1:1
		4" from wall		from foundation		
	lin cob	ends 16"		and bond beam		

		embedment in cob 2"x2"x1/4" washer and nut at cob end				
С	#5 bar @ 12" 16" embedment in cob	5/8" threaded rod @12" 16" embedment in cob	5/8" threaded rod 4" from each end of braced wall panel continuous from foundation to bond beam	2"x2"x14 gage welded wire mesh ^f @ 18", 6" from foundation and bond beam	7 ^e	2:1
D	(see vertical steel reinforcing)	(see vertical steel reinforcing)	5/8" threaded rod 4" from each end of braced wall panel and @12", continuous from foundation to bond beam	2"x2"x14 gage welded wire mesh ^f @ 18", 6" from foundation and bond beam	7 ^e	2:1
E	6"x6"x6 gage welded wire mesh 12"embedment in foundation	5/8" threaded rod @12" 4" from wall ends 12" embedment in cob	6"x6"x6 gage welded wire mesh 2" from each wall face	none	7.5	1:1

<u>SI: 1 inch = 25.4 mm.</u>

a. *Braced wall panel* types A, B, C, and D shall be not less than 16 inches thick. *Brace wall panel* type E shall be not less than 12 inches thick. All *braced wall panels* shall be not greater than 24 inches thick.

b. Not less than 8" embedment into foundation, unless otherwise stated.

c. Not less than 4" embedment into concrete bond beams. Full penetration through wood bond beam, secured with nut and washer.

d. H = height of the cob portion of the wall only. See Figure AU101.4.

e. Maximum height shall be 8 feet when wall thickness is increased to 18".

f. Galvanized mesh.

TABLE AU106.11(2) BRACING REQUIREMENTS FOR COB BRACED WALL PANELS BASED ON WIND

ICC COMMITTEE ACTION HEARINGS ::: April, 2019

SPEED						
• EXPOSURE C	ATEGORY	́ В ^d	MINIMUM TOTAL LENGTH (FEET) OF COB BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE ^{a, b, c, d}			
• 25-FOOT ME	AN ROOF	HEIGHT				
• 10-FOOT EA	VE-TO-RID	GE HEIGHT ^d				
• 10-FOOT WA	LL HEIGH	T ^d				
• 2 BRACED WALL LINES ^d				1	T	Τ
Ultimate Design Wind Speed	Story Location	Braced Wall Line Spacing (feet)	Cob braced wall panel ^e A	Cob braced wall panel ^e B	Cob braced wall panel ^e C, D	Cob braced wall panel ^e E
(mph)			(aspect ratio	(aspect ratio	(aspect ratio	(aspect ratio
10	6.0	6.0	$\frac{\Pi:L \geq 1:1)}{2.7}$	$\Pi: L \ge 1:1)$	$\Pi(L \ge 2; 1)$	$\square(L \ge 1;1)$
< 110	0.0 One-	20	7.9		7 4	NP
110	story building		1.5	7.4	/	
30	11.8	11.0	11.0	NP		
10	6.0	6.0	4.1	NP		
≤ 115	One- story building	20	8.7	8.1	8.1	NP
30	13.0	12.1	12.1	NP		
10	6.0	6.0	4.4	NP		
≤ 120	One- story building	20	9.4	8.8	8.8	NP
30	14.1	13.1	13.1	NP		
10	6.0	6.0	5.1	NP		
≤ 130	One- story building	20	11.0	10.3	10.3	NP
30	16.5	15.4	15.4	NP		
10	6.0	6.0	5.9	NP		
≤ 140	One- story building	20	12.7	11.9	11.9	NP
30	19.1	17.8	17.8	NP		

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 mile per hour = 0.447 m/s.

a. Linear interpolation shall be permitted.

b. Braced wall panels shall be without openings.

<u>c. Braced wall panel types A, B and E shall have an aspect ratio (H:L) \leq 1:1. Braced wall panel types C and D shall have an aspect ratio (H:L) \leq 2:1.</u>

d. Subject to applicable wind adjustment factors associated with Items 1 and 2 of Table R602.10.3(2)

e. *Cob* braced panel types indicated shall comply with Sections AU106.11.1, AU106.11.2 and Table AU106.11(1).

TABLE AU106.11(3A) BRACING REQUIREMENTS FOR COB-BRACED WALL PANELS BASED ON SEISMIC DESIGN CATEGORY A

• SOIL CLAS	• SOIL CLASS D ^e				MINIMUM TOTAL LENGTH (FEET) OF COB- BRACED WALL PANELS REQUIRED ALONG			
• TOTAL WALL HEIGHT = 10 FEET (INCLUDING STEM WALL AND BOND BEAM)				EACH BRACED V	VALL LINE ^{a, b, c, d}			
• COB WALL HEIGHT PER TABLE AS106.11(1)								
• 15 PSF ROOF-CEILING DEAD LOADd								
• STORY LOCATION: ONE-STORY BUILDING								
• SEISMIC D	ESIGN CATE	EGORY A						
• 1.5" PLAST		IESS EACH S	SIDE ^h					
Braced wall line spacing (feet)	Braced wall line length (feet)	Braced wall line % openings	Perpendicular braced wall line % openings	Cob-braced wall panel ^e A, B	Cob-braced wall panel ^e C, D	Cob-braced wall panel ^e E		
10	30	Any % ^g	Any % ^g	Wind ⁱ	Wind ⁱ	NP		
20	20	Any % ^g	Any % ^g	Wind ⁱ	Wind ⁱ	NP		
20	30	Any % ^g	Any % ^g	Wind ⁱ	4.5	NP		
30	30	Any % ^g	Any % ^g	Wind ⁱ	Wind ⁱ	NP		

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 pound per square foot = 0.0479 kPa.

a. Interpolation is not permitted.

b. Braced wall panels shall be without openings.

<u>c</u>. Braced wall panel types A, B and E shall have an aspect ratio (H:L) \leq 1:1. Braced wall panel types C and D shall have an aspect ratio (H:L) \leq 2:1.

d. Subject to applicable seismic adjustment factors associated with item 5 in Table R602.10.3(4).

e. Cob braced panel types indicated shall comply with Sections AU106.11.1 and AU106.11.2 and Table AU106.11(1).

<u>f. Wall bracing lengths are based on a soil site class "D." Interpolation of bracing lengths between S_{ds} values associated with the seismic design categories is allowable where a site-specific S_{ds} value is determined in accordance with Section 1613.3 of the *International Building Code*.</u>

g. Openings in the braced wall line shall not be limited, except that the minimum total braced wall panel length shall be as determined by Tables AU106.11(3A) and AU106.11(2).

h. For total plaster thickness between 3-inches and 6-inches, the minimum total length of braced wall panels shall be mulitplied by 1.2.

i. The minimum total braced wall panel length shall be governed by Table AU106.11(2).

AU106.11(3B) BRACING REQUIREMENTS FOR COB-BRACED WALL PANELS BASED ON SEISMIC DESIGN CATEGORY B

• SOIL CLAS	SS D ^e			MINIMUM TOTAL LENGTH (FEET) OF COB- BRACED WALL PANELS REQUIRED ALONG			
• TOTAL WA	TOTAL WALL HEIGHT = 10 FEET (INCLUDING STEM VALL AND BOND BEAM)			EACH BRACED V	VALL LINE ^{a, b, c, d}		
• COB WALL HEIGHT PER TABLE AS106.11(1) • 15 PSF ROOF-CEILING DEAD LOAD ^d							
• STORY LO	CATION: ON	NE-STORY B	UILDING				
• SESIMIC D	• SESIMIC DESIGN CATEGORY B						
• 1.5" PLASTER THICKNESS EACH SIDE ^h							
Braced wall	Braced	Braced	Perpendicular	Cob-braced wall	Cob-braced wall	Cob-braced	
line	wall line	wall line %	braced wall	panel ^e A, B	panel ^e C, D	wall panel ^e E	
spacing	length	openings	lines % openings				
(feet)	(feet)						
10	10	Any % ^g	Any % ^g	Wind ⁱ	Wind ⁱ	NP	
10	20	0	Any % ^g	6.0	4.9	NP	
10	20	50	Any % ^g	6.0	Wind ⁱ	NP	
10	30	0	Any % ^g	7.1	6.6	NP	
10	30	50	Any % ^g	6.0	4.5	NP	
20	10	0	0	6.0 ^j	4.9 ^j	NP	
20	10	0	50	6.0	Wind ⁱ	NP	
20	10	50	Any % ^g	6.0	4.2	NP	
20	10	50	50	6.0	4.2	NP	
20	20	0	0	7.4	6.9	NP	
20	20	0	50	6.0	5.5	NP	
20	20	50	0	6.0	5.5	NP	
20	20	50	50	6.0	4.1	NP	
20	30	0	0	9.4	8.8	NP	

20	30	0	50	7.9	7.4	NP
20	30	50	0	7.2	6.7	NP
20	30	50	50	6.0	5.3	NP
30	10	Any % ^g	Any % ^g	Wind ⁱ	Wind ⁱ	NP
30	20	0	0	9.4	8.8	NP
30	20	0	50	Wind ⁱ	Wind ⁱ	NP
30	20	50	Any % ^g	7.9	Wind	NP
30	30	0	0	11.8	11.0	NP
30	30	0	50	9.5	8.9	NP
30	30	50	0	9.5	8.9	NP
30	30	50	50	Wind ⁱ	Wind ⁱ	NP

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 pound per square foot = 0.0479 kPa.

<u>NP = Not Permitted</u>

a. Interpolation is not permitted.

b. Braced wall panels shall be without openings.

c. Braced wall panel types A, B and E shall have an aspect ratio (H:L) \leq 1:1. Braced wall panel types C and D shall have an aspect ratio (H:L) \leq 2:1.

d. Subject to applicable seismic adjustment factors associated with Item 5 in Table R602.10.3(4)

e. Cob braced panel types indicated shall comply with Sections AU106.11.1, AU106.11.2 and Table AU106.11(1).

f. Wall bracing lengths are based on a soil site class "D." Interpolation of bracing lengths between *Sds* values associated with the seismic design categories is allowable where a site-specific *Sds* value is determined in accordance with Section 1613.3 of the *International Building Code*.

g. Openings in the braced wall line shall not be limited, except that the minimum total braced wall panel length shall be as determined by Tables AU106.11(3A) and AU106.11(2).

h. For total plaster thicknesses 3-inches to 6-inches, the minimum total length of braced wall panels shall be multiplied by 1.2.

i. The minimum total braced wall panel length shall be governed by Table AU106.11(2).

j. Total plaster thicknesses shall be not greater than 3-inches. Substitute 15/32" roof sheathing and 10d at 6" edge nailing for requirements in Table R602.3(1).

AU106.11(3C) BRACING REQUIREMENTS FOR COB-BRACED WALL PANELS BASED ON SEISMIC DESIGN CATEGORY C

SOIL CLASS D^e

MINIMUM TOTAL LENGTH (FEET) OF COB-BRACED WALL PANELS REQUIRED ALONG

• TOTAL WALL HEIGHT = 10 FEET (INCLUDING STEN WALL AND BOND BEAM)				EACH BRACED V	VALL LINE ^{a, b, c, d}	
• COB WALL	. Height Pe	R TABLE A	S106.11(1)			
• 15 PSF RO	OF-CEILING		Dq			
• STORY LOCATION: ONE-STORY BUILDING						
SESIMIC DESIGN CATEGORY C						
Braced wall	Braced	Braced	Perpendicular	Cob-braced wall	Cob-braced wall	Cob-braced
line	wall line	wall line %	braced wall	panel ^e A. B	panel ^e C. D	wall panel ^e E
spacing	length	openings	lines % openings	····, -		
(feet)	(feet)					
10	10	0	0	8.3 ⁱ	7.8 ⁱ	NP
10	10	0	50	6.5	6.1	NP
10	10	25	0	7.4 ⁱ	6.9 ⁱ	NP
10	10	50	50	4.7	4.4	NP
10	15	0	0	10.6	9.9	NP
10	15	0	50	8.7	8.2	NP
10	15	50	0	7.8	7.3	NP
10	15	50	50	6.0	5.6	NP
10	20	0	0	12.8	11.9	NP
10	20	0	50	11.0	10.2	NP
10	20	50	0	9.1	8.5	NP
10	20	50	50	7.3	6.8	NP
15	10	25	0	9.6	9.0	NP
15	10	0	50	7.8	7.3	NP
15	10	50	0	8.7	8.2	NP
15	10	50	50	6.0	5.6	NP
15	15	0	0	12.9	12.1	NP
15	15	0	50	10.2	9.5	NP
15	15	50	0	10.2	9.5	NP
15	15	50	50	7.5	7.0	NP
15	20	0	0	15.3	14.3	NP
15	20	0	50	12.6	11.7	NP
15	20	50	0	11.7	10.9	NP
15	20	50	50	8.9	8.3	NP
20	10	25	0	NP	NP	NP
20	10	0	50	9.1	8.5	NP
20	10	50	Any % ^g	NP	NP	NP
	İ	1	İ	İ	İ	

20	10	50	50	7.3	6.8	NP
20	15	0	0	NP	NP	NP
20	15	0	50	11.7 ⁱ	10.9 ⁱ	NP
20	15	50	0	NP	NP	NP
20	15	50	50	8.9 ⁱ	8.3 ⁱ	NP
20	20	0	0	NP	NP	NP
20	20	0	50	14.2	13.3	NP
20	20	50	0	NP	NP	NP
20	20	50	50	NP	9.9	NP

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 pound per square foot = 0.0479 kPa.

NP = Not Permitted

a. Interpolation is not permitted.

b. Braced wall panels shall be without openings.

c. Braced wall panel types A, B and E shall have an aspect ratio (H:L) \leq 1:1. Braced wall panel types C and D shall have an aspect ratio (H:L) \leq 2:1.

d. Subject to applicable seismic adjustment factors associated with item 5 in Table R602.10.3(4).

e. Cob braced panel types indicated shall comply with Sections AU106.11.1, AU106.11.2 and Table AU106.11(1).

<u>f. Wall bracing lengths are based on a soil site class "D." Interpolation of bracing lengths between Sds values</u> <u>associated with the seismic design categories is allowable where a site-specific Sds value is determined in</u> <u>accordance with Section 1613.3 of the International Building Code.</u>

g. Openings in the braced wall line shall not be limited, except that the minimum total braced wall panel length shall be as determined by Tables AU106.11(3A) and AU106.11(2).

h. For total plaster thicknesses 3" to 6", multiply the minimum total length of braced wall panels by 1.2.

i. Total plaster thickness > 3" is not permitted. Substitute 15/32" roof sheathing and 10d at 6" edge nailing for requirements in Table R602.3(1).

AU106.12 Resistance to wind uplift forces. *Cob* walls that resist uplift forces from the roof assembly, as determined in accordance with Section R802.11, shall be in accordance with Table AU106.12.

TABLE AU106.12 ANCHORAGE OF BOND BEAMS FOR WIND UPLIFT

· ANCHORS: 5/8" ALL THREAD AT 12" O.C. a, b

· 2"x2"x1/4" WASHERS AND NUT AT END IN COB

· 4" EMBEDMENT IN CONCRETE BOND BEAMS

\cdot FULL PENETRATION THROUGH WOOD BOND BEAMS WITH 2"X2"X1/4" WASHER AND NUT

ANCHORAGE DEPTH IN INCHES, PER WALL WIDTH AND WIND UPLIFT FORCE

WIND UPLIFT FORCE FROM	≤ 12" wall width ^c	≤ 16" wall width ^c	≤ 24" wall width ^c
< 75	16	10	12
< 100	04	16	12
< 100	24		12
< 150	4' o.c. continuous from foundation to bond beam ^d	24	16
< 200	4' o.c. continuous from foundation to bond beam ^d	4' o.c. continuous from foundation to bond beam ^d	24

a. For wood bond beams a maximum of 6" from bond beam ends.

b. For min. 6"x8" concrete bond beams, at 18" o.c. for wind uplift forces < 75 plf., and at 16" o..c for wind uplift forces < 100 plf.

c. Excluding finishes.

d. With 7-inch embedment in foundation, 4-inch embedment in concrete bond beam or full penetration through wood bond beam with 2"x2"x1/4" washer and nut.

AU106.13 Post-and-beam with cob infill. Post-and-beam with cob infill wall systems shall be in accordance with an approved engineered design.

AU106.14 Buttresses. *Cob* buttresses that are intended to provide out-of-plane wall bracing, or additional capacity for *braced wall panels* shall be in accordance with an *approved* engineered design.

SECTION AU107 COB FLOORS

AU107.1 Cob floors. *Cob* floors supported by grade shall be in accordance with an *approved* specification. Straw shall not be required in the material mix.

SECTION AU108 FIRE RESISTANCE

AU108.1 Fire-resistance rating. *Cob* walls shall be considered to exhibit a 1-hour fire-resistance rating in accordance with the following:

- 1. Wall thickness shall be 10 inches (254 mm) or greater.
- 2. Density shall be 70 pcf (1121 kg/m³) or greater.
- 3. When used as a *load-bearing wall*, the maximum design load shall be 1000 pounds per lineal foot (14,590 N/m) in accordance with Section AS106.8.
- 4. When used as a braced wall panel, the wall shall be in accordance with Section AS106.11.

AU108.2 Clearance to fireplaces and chimneys. *Cob* walls or other *cob* surfaces shall not require clearance to fireplaces and chimneys, except where clearance to non-combustibles is required by the manufacturer's instructions.

SECTION AU109

THERMAL PERFORMANCE

AU109.1 Thermal characteristics. *Cob walls* shall be classified as mass walls in accordance with Section N1102.2.5 (R402.2.5) and shall meet the R-value requirements for mass walls in Table N1102.1.2 (R402.1.2).

AU109.2 Thermal resistance. The unit R-value for *cob* walls with a density of 110 pcf (1762 kg/m³) shall be R-0.22 per inch of *cob* thickness. Walls that vary in thickness along their height or length shall use the average thickness of the wall to determine its R-value. The thermal resistance values of air films and finish materials or additional insulation shall be added to the cob wall's thermal resistance value to determine the R-value of the wall assembly.

AU109.3 Additional insulation. When insulating materials are added to the face of a *cob* wall, the combination of additional insulation and any associated connecting, weather-resisting, or protective materials shall comply with Section AU104.1, Items 1-4.

SECTION AU110 REFERENCED STANDARDS ASTM C5—10 Standard Specification for Quicklime for Structural Purposes - AU104.4.6.1 ASTM C141/C141M—14 Standard Specification for Hydrated Hydraulic Lime for Structural Purposes -AU104.4.6.1

ASTM C206—14 Standard Specification for Finishing Hydrated Lime - AU104.4.6.1

ASTM C1707—11 Standard Specification for Pozzolanic Hydraulic Lime for Structural Purposes - AU104.4.6.1

ASTM E2392/ E2392M—10 Standard Guide for Design of Earthen Wall Building Systems - AU104.4.3.2

ASTM BS1, ASTM BS EN 459—2015 Part 1: Building Lime. Definitions, Specifications and Conformity Criteria; Part 2: Test Methods - AU104.4.6.1

Reason: Cob is an earthen material mix of clay-soil, sand, straw, and water, placed onto a wall in layers to create a monolithic wall. Because the material mix and density of cob are very similar to those of adobe bricks, cob is sometimes known as "monolithic adobe."

Cob has been used for thousands of years around the world, notably in England and Northern Europe, the Middle East, West Africa, China, and the Southwestern United States. An estimated 20,000 cob homes are still inhabited in the English county of Devon alone, some dating from the 15th century. The term "cob" derives from an Old English word for "lump," since historical structures were often constructed one handful at a time.





Today, cob is often mixed mechanically using a tractor or mortar mixer, but the wall construction is still generally manual. Cob buildings typically feature raised impermeable foundations and extended roof eaves to protect the walls from moisture and weather. Walls are often plastered with clay, lime or gypsum plasters which protect and beautify the cob without leading to the moisture problems associated with less vapor-permeable finishes such as cement stucco on historic adobe structures.

Since the 1990's, there has been increasing interest in cob construction in the United States and much of the world. Like other earthen construction methods, cob can greatly reduce embodied energy and life-cycle CO2 emissions of buildings. Cob is highly recyclable, and with good design, construction and maintenance, can withstand centuries of use. The constituent materials are inexpensive compared with lumber, steel, concrete and other commonly used building materials. Cob is non-combustible and non-toxic in all stages of construction and use. Cob's thermal mass and moisture management properties modulate interior temperature and humidity, creating healthful building.



While adobe is included in the masonry chapter of the IBC, and cob building codes or guidelines exist in England and New Zealand, there is currently no cob building code in the United States. As a result, permitting of cob buildings has been left to individual building officials on a case-by-case basis. Designers, builders and officials may be unaware of proper practices to make cob buildings safe and durable. Nevertheless, the desire to utilize cob construction continues, and promises to accelerate in response to economic and environmental pressures. These include the need for non-combustible construction systems that can withstand the increased frequency and intensity of wildfires in the western U.S. The lack of a cob building code has been an impediment to the proper and broader use of cob construction.



The proposed Cob Construction appendix for the IRC was created in response to this need. It is based on New Zealand's earthen building standards, on US codes for the closely-related earthen building systems of adobe and straw-clay, and on the experience and the testing of cob buildings over the past 25 years by architects, engineers, builders, and academics throughout the U.S. and the world. It has received review and input from over 25 experts including 4 architects and 6 civil engineers, including the architect and chair of the Committee that developed the New Zealand Standard for Earth Buildings. Much of the recent testing and research has been compiled or performed by the California-based Cob Research Institute, a non-profit organization founded in 2008 to remove legal barriers to cob construction and promote its safe use. If adopted, the proposed appendix will serve designers, builders, owners, inhabitants, and building officials alike in the design and construction of safe and durable cob buildings.

Supporting documents for the proposed Cob Construction appendix is available at: <u>https://www.cobcode.org/cobcode-documents</u>

Rationale for Specific Sections of Proposed Appendix U – Cob Construction

GENERAL:

Cob construction can help address the increasing need to reduce our buildings' negative impacts on the environment, including the global climate, and address the impacts of a changing climate on buildings, including increased firestorms. Like other earthen wall systems, cob is among the most fire-resistant building materials available, while also having a low environmental impact. The ability to build with site- or locally-sourced materials further reduces processing and transportation impacts as well as costs.

Though cob construction is not an industrialized building system, its centuries of continuous use in many parts of the world provide empirical evidence and guidance for good practice. This appendix gives the building official greater flexibility to consider empirical evidence and lifecycle impacts in meeting the intent of the code while not abridging health and life-safety requirements.

DEFINITIONS:

Cob-specific terms not found in the IRC are defined. Some terms already defined in the IRC are adjusted to give

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specific meaning for cob construction. Some definitions are consistent with identical terms defined in IRC Appendix R – Light Straw Clay Construction, and Appendix S – Strawbale Construction.

MATERIALS, MIXING AND INSTALLATION:

The provisions for materials, mixing, and installation are based on existing codes, standards, and guidelines from the UK, New Zealand and the U.S., including ASTM E2392-10 Standard Guide for the Design of Earthen Wall Systems, as well as the experience of designers and builders of cob and earthen buildings in the U.S. and other countries.

Though the materials for cob can vary considerably, the material specifications coupled with the mix design tests for shrinkage, compressive strength and modulus of rupture ensure adequate strength and stability of the wall materials.

FINISHES:

Where cob walls are not substantially rain-exposed they are allowed to remain without finish. Minor erosion has proven to be acceptable on cob walls, and is a matter of maintenance, not unlike the need to periodically repaint the exterior of buildings of conventional construction. However, where cob walls are susceptible to excessive erosion or water intrusion from weather, finishes are necessary to protect the wall while ensuring that any moisture that might enter the wall is able to escape without causing harm. Thus, finishes and finish assemblies must be a minimum of 5 perms, the IRC defined threshold of vapor permeable. Class I and II vapor retarders are prohibited on cob walls except where specifically permitted or required, for example at showers.

A range of plaster types are allowed and described, specifying critical components and characteristics of the plasters, the recognized standards with which they must comply, and other necessary details for their installation. The plasters allowed in the appendix have a history of successful use on cob and other earthen wall systems.

Non-plaster finishes systems are allowed with approved specifications that ensure: adequate attachment or support, the ability to safely discharge moisture, a minimum vapor permeance rating, and compliance with stated weight limits.

COB WALLS - GENERAL:

General limits are given for all cob buildings, including: one story; maximum building height of 25 feet; Seismic Design Categories A, B, and C (except with an approved engineered design); wall height and wall thickness limitations; and an approved engineered design for interior cob walls that addresses their seismic lateral loads (except in Seismic Design Category A).

A method of out-of-plane resistance is required for all walls, and wall height limits are given. Bond beams are required and described for all cob walls, as are lintels over door and window openings. Reinforcing at window and door openings is required for openings wider than 2 feet. Window openings are limited to 6 feet in width and horizontal and vertical reinforcing at window and door openings is required and described. A minimum cob wall length between openings is given and reinforcing required to ensure the wall's stability.

Moisture control requirements address potential moisture intrusion from rain or snow, or through capillary action from the ground and help ensure that moisture that might enter is not trapped. That protection includes limiting the use of membranes and barriers between the cob and plaster finishes. Limiting the use of membranes also enables a mechanical bond between the plaster and the cob.

A Class I or II vapor retarder is required between the bottom of the cob wall and the foundation to prevent ground moisture from rising into the wall, unless the particular project conditions and design eliminate this need. A minimum separation of the cob wall above finished grade is required. Protection of horizontal surfaces is required to prevent erosion and water intrusion.

Requirements for installing windows and doors are given so they are secure and prevent the passage of air or moisture through or into the wall.

In addition to inspections normally required, inspections specific to cob construction are required for the anchors connecting cob walls to the foundation and the bond beam, for required vertical or horizontal reinforcing in the walls, and for reinforcing in any concrete bond beams or lintels.

COB WALLS - STRUCTURAL:

Cob walls are a compression dominant wall system containing a micro-reinforcing system of straw throughout. Testing has shown this increases ductility compared to earthen materials with no straw. Cob can be reinforced with other standard reinforcing materials such as steel bar and welded wire mesh, making it akin to concrete construction in this respect. Cob wall systems using these reinforcing materials are included in the proposed appendix.



University and independent lab structural tests on cob have been conducted and documented since the 1990s. Testing this proposed code has used as the bases of its analysis include: In-Plane Reverse Cyclic Tests as well as small scale batch testing at Santa Clara University; Small Scale batch testing at the University of Plymouth (England); Federal Institute for Materials Research and Testing, Berlin, Germany; The University of Oregon; Wuhan University of Technology, China; the University of San Francisco; and the Washington State University. Shake table test results were also used from the University of Sydney (Australia), and the University of British Columbia (Canada).



This proposed code also drew on the following codes, standards and earthen engineering texts: ASTM E2392 Standard Guide for Design of Earthen Wall Building Systems; the engineered and prescriptive New Zealand Standard for Earth Buildings NZS4297-99; The New Mexico Earthen Building Materials Code; the prescriptive German Earthen Building Standard, DIN 4102; and earthen engineering texts such as Building with Earth: Design and Technology of a Sustainable Architecture, by Gernot Minke.

Gravity load-bearing values are based on project specific, required material tests. Lateral loads are limited to Seismic Design Categories (SDC) A, B, and C, with increased safety factors and decreased Response Modification Factors for SDC C. Gravity and earthquake effects of the cob weight itself have been generated assuming a material density of 110 pcf which is the upper limit of density for all tests assessed. A common density range of 80-105 pcf is expected in the field. Appropriate adjustment factors have been applied for other structural elements and connections contained in other parts of the IRC that may be uniquely affected by the increased dead load of cob walls, such as the roof diaphragm. A full report of the structural analysis that generated this proposed appendix is available at: <u>https://www.cobcode.org/cobcode-documents</u>

COB FLOORS:

Cob floors on grade, with or without straw, are permitted in cob buildings, but the specifications must be approved by the building official. There are numerous viable cob floor systems. The modern evolution and growing use of cob and other earthen floors in high-end custom homes is testament to their serviceability, aesthetic appeal, and low environmental impact.

FIRE RESISTANCE:

ASTM E119 Fire-Resistance Rating Equivalency for Monolithic Adobe (Cob) walls.

To establish the minimum 1-hour fire resistance rating for a 10" thick cob wall included in this appendix, extensive research was done into existing ratings in codes and standards, testing, and fire experience in earthen wall buildings. A technical equivalency evaluation was conducted by Reax Engineering, Inc., which is summarized below. In addition, it is worth noting that in Australia as in the western U.S., devastating wildfires, or bushfires as they are called in Australia, have been increasing in frequency and intensity. Because of a tradition of buildings with earthen walls in areas that have experienced the most intense bushfires, they have had the opportunity to observe how earthen walls perform in firestorms.



The Australian Standard AS 3959-2009, "Construction of buildings in bushfire-prone areas," was developed as a result. This standard lists "earth wall including mud brick" as one of only three external wall materials not needing additional testing even in the most extreme and vulnerable bushfire zones, BAL FZ (Bushfire Attack Level- Flame Zone). The standard stipulates that the exposed components of external walls shall be of non-combustible material at least 90mm (3.54 inches) thick. Along with earth walls, the other materials listed as acceptable without additional testing for external walls are full masonry and precast or in situ concrete. The minimum 10-inch thick 1-hour cob wall in this proposed appendix is almost three times as thick as the minimum

thickness of the earth wall accepted by that standard for the highest fire risk zones in Australia.

Additionally, the Australian Earth Building Handbook, HB195-2002, in Section 4.6 Fire Resistance Level, states, "In the absence of specific test data, the general fire resistance level (FRL) of earth walls satisfying the minimum thickness requirements outlined in Clause 4.3.4 may be taken as not greater than 120/120/120, or 90/90/90 where wall thickness is less than 200 mm." Clause 4.3.4 Structural Adequacy states: "Minimum recommended thicknesses for mud brick, stabilized pressed block and rammed earth are as follows: External walling - 200 mm, Internal walling - 125 mm. The minimum wall thickness for poured earth and cob wall construction is also recommended to be 200 mm, though in practice wall thickness will often exceed this value."

The three numbers in the FRL represent minutes before failure for structural adequacy/integrity/insulation. In other words the time for the wall to be able to maintain a load, maintain its integrity, and before heat increase on the unheated side of the wall exceeds accepted limits. Thus Australia gives a 2-hour fire resistance rating for a 200 mm (7.87") earth wall. This Standards Australia handbook is available via the supporting documents link above.

Summary of the Reax Engineering Inc. evaluation and analysis of historical tests and other relevant evidence to determine a fire-resistance rating equivalency for cob walls.

Code Requirement

IRC Section R302.1 Exterior Walls and Table R302.1(1) requires 1-hour fire-resistance rated walls to be tested in accordance with ASTM E119 or UL 263 with exposure from both sides. E119 fire-resistance ratings \geq 1 hour must include a one-minute hose stream test following the fire-resistance test.

Proposed Equivalency

ASTM E119 and equivalent international tests AS 1530 and EN 1363 on closely-related compressed earth block and adobe block walls, were used to demonstrate a minimum of 1-hour fire resistance of Monolithic Adobe (Cob) walls greater than or equal to 10 inches thick, including a significant factor of safety.

Rational Engineering Analysis of Proposed Equivalency

Reax Engineering Inc. evaluated results from standardized testing, published standards, and empirical evidence, to establish a conservative minimum value for the fire resistance of monolithic adobe (sand, straw and unfired clay in monolithic form). Data was from allied construction systems using the same sand, clay, straw materials in brick form (brick and monolithic walls of these materials are referred to collectively as "earthen walls").

The tests are described below and summarized in Table 1. All tests except test (c) (run to insulation failure) passed all parameters tested: loadbearing, integrity, insulation. Test (a) also included and passed a hose stream test. All wall specimen sizes were 10' x 10' or the close metric equivalent of 3.1 x 3.1 meters.

Test Descriptions

a. A test of a 10" thick, compressed earth block wall was conducted in 2013 in Texas to the ASTM E119 2hour load-bearing standard. Results for the test including the hose stream component are proprietary but a video is available at the following link: Urban Earth Fire Resistance Test (video)

b. A test of a 9.84" thick compressed earth block wall was conducted in 2011 in South Africa to a 1-hour

standard using an ISO 834 time/temperature curve identical to the ASTM E119 temperature curve. This test provided the basis for a 2-hour loadbearing fire-resistance rating for 9.84" thick compressed earth block wall.

c. A test of a 5.9" thick Cinva-ram earth block wall was conducted in Australia to insulation failure at 3 hrs 41 minutes, to the AS1530.4 standard. It was reported in the Commonwealth Scientific and Industrial Research Organization's (CSIRO) Bulletin 5: Earth Wall Construction, 1976. CISRO is an independent Australian federal government agency responsible for scientific research.

d. A test was conducted in Australia in 1982 to the AS1530.4-1975 4-hour standard, which is nearly identical to the ASTM E119 4-hour standard. The test provided a 4-hour loadbearing fire-resistance rating for a 9.8" thick adobe block wall. The test was stopped after 4 hours. Researchers extrapolated a 6 to 7-hour rating had the test continued, with heat rise on the unexposed face the predicted limiting factor.

e. A test of a 5.9" thick walls was conducted at the Laboratory for Structures and Fire Resistance at the University of Aveiro, Portugal, using ISO 834 time-temp curve and the European Standards for testing fire resistance (EN1363-1 and EN 1364-1). One wall tested soil stabilized with cement, and one tested soil stabilized with Kraft fibers.

Test	Material	Rating	Load	Hose	Thickness	Standard /
		(hours) / Test duration (hours)	Bearing	Stream	(In.)	Variation from E119
а	Compressed Earth Block	2.0 / 2.4	Y	Pass	10	ASTM E119 / no variation
b	Compressed Earth Block	2.0 / 2.4	Y	Not done	9.84	ISO 834 / Nearly identical to ASTM E119
С	Ram Earth Block	3.6 / 7.3	Y	Not done	5.9	AS 1530- 1975 / Based on ISO 834
d	Adobe Block	4.0 / 4.9	Y	Not done	9.8	AS 1530- 1975 / Based on ISO 834
е	Compressed Earth Block	2.0 / 4.1	N	Not done	5.9	EN 1363-1 w ISO 834 time temp curve to 120

Table 1. Summary of Testing

Several of these tests are on compressed earth block systems which lack the straw component of cob wall construction. Straw adds resistance to heat transfer thus decreasing the rate of surface temperature rise on the unexposed side. Straw in the wall will not combust due to lack of oxygen, and it will continue to offer its primary role in adobe of limiting crack propagation, a property expected to enhance a cob wall's resistance to thermally induced structural failure.

As a massive system, a monolithic adobe wall can absorb a significantly greater amount of heat when compared to a standard stuccoed wood-framed wall. For slow growing fires, this translates to less heat on the interior, and prolonged time to flashover with increased protection and time for escape.

Photos were reviewed of surviving earthen walls with completely incinerated wooden floor and roof structures in California and Australian firestorms. These show further evidence of the resistance of earthen wall systems to intense fire conditions.

Monolithic adobe is used to construct fireplaces, ovens, kilns, and forges, a testament to its ability to contain fire. It is favored for these applications over concrete, rock, and red brick, for its lesser tendency to crack or spall.

Comparison to Tests and Adopted Standards

The engineering judgment was checked against standards from two jurisdictions with prescribed fire-resistance ratings for earthen walls. The Pima County Approved Standard for Earthen IBC Structures, provides a 2-hour rating for a 10" thick wall. New Zealand's NZS 4297 Engineering Design of Earth Buildings provides a 2-hour rating for a 5.9" thick wall. Thus an engineering judgment of a 1-hour fire-resistance rating for a 10" thick monolithic adobe wall provides a 100% safety margin compared to these standards and as compared to four of the five described tests. A 1-hour rating provides a 300% safety margin compared with the Australian adobe block test that yielded a 4-hour rating.

Conclusion

All relevant evidence strongly supports the judgment that monolithic adobe (cob) walls constructed to a minimum thickness of 10 inches provide a conservative minimum fire-resistance rating of 1-hour.

Fire testing reports, related documents and the equivalency report are available at <u>https://www.cobcode.org/cobcode-documents</u>

THERMAL PERFORMANCE:

Cob walls are classified as mass walls in accordance with Section N1102.2.5 because the heat capacity of cob walls is greater than the 6 Btu/ft² x ^oF threshold defined in that section. The lowest heat capacity of a cob wall is 16 Btu/ft² x ^oF, for the required minimum wall thickness of 10" and at the lowest practical density of 70 pcf.

Cob's assigned unit R-value of 0.22 per inch with a density of 110 pcf was determined with an ASTM C1363 thermal resistance test at Intertek Laboratory in Fresno, CA in December 2018. The R-value of the wall assembly is determined by adding the thermal resistance of the air films and any finish or additional insulation.

Adding insulation to the face of cob walls can allow them to be used more readily in cold climates. This is allowed, providing the insulation assembly complies with the requirement in Section AU104.1 for attachment or

support, vapor permeance, and weight limits.

Bibliography: <u>The following documents relate to one or more categories in the code proposal as</u> <u>indicated: General (G), Structural (S), Fire (F).</u> Australian Earth Building Handbook, HB195-2002, Peter Walker, Standards Australia. G, S, F

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"Cob Property Analysis," G. Brunello, J. Espinoza, A. Golitz, Santa Clara University Department of Civil Engineering, 2018. *S*

Building With Earth: Design and Technology of Sustainable Architecture, Gernot Minke, 2006. G, S

"Transforming building regulatory systems to address climate change," David Eisenberg, Building Research and Information, 2016. *G*

Cost Impact: The code change proposal will not increase or decrease the cost of construction As a wall system cob can be more costly or less costly than conventional wall systems found in the IRC, depending on many variables. The materials for cob walls or clay soil (often from the site), sand, and straw are relatively inexpensive whereas the cob walls can be more labor intensive. Other elements or systems in the building such as the foundation, roof, electrical, plumbing and mechanical can be very similar to those used in conventional construction and therefore the same cost. As an overview this proposal will not affect the cost of construction.

Proposal # 4700

RB299-19

RB300-19

IRC®: Appendix (New), SECTION AU101 (New), AU101.1 (New), AU101.2 (New), SECTION AU102 (New), AU102.1 (New), AU102.1.1 (New), AU102.1.2 (New), AU102.1.3 (New), AU102.1.4 (New), AU102.1.5 (New), SECTION AU103 (New), AU103.1 (New), AU103.1.1 (New), AU103.1.2 (New), SECTION AU104 (New), AU104.1 (New), SECTION AU105 (New), AU105.1 (New), AU105.1.1 (New), AU105.1.2 (New), AU105.1.3 (New), AU105.1.4 (New), AU105.1.5 (New), SECTION AU106 (New), AU106.1 (New)

Proponent: Eirene Knott, representing Metropolitan Kansas City Chapter of the ICC (Eirene.Knott@brrarch.com); David Allen (davidallen89@att.net); Ron Olberding (ronolberding@sbcglobal.net)

2018 International Residential Code

Add new text as follows:

Appendix U Physical Security

SECTION AU101 General

AU101.1 Purpose. The purpose of this appendix is to establish minimum standards that incorporate physical security to make dwelling units resistant to unlawful entry.

AU101.2 Scope. The provisions of this appendix shall apply to all new structures and to additions and alterations made to existing buildings.

SECTION AU102 Doors

AU102.1 Doors. All exterior swinging doors of residential dwelling units and attached garages, including doors leading from the garage area into the dwelling unit, shall comply with Sections AU102.1.1 through AU102.1.5 based on the type of door installed. Exceptions: Vehicular access doors.

AU102.1.1 Wood doors. Exterior wood doors shall be of solid core construction such as high-density particleboard, solid wood, or wood block core with a minimum thickness of 1-3/4 inches (45 mm) at any point. Doors with panel inserts shall be solid wood with the insert being a minimum of 1-inch (25.4 mm) in thickness.

AU102.1.2 Steel doors. Exterior steel doors shall be a minimum thickness of 24 gauge and have reinforcement material at the location of the deadbolt.

AU102.1.3 Fiberglass doors. Fiberglass doors shall have a minimum skin thickness of one-sixteenth inch and have reinforcement material at the location of the deadbolt.

AU102.1.4 Double doors. The inactive leaf of an exterior double door shall be provided with flush bolts having an engagement of not less than 1-inch (25.4 mm) into the head and threshold of the door frame, or by other approved methods.

AU102.1.5 Sliding doors. Exterior sliding doors shall be installed to prevent the removal of the panels and the glazing from the exterior.

SECTION AU103 Door Frames

AU103.1 Door frames. The exterior door frames shall be installed prior to the rough-in inspection. Horizontal blocking shall be placed between studs at the door lock height for three stud spaces of equivalent bracing on each side of the door opening. Door frames shall comply with Sections AU103.1.1 through AU103.1.2 based on the type of door installed.

AU103.1.1 Wood frames. Wood frame doors shall be set in frame openings constructed of double studding or equivalent construction. Door frames, including those with sidelights, shall be reinforced in accordance with ASTM F476 Grade 40.

AU103.1.2 Steel frames. Steel door frames shall be constructed of 18 gauge or heavier steel and reinforced at the hinges and strikes. Doors are to be anchored to the wall in accordance with the manufacturer's instructions.

SECTION AU104 Door Jambs

AU104.1 Door jambs. Door jambs shall comply with one of the following:

- 1. Door jambs constructed as per ASTM F476.
- 2. Door stops on wooden jambs for in-swinging doors shall be of one-piece construction.

SECTION AU105 Door Hardware

AU105.1 Door hardware. Exterior door hardware shall comply with Sections AU105.1.1 through AU105.1.5.

AU105.1.1 Hinges. Hinges for exterior swinging doors shall comply with the following:

- 1. <u>At least two screws, 3 inches (76 mm) in length, penetrating at least 1-inch (25.4 mm) into the wall</u> <u>structure shall be used. Solid wood fillers or shims shall be used to eliminate any space between the wall</u> <u>structure and the door frame behind each hinge.</u>
- 2. <u>Hinges for out-swinging doors shall be equipped with mechanical interlock to prevent removal of the door</u> <u>from the exterior.</u>

AU105.1.2 Escutcheon plates. All exterior doors shall have escutcheon plates protecting the door's interior side.

AU105.1.3 Locks. Exterior doors shall be provided with a deadbolt with a minimum grade 2 as determined by ANSI/BHMA.

AU105.1.4 Entry vision and glazing. All main or front entry doors to dwelling units shall be arranged so that the occupant has a view of the area immediately outside the door without opening the door. The view may be provided by a door viewer having a field of view of not less than 180 degrees, through windows or through view ports.

AU105.1.5 Side light entry doors. Side light doors units shall have framing of double stud construction or equivalent construction that complies with Sections AU103.1.1 or AU103.1.2. Double stud construction or equivalent construction shall exist between the glazing unit of the side light and the wall structure of the dwelling.

SECTION AU106 Alternate Materials and Methods of Construction

AU106.1 Alternate materials and methods of construction. The provisions of this appendix are not intended to prevent the use of any material or method of construction not specifically prescribed by this appendix, provided any such alternate has been approved. Nor is it the intention of this section to exclude any sound method of structural design or analysis not specifically provided for in this appendix. The materials, method of construction and structural design limitations provided for in this appendix shall be used unless otherwise approved. Compliance with ASTM F476 will be deemed to be in compliance with this appendix.

Reason: In the summer of 1996, Overland Park, Kansas, experienced a series of home invasions resulting in the sexual assault of several women. For the victims of a home invasion, it's more than a property crime; it scares the victim into thinking that the criminal will return only to commit a more violent or heinous crime. To have an emotional investment in their residence is priceless.

As a result of these home invasions, the City's Police Department conducted hundreds of surveys of residents in an effort to develop a solution to the home invasions. The results of the surveys lead the City to develop a building code that makes home more safe and secure. You may ask, why secure the front door? What about installing an alarm? Communities across the country continue to report a growing increase in false alarms. In an effort to provide physical security to the homeowner, there needs to be a more reliable option available.

The longer a criminal spends trying to gain access to a home, the greater the risk of detection. In addition, most home invaders will not attempt to break a window, as that makes noise that neighbors could potentially hear. Rather than face these risks, the invader is more likely to try to kick in an exterior door, where they can easily gain access without being detected.

This code change will provide for minimal provisions to be made to a new home under construction that will give the homeowner safety and peace of mind, while delaying and frustrating the criminal. Since this proposal is not dependent on electrical power, these provisions will always be available to the homeowner and will require no further action after installation. There is no on-going cost to the homeowner and these provisions will not affect the overall aesthetics of the home.

Cost Impact: The code change proposal will increase the cost of construction The cost to secure a single door ranges from \$40-\$60 for a single door unit and between \$140 and \$180 for a double sidelite unit.

Staff Analysis: A review of the standards proposed for inclusion in the code, ASTM F476 and ANSI/BHMA, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 2, 2019.

Proposal # 4864

RB300-19

RB301-19

IRC: APPENDIX U(New)

Proponent: Deck Code Coalition, Charles Bajnai (chair), North American Deck and Railing Assoc (NADRA), representing Deck Code Coalition (csbajnai@gmail.com)

2018 International Residential Code

Add new text as follows:

APPENDIX U DECK GUARD DETAILS

SECTION AU101 GENERAL

AU101.1 Deck guards. Figures AU101.1(1) and AU101.1(2) are prescriptive options for deck guard, wood post connections to deck framing.



6 x2

POST CAN OCCUR

6 x2

3

FIGURE AU1 GUARD POST CONNECTIONS WITH COMMODITY FASTENERS

UA101.1(1) **GUARD POST CONNECTION WITH COMMODITY FASTENERS**

9

(4

3



FIGURE AU2 GUARD POST CONNECTIONS WITH TENSION DEVICES

AU2 GUARD POST CONNECTIONS WITH TENSION DEVICE

Reason: The Deck Code Coalition (DCC) proposes a new appendix to offer direction for constructing exterior guards on decks where the code is currently silent.

The members of the DCC recognize that there are many methods for constructing guards, and that the inclusion of a single detail within the body of the code may restrict creativity in the building community. However,

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there are many people building, specifying, and reviewing decks that are eager for guidance with the complicated connection that is required for connecting deck guard posts to deck framing. Providing a prescriptive detail in an appendix allows us to provide the guidance of an engineered solution that meets the intent of the code.

<u>Homeowners need these details.</u> Empirical evidence shows us that over fifty percent of the decks constructed in the country are built by the homeowners themselves. These details might not be the typical by professional, customized deck builders, but they will be infinitely valuable for the homeowner who has little or no construction knowledge, does not want to pay for design services and will build one deck in his/her lifetime. Without prescriptive details, they will either resort to friends, YouTube or other sources, such as DCA6, for guidance. They say, "just show me how you want it, and I will build it that way".

<u>Building officials need these details</u>. Short of having every deck design tested in a lab or sealed by an engineer, there is not a building official who knows if the guards pass muster. The hip check is not a proper testing method. These details are a minimum engineered design which they can look for if they have no other evidence of code compliance.

Cost Impact: The code change proposal will increase the cost of construction Two figures are offered. One figure offers generic, cheap fastening techniques of nails and bolts into blocking, the other figure uses proprietary fasteners for about \$20 per post (around \$140 for a 144 square foot deck using 7 guard posts).

On the other hand, a savings of time and money could be anticipated for the conscientious homeowner who might pay a professional designer to prepare his deck drawings.

Any extra cost has to be weighed against the increased safety and potential life savings that will occur across the country over many years.

Proposal # 4987

RB301-19

RB302-19

IRC®: Appendix (New), SECTION U101 (New), U101 (New), SECTION U102 (New), U102.1 (New), SECTION U103 (New), U103.1 (New), U103.2 (New), U103.3 (New), U103.4 (New), U103.5 (New), SECTION U104 (New), U104.1 (New), U104.2 (New), U104.3 (New), U104.4 (New), SECTION U105 (New), U105.1 (New), UL Chapter 44 (New)

Proponent: Jonathan Roberts, UL LLC, representing UL LLC (jonathan.roberts@ul.com)

2018 International Residential Code

Add new text as follows:

Appendix U 3D PRINTED BUILDING CONSTRUCTION

SECTION U101 General

U101 Scope. Buildings and structures fabricated in whole or in part using 3D printed construction techniques shall be designed, constructed and inspected in accordance with the provisions contained in this Appendix and other applicable requirements in this code.

SECTION U102 Definitions

U102.1 Definitions. The following words and terms shall, for the purposes of this appendix, have the meanings shown herein. Refer to Chapter 2 of this code for general definitions.

3D PRINTED BUILDING CONSTRUCTION. A process for fabricating buildings and structures from 3D model data using automated equipment that deposits construction material in a layer upon layer fashion.

ADDITIVE MANUFACTURING MATERIALS. Materials used by the 3D printer to produce the building structure or system components of the building.

PRODUCTION EQUIPMENT. The equipment, including 3D printer, its settings, nozzles and other accessories used in the fabrication process.

FABRICATION PROCESS. Preparation of the job site and construction material, and the deposition, curing, finishing, insertion of components and other methods used to build building elements such as walls, partitions, roof assemblies and structural components, and the means used to connect assemblies together.

SYSTEM COMPONENTS. Devices, equipment and appliances that are installed in the building elements as part of the wiring, plumbing, HVAC and other systems. These include, but are not limited to, electrical outlet boxes, conduit, wiring, piping, tubing, and HVAC ducts, each of which is covered by a product standard or Installation Code Requirement.

SECTION U103 Building Design

U103.1 Design organization. 3D printed buildings and structures shall be designed by an organization certified

in accordance with UL 3401 by an approved agency and approved by the building official based on this section.

U103.2 Engineered design. The plans included in the UL 3401 compliance report shall be used for determining compliance with the engineering design requirements in Section R301.1.3 of this code.

U103.3 Performance design. The requirements in Chapters 4 through 9 and Chapter 11 of this code shall be waived where the UL 3401 compliance report demonstrates that the 3D printed construction provides an equivalent level of performance as the prescriptive code requirements.

U103.4 Other Equipment and Systems. Where not covered by the UL 3401 compliance report, the following provisions of this code shall be used as a basis for determining compliance for the following equipment and systems:

- 1. Chimneys and fireplaces Part III, Chapter 10.
- 2. Energy efficiency Part IV.
- 3. Mechanical Part V.
- 4. <u>Fuel gas Part VI.</u>
- 5. Plumbing Part VII.
- 6. Electrical Part VIII.

U103.5 Ratings The building or structure ratings in the UL 3401 compliance report, including but not limited to fire-resistance, interior finish, roofing fire classification, insulation material R-value shall be suitable for the installation. The acceptability of material and system ratings not included in the compliance report shall be determined by the building official.

SECTION U104 BUILDING CONSTRUCTION

U104.1 Construction. 3D printed buildings and structures shall be constructed in accordance with this section.

U104.2 Construction method. The building construction method, consisting of the manufacturer's *production equipment* and *fabrication process* shall be in accordance with the UL 3401 compliance report. The unique identifier of the construction method used shall match the identifier in the UL 3401 compliance report.

U104.3 Additive manufacturing materials. Only the listed additive manufacturing materials identified in the UL 3401 compliance report shall be used to fabricate the building structure or system components. Containers of the additive manufacturing materials shall be labeled.

U104.4 Depositing of manufacturing materials. Manufacturing materials shall only be deposited where ambient temperature and environmental conditions at the job site are within limits specified in the UL 3401 compliance report. The maximum number of layers permitted, specified curing time and any surface preparation or finishing shall be performed as specified in the UL 3401 compliance report.

SECTION U105 Special Inspections

U105.1 Initial inspection An initial inspection of the production equipment, including 3D printer, and the fabrication process shall be performed after the production equipment is located onsite and before building fabrication has begun. The inspection shall be conducted by representatives of the organization that evaluated the fabrication process for compliance with UL 3401. The inspection shall verify that the fabrications process, including production equipment, 3D printing parameters and construction materials are in accordance with the UL 3401 compliance report, and proprietary information in the UL 3401 detailed report of findings.

Exception: Where approved by the building official, inspections of the production equipment, including 3D

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printer, and the fabrication process used in a single housing tract shall be conducted on the first building to be constructed, and on a selected number of subsequent buildings, where the same equipment, equipment operators and fabrication process are used on all buildings. The number of inspections to be performed shall be determined by the building official.

Add new standard(s) as follows:

UL

UL LLC 333 Pfingsten Road Northbrook IL 60062

UL 3401 -19: Outline of Investigation for 3D Printed Building Construction

Reason: 3D building construction has moved from a conceptual stage to reality, and projects are being proposed in an increasing number of jurisdictions. Unfortunately the prescriptive design and construction requirements in the IRC are not applicable to 3D printed fabrication techniques, so code officials have to approve this construction based on limited equivalency evaluations that may not take into account variations in material properties introduced by the 3D printing process, or variances in the physical characteristics of the construction materials used.

The UL 3401 Outline of Investigation for 3D Printed Building Construction was developed to evaluate critical aspects of this construction process, and level the playing field so that 3D printed building techniques comply with an equivalent level of safety and performance as legacy construction techniques currently in the code.

This proposal introduces an Appendix U, which is not mandatory unless specifically referenced in an adopting ordinance. The Appendix includes definitions, and requirements for 3D printed building design, construction and special inspections, which rely on the design being evaluated in advance by an approved agency for compliance with UL 3401. The resulting compliance report includes the information needed by the contractor and code official to verify compliance with applicable code requirements, and to verify that the 3D printing process and materials used on site are the same as those used during the UL 3401 evaluation and testing. The special inspection requirements are necessary because the portions of the fabrication process such as 3D printer settings, deposition rates and thickness, and curing processes, require special expertise to evaluate, especially when they include proprietary formulations, equipment and settings.

A companion proposal introduces revisions to R301.1.1 that also references UL 3401 and 3D printed building construction. These two proposals will work together, but each also stands on its own.

Cost Impact: The code change proposal will not increase or decrease the cost of construction The proposal will not increase the cost of construction because it covers a construction technique that is not currently addressed in the code.

Proposal # 4836

RB302-19